Guidance on

SHIP ENERGY EFFICIENCY MANAGEMENT PLAN (SEEMP)

Development of

Part II – Data Collection Plan

August 2018

IRCLASS
Indian Register of Shipping

1.0 Introduction

The Marine Environment Protection Committee (MEPC) at its 70th session adopted amendments to MARPOL Annex VI vide MEPC Resolution 278(70), regarding a data collection system for fuel consumption of ships. A new regulation 22A is inserted in MARPOL Annex VI Ch.4 on "Collection and reporting of ship fuel oil consumption data".
IMO's Data Collection System (DCS) will follow three step approach -

2.0 Applicability

The inclusion of new regulation 22A, will now require two parts to a SEEMP. Part I (ship management plan to improve energy efficiency), which is applicable to ships of 400 gross tonnage and above, to contain a possible approach for monitoring ship and fleet efficiency performance over time and some options to optimize the performance of the ship. Part II (ship fuel oil consumption data collection plan), which is applicable to ships of 5000 gross tonnage and above, to contain the methodologies that the ship should use to collect the data required pursuant to regulation 22A of MARPOL Annex VI and the processes that the ship should use to report the data to the ship's Administration or any organization duly authorized by it (i.e. RO). SEEMP Part II format is given in Appendix I of this document. Thus, for ships which are greater than 400GT but less than 5000 GT, are not required to comply with MARPOL Annex VI, Ch.4, Regulation 22A but still have to carry SEEMP Part I. Each ship of 5000 GT or above is required to update SEEMP by including Part II (data collection plan) based on MEPC 282 (70) "2016 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP)". SEEMP Part II it is to be approved by the Administration or RO prior to 31 December 2018 and Confirmation of Compliance (CoC) is to be issued which is to be kept on-board. From 1st January 2019, each ship shall commence collecting the required data given in Appendix IX of MEPC 278(70) and submit to its Administration/RO for each calendar year or part thereof.
Regulation does not apply to ships not propelled by mechanical means, and platforms including FPSOs and FSUs and drilling rigs, regardless of their propulsion.
Administrations will decide for ships solely engaged in voyages within waters under their jurisdiction.

Data to be collected as per Appendix IX of MEPC 278(70)

Identity of the ship
- IMO number

Period of calendar year for which the data is submitted
- Start date (dd/mm/yyyy)
- End date (dd/mm/yyyy)

Technical characteristics of the ship
- Ship type
- Gross tonnage (GT)
- Net tonnage (NT)
- Deadweight tonnage (DWT)
- Power output (rated power in kW) of main and auxiliary reciprocating internal combustion engines over 130 kW
- EEDI (if applicable)
- Ice class (if applicable)

Fuel oil consumption
- by fuel oil type in metric tonnes
- methods used for collecting fuel oil consumption data

Distance travelled

Hours underway

The aggregated value of above data for each calendar year will have to be reported before 31st March 2020 and each year thereafter, to ship's Administration or RO. This reporting would be via electronic

communication and using a standardized format developed by IMO (Appendix 3 of MEPC 282(70)) and given in Appendix II of this guidelines. Upon receipt of reported data, the Administration or RO will verify that it is in compliance with regulation 22A and issue a Statement of Compliance (SoC) (Appendix X of MEPC 278(70)). This SoC is to be issued before 31st May of each calendar year. The SoC will be valid for the calendar year in which it is issued and till 31st May of following calendar year. It is to be kept on board for at least the period of its validity.
Administration will be required to subsequently transfer this data to the IMO Ship Fuel Consumption Database within one month of issuance of SoC. The database will be anonymized such that identification of a specific ship will not be possible as described by MEPC.293 (71) "2017 Guidelines for the Development and Management of the IMO Ship Fuel Oil Consumption Database".

