**Ship Energy Efficiency**

**Management Plan (SEEMP)**

|  |
| --- |
| **(Part Ⅱ - Ship Fuel Oil Consumption Data Collection Plan)** |
| (\*\*\* Shipping ) |

|  |  |
| --- | --- |
| Name of vessel |  |
| IMO NO. |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Ver. No | Date | History | Remark |
|  |  |  |  |

**Contents**

[1. Introduction 4](#_Toc201912068)

[**1.1** **Background** 4](#_Toc201912069)

[**1.2** **Purpose** 4](#_Toc201912070)

[**1.3** **Implementation** 4](#_Toc201912071)

[**1.4** **Definition** 5](#_Toc201912072)

[**1.5** **Relation between SEEMP Part I, Part II and Part III** 7](#_Toc201912073)

[**1.6** **Fuel Consumption Data Collection Process** 8](#_Toc201912074)

 [8](#_Toc201912075)

[2. Ship fuel oil consumption data collection 9](#_Toc201912076)

[**2.1 Ship particulars** 9](#_Toc201912077)

[**2.2 Fuel oil consumers and fuel oil type used** 10](#_Toc201912078)

[**2.3 Emission factor** 11](#_Toc201912079)

[**2.4** **Method to measure Annual toal fuel oil consumption** 11](#_Toc201912080)

[**2.5 Fuel oil consumption per consumer type** 17](#_Toc201912081)

[**2.6 Method to measure distance travelled including laden distance** 20](#_Toc201912082)

[**2.7 Method to measure hours underway** 21](#_Toc201912083)

[**2.8 Method to measure total amount of onshore power supplied** 21](#_Toc201912084)

[**2.9 Method to measure total transport work** 22](#_Toc201912085)

[**2.10 Procedure that will be used to report the data to the Administration** 22](#_Toc201912086)

[**2.11 Data quality** 23](#_Toc201912087)

[**2.12 Direct CO2 Emissions Measurement** 26](#_Toc201912088)

1. **Introduction**
	1. **Background**

With growing concerns of Environment, the International Maritime Organization (IMO), the main regulatory body for shipping, has developed technical and operational measures below in order to regulate shipping energy efficiency and thereby control the marine GHG emissions.

* Energy Efficiency Design Index (EEDI)
* Energ Efficiency Existing Ship Index (EEXI)
* Energy Efficiency Operational Index (EEOI)
* Ship Energy Efficiency Management Plan Part I & Part II & Part III(SEEMP)

SEEMP Part II (Ship Fuel Oil Consumption Data Collection System) applies to ships in the case of 5,000 gross tonnage and above. The SEEMP shall be amended to include data collection systems by 31 December 2018 as a result of the MEPC 70th session, and each ship shall comply with the methodology specified in the SEEMP part II from 1st January, 2019.

* 1. **Purpose**

This plan is designed to participate and implement the Ship Fuel Oil Consumption Data Collection System, which will be enforced by International Maritime Organization from 2019, in order to improve the efficiency of the energy used in the activities of the ship, to reduce costs, to reduce GHG (Green House Gas) emissions and to protect the natural environment. Also, this plan provides for the construction of a standard ship fuel consumption collection plan, which not only allows the workplace to prepare for the IMO international conventions, but also enables users to operate the best way of ship energy efficiency.

* 1. **Implementation**

For the implementation of SEEMP, in general, shipping companies need to organize two groups: A Company Management Team and an Onboard Management Team.

Firstly, the Company Management Team will be responsible for developing the plan; assessing the appropriate measures to be introduced within the fleet; collecting the information from the fleet; and monitoring and assessing the effectiveness of those implemented measures.

Secondly, the Onboard Management Team, ship’s crews, will be involved in applying selected energy saving measures into practice. In order to implement the SEEMP effectively, crew familiarization will be essential and, the burden of the crews should be kept to a minimum.

This plan should be written in the common language of the crew. If it is not English, French or Spanish, the plan must be translated into one of these languages.

* 1. **Definition**
1. Ship fuel oil consumption data

Ship fuel oil consumption data means the data required to be collected in annual basis and reported as specified in appendix IX to MARPOL Annex VI.

1. Safety management system

Safety management system means a structured and documented system enabling company personnel to implement effectively the company safety and environmental protection policy as defined in paragraph 1.1 The International Safety Management Code.

