VESSEL PARTICULARS (FORM C)
LPG/C GAS FLAWLESS
(last updated 25 / 9 / 2019)

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

(A) VESSEL'S CHARACTERISTICS

PREAMBLE

Name	:	**GAS FLAWLESS**
Owner	:	**EVOLUTION CRUDE INC.**
Flag	:	**MARSHALL ISLAND**
Build	:	**FEBRUARY 2007**
Date on Service	:	**02 FEB. 2007**
Class	:	**LLOYDS REGISTER** 100A 1 liquefied gas carrier (LPG - 2PG)

GRT International	:	**4779**	Suez :	**5164.09**
			Panama :	
NRT International	:	**1695**	Suez :	**4352.64**
			Panama :	**4074.93**

Is vessel build according to	USCG regulations?	:	**YES**
	RINA regulations?	:	**NO**
	Japanese regulation?	:	**NO**
Has vessel received	USCG approval?	:	**NO**
	RINA approval?	:	**NO**

HULL

LOA	**99.93**	**M**
LBP	**94.90**	**M**
Breadth	**19.60**	**M**
Depth	**7.70**	**M**
Summer Draft	**5.713**	**M corresponding to Summer DWT = 4954.50**
Multiple Draft	**5.595**	**M corresponding to Multiple DWT = 4760.58 WINTER**

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

Product	Draft Fore' (m)	Draft Aft' (m)	Draft Mean (m)	Corresponding Deadweight (t)
Propane (98%)	**4.40**	**5.60**	**5.00**	**3786**
Butadiene (98%)	**5.10**	**5.90**	**5.50**	**4588**
VCM (70%)	**5.20**	**6.00**	**5.60**	**4777**

Propeller immersion :

At draft	**At 5.60 m correspond.**	**: 121.74%**
At draft	**At 5.90 m correspond.**	**: 128.26 % :**
At draft	**At 6.00 m correspond.**	**: 130.43 %**

COMMUNICATION EQUIPMENT

Call letter		:	**V7TS2**
Radio Station normally watched		:	**STRATOS**
Radio MF/HF NBDP		:	**INMARSAT -C**
Radio MF/HFTEL/DSC		:	**RADIO TELEPHONE DSC - JRC**
VHF		:	**VHF RADIO TELEPHONE - JRC**
Satellite Communication	**Inmarsat 'C'**	:	**TELEX 453834922**
	Inmarsat 'F'	:	**FBB** Tel: 0870773131258 Fax : 00870764626575 email : gasflawless@stealth.gr

MACHINERY

Main Engine x 1	Type and make :	**MAKITA CORP. 6L 35MC B & W : 3900 KW X**
	Service power :	**210 RPM**
	No of Cylinders :	**6**
	Cyl Bore x Stroke :	**350 mm X 1050 mm**
	. Grade of fuel used	**380 CST RME 25**
Auxiliaries	Type and make (Electrical)	**6NY16L SN YANMAR 450 KVA**
	(Mechanical)	
	Grade of fuel used No off	**MGO** **2 UNITS**
Emergency Gen	Type No	**F6L912, 65KVA/DEUTZ AG**
	off	**1 UNIT**
Bow Thruster	Type	M DCPP/ KAWASAKI 315
	Power:	KW
Boiler	Type	VERTICAL WATER TUBE /MIURA 700 KG/HR
	Evaporation :	
	Max Design Pressure :	0.69 mpa
		85 C
	Feed Water Temp : No off :	1 unit
Exhaust Economiser	Type :	Composite Boiler GK 1428-500/450 450
	Evaporation : No off :	KG/H 2 UNITS
Air Compressors (Main)	Type / Capacity :	VERTICAL 2 STAGE WATER COOLED / 69.5 M3/H
	Model :	MH 108 /MATSUBARA
	No off :	2 UNITS

Air Compressors (Emergency)	Type :	KSC3N-T YANMAR/2.94 mpa
	No off :	1 UNIT
Fuel Oil Purifier	Type : No off	SJ 20G/MITSUBISHI SELF JECTOR
	Capacity :	2100 L/H
Lub Oil Purifier	Type : No off	SJ20G /MITSUBISHI SELF JECTOR
	Capacity :	2100 L/H
Evaporator	Type :	WM-10M/MIURA
	Capacity :	10 TONS /DAY
Fresh Water Sterilizer	Type :	USS - 500
	Capacity :	500 L/H
Fresh Water Mineraliser	Type / Capacity -	NIL
Waste Oil Incinerator (IMO MEPC 76 (40))	Type :	BGW 20N/ MIURA
	Capacity :	24.3 KG/H 24.3 L/H
Oily Water Separator	Type :	USH - 20 /TAIKO KIKAI
	Capacity :	2.0 M3 /H
Sewage Treatment plant	Type :	SBT - 25 / TAIKO KIKAI
	Capacity :	25 PERSONS/DAY
Hot Water Set (Calorifier unit)	Type:	CFT -700-S
		No off
Steering Gear	Type :	RV 21 - 017/KAWASAKI
	Duty Capacity :	170 KN-M
	Hydraulic pump :	LVPO 17-210 **0** ROL
	Unit :	2 UNITS