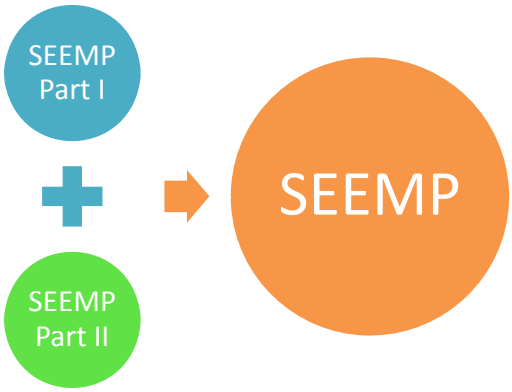
2.1 Reporting Scenarios in the middle of a calendar year.

Requirements are also added in regulation 22A to address instances where a change of ownership and/or change of flag takes place. In case of vessel changes company or flag or both then the company shall on the day of completion of the transfer / change or as close as practical thereto report the corresponding data for that portion of calendar year to the losing Administration or any organization duly authorized by it, in accordance with MARPOL Annex VI Reg. 22A.

3.0 Important Dates

Dates	Activity	Responsibility	Reference Document
31 Dec 2018	SEEMP part II to be approved. Confirmation of Compliance (CoC) to be issued. SEEMP and CoC made available onboard. It shall include methodology that will be used to collect the data and the processes to report the data to the Administration.	Submission of SEEMP by Shipowner / Manager Approval by Administration / RO	• Appendix II of MEPC 282(70)
1st Jan 2019 – 31st Dec 2019	Collect fuel oil consumption data for each type of fuel oil, as well as the distance travelled and the hours underway.	Shipowner / Manager	• Approved SEEMP as per MEPC 282(70) • MEPC 278 (70)
31st March 2020	Aggregated annual data to be reported to the Administration / RO	Shipowner / Manager	• Approved SEEMP • MEPC 278 (70) • Appendix III - MEPC 282 (70)
31st May 2020	The data will be verified according to IMO Guidelines and a Statement of Compliance (SoC) will be issued by Administration / RO	Administration / RO	• MEPC 292 (71) • MEPC 278 (70)
Within 1 month of issuing SoC	Administration or RO will transfer this data to IMO Ship Fuel Oil Consumption Database.	Administration / RO	• MEPC 278 (70) • MEPC 282 (70)(App.3) • Annex VI Reg. 22A, Par 9

4.0 Contents of SEEMP



Part 1 of SEEMP

This part mostly remains unchanged. Part I of the SEEMP should be developed as a ship-specific plan by the company, and should reflect efforts to improve a ship's energy efficiency through four steps:

- Planning
- Implementation
- Monitoring
- Self-evaluation and improvement.

The contents of SEEMP Part I are:

- Ship particulars
- Energy Efficiency Measures
- Description of monitoring tools
- Measurable goals
- Procedures of evaluation

Part II of SEEMP (Data Collection Plan)

- Ship particulars
- Record of revision of Fuel Oil Consumption Data Collection Plan
- Ship engines and other fuel oil consumers and fuel oil types used
- Emission factor of fuels used (Conversion factor C_F)
- Method to measure fuel oil consumption
- Method to measure distance travelled
- Method to measure hours underway
- Processes that will be used to report the data to the Administration
- Data quality

5.0 Methods to monitor fuel consumption

- Method 1: Using Bunker Delivery Notes (BDN)
- Method 2: Using Flow meters
- Method 3: Using bunker fuel oil tank monitoring on board

Direct CO_2 emission measurement is not required by regulation 22A of MARPOL Annex VI. However, if it is used, should be carried out as follows:

- This method is based on the determination of CO_2 emission flows in exhaust gas stacks by multiplying the CO_2 concentration of the exhaust gas with the exhaust gas flow. In case of the absence or/and breakdown of direct CO_2 emissions measurement equipment, manual tank readings will be conducted instead;
- The direct CO_2 emissions measurement equipment applied to monitoring is located exhaustively so as to measure all CO_2 emissions in the ship. The locations of all equipment applied are described in this monitoring plan; and
- Calibration of the CO_2 emissions measurement equipment should be specified. Calibration and maintenance records should be available on board.