1. Fuel oil

Fuel oil means any fuel delivered to and intended for combustion purposes for propulsion or operation on board a ship, including gas, distillate and residual fuels.

1. Emission

Emission means any release of substances, subject to control by MARPOL Annex VI, from ships into the atmosphere or sea.

1. Conversion factor

Conversion Factor(Cf) means non-dimensional conversion factor between fuel oil consumption and CO2 emission.

1. Voyage

Voyage means the period between a departure from a port to the departure from the next port. Alternative definitions of a voyage could also be acceptable.

1. Company

Company means the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the owner of the ship and who on assuming such responsibility has agreed to take over all the duties and responsibilities imposed by the International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention, as amended.

1. Calendar Year

Calendar year means the period from 1st January until 31st December of a year.

1. Hours underway

Hours underway means the duration while the ship is under way.

1. Distance Travelled

Distance travelled means a distance travelled over ground in nautical miles(should be recorded in log-book).

1. Consumer Type

Consumer Type means a type of engine or set of engines, fired boiler, fuel cell or others used for the same purpose).

* 1. **Relation between SEEMP Part I, Part II and Part III**

The SEEMP is consist of two parts. Part I provides a possible approach for monitoring ship and fleet efficiency performance over time and some options to be considered to optimize the performance of the ship. Part II provides the methodologies for ships of 5,000 gross tonnage and above about collecting the required data pursuant to regulation 26.2 of MARPOL Annex VI and reporting the data to the ship’s Administration or any Organization duly authorized by it. Ultimately, GHG emissions can be calculated through Part II, and since this series of activities is closely related to the energy efficiency activities of Part I, it is essential to carry out activities to improve energy efficiency of Part I. SEEMP Part II shall include a description of the methodology at will be used to collect the data required by regulation Reg. 27.1 of MARPOL Annex VI.

* 1. **Fuel Consumption Data Collection Process**

1. **Ship fuel oil consumption data collection**
	1. **Ship particulars**

|  |  |
| --- | --- |
| Name of ship |  |
| IMO number |  |
| Company |  |
| Flag |  |
| Year of delivery |  |
| Ship type |  |
| Gross tonnage |  |
| NT |  |
| DWT***\**** |  |
| EEDI (if applicable) |  |
| EEXI (if applicable) |  |
| Ice class |  |

***\**** DWT means the difference in tonnes between the displacement of a ship in water of relative density of 1,025 kg/m3 at the summer load draught and the lightweight of the ship. The summer load draught should be taken as the maximum summer draught as certified in the stability booklet approved by the Administration or an Organization recognized by it.

* 1. **Fuel oil consumers and fuel oil type used**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Fuel oil consumers | Type/Model | Quantity | Power | Fuel oil types |
| 1 | Main engine  |  |  |  |  |
| 2 | Auxiliary engine  |  |  |  |  |
| 3 | Fired boiler  |  |  |  |  |
| 4 | Inert gas generator |  |  |  |  |
| 5 | Others( ) |  |  |  |  |
| 6 |  |  |  |  |  |
| 7 |  |  |  |  |  |

* 1. **Emission factor**

CF is a non-dimensional conversion factor between fuel oil consumption and CO2 emission in the 2018 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships (resolution MEPC.308(73)), as amended. The total annual amount of CO2 is calculated by multiplying annual fuel oil consumption and CF for the type of fuel.

|  |  |
| --- | --- |
| Fuel oil Type | CF (t-CO2 / t-Fuel)  |
| Diesel/Gas oil (e.g. ISO 8217 grades DMX through DMB)  | 3.206  |
| Light fuel oil (LFO) (e.g. ISO 8217 grades RMA through RMD) | 3.151 |
| Heavy fuel oil (HFO) (e.g. ISO 8217 grades RME through RMK) | 3.114  |
| Liquefied petroleum gas (LPG) (Propane) | 3.000  |
| Liquefied petroleum gas (LPG) (Butane)  | 3.030  |
| Liquefied natural gas (LNG)  | 2.750  |
| Methanol  | 1.375  |
| Ethanol  | 1.913  |
| Other (………)  |  |

***\* Conversion factor CF***

If fuels are used that do not fall into one of the above categories, fuel supplier should provide a *CF*-factor for the respective product supported by documentary evidence. (e.g. some "hybrid fuels", “non-fossil fuels”)

* 1. **Method to measure Annual toal fuel oil consumption**

Fuel oil consumption should include all the fuel oil consumed on board including but not limited to the fuel oil consumed by the main engines, auxiliary engines, gas turbines, fired boilers and inert gas generator, for each type of fuel oil consumed, regardless of whether a ship is underway or not. Except for the case of using mass flow meter, when using the annual fuel oil consumption measurement method, the density should be obtained by one of the following methods to calculate Volume Correction Factor and Weight Correction Factor for converting the measured fuel oil consumption value into metric tonnes units.

