

**GAS FORM C****Main Particulars****2.1 PREAMBLE**

|                        |  |
|------------------------|--|
| <b>Ship's name</b>     | BW ORION   |
| <b>Owners</b>          | BW CONSTELLATION I   |
| <b>Flag – Registry</b> | Isle of Man (IOM)  |
| <b>Builder</b>         | Hyundai Heavy Industries Co., Ltd, Ulsan, Korea  |
| <b>Delivery</b>        | 15 <sup>th</sup> October 2015  |
| <b>Class</b>           | DNV-GL   |
| <b>Class notation</b>  | +1A1, Tanker for Liquefied Gas, Ship Type 2G(-50°C, 0.610kg/m <sup>3</sup> , 0.275 bar), E0, NAUTICUS(Newbuilding), PLUS, TMON, BIS, BWM-E(s), BWM-T, COAT-PSPC(B) |
| <b>IMO No.</b>         | 9719501  |

| <b>GRT / NRT</b>     |                     |
|----------------------|---------------------|
| <b>International</b> | 47342 / 18644       |
| <b>Suez</b>          | 50476.37 / 44505.69 |
| <b>Panama</b>        | NA                  |

**2.2 HULL**

|                              | <b>Metres</b>   |
|------------------------------|---|
| <b>LOA</b>                   | 225.2 mtrs  |
| <b>LBP</b>                   | 220.23mtrs  |
| <b>Breadth</b>               | 36.6 mtrs   |
| <b>Depth</b>                 | 22.2mtrs  |
| <b>Keel to highest point</b> | 49.73mtrs(without tilting), 48.02 mtrs (with tilting) |

|                               |             |                                 |         |
|-------------------------------|-------------|---------------------------------|---------|
| <b>Max summer draft</b>       | 12.022 mtrs | <b>Corresponding deadweight</b> | 54561mt |
| <b>Freeboard summer draft</b> | 6.646 mtrs  |                                 |         |

|                         |          |
|-------------------------|----------|
| <b>TPC fully loaded</b> | 70.60 mt |
|-------------------------|----------|

| <b>Mean draft with 95% full bunkers and full cargo</b> |                   |                         |
|--|-------------------|-------------------------|
| <b>Specific Gravity</b>                                | <b>Mean draft</b> | <b>Corresponding DW</b> |
| 0.5800   | 11.51 m           | 51494.6                 |
| 0.6100   | 11.88 m           | 53965.9                 |
|  |                   |                         |
|  |                   |                         |



| Communication equipment                     |  |
|---|--|
| International call sign                     | 2IUA8  |
| Radio Station                               | Isle of Man  |
| Satcom FBB 500 (Capt Office/Dayroom,Bridge) | +870 773930526   |
| - Telefax                                   | +870 783157208   |
| V-SAT (Bridge/Capt Office/Dayroom)          | +65  |
| Satcom C                                    | 423594469 / 423594470                                    |
| Cell phone                                  |  |
| MMSI  | 235112806  |
| E-mail                                      | <a href="mailto:orion@bwfleet.com">orion@bwfleet.com</a> |

### 2.3 MACHINERY

| Main Engine                 |                                       |
|-----------------------------|---------------------------------------|
| HYUNDAI-MAN B&W 6G60ME-C9.2 |                                       |
| Max Cont.                   | 12,400 kW (16,622 (HP) PS) x 92.2 RPM |
| Grade fuel used             | IFO 380 cst                           |

| Auxiliaries     |                            |
|-----------------|----------------------------|
| Diesel          | 3 units                    |
| Make            | HYUNDAI HIMSEN 6H21/32     |
| kW/RPM          | 1200 kW / 900 rpm          |
| Grade fuel used | 700 cSt at 50°C (ISO 8217) |

| Speed/Consumption*                                     |  |
|--|--|
| Guaranteed average loaded/ballast speed over 12 months |  |
| Average consumption on Main Engine guaranteed speed    |  |
| Average consumption on auxiliaries                     |  |