6.0 GUIDANCE ON METHODOLOGY FOR COLLECTING DATA ON FUEL OIL CONSUMPTION, DISTANCE TRAVELLED AND HOURS UNDERWAY

6.1 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, boilers and inert gas generator, for each type of fuel oil consumed, regardless of whether a ship is underway or not. Methods for collecting data on annual fuel oil consumption in metric tonnes include (in no particular order):

6.1.1 Method 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; BDNs are required to be retained on board for three years after the fuel oil has been delivered. The Data Collection Plan should set out how the ship will operationalize the summation of BDN information and conduct tank readings. The main components of this approach are as follows:

i. annual fuel oil consumption would be the total mass of fuel oil used on board the vessel as reflected in the BDNs. In this method, the BDN fuel oil quantities would be used to determine the annual total mass of fuel oil consumption, plus the amount of fuel oil left over from the last calendar year period and less the amount of fuel oil carried over to the next calendar year period;
ii. to determine the difference between the amount of remaining tank oil before and after the period, the tank reading should be carried out at the beginning and the end of the period;
iii. in the 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;
iv. fuel oil tank readings should be carried out by appropriate methods such as automated systems, soundings and dip tapes. The method for tank readings should be specified in the Data Collection Plan;
v. the amount of any fuel oil offloaded should be subtracted from the fuel oil consumption of that reporting period. This amount should be based on the records of the ship's oil record book; and
vi. any supplemental data used for closing identified difference in bunker quantity should be supported with documentary evidence.

6.1.2 Method using flow meters:

This method determines the annual total amount of fuel oil consumption by measuring fuel oil flows on board by using flow meters. In case of the breakdown of flow meters, manual tank readings or other

alternative methods will be conducted instead. The Data Collection Plan should set out information about the ship's flow meters and how the data will be collected and summarized, as well as how necessary tank readings should be conducted:

i. 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;
ii. the flow meters applied to monitoring should be located so as to measure all fuel oil consumption on board. The flow meters and their link to specific fuel oil consumers should be described in the Data Collection Plan;
iii. note that 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;
iv. the flow meters applied to monitoring fuel oil flow should be identified in the Data Collection Plan. Any consumer not monitored with a flow meter should be clearly identified, and an alternative fuel oil consumption measurement method should be included; and
v. calibration of the flow meters should be specified. Calibration and maintenance records should be available on board.

6.1.3 Method using bunker fuel oil tank monitoring on board:

i. to determine the annual fuel oil consumption, the amount of daily fuel oil consumption data measured by tank readings which are carried out by appropriate methods such as automated systems, soundings and dip tapes will be aggregated. The tank readings will normally occur daily when the ship is at sea and each time the ship is bunkering or de-bunkering; and
ii. the summary of monitoring data containing records of measured fuel oil consumption should be available on board.

Any corrections, e.g. density, temperature, if applied, should be documented.

Note: Monitoring of fuel used by LNG ships / Boil-Off-Gas (BoG) consumption:

a) For calculating the BoG quantity by CTMS (custody transfer measurement system), cargo consumed on the passage is calculated by using the “CTMS closing” (final volume on board at the loading terminal upon completion of loading) and “CTMS opening” (total volume upon arrival at the discharge terminal just before commencement of discharging) figures. Cargo discharge at several locations in a port of call and new cargo added is to be considered.

b) Alternatively, flow meters may be used to measure BoG instead of measuring through the CTMS. The BoG is measured either in volume (is to be converted to mass using appropriate density, pressure and temperature corrections) or measured directly in mass (Coriolis type flow meters).

c) For the consumption in ports, the CTMS (opening and closing) method might not give the BoG consumption. Therefore, flow meters should be used as alternative for port consumption.