1. On-board measurement systems
2. Fuel invoice or BDN from fuel supplier at bunkering port
3. Laboratory test

Methods for collecting data on annual fuel oil consumption include as below (in no particular order):

|  |  |
| --- | --- |
| Method | Description |
| A | * Method using bunker delivery notes (BDNs)
 |
| B | * Method using flow meters
 |
| C | * Method using fuel oil tank monitoring
 |
| D | * Method using LNG cargo tank monitoring on board
 |
| E | * Method using cargo tank monitoring on board for ships using cargo other than LNG as a fuel
 |

|  |  |  |
| --- | --- | --- |
|  | Fuel oil type | Method to measure |
| 1 | Diesel/Gas Oil | Choose A / B / C / D / E |
| 2 | LFO | Choose A / B / C / D / E |
| 3 | HFO | Choose A / B / C / D / E |
| 4 | LPG(Propane) | Choose A / B / C / D / E |
| 5 | LPG(Butane) | Choose A / B / C / D / E |
| 6 | Ethan | Choose A / B / C / D / E |
| 7 | LNG | Choose A / B / C / D / E |
| 10 | Methanol | Choose A / B / C / D / E |
| 11 | Ethanol | Choose A / B / C / D / E |
| 12 | Other(…….)(Cf:……) | Choose A / B / C / D / E |

1. Method “A” : using bunker delivery notes(BDNs)

This method determines the annual total amount of fuel oil used based on BDNs, which are required for fuel oil for combustion purposes delivered to and used on board a ship in accordance with regulation 18 of MARPOL Annex VI. Annual fuel oil consumption(Q) would be calculated as follows

**Q = T1 + R - S - T2**

Q = Annual fuel oil consumption

T1 = Amount of remaining tank oil at the beginning of the year

R = Total amount of bunkering for calendar year

S = Total amount of fuel oil offloaded for calendar year

T2 = Amount of remaining tank oil at the end of the year

Fuel oil tank readings should be carried out by appropriate methods such as automated systems (remote reading), soundings and dip tapes. Details of the equipment is as follows;

|  |  |  |
| --- | --- | --- |
| Equipment | Applied to | Details |
| e.g.) sounding tape | e.g.) emission sources, tanks | e.g.) Measurement equipment specification, maintenance intervals |
|  |  |  |
|  |  |  |

The amount of any fuel oil loaded or offloaded should be based on the records of the ship's oil record book. Any supplemental data used for closing identified difference in bunker quantity should be supported with documentary evidence.

In case of a voyage that extends across the data reporting period, the tank reading should occur by tank monitoring at the ports of departure and arrival of the voyage and by statistical methods such as rolling average using voyage days. The Bunker Delivery Note(BDN) is to include at least the following information in accordance with MAROL Annex VI Appendix 5.

* Name and IMO number of receiving ship
* Port of bunkering
* Date of commencement of delivery
* Name, address and telephone number of fuel oil supplier
* Delivered product name
* Quantity in metric tons
* Density at 15ºC
* Sulfur content, %m/m

Based on the quantities in metric tons above, the total annual amount of oil supply and demand can be calculated.

