VESSEL PARTICULARS (FORM C)
LPG/C "ECO CHIOS"
(last updated 12/10/2014)

Specifications of the vessel and the gas installation which are representations by the Owners.

(A) VESSEL'S CHARACTERISTICS

PREAMBLE

Name	:	**Epic Bird**
Owner	:	**Echo Chios**
Flag	:	**Singapore**
Build	:	**05 December 2013**
Date on Service	:	**04 June 2014**
Class	:	**Nippon Kaiji Kyokai**

GRT International	:	**5320.00**	Suez	:	**6008.77**
			Panama	:	**4529.00**
NRT International	:	**1995.00**	Suez	:	**5001.99**
			Panama	:	**4529.00**

Is vessel build according to		USCG regulations?	:	**Yes**
		RINA regulations?	:	**No**
		Japanese regulation?	:	**JIS,JMS**
Has vessel received		USCG approval?	:	**No**
		RINA approval?	:	**No**

HULL

LOA	:	**117.03**	**M**	
LBP	:	**110.11**	**M**	
Breadth	:	**18.20**	**M**	
Depth	:	**8.90**	**M**	
Summer Draft	:	**6.80**	**M**	**corresponding to Summer DWT = 5872.00**
Multiple Draft		**N/A**	**M**	**corresponding to Multiple DWT**

Estimated draft with full cargo and full bunkers are as follows.

Product/Qty (mt)	Draft Fore' (m)	Draft Aft' (m)	Draft Mean (m)	Corresponding Deadweight (t)
Propane / 3238	5.68	6.80	6.24	4934
Butane / 3710	6.33	6.99	6.66	5644
VCM / 5152	6.54	6.99	6.77	5872

NOTE: For VCM only, The cargo quantity can be loaded subject to ROB of bunker and fresh water.

Propeller immersion :

At draft	**At**	**6.24**	**m correspond.**	**: 118 %**
At draft	**At**	**6.66**	**m correspond.**	**: 123%**

COMMUNICATION EQUIPMENT

Call letter		:	**9V2659**
Radio Station normally watched		:	**2182 / 2187.5**
Radio MF/HF NBDP		:	**Furuno 1 set / SELCAL 564647000**
Radio MF/HFTEL/DSC		:	**Furuno 1 Set / ID 564647000**
VHF		:	**2**
Satellite Communication	**Inmarsat 'C'**	:	**456464710**
	Inmarsat 'FBB'	:	**+870 773165091**
	VSAT	:	**+6531587565/+4723673458**

MACHINERY

Main Engine x 1	. Type and make	:	**Makita Co.; MAN B&W Diesel 6L35MC Mark6**
	. Service power	:	**3900kw**
	No of Cylinders		**6**
	Cyl Bore x Stroke		**350mmx1050**
	. Grade of fuel used	:	**380cst**
Auxiliaries	Type and make (Electrical)		**Yanmar Diesel Co., Ltd 6NY16L-EW Nishishiba electric Co. Ltd. 400kw / AC450 60Hz**
	(Mechanical)		
	Grade of fuel used		**Diesel Oil**
	No off		**2 sets**
Emergency Gen	Type		**Cummins Generator Tech. 400kw / AC450 60Hz**
	No off		**1 set**
Bow Thruster			**310 kw**
Boiler	Type		**Alfa Laval KK, Misson Oc - Composite**
	Evaporation		**750kg/h Oil fire Side, 585kg/h ME M.C.O., 500kg/h ME C.S.O.**
	Max Design Pressure		**0.69mpa**
	Feed Water Temp		**90 DegC**
	No off		**1 set**
Exhaust Economiser	Type		
	Evaporation		**N/A**
	No off		
Air Compressors (Main)	Type / Capacity		**MH120K/Vertical 2 stage water cooled 85M3/HX2.94MPA**
	No off		**2 sets**

Air Compressors (Emergency)	Type	**As per above**
	No off	
Fuel Oil Purifier	Type	**SG20G (5.5kw X 1800RPM)**
	No off	**2**
	Capacity	**1,750L/H**
Lub Oil Purifier	Type	**SG20G (5.5kw X 1800RPM**
	No off	**1**
	Capacity	**1950L/H**
Evaporator	Type	**KE10 / Electric motor driven horizontal centrifugal**
	Capacity	**10m3/24H**
Fresh Water Sterilizer	Type	**Ultra violet(L-N101F)**
	Capacity	**1000L/H**