6.2 Emission factor / Conversion factor C_F

C_F is a non-dimensional conversion factor between fuel oil consumption and CO2 emission in the 2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships (resolution MEPC.245(66)), as amended. If fuel oils are used that do not fall into one of the categories as described in the 2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships (resolution MEPC.245(66)), as amended, and have no C_F-factor assigned (e.g. some "hybrid fuel oils"), the fuel oil supplier should provide a C_F-factor for the respective product supported by documentary evidence.

6.3 Distance travelled

Appendix IX of MARPOL Annex VI specifies that distance travelled should be submitted to the Administration and:

i. distance travelled over ground in nautical miles should be recorded in the log-book in accordance with SOLAS regulation V/28.13;
ii. the distance travelled while the ship is underway under its own propulsion should be included into the aggregated data of distance travelled for the calendar year; and
iii. other methods to measure distance travelled accepted by the Administration may be applied. In any case, the method applied should be described in detail in the Data Collection Plan.

6.4 Hours underway

Appendix IX of MARPOL Annex VI specifies that hours underway should be submitted to the Administration. Hours underway should be an aggregated duration while the ship is underway under its own propulsion.

6.5 Data quality

The Data Collection Plan should include data quality control measures which should be incorporated into the existing shipboard safety management system. Additional measures to be considered could include:

i. the procedure for identification of data gaps and correction thereof; and
ii. the procedure to address data gaps if monitoring data is missing, for example, flow meter malfunctions.

7.0 A standardized data reporting format

Regulation 22A.3 of MARPOL Annex VI states that the data specified in appendix IX of the Annex are to be communicated electronically using a standardized form developed by IMO. The collected data should be reported to the Administration in the standardized format shown in appendix II of this document.

8.0 Verification of the reported annual data

To facilitate data verification, the Administration or RO may seek following documents:

1. a copy of the approved ship's Data Collection Plan (SEEMP Part II)
2. summaries of bunker delivery notes (BDNs), in sufficient detail to show that all fuel oil consumed by the ship is accounted for (see sample form of BDN summary set out in appendix III);
3. summaries of disaggregated data of fuel oil consumption, distance travelled and hours underway, in a format specified by the Administration (see sample form of data summary set out in appendix IV);
4. information to demonstrate that the ship followed the Data Collection Plan set out in its SEEMP, including information on data gaps and how they were filled as well as how the event that caused the data gap was resolved; and
5. copies of documents containing information on the amount of fuel oil consumption, distance travelled and hours underway for the ship's voyages during the reporting period (e.g. the ship's official logbook, oil record book, BDNs, arrival/noon/departure reports, etc.).
6. Any other document as deemed necessary for verification of data pertaining to ship's annual fuel oil consumption, distance travelled, and hours underway.

The above documentation will be used by Administration or RO to verify whether the ship followed the methodology specified in its Data Collection Plan, with a view to confirming:

.1 consistency of reported data and calculated values, including with previous reporting periods (if applicable), through recalculating the annual reported values using the underlying data, etc.

.2 completeness of data (e.g. perform substantive testing based on reconciliation, recalculations, and document cross-check, for example with official logbook and/or arrival/noon/departure reports, recalculate hours underway and total quantities of fuel oil used and distance travelled); and

.3 reliability and accuracy of the data (e.g. test that the data quality procedures as described in the Data Collection Plan (see section 9 of sample form of Data Collection Plan, as set out in appendix 2 of the *2016 Guidelines for the development of a ship energy efficiency management plan (SEEMP)*) have been properly implemented, carry out site visits (typically to the Company's offices rather to the ship) to test the systems, processes and the control activities) through corroborating fuel oil consumption data with distance travelled and hours underway, comparing reported fuel oil consumption with that which is expected for the ship size, operational profile, and technical characteristics, and/or comparing reported fuel oil consumption total fuel bunkered, etc.

9.0 Salient points for shipowners to note

1. The focus of the verifiers will be on the following:
   - Consistency of reported data and calculated values
   - Completeness of data
   - Reliability and accuracy of the data

2. Shipowners need to ensure that the quality of data reported is free of omission, misrepresentation or error.

3. Ship's crew is the primary source of data collection. Training of ship's crew is important to ensure SEEMP is implemented as documented.