1. Method “B” : using flow meters

This method determines the total annual amount of fuel oil consumption by measuring fuel oil flows on board with flow meters. Annual fuel oil consumption may be the sum of daily fuel oil consumption data of all relevant fuel oil consuming processes on board measured by flow meters. The flow meters applied to monitoring should be located so as to measure all fuel oil consumption on board and should be identified in this plan. In case of flow meter malfunction, manual tank readings or other alternative methods shall be conducted instead. It should not be necessary to correct this fuel oil measurement method for sludge if the flow meter is installed after the daily tank as sludge will be removed from the fuel oil prior to the daily tank.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Flow meters | Location | Type/Model | Fuel consumer | Fuel oil type |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |

<Information of flow meters>

|  |  |  |  |
| --- | --- | --- | --- |
|  | Fuel consumer | Fuel oil types | Method to measure |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

< Alternative method in case for consumer not monitored with a flow meter >

1. Method “C” : using fuel oil tank monitoring

This method determines the total annual fuel oil consumption by measuring the remaining amount of the fuel oil tank through indirect reading using an automation systems(remote reading) or direct reading using the sounding tape/dip tape. The total annual consumption is calculated by summing up the measured daily fuel consumption. The measurement of the remaining amount of the tank is normally carried out daily and every time the ship is receiving or discharging fuel oil. A summary of the measurement data, including a record of the measured fuel consumption, shall be provided on board. When a fuel oil purifier is installed, the amount of sludge generated can be reduced from fuel oil consumption.

* When using automated measuring equipment

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Equipment | Location | Type | Emission source | Fuel types used |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |

<Information of measuring equipment>

* When using the Sounding tape/Dip tape

|  |  |  |
| --- | --- | --- |
| Equipment | Applied to | Details |
| e.g.) sounding tape | e.g.) emission sources, tanks | e.g.) Measurement equipment specification, maintenance intervals |
|  |  |  |
|  |  |  |

1. Method “D” : using LNG cargo thank monitoring on board

LNG carriers monitor/record the cargo volume in their tanks using the Custody Transfer Monitoring System (CTMS). When calculating the usage,

1. Since the temperature of methane when transported is at its boiling point, while other heavy hydrocarbons have higher boiling points and remain in a liquid state, the volumetric LNG usage is converted to mass using the density of methane, 422 kg/m3.
2. Since the mass content of nitrogen does not contribute to CO2 emissions, it is deducted from the LNG usage when sailing full (laden voyage).

|  |  |  |
| --- | --- | --- |
| Equipment | Applied to | Details |
| e.g.) CTMS | e.g.) tanks | e.g.) Measurement equipment specification, maintenance intervals |
|  |  |  |
|  |  |  |

1. Method “E” : Method “E” : using cargo tank monitoring on board for ships using cargo other than LNG as a fuel
2. When using cargo as fuel to determine annual fuel usage, use the daily fuel oil usage measured by tank reading conducted by the method below.

|  |  |  |
| --- | --- | --- |
| Equipment | Applied to | Details |
| e.g) Cargo tank monitoring device | e.g.) emission sources, tanks | e.g.) Measurement equipment specification, maintenance intervals |
|  |  |  |
|  |  |  |

1. Tank readings are generally conducted daily while the vessel is at sea and whenever the vessel is loading or unloading cargo. A summary of monitoring data, including fuel usage records, is prepared and maintained on board.

**2.5 Fuel oil consumption per consumer type**

Fuel oil consumption should include all the fuel oil consumed on board including but not limited to the fuel oil consumed by the main engines, auxiliary engines, gas turbines, fired boilers and inert gas generator, for each type of fuel oil consumed, regardless of whether a ship is underway or not. Except for the case of using mass flow meter, when using the annual fuel oil consumption measurement method, the density should be obtained by one of the following methods to calculate Volume Correction Factor and Weight Correction Factor for converting the measured fuel oil consumption value into metric tonnes units.

1. On-board measurement systems
2. Fuel invoice or BDN from fuel supplier at bunkering port
3. Laboratory test

The applied methods for measurement for each consumer type of this ship are given below(in no particular order):

|  |  |
| --- | --- |
| Method | Description |
| A’ | * Method using flow meters
 |
| B’ | * Method using fuel oil tank monitoring
 |
| C’ | * Method using subtraction
 |
| D’ | * Method using estimated fuel oil consumption
 |

|  |  |  |
| --- | --- | --- |
|  | Fuel consumer | Method to measure |
| 1 | Main engine | Choose A’ / B’ / C’ / D’ |
| 2 | Auxiliary engine | Choose A’ / B’ / C’ / D’ |
| 3 | Fired boiler | Choose A’ / B’ / C’ / D’ |
| 4 | Inert gas generator | Choose A’ / B’ / C’ / D’ |
| 5 | Others( )  | Choose A’ / B’ / C’ / D’ |
| 6 |  |  |