Ballast Water Treatment Mineraliser	maker	**PANASIA**
	model	**GloEn-P250**
	capacity at ballasting	**250m3/hr,**
	capacity at de-balasting	**250m3/hr,**
	filtration degree	**50 micron,**
	working principle	**UV –model No : SUV 20.2 Y2C/ZIG-1**

Fresh Water Mineraliser	Type / Capacity	**nil**
Waste Oil Incinerator (IMO MEPC 76 (40))	Type	**OSV-360SAI**
	Capacity	**W.OIL 38KG/H / SOLID 30KG/H**
Oily Water Separator	Type	**HFM-100**
	Capacity	**1M3/H w/ 15ppm bilge alarm**
Sewage Treatment plant	Type	**SBH-25 × 1 set**
	Capacity	**255 liter/min × 0.015 MPa (Motor 0.4 kW)**
Hot Water Set (Calorifier unit)	No off	**1 x 15mt/h**
Steering Gear	Type	**RV21-022 1 ram × 2 cylinders (Rapson-slide type)**
	Duty Capacity	**18.0 MPa (184 kgf/cm2) / 65 deg./28 sec. (by one power unit)**
	Hydraulic pump unit	**Hydraulic pump (LVP017-210R0L)**

Speed

In Moderate weather:

About: . Knots @ CSR with 15% sea margin

CONSUMPTION/ DAY

Main Engine	HFO	**mt / Day**
Auxiliary Engine	DO	**At sea / In port**

Permanent bunker
capacity (100%)

HFO : **492.64**

Diesel	:	**69.28**
Fresh Water	:	**193.06**

(B) CARGO INSTALLATIONS

1. Transportable products and respective quantities, calculated in accordance with IMO – maximum filling formula. (Tonnes)

	100% (CBM)	98% (CBM)		
NO.1 CARGO TANK	3606.336	3534.209		
NO.2 CARGO TANK	3606.757	3534.622		
T O T A L	7213.093	7068.831		
	SPSV (bar g)	Ref. Temp. (deg. C.)	Density at (Ref. Temp.)	Corresponding Quantity (MT)
Propane	17.65	45.0	0.459	3238
Propylene	17.65	45.0	0.470	3316
B/P Mixture *1	17.65	45.0	0.487	3502
I-Butane	17.65	45.0	0.526	3710
N-Butane	17.65	45.0	0.548	3866
Butylene	17.65	45.0	0.565	3986
Butadiene *2	17.65	45.0	0.588	4148
V.C.M. SDWT(5866) *3	17.65	45.0	0.872	5152
Isoprene	17.65	45.0	0.656	4628
Pentane	17.65	45.0	0.600	4232
Pentene	17.65	45.0	0.611	4310

***1 For reference mixing ratio of P/B mixture shows Butane 35% and Propane 65%**

***2 The cargo should be sufficiently inhibited to prevent polymerization.**

***3 Maximum loadable of VCM will be 73 to 75% tank filling capacity only due to load line draft limitation and subject to bunker/ FW and other constant.**

2. Other transportable products (approx. density taken for calculation)

	SPSV	Ref. Temp. (°C.)	Density at Ref. Temp.	Corresponding Quantity (MT)
Raffinate 1	**17.65**	**45.0**	0.6216	4387
Raffinate 2	**17.65**	**45.0**	0.6216	4387
Crude C4	**17.65**	**45.0**	0.6216	4387

3. TANKS

3.1 Design pressure (Vapour) – BV-IGC : **17.65 bar g (1.765 MPag)**

3.2	Valve setting	:	**17.65 bar g (1.765 MPag)**
3.3	Maximum vacuum obtainable	:	**0.0**
3.4	Maximum specific gravity	:	**0.949 (VCM @ 0 Degc C)**
3.5	Maximum temperature acceptable	:	**45 °C**
3.6	Minimum temperature acceptable	:	**-10 °C**
3.7	Hydrostatic Test Pressure	:	**26.48 bar g (2.648 MPag)**

4. LOADING RATE (TONS/HOUR) – For Full Cargo Parcels

Case 1: with vapour return	:	1 tank	:	**730 m^3 per hour (For LPG)**
				560 m3 per hour (For VCM)
Case 2: with vapour return	:	2 tanks	:	**1130 m^3 per hour (For LPG)**
				870 m3 per hour (For VCM)

Remarks:

***** Based on maximum velocity of **5** metres /sec for VCM & **6.5** meters/sec for LPG in the liquid piping

***** If cargo temperature is less than -10°C, shore heater to be used. If ship heater used, max rate as per **550** m^3 per hour basis on cargo heater capacity.