4. Diligent review of the submitted data at shore office is required to ensure consistency and avoid misreporting.

5. Implement data quality control measures which could include:
   i. the procedure for identification of data gaps and correction thereof; and
   ii. the procedure to address data gaps if monitoring data is missing, for example, flow meter malfunctions.

Data Gaps are to be addressed by having procedures for dealing with possible mistakes or omissions due to data loss and lay down control measures that are to be taken by the company to minimize this risk for incorrect or incomplete data. If the data submitted and supporting documents give confidence to the verifiers about its reliability, then the verification risk is less. If not, then the verifiers will try to reduce the verification risk by carrying out additional site visits, seek more information through documents or interview.

10.0 IRS Services

With a good understanding of the shipping industry and applicable regulatory requirements and having a team of qualified technical expertise in fuel and maritime emissions, IRClass is well equipped to provide services for IMO Data Collection System. IRS is accredited by RvA as an independent verifier for EU MRV. IRClass would also extend its acquired expertise to serve as recognized organization as authorized by various Flag Administrations and offer following services:

- Approval of SEEMP Part II and issue Confirmation of Compliance
- Verification of Annual Report and issue Statement of Compliance

The service request forms for the above services alongwith the list of supporting documents to be submitted will be available on our website www.irclass.org. IRClass' electronic tool assists ship owners in developing the SEEMP and Annual Report as per the format prescribed by IMO.
Additionally, IRClass can offer training and awareness workshops for its clients to understand the regulatory requirements for preparation towards compliance.

Appendix I

SAMPLE FORM OF SHIP FUEL OIL CONSUMPTION DATA COLLECTION PLAN (PART II OF THE SEEMP)

1 Ship particulars

Name of the Ship	
IMO number	
Company	
Flag	
Ship type	
Gross tonnage	
NT	
DWT	
EEDI (if applicable)	
Ice class	

2 Record of revision of Fuel Oil Consumption Data Collection Plan

Date of revision	Revised provision

3 Ship engines and other fuel oil consumers and fuel oil types used

	Engines or other fuel oil consumers	Power	Fuel oil types
1	Type/model of main engine		
2	Type/model of auxiliary engine		
3	Boiler		
4	Inert gas generator		
5	(…)		

4 Emission factor

C_F is a non-dimensional conversion factor between fuel oil consumption and CO_2 emission in the 2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships (resolution MEPC.245(66)), as amended. The annual total amount of CO_2 is calculated by multiplying annual fuel oil consumption and C_F for the type of fuel.

Fuel oil Type	C_F (t-CO_2 / 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 (……)	

5 Method to measure fuel oil consumption

The applied method for measurement for this ship is given below. The description explains the procedure for measuring data and calculating annual values, measurement equipment involved, etc.

Method	Description

6 Method to measure distance travelled

Description

7 Method to measure hours underway

Description

8 Processes that will be used to report the data to the Administration

Description

9 Data quality

Description

Appendix II

STANDARDIZED DATA REPORTING FORMAT FOR THE DATA COLLECTION SYSTEM

Start date (dd/mm/yyyy)	End date (dd/mm/yyyy)	IMO number[1]	Ship type[2]	Gross Tonnage[3]	NT[4]	DWT[5]	EEDI (if applicable)[6] (gCO_2/t.nm)	Ice class[7] (if applicable)	Power output[8] (rated power) (kW)		Distance Travelled (nm)	Hours underway (h)	Fuel oil consumption (t)									Method used to measure fuel oil consumption[9]
									Main Propulsion Power	Auxiliary Engine(s)			Diesel/Gas Oil (C_f 3.206)	LFO (C_f 3.151)	HFO (C_f 3.114)	LPG (Propane) (C_f 3.000)	LPG (Butane) (C_f 3.030)	LNG (C_f 2.750)	Methanol (C_f 1.375)	Ethanol (C_f 1.913)	Other(……)	(C_f ……)	