1. Method “A’” : using flow meters

This method determines the total annual amount of fuel oil consumption by measuring fuel oil flows on board with flow meters. Annual fuel oil consumption may be the sum of daily fuel oil consumption data of all relevant fuel oil consuming processes on board measured by flow meters. The flow meters applied to monitoring should be located so as to measure all fuel oil consumption on board and should be identified in this plan. In case of flow meter malfunction, manual tank readings or other alternative methods shall be conducted instead. It should not be necessary to correct this fuel oil measurement method for sludge if the flow meter is installed after the daily tank as sludge will be removed from the fuel oil prior to the daily tank.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Flow meters | Location | Type/Model | Fuel consumer | Fuel oil type |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |

<Information of flow meters>

|  |  |  |  |
| --- | --- | --- | --- |
|  | Fuel consumer | Fuel oil types | Method to measure |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

<Alternative method in case for consumer not monitored with a flow meter >

1. Method “B’” : using fuel oil tank monitoring

This method determines the total annual fuel oil consumption by measuring the remaining amount of the fuel oil tank through indirect reading using an automation systems(remote reading) or directly measuring the tank using a sounding tape/dip tape. The total annual consumption is calculated by summing up the measured daily fuel consumption. The measurement of the remaining amount of the tank is normally carried out daily and every time the ship is receiving or discharging fuel oil. A summary of the measurement data, including a record of the measured fuel consumption, shall be provided on board. When a fuel oil purifier is installed, the amount of sludge generated can be reduced from fuel oil consumption.

* When using automated measuring equipment

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Equipment | Location | Type | Emission source | Fuel types used |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |

<Information of measuring equipment>

* When using the Sounding tape/Dip tape

|  |  |  |
| --- | --- | --- |
| Equipment | Applied to | Details |
| e.g.) sounding tape | e.g.) emission sources, tanks | e.g.) Measurement equipment specification, maintenance intervals |
|  |  |  |
|  |  |  |

<Information of the Sounding tape or dip tape>

1. Method “C’” : using subtraction

If the fuel consumption for only one of the consumer types is not available, the fuel consumption of this consumer type may be derived by subtracting the fuel consumption of the other consumer types from the total annual fuel oil consumption measured in accordance with 2.3.

1. Method “D’” : using estimated fuel oil consumption

Alternative method to the satisfaction of administration or RO may be used to estimate the annual fuel oil consumption of the consumer type, based for example on manufacturer data or actual historic fuel consumption for a specified period.

**2.6** **Method to measure distance travelled including laden distance**

1. Distance travelled over ground in nautical miles should be recorded in the log-book in accordance with SOLAS regulation V/28.13
2. Under way is defined as the period between full ahead on passage (FAOP) and end of sea passage (EOSP) as per the guidelines for setting up a maritime single window (FAL.5/Circ.42/Rev.3). Full ahead on passage is more commonly referred to in performance monitoring systems as begin of sea passage, which is also defined in the IMO Compendium on Facilitation and Electronic Business (IMO Compendium) under IMO 0597 (Code EV10). "Not under way" is therefore the period between end of sea passage and full ahead on passage.
3. The canal passage, that is the period between begin canal passage (EV08) and end canal passage (EV09) which are also defined in the IMO Compendium under IMO 0597 should be considered not under way due to frequent manoeuvring, acceleration and deceleration.
4. The distance travelled while the ship is under way should be included into the aggregated data of distance travelled for the calendar year.
5. The laden distance refers to the distance traveled by a vessel while loaded with cargo, and the corresponding travel distance is added up over a calendar year.
6. When the distance travelled is measured using a satellite data, the devices used are as below.

|  |  |  |  |
| --- | --- | --- | --- |
| Device | Location | Type/Model | Alternative method |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |

**2.7** **Method to measure hours underway**

1. Hours under way should be an aggregated duration while the ship is under way under.
2. The definition of "under way" applies according to 2.5.2.
3. The hours underway should be recorded in the log-book.

**2.8 Method to measure total amount of onshore power supplied**

Total amount of onshore power supplied should be calculated as the sum of amount of onshore power supplied in kWh. The amount of onshore power supplied should be recorded based on relevant document by power supplier.