***** Loading by shore pump only, proper size gas return line to be connected.

***** Subject to both ship and shore tanks being under favourable conditions

* The loading rate will decrease when vapour return is not available.

* In case an excess vibration or noise, etc for the cargo piping are observed during loading. The loading rate should be reduced.

5. CARGO PUMPS

5.1	Type	:	**Electric Motor Driven Deep well Type**
	Make	:	**Wartsila**
	How many	:	**2 Sets**
	Maximum specific gravity	:	**0.610 (LPG) / 0.965 (VCM) Kg/L**
5.2	Capacity (CMB/Hour)	:	**400 m3/H / LPG, 200m3/H / VCM**
	Two speed or variable speed	:	**1785 RPM**
	Rated kW (each)		**150 Kw (AC 440V, 60Hz, 3-phase)**
	Working pressure maximum	:	**2.0 Mpa G**
5.3	Location	:	**Cargo Tank 1 and Cargo Tank 2**
	Removable	:	**Fixed type.**
5.4	Booster pumps	:	**1 set**
	Type	:	**Horizontal centrifugal type – NMB 150C**
	Maker	:	**WARTSILA SVANEHOJ A/S.**
5.5	Capacity (CMB/Hour)	:	**400 m3 per hour x 110 mTH**
	Working pressure	:	**26 Bar**
5.6	Location	:	**Starboard rack at the top of starboard manifold**
5.7	Time to discharge a full liquid cargo using all pumps against back pressure at pump		
	1 bar	:	**about 12hours for LPG**
	5 bars	:	**about 16hours for LPG**
	10 bars	:	**about 16hours for LPG**

5.8	Nominal back pressure when working	:	**about 1 bar**
	In series corresponding head	:	**N/A**
	Maximum back pressure	:	**about 5 bar**
	Nominal pressure at rail (propane)	:	**about 13 bar at 20 degree C of cargo temperature**

5.9 What amount of cargo remains in tanks after completion pumping before stripping:

- liquid	:	**About 2 ton per one tank for LPG**
- vapour	:	**About 15 ton per one tank for LPG**

6. STRIPPING

6.1	Stripping system, if any	:	**Nil**

6.2 Time required to remove all traces of liquid cargo as stated in 5.9 for:

- LPG	:	**about 5 hours**

7. CARGO COMPRESSORS

7.1	Type	:	**Vertical water-cooled 1 stage double acting**
	Make	:	**Tanabe**
	How many	:	**2**
	Piston displacement		**460 m3/H**
	Suction Pressure		**0.002- 1.72 MPAG**
	Rated KW		**75 kw / ac 440v**
	Max discharge pressure		**20 Bar**
	Pressure differential		**4 Bar / max 7 Bar single action**
	No of Revolutions		**450 rpm**
7.2	Are compressors oil free	:	**Yes**
7.3	Can they reliqufy VCM without risk	:	**N/A**
7.4	State time to bring full cargo of butane to atmospheric pressure from	:	**N/A**

8. INERT GAS SYSTEM

8.1	Does the vessel use inert gas?	:	**PSA type nitrogen gas generating equipment**
	If so, state utilization and quantities	:	**N2 99.9%: 185Nm^3 /hr** **N2 99.0%: 300Nm^3 /hr** **N2 97.0%: 380Nm^3 /hr**
8.2	Can the vessel produce inert gas?	:	**PSA type nitrogen gas generating equipment**

If so, state type and composition of gas produce: **Nitrogen 99.9%**

Discharge Capacity		**185 Nm3/h**
8.3 Maximum production obtainable		**3% Oxygen – 380 M^3/HR** **2% Oxygen – 350 M^3/HR** **1% Oxygen – 300 M^3/HR** **0.5% Oxygen – 265 M^3/HR** **0.1% Oxygen – 185 M^3/HR**

NOTE:- Above quantities obtained at engine room temperature 45° C

8.4 State if there are storage facilities for inert gas onboard: **N/A**

- Size : **N/A**
- Pressure : **N/A**

8.5 State if any shore supply of nitrogen may be required: : **N/A**

- for what purpose : **N/A**
- what quantities : **N/A**

9. GAS FREEING

9.1 State method used giving all details : **Nitrogen Plant / Fan**

1) Discharge remaining cargo tanks as much as possible
2) Purge remaining cargo tanks with inert gas produced by Nitrogen Generator onboard vessel.
3) Ventilate cargo tank with dry air produced by N2 system

9.2 State time required including stripping **Approx 6 days**

10. CHANGING GRADE

10.1 From completion discharge of cargo Propane, time required in hours and inert gas in CBM required to reach a tank and gas installation atmosphere of less than 100 ppm of Propane in Vapour phase.
Time required: 4.5 days.