1 In accordance with the IMO Ship Identification Number Scheme, adopted by the Organization by resolution A.1078(28).
2 As defined in regulation 2 of MARPOL Annex VI or other (to be stated).
3 Gross tonnage should be calculated in accordance with the International Convention on Tonnage Measurement of Ships, 1969.
4 NT should be calculated in accordance with the International Convention on Tonnage Measurement of Ships, 1969. If not applicable, note "N/A".
5 DWT means the difference in tonnes between the displacement of a ship in water of relative density of 1025 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.
6 EEDI should be calculated in accordance with the 2014 Guidelines on the method of calculation of the attained Energy Efficiency Design Index (EEDI) for new ships, as amended, adopted by resolution MEPC 245(66). If not applicable, note "N/A".
7 Ice class should be consistent with the definition set out in the International Code for ships operating in polar waters (Polar Code), adopted by resolutions MEPC.264(68) and MSC.385(94)). If not applicable, note "N/A".
8 Power output (rated power) of main and auxiliary reciprocating internal combustion engines over 130 kW (to be stated in kW). Rated power means the maximum continuous rated power as specified on the nameplate of the engine.
9 Method used to measure fuel oil consumption: 1: method using BDNs, 2: method using flow meters, 3: method using bunker fuel oil tank monitoring.

Appendix III

SAMPLE OF THE BDN SUMMARIES

Date of Operations (dd/mm/yyyy)	Fuel Oil Type/Mass(MT)							Descriptions
	DO/GO	LFO	HFO	LPG(P)	LPG(B)	LNG	Others(Cr)	
① BDN								
09/01/2019								
02/05/2019			150					
08/07/2019								
09/10/2019								
10/12/2019			300					
①Annual Supply Amount	0	0	450	0	0	0	0	
② Correction for the tank oil remainings								
01/01/2019			400					
31/12/2019			200					
②Correction for the tank oil remainings	0	0	200	0	0	0	0	The difference in the amount of the remaining tank oil at the beginning/end of the data collection period.
③ Other corrections								
30/03/2019								
15/09/2019								
31/12/2019								
③Annual other corrections	0	0	0	0	0	0	0	
Annual Fuel Consumption								
Annual Fuel Consumption (①+②+③)	0	0	650	0	0	0	0	

Explanatory remarks; If bunker supply /correction data have been recorded in a Company's electronic reporting system, the data is acceptable to be submitted in the existing format instead of submitting the data by this format.

Appendix IV

SAMPLE OF THE COLLECTED DATA SUMMARIES

Date from (dd/mm/yyyy)	Date to* (dd/mm/yyyy)	Distance Travelled (n.m)	Hours Underway (hh:mm)	Fuel Consumption (Metric tons)						
				DO/GO	LFO	HFO	LPG(P)	LPG(B)	LNG	Others(C_F)
01/01/2019		210	24:00	2	3	19	0	0	0	0
02/01/2019		283	24:00	2	0	20	0	0	0	0
03/01/2019		321	24:00	2	0	18	0	0	0	0
04/01/2019		221	24:00	1	0	19	0	0	0	0
05/01/2019		320	18:00	2	0	13	0	0	0	0
06/01/2019		302	24:00	2	0	17	0	0	0	0
07/01/2019		210	24:00	1	0	19	0	0	0	0
08/01/2019		302	24:00	1	0	20	0	0	0	0
09/01/2019		280	24:00	2	0	21	0	0	0	0
10/01/2019		50	01:00	3	0	2	0	0	0	0
11/01/2019		198	24:00	3	0	21	0	0	0	0
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30/12/2019		320	24:00	0	0	20	0	0	0	0
31/12/2019		213	24:00	1	0	17	0	0	0	0
Annual Total										

*In the case of daily underlying data, this column would be left in blank. Explanatory remarks; If the listed data in the format have been recorded in a Company's electronic reporting system, the data is accep table to be submitted in the existing format instead of submitting the data by this format.

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