**2.9 Method to measure total transport work**

Total transport work is the annual sum of the transport work of each voyage multiplied by the distance traveled and the cargo carried during the voyage. The relevant transport work indicators per vessel types are given in the table below.

|  |  |
| --- | --- |
| Ship type | Transport work metric |
| Bulk carriers, tankers, combination carriers, gas carriers, LNG carriers, general cargo ships, ro-ro cargo ships(vehicle carriers), ro-ro cargo ships | $$\sum\_{v}^{}(cargo\\_mass\_{v} ×distance\_{v})$$ |
| containerships | $$\sum\_{v}^{}\left(\left(cargo\\_mass\_{v}+Container\\_mass\_{v}\right)×distance\_{v}\right)$$and$$\sum\_{v}^{}(No\\_of\\_TEU\_{v} ×distance\_{v})$$ |
| Cruise passenger ships | $$\sum\_{v}^{}(No\\_of\\_passengers\_{v} ×distance\_{v})$$ |
| Ro-ro passenger ships | $$\sum\_{v}^{}(No\\_of\\_passengers\_{v} ×distance\_{v})$$and$$\sum\_{v}^{}(cargomass\_{v} ×distance\_{v})$$ |

**2.10 Procedure that will be used to report the data to the Administration**

1. The Master is responsible for reporting the data collected from ship to the company management team.
2. The collected data shall be reported in company with the Abstract-LOG(AB-LOG) when the voyage is finished, or it shall be reported collectively after the end of the calendar year to the company management team, and the documentary evidence for verification of the data should be reported together.
3. Within three months after the end of each calendar year, the company management team shall report the aggregated value of each data specified in appendix I to its Administration by a standardized format which will be developed by the organization.
4. In the event of the transfer of a ship from one Administration to another, the company management team shall on the day of completion of the transfer or as close as practical thereto report to the losing Administration, the aggregated datum for the period of the calendar year corresponding to that Administration, as specified in appendix I and, upon prior request of that Administration, the disaggregated data.
5. In the event of a change from one Company to another, the company management team before change shall on the day of completion of the change or as close as practical thereto report to its Administration, the aggregated data for the portion of the calendar year corresponding to the Company, as specified in appendix I and, upon request of its Administration, the disaggregated data.
6. In the event of change from one Administration to another and from one Company to another concurrently, paragraph 4 and 5 of MARPOL Annex VI Reg. 27 shall apply.

**2.11** **Data quality**

Refer to the following procedure as a measure of controlling data quality.