10.2 Can this operation be carried out at sea? : **Yes**

10.3 Can the ship measure the number of ppm in vapour phase? : **Volume%**

10.4 Has vessel deck tank for changing grade/cooling operations? : **No**

10.5 Deck tanks : **NIL**
Capacity :
Purpose :

11. COOLING BEFORE LOADING : ***N/A***

12. CARGO HEATER

12.1 State heating source : **Horizontal shell and tube type _Cargo heater**
Max cargo flow rate **550 M^3/HR**
Heating capacity **-45 deg. C to -10 deg. C (Propane base)**
-13 deg. C to -10 deg. C (V.C.M base)
Required sea water capacity **600 M^3/HR**
Design temp of sea water **18 deg. C (min)**

12.2 State discharging rate for propane to be brought to -10°C. (**550 M^3/HR**)
(Sea temperature inlet: + **18 °C;** **Outlet is not less than +6 °C**)
Cargo flow rate **550 M^3/HR**
Loading rate for Propane: **-45 deg. C** **to -10 deg. C: Maximum 550 M^3/HR.**

13. CARGO VAPORIZER

In case vapour gas is needed to feed compressors, can vessel produce its own if no shore available:

No

14. REFRIGERATING APPARATUS **NA**

14.1 Is it independent of cargo? : **NA**

Is so, state cooling agents : **NA**

14.2 What minimum temperature can be maintained : **NA**

14.3 What time required at sea to lower by 1°C the full cargo of : **NA**

15. MEASURING APPARATUS

What gauges on board? **Musasino Co., Ltd**

Type : **Float type level gauge**

Location : **At each cargo tank dome**

16. SAMPLES

16.1 State how tank atmosphere samples can be taken and where from? **Sample points at tank bottom, mid and top**

Standard of fitting? : **Yes / Size : PT ¼" with closed loop**

16.2 Same question for cargo : **Discharge Line and Tank bottom and mid**

16.3 Are sample bottles available on board? : **No**

17. CARGO LINES

17.1 Is ship fitted with a port and starboard cargo manifold? : **Yes**

17.2 Position of cargo manifold

- distance from stern (AP)	(S / P)	:	**59.30**	**M**
- distance form stem (FP)	(S / P)	:	**50.70**	**M**
- height above deck		:	**1.50**	**m for Liquid manifold**
- distance from ship's rail		:	**2.40**	**M**
- underside keel to manifold		:	**10.2**	**M**

17.3 Liquid line

- flange-size : **10 in.**
- type : **250 A x 300 LB**

Gas line

- flange-size : **6 in.**
- type : **200 A x 300 LB**

17.4 What reducers on board? : **NK STEEL**

For Liquid line (- 48 ºC to + 45 ºC) : **ANSI 12" x 300 / 8" x 300 / 6" x 300 / 5" x 300 / 4" x 300.**

: **ANSI 10" x 150 / 8" x 150 / 6" x 150 / 5" x 150**

For Vapor line (-10 ºC to + 45 ºC) : **ANSI 8" x 300 / 5" x 300 / 4" x 300 / 3" x 300 2" x 300**
8" x 150 / 6" x 150 / 5" x 150 / 4" x 150 / 3" x 150

17.5 Is ship fitted with stern discharge? **No**

- Liquid line - diameter : **N/A**
- flange – size : **N/A**
- type : **N/A**

18. HOSES

Are serviceable hoses available on board? : **None**

18.1 Two pieces, each : **N/A**
Length :
Diameter :
Flange-size :
Type :
Bending radius :

18.2 Minimum temperature acceptable : **N/A**
Maximum pressure acceptable : **N/A**

18.3 For what products are hoses suitable? : **N/A**

19. DERRICKS

- Hose cranes : **Electric hydraulic type (Hoisting/Slewing/Luffing) x 1 set**
- Where situated : **Mid ship**
- Lifting capacity : **5 tons**
  - Maximum distance ship's side of lifting hook when derrick swung outboard? : **5 Mtrs**

20. SPECIAL FACILITIES

20.1 How many grades can be segregated? : **2, by double valve segregation. Subject to loading and Discharging grade by grade, stability permitting.**

20.2 How many cooled? : **N/A**

20.3 Can vessel sail with slack cargo tanks? : **Yes**