Speed

Up to and weather Beaufort scale 4 and max significant wave height of 1.25m (all details are "about" defined as 0.5knot less and +/- 5% on consumption respectively)

LADDEN : About : 13.0 KTS – BALLAST : About : 13.0 KTS

CONSUMPTION/ DAY

		AT SEA	AT PORT
Main Engine	HFO	**ABOUT 13.50 MT/D**	**NIL-only when standby with Boiler: abt 0.8 MT**
Auxiliary Engine	MGO -	**ABOUT 1.2 MT/D PLUS ABT 1.0 MT/DAY WHEN Inerting/abt 1.5MT SHIFTING**	**IDLE/LOADING ABT 1.2 MT/D DISCH. ABT 2.5 MT/D**

Notes:

1. Speed and consumption figures at sea, are best estimated basis daily weather conditions are up to Beaufort scale 4 – max. significant wave height 1.25 m, without effect of sea currents or swell, and vessel en-route under a steady course, with a net sea passage duration of at least 24 hrs.
2. Consumption figures at port, are subject to port movements, port and/or harbour, terminal requirements, for the safe manoeuvring, approach, inland navigation, and port stay of the vessel throughout her call.

Permanent bunker capacity (100%)

HFO	:	**578.89 M3**
Diesel	:	**129.32 M3**
Fresh Water	:	**212 MT**
Sludge tank	:	**7.41 cbm**

(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	3169.127	3105.74
NO.2 CARGO TANK	3167.578	3104.23
T O T A L	6336.705	6209.97

	SPSV (bar g)	Ref. Temp. (deg. C.)	Density at (Ref. Temp.)	Corresponding Quantity (MT)
Propane	17.65	45.0	0.459	2851
Propylene	17.65	45.0	0.470	2919
B/P Mixture	17.65	45.0	0.487	3024
I-Butane	17.65	45.0	0.526	3267
N-Butane	17.65	45.0	0.548	3403
Butylene	17.65	45.0	0.565	3509
Butadiene	17.65	45.0	0.588	3652
V.C.M.	17.65	45.0	0.872	4055
Isoprene	17.65	45.0	0.656	4074
Pentanes (all isomers)	17.65	45.0	0.600	3726
Pentene (all isomers)	17.65	45.0	0.611	3795

Note(1): In case of USCG, propylene, propane and B/P mixtures are not to be carried except the vapour pressure of B/P mixtures is not more than 12.75 bar g, 13.0 kg/cm² @ 45 °C Note(2): On and after, the pressure value in parentheses is shown as a conversion value Mixing ratio of above mentioned B/P mixtures is as follows: Butane 35 wt% and propane 65 wt%

2. Other transportable products N/A

	SPSV	Ref. Temp. (°C.)	Density at Ref. Temp.	Corresponding Quantity (MT)
Raffinate 1				
Raffinate 2				
C4				

3. TANKS

3.1	Design pressure (Vapour) – BV-IGC	:	**17.65 bar g (1.765 MPag)**
	- USCG	:	**12.75 bar g (1.275 MPag)**
3.2	Valve setting	:	**17.65 bar g (1.765 MPag) / 12.75 bar g (1.275 MPag)**
3.3	Maximum vacuum obtainable	:	**Atmospheric**
			45 °C
3.5	Maximum temperature acceptable	:	**-10 °C**
3.6	Minimum temperature acceptable	:	
3.7	Hydrostatic Test Pressure	:	**26.48 bar g (2.648 MPag)**

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

Ex-atmospheric storage with gas	:	1 tank	:	**220 M/H**
Return		2 tanks	:	**220 M/H**

Remarks: WITH VAPOUR RETURN.

***** Based on maximum velocity of 6.5 metres/sec except VCM, and 4.0 meters/sec for VCM in the liquid piping.

* If cargo temperature is less than 0 °C , shore heater to be used. If ship heater used, max rate is **250 m³** per hour.
* Loading by shore pump only, proper size gas return line to be connected
* Subject to both ship and shore tanks being under favourable conditions

5. CARGO PUMPS

5.1	Type	:	**DEEPWELL PUMPS CENTRIFUGAL MULTISTAGE**
	Make How many Maximum	:	**SVANEHOJ**
	specific gravity	:	**2**
		:	**0.940**
5.2	Capacity (CMB/Hour)		**400 3M/H/LPG VCM 200 M3/H 150**
	Two speed or variable speed		**KW**
	Rated kW (each)		
	Working pressure maximum		***12 KG/CM2***
5.3	Location	:	**CARGO TANK 1 & CARGO TANK 2** : **FIX**
	Removable		
5.4	Booster pumps		**N/A**
	Type Maker		
5.5	Capacity (CMB/Hour)		
	Working pressure		
5.6	Location	:	