1. Measurement of fuel oil consumption
2. When using method “A”(method of using bunker delivery notes)
3. The tank reading should be carried out at the beginning and the end of the bunkering.
4. The sounding tape to be used is of sufficient length for the height of the tank to be gauged and markings are to be visible. It is not to be kinked or spliced.
5. During a bunkering, even keel should be kept as possible.
6. If fuel oil supplied and actual received differs by more than OO%, process according to the procedure and maintain related records.
7. BDNs are required to be retained on board for three years after the fuel oil has been delivered.
8. In the event of a data gap due to unexpected conditions, the performance manager (shore) communicates its existence to the Chief Engineer who fills the gap once arrival established using the average of the ROB difference between arrival and departure ROBs. He then records the value as an error to the engine log book and communicates this to the Performance Manager (shore).
9. When using method “B”(method of using flow meters)
10. Flow meters shall be periodically calibrated by a specialist at intervals not exceeding OO months.
11. Calibration and maintenance records of the flow meters shall be available on board and shall be kept for a minimum of OO months.
12. The standard error range of the flow meters shall be within O%.
13. In ​​case of failure of the flowmeter, it is possible to replace it by using historical log records in the log-book.
14. When the related data is missing, the Chief Engineer requests to perform as soon as possible tank sounding in order to close the gap. In the case where the missing data is not immediately identified then the responsible Superintended closes the gap manually by using the average fuel consumption of the previous and the next day.
15. When using method “C”(method of using measurement for fuel oil tank)
16. The sounding tape or dip tape to be used is of sufficient length for the height of the tank to be gauged and markings are to be visible. It is not to be kinked or spliced.
17. Measures shall be taken to ensure the validity of the measurements in case of heavy weather.
18. When using method “D” (method of using LNG cargo thank monitoring on board)
19. The Custody Transfer Monitoring System(CTMS) shall be periodically calibrated by a specialist at intervals not exceeding OO months.
20. The standard error range of the CTMS shall be within O%.
21. Calibration and maintenance records of the CTMS shall be available on board and shall be kept for a minimum of OO months.
22. In case of failure of the CTMS, it is possible to replace it by using historical log records in the log-book.
23. When using method “D” (method of using cargo tank monitoring on board for ships using cargo other than LNG as a fuel)
24. The tank monitoring device shall be periodically calibrated by a specialist at intervals not exceeding OO months.
25. The standard error range of the tank monitoring device shall be within O%.
26. Calibration and maintenance records of the tank monitoring device shall be available on board and shall be kept for a minimum of OO months.
27. In case of failure of the tank monitoring device, it is possible to replace it by using historical log records in the log-book.
28. Measurement of distance travelled
29. The distance travelled may be calculated by the two (2) Electronic Chart Display and Information System (ECDIS) which are installed on board per vessel and connected with the two (2) GPS apparatus. The Master reports distance travelled through the daily messages (departure/noon/arrival) and records distance travel on the Log Book.
30. In the event of a data gap related to distance traveled, while using an automated/electronic chart navigation system, the master shall fill the gap by means of back-up methods such as terrestrial or celestial navigation being documented in the Deck Log Book.
31. Measurement of hours underway
32. The Master reports the time as per the GPS indications (or the Master Clock(s) / local time zone or GMT) in the Deck Log Book and in the Daily Noon Reports, Arrival and Departure. Time spent at sea is calculated at the end of each voyage and recorded in the voyaged documents.
33. In the event of a data gap related to time spent at sea, the responsible Operator must immediately communicate with the Master and raise the existence of it and close it using the data from the Statement of Facts documents. The data gap shall be filled by using the average of the time difference in hours between Arrival and Departure.
34. The data gap shall be filled by using the average of the time difference in hours between Arrival and Departure.

**2.12** **Direct CO2 Emissions Measurement**

Direct CO2 emission measurement is not required by regulation 27 of MARPOL Annex VI, but if direct CO2 emission measurement is used, it should be as follows

1. This method is based on the determination of CO2 emission flows in exhaust gas stacks by multiplying the CO2 concentration of the exhaust gas with the exhaust gas flow. In case of the absence or/and breakdown of direct CO2 emissions measurement equipment, manual tank readings will be conducted instead.
2. The direct CO2 emissions measurement equipment applied to monitoring is located exhaustively so as to measure all CO2 emissions in the ship.
3. The measurement device shall be periodically calibrated by a specialist at intervals not exceeding OO months
4. The standard error range of the measurement device shall be within O%.
5. Calibration and maintenance records of the measurement device shall be available on board and shall be kept for a minimum of OO months.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device | Location | Model/Type | Fuel Consumer | Fuel oil used |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |

<Information of CO2 measurement device>

**APPENDIX I**

**STANDARDIZED DATA REPORTING FORMAT FOR THE DATA COLLECTION SYSTEM AND OPERATIONAL CARBON INTENSITY TO THE ADMINISTRATION**

|  |
| --- |
| **Identity of the ship** |
| Name of the ship |  |
| Company |  |
| Flag |  |
| IMO number |  |
| Period of the calendar year for which the data is submitted |
| Start date for DCS(dd/mm/yy) |  |
| End date for DCS(dd/mm/yy) |  |

|  |
| --- |
| **Technical characteristics of the ship** |
| Year of delivery |  |
| Ships type, as defined in regulation 2.2 of MARPOL Annex VI or other (to be stated) |  |
| Gross tonnage (GT) |  |
| Net tonnage (NT) |  |
| Deadweight tonnage(DWT) |  |
| Power output (rated power) over 130 (kW) | Main Propulsion Power |  |
| Auxiliary Engine(s) |  |
| Attained EEDI (if applicable) |  |  |
| Attained EEXI (if applicable) |  |  |
| Ice class (if applicable) |  |  |