\*) Above based on 50/50 propane/butane and max force 5 Beaufort

| Slow speed/consumption figures as guidance only |             |
|---|-------------|
| Average loaded/ballast                          | Consumption |
| 13 Knots  |             |
| 14 Knots  |             |
| 15 Knots  |             |

|                                |  |
|--------------------------------|--|
| Average consumption in port    |  |
| Inert gas plant when operating |  |
| Boiler consumption             |  |

| Permanent bunkers capacity (95% full)<br>(Excl. daily service and settling tanks) |           |           |
|---|-----------|-----------|
| HFO   | 2112.0 m3 | 2090.9 mt |
| LSFO  | 150.0 m3  | 148.5 mt  |
| GAS OIL   | 270.1 m3  | 229.6 mt  |
| MDO   | NA        | NA        |

### 2.4 CARGO INSTALLATION

| REVISION | DATE       | PREPARED BY | APPROVED BY | CHAPTER | PAGE NO |
|----------|------------|-------------|-------------|---------|---------|
| 00       | 02/10/2014 | -           | -           | 02      | 2.2     |



| Transportable products and respective quantities   |                         |                        |                                  |                                    |   |                                    |                                      |                                |
|--|-------------------------|------------------------|----------------------------------|------------------------------------|---|------------------------------------|--------------------------------------|--------------------------------|
| Tank No.   | 100 %<br>m <sup>3</sup> | 98 %<br>m <sup>3</sup> | Butane<br>0.6012<br>-0.0°C<br>Mt | Propane<br>0.5813<br>-42.0°C<br>mt | NH <sub>3</sub><br>0.680<br>-32°C<br>MT | Butadiene<br>0.651<br>-5.0°C<br>MT | Propylene<br>0.6094<br>-48.0°C<br>MT | Naphtha<br>0.676<br>30°C<br>MT |
| 1  | 18038.207               | 17677.443              | 10620.50                         | 10255.1                            | NA                                      | 11498.8                            | 10748.9                              | NA                             |
| 2  | 22583.527               | 22131.856              | 13297.10                         | 12839.7                            | NA                                      | 14396.3                            | 13457.7                              | NA                             |
| 3  | 22592.128               | 22140.285              | 13302.2                          | 12844.6                            | NA                                      | 14401.8                            | 13462.9                              | NA                             |
| 4  | 20981.664               | 20562.03               | 12354.0                          | 11928.9                            | NA                                      | 13375.1                            | 12503.2                              | NA                             |
| <b>Total</b>   | 84195.526               | 82511.614              | 49573.8                          | 47868.3                            | NA                                      | 53672.0                            | 50172.7                              | NA                             |
| <b>Deck tank capacity</b>  |                         |                        |                                  |                                    | NA                                      |                                    |                                      |                                |
| Transportable products and respective quantities   |                         |                        |                                  |                                    |   |                                    |                                      |                                |
| <i>Other transportable products:<br/>Pure Propane, Commercial Propane, Commercial Butane,<br/>Mixture of Propane and Butane in any proportion, Propylene</i> |                         |                        |                                  |                                    |   |                                    |                                      |                                |

Scantlings of the cargo tanks are based on a maximum density of cargo of 610kg/m<sup>3</sup>. Cargo with density up to 1,000 kg/m<sup>3</sup> may be carried in the cargo tanks on the following conditions:

|   |   |
|---|---|
| For density of 1,000 kg/m <sup>3</sup>                | N/A   |
| For densities between 610 and 1,000 kg/m <sup>3</sup> | Inversely linear proportional to cargo density 98% filling at S.G=0.61 to 67 % filling at S.G=1.0 |

| Tank working pressure                   |   |
|---|---|
| Maximum pressure                        | 0.400 barg (harbour) / 0.275 barg (sea) |
| Minimum pressure                        | -0.05 bar                               |
| Minimum temperature acceptable in tanks | -50°C                                   |

|                          |   |
|--------------------------|---|
| Loading rate - tons/hour | 2700 mt on two manifolds with vapour return |
|--------------------------|---|

## 2.5 CARGO PUMPS

|   |   |
|---|---|
| Number and type   | 8 x 600 m3/hr / Wartsila Svanehoj                         |
| Location  | 2 x pumps in each cargo tank                              |
| Max permissible specific gravity  | 120 mLC, 0.610 kg/m3                                      |
| Time for discharging full cargo using all pumps against no backpressure | 19 hrs (excluding stripping)                              |
| Cargo remaining onboard in cargo tanks after completion pumping         | Total appr 115 m3 un pumpable liquid (all cargo tanks)    |
| Total head when working in series with booster pump                     | 350 mLC (1 DWP + 2 BP)                                    |
| Booster pumps   | 2 x 600 m3/hr at 115 mLC / Wartsila Svanehoj, 0.610 kg/m3 |