5.7 Time to discharge a full liquid cargo using all pumps against back pressure at pump

1 bar	:	**About 8 hours for LPG Mix**
5 bars	:	**about 18 hours for LPG Mix**
10 bars	:	**About 20 hours for LPG Mix**

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	:	**NIL**
- vapour	:	**about 10 tons per one tank for LPG**

Nil

6. STRIPPING

6.1 Stripping system, if any

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

- LPG	:	**about 30 Min**

7. CARGO COMPRESSORS

7.1	Type	: **VERTICAL SINGLE CYLINDER DOUBLE ACTING** :	**MIKUNI**
	Make How many Piston	**JUKOGYO/DNL -710 HB2 GST 21** :	**2**
	displacement Rated Kw	**467 M3 /H**	
	Stroke	**75 KW**	
	Max discharge pressure		
	Pressure differential	**1.96 mpa G**	
	No of Revolutions	**450 RPM**	
7.2	Are compressors oil free	**YES**	
7.3	Can they reliquefy VCM without risk	**NO**	
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?	: **N2 GENERATOR**	
	If so, state utilization and quantities :		
8.2	Can the vessel produce inert gas?	: **YES**	
	If so, state type and composition of gas produce: **NITROGEN (N2)**		
	Discharge Capacity	185 Nm /h – 99.5% of N2	
		446 Nm /h - 95% of N2	
8.3	Maximum production obtainable	**446** Nm /h - 95%	

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 / Fans TBA**	
9.2	State time required including stripping :		

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: TBA

10.2 Can this operation be carried out at sea? **N/A**

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

10.4 Has vessel deck tank for changing grade/cooling operations? **NA**

Deck tanks 10.5 **NIL**
Capacity
Purpose ***NA***

11. COOLING BEFORE LOADING

12. CARGO HEATER

12.1 Type **HORIZONTAL SHELL & TUBE**
12.2 Inside Diameter
12.3 Overall length
12.4 Cargo flow rate **550 M3/H**
12.5 Min Inlet Temp **- 45 C**
12.6 Min Outlet Temp **- 10 C**
12.7 Required Sea water Capacity: **600 M3/H@ 18 DEG C SW TEMP.**
12.8 Design Pressure **1.96 mpaG**
12.9 Hydrostatic Test Pressure **2.94 mpaG**
12.10 Tightness Test Pressure

12.0 State discharging rate for propane to be brought from atmospheric pressure
Loading rate for Propane - ° C / 0° C: **about** Mt/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 oC the full cargo of **NA**

15. MEASURING APPARATUS

What gauges on board? **Float Gauge** : **Float type**
Type **level gauge** : **At each cargo**
Location **tank dome**

16. SAMPLES

16.1 State how tank atmosphere samples can be taken and where from? TANK DOME

Standard of fitting? : YES

16.2 Same question for cargo : **TBA**

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)	:	**53.37**	**M**
- distance form stem (FP) (S / P)	:	**47.50**	**M**
- height above deck	:	**1.30**	**m for Liquid manifold**
- distance from ship's rail	:	**2.70**	**M**
- underside keel to manifold	:	**9.26**	**M**

17.3 Liquid line

flange-size **8" ANSI 300 in.**
type

Gas line

flange-size **5" ANSI 300 in.**
type

17.4 What reducers on board?

For Liquid line (low temperature)

8" X 12" 300/300 ANSI 2 pcs
8" X 3" 300/300 ANSI 2 pcs
8" X 4" 300/300 ANSI 2 pcs
8" X 5" 300/300 ANSI 2 pcs
8" X 6" 300/300 ANSI 2 pcs
8" X 8" 300/150 ANSI 1pc
8" X 10" 300/300 ANSI 1pc

For Vapor line (normal temp.)

6 " X 5" 300/300 ANSI 2 pcs
5" X 4" 300/300 ANSI 2 pcs
5" X 3" 300/300 ANSI 1 pc
5" X 2" 300/300 ANSI 1 pc

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 :

Length : Diameter
: Flange-size : Type
: Bending radius :

18.2 Minimum temperature acceptable :
Maximum pressure acceptable :

18.3 For what products are hoses suitable?

19. DERRICKS

- Hose cranes : **1 DERRICK**

- Where situated : **BETWEEN CARGO TANK 1 & 2**
- Lifting capacity : **4.0 T**
- Working radius : **1.0M OUTSIDE OF SHIPRAIL**

20. SPECIAL FACILITIES

20.1	How many grades can be segregated?	:	**1**
20.2	How many cooled?	:	**N/A**
20.3	Can vessel sail with slack cargo tanks?	:	**Yes**