|  |
| --- |
| **Fuel oil[[1]](#footnote-1) consumption data** |
| **Total fuel oil consumption data** |
| Fuel oil type | Quantity in metric tonnes (t) | Method(s) used for collecting fuel oil consumption data (BDN / Flow meters / bunker FO tank monitoring / LNG cargo tank monitoring / Cargo tank monitoring other than LNG) |
| Diesel/Gas Oil (Cf: 3.206) |  |  |
| LFO (Cf: 3.151) |  |  |
| HFO (Cf: 3.114) |  |  |
| LPG (Propane) (Cf: 3.000) |  |  |
| LPG (Butane) (Cf: 3.030) |  |  |
| Ethan (Cf: 2.927) |  |  |
| LNG (Cf: 2.750) |  |  |
| Methanol (Cf: 1.375) |  |  |
| Ethanol (Cf: 1.913) |  |  |
| Other (……….) (Cf ;..) |  |  |
| **Total fuel oil consumption data per consumer type** |
| Fuel oil type | Consumer type | Quantity in metric tonnes (t) | Method(s) used for collecting fuel oil consumption data ( Flow meters / bunker FO tank monitoring / subtraction / estimated ) |
| Diesel/Gas Oil (Cf: 3.206) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| LFO (Cf: 3.151) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| HFO (Cf: 3.114) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| LPG (Propane) (Cf: 3.000) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| LPG (Butane) (Cf: 3.030) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| Ethan (Cf: 2.927) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| LNG (Cf: 2.750) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| Methanol (Cf: 1.375) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| Ethanol (Cf: 1.913) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| Other (……….) (Cf ;..) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| **Fuel oil consumption while the ship is not under way, per consumer type** |
| Fuel oil type | Consumer type | Quantity in metric tonnes (t) | Method used for collecting fuel oil consumption data |
| Diesel/Gas Oil (Cf: 3.206) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| LFO (Cf: 3.151) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| HFO (Cf: 3.114) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| LPG (Propane) (Cf: 3.000) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| LPG (Butane) (Cf: 3.030) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| Ethan (Cf: 2.927) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| LNG (Cf: 2.750) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| Methanol (Cf: 1.375) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| Ethanol (Cf: 1.913) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |
| Other (……….) (Cf ;..) | Main engines(s) |  |  |
| Auxiliary engines(s) / Generator(s) |  |  |
| Oil-fired Boiler(s) |  |  |
| Others (specify) |  |  |

|  |  |
| --- | --- |
| Total distance travelled (nm) |  |
| Laden distance travelled (nm) (on a voluntary basis) |  |
| Hours under way (h)  |  |
| Total amount of onshore power supplied (kWh) |  |

|  |
| --- |
| **For ships to which regulation 28 of MARPOL Annex VI applies:** |
| Total transport work |  |
| Applicable CII | [ ]  AER ; [ ]  cgDIST |
| Required annual operational CII |  |
| End date for annual CII (dd/mm/yy) [[2]](#footnote-2) |  |
| Start date for annual CII (dd/mm/yy) 2 |  |
| Attained annual operational CII before any correction factors(AER in g CO₂/dwt. nm or cgDIST in g CO₂/gt.nm) |  |
| Attained annual operational CII(AER in g CO₂/dwt. nm or cgDIST in g CO₂/gt.nm) |  |
| Installation of innovative technology, if applicable (refer to MEPC.1/Circ.896) | [ ]  A ; [ ]  B-1 ; [ ]  B-2 ; [ ]  C-1; [ ]  C-2  |
| Operational carbon intensity rating | [ ]  A ; [ ]  B ; [ ]  C ; [ ]  D ; [ ]  E  |
| CII for trial purpose(non, one or more on voluntary basis) | [ ]  EEPI ; [ ]  cbDIST ; [ ]  clDIST ; [ ]  EEOI |
| EEPI (gCO2/dwt.nm) |  |
| cbDIST (gCO2/berth.nm) |  |
| cbDIST (gCO2/m.nm) |  |
| EEOI (gCO2/t.nm or others) |  |

#

* **End of Document -**
1. Regulation 2.1.14 of MARPOL Annex VI defines "fuel oil" as any fuel delivered to and intended for combustion purposes for propulsion or operation on board a ship, including gas, distillate and residual fuels. [↑](#footnote-ref-1)
2. In the event of any transfer of a ship addressed in regulations 27.4, 27.5 or 27.6, these dates should be completed consistent with regulation 28.3 of MARPOL Annex VI (i.e. full 12-month period from 1 January to 31 December in the calendar year during which the transfer took place). [↑](#footnote-ref-2)