2.6 CARGO COMPRESSORS

|                               |   |         |
|-------------------------------|---|---------|
| <b>Number and type</b>        | 2 x Burckhardt Compression / 4K165-3P_1 |         |
|                               |   |         |
|                               | <b>Propane</b>                          | Ammonia |
| <b>Refrigeration Capacity</b> | 2 x 660 KW (710 rpm, F-LSC, 5% Ethane)  | N/A     |
| <b>Suction pressure</b>       | 1.4 bar (A)                             | N/A     |
| <b>Condensate Temp.</b>       | 28°C                                    |         |

2.7 INERT GAS SYSTEM

|                                       |   |
|---------------------------------------|---|
| <b>Does the vessel use inert gas?</b> | Yes   |
| <b>Utilization</b>                    | Inerting of Void spaces and Cargo tanks as required |

|   |                  |
|---|------------------|
| <b>Does the vessel produce inert gas?</b> | Yes              |
| <b>Type</b>                               | Wartsila Moss AS |
| <b>Daily production</b>                   | NA               |

| Composition of inert gas    |                      |
|-----------------------------|----------------------|
| <b>Carbon dioxide</b>       | 14 %                 |
| <b>Oxygen max.</b>          | 1.0 %                |
| <b>Carbon monoxide max.</b> | 100 ppm by volume    |
| <b>Hydrogen max.</b>        | -                    |
| <b>Nitrogen</b>             | Balance              |
| <b>Soot</b>                 | 0 on Bacharach scale |
| <b>Sulphur oxides max.</b>  | 1 ppm by volume      |
| <b>Dew point</b>            | -40.0 °C at 760 mmHG |

|   |    |
|---|----|
| <b>State if any shore supply of liquid nitrogen may be required</b> | No |
| <b>What quantity?</b>   | NA |

2.8 GAS FREEING

|  |     |
|--|-----|
| <b>Can this operation be carried out at sea?</b> | Yes |
|--|-----|

| State method incl. all details |  |
|--------------------------------|--|
| <b>For LPG</b>                 | <b>Boil Off</b> 36 hrs C3/C4                   |
|                                | <b>Inerting</b> 35 hrs                         |
|                                | <b>Ventilating for Entry</b> 11 hrs (Deck fan) |
| <b>For NH<sub>3</sub></b>      | N/A  |

| Advise time required and consumption of inert gas if any |                    |
|--|--------------------|
| <b>From LPG approximately</b>                            | 35 hrs / 175000 m3 |
| <b>From NH<sub>3</sub> approximately</b>                 | N/A                |

|  |                                     |
|--|-------------------------------------|
| <b>Is the vessel equipped with inert gas blower?</b> | Yes                                 |
| <b>Capacity</b>                                      | 5300Nm <sup>3</sup> /hr at 0.4 barg |

|                        |   |
|------------------------|---|
| <b>Ventilation fan</b> | 2 x 10000 m <sup>3</sup> /hr at 1475 mmWC |
|------------------------|---|

**2.9 CHANGING GRADE**

|   |     |
|---|-----|
| Can this operation be carried out at sea? | Yes |
|---|-----|

State method used and time required for changing from NH<sub>3</sub> to LPG and vice versa, to reach 50 ppm of previous cargo in tanks atmosphere, the tanks being dry and free of moisture (dewpoint plus 10 degrees C)

|                             |    |
|-----------------------------|----|
| From NH <sub>3</sub> to LPG | NA |
| Time required               | NA |

|                             |    |
|-----------------------------|----|
| From LPG to NH <sub>3</sub> | NA |
| Time required               | NA |

|   |  |
|---|--|
| Can vessel reduce in tank atmosphere and gas installation concentration of previous cargo below 50 ppm? | NA                                     |
| Method used, time required and extra shore supply if any  | NA                                     |
| How can it be checked that no liquid gas remain onboard   | Temperature indication & Pressure Rise |

**2.10 CARGO HEATER**

|  |           |
|--|-----------|
| State discharging rate for propane with 2.5 mol % ethane to be brought from -42 °C to 0 °C at sea temperature of 15 °C | 325 mt/hr |
|--|-----------|

**2.11 CARGO VAPORIZER**

|   |     |
|---|-----|
| In case of need of vapour gas during discharge, can vessel produce its own if no shore gas available? | Yes |
|---|-----|

**2.12 REFRIGERATING APPARATUS**

|                             |    |
|-----------------------------|----|
| Is it independent of cargo? | No |
|-----------------------------|----|

**2.13 MEASURING APPARATUS**

|  |  |
|--|--|
| What gauges onboard                          | Radar  |
| Location and type                            | 2 for each cargo tank<br>Kongsberg / GLA-100/5 |
| Number of temperature sensors/gauges pr tank | 7 – (3 each side of tank and 1 in vapour dome) |
| Number of pressure sensors/gauges pr tank    | 1 in each tank                                 |



2.14 SAMPLES

|                                       |   |
|---------------------------------------|---|
| Where can samples be taken?           | 1) Cargo tank dome using cargo pump (liquid)<br>2) Manifold (liquid)<br>3) Cargo tank dome (vapour) |
| Are sample bottles available onboard? | Yes   |

2.15 CARGO LINES

(See also last page of this gas form C)

|  |             |
|--|-------------|
| Is vessel fitted with midship manifolds                                      | Yes         |
| Distance from cargo manifold to bow  | 111.41 mtrs |
| Distance from manifold to stern  | 113.75 mtrs |
| Height cargo manifold above main deck  | 2.110 mtrs  |
| Height cargo manifold above waterline when in ballast                        | 17.41 mtrs  |
| Height cargo manifold above waterline when loaded                            | 12.29* mtrs |
| Distance from shipside to manifold flange                                    | 4.250 mtrs  |
| Distance between loading and vapour return connections                       | 2.250 mtrs  |
| Windage area in normal ballast condition                                     | 4166.0m2    |
| Is vessel fitted with SPM chainstopper suitable for 76 mm chain.             | Yes         |
| Is vessel fitted with cruziform bollards/fairleads/eye-pads in manifold area | Yes         |

\*Summer Draught.

| Dimension of lines |                              |   |
|--------------------|------------------------------|---|
|                    | Diameter                     | Flange size   |
| Liquid             | 350 mm / 14 inch (Manifold)  | 14"   |
| Gas Line           | 250 mm / 10 inch (Manifold)  | 10"   |
| Booster Line       | 350 mm / 14 inch* (Manifold) | 14"(*No separate booster manifold, liquid manifolds used to unload cargo using booster) |

| What reducers onboard |           |         |                  |
|-----------------------|-----------|---------|------------------|
| Number                | Diameter  | Length  | Pressure rating  |
| 2                     | 14" x 16" | 62.5 cm | (ANSI) 300 x 150 |
| 2                     | 14" x 14" | 50.0 cm | (ANSI) 300 x 150 |
| 2                     | 14" x 12" | 58.7 cm | (ANSI) 300 x 150 |
| 2                     | 14" x 10" | 57.5 cm | (ANSI) 300 x 150 |
| 2                     | 14" x 8"  | 57.5 cm | (ANSI) 300 x 150 |
| 2                     | 14" x 16" | 64.4 cm | (ANSI) 300 x 300 |
| 2                     | 14" x 12" | 60.3 cm | (ANSI) 300 x 300 |
| 2                     | 14" x 10" | 59.0 cm | (ANSI) 300 x 300 |
| 2                     | 14" x 8"  | 58.4 cm | (ANSI) 300 x 300 |
| 2                     | 10" x 12" | 55.0 cm | (ANSI) 150 x 150 |
| 2                     | 10" x 8"  | 50.0 cm | (ANSI) 150 x 150 |
| 2                     | 10" x 6"  | 50.0 cm | (ANSI) 150 x 150 |
|                       |           |         |                  |
|                       |           |         |                  |

2.16 LIFTING DEVICE

| Where situated                                 | Aft                             | Amidship             |
|--|---------------------------------|----------------------|
| Number and type                                | 2, Electro Hydraulic            | 1, Electro Hydraulic |
| Lifting capacity                               | 4 tons                          | 10 tons              |
| Max. distance from ship's side of lifting hook | Port 9.2 mtrs<br>Stb. 11.2 mtrs | 6.7 mtrs             |

**2.17 HOSES**

|   |                                 |
|---|---------------------------------|
| <b>For what products are hoses suitable</b> | No Cargo Hoses Carried on-board |
|---|---------------------------------|

| <b>Number</b> | <b>Length</b> | <b>Diameter</b> | <b>Working pressure</b> | <b>Flange</b> |
|---------------|---------------|-----------------|-------------------------|---------------|
|---------------|---------------|-----------------|-------------------------|---------------|

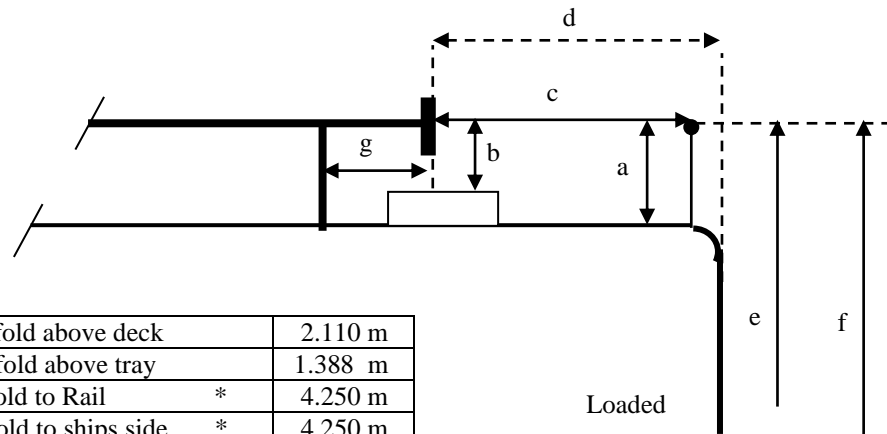
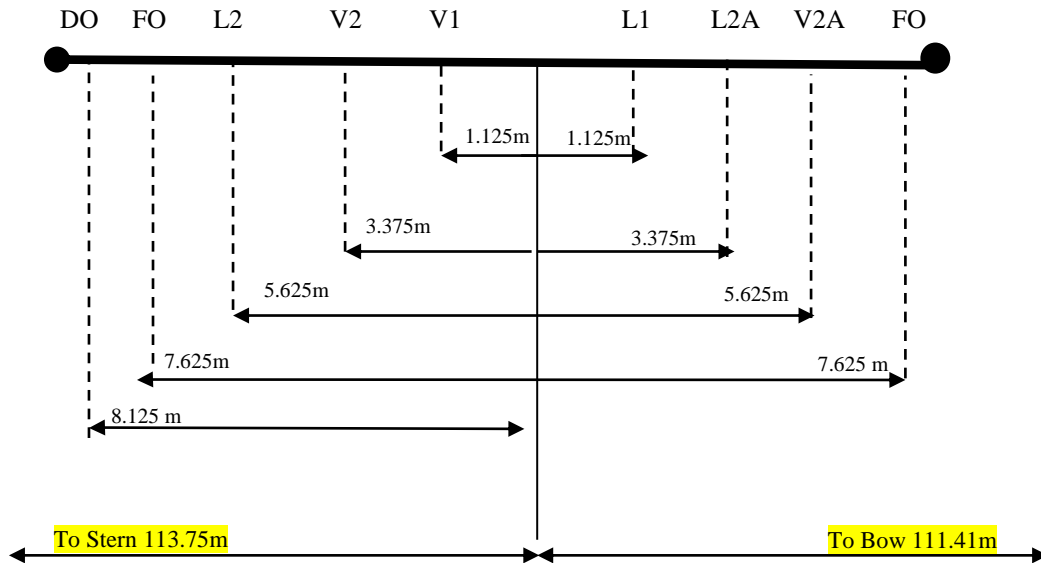
**2.18 SPECIAL FACILITIES**

|  |   |
|--|---|
| <b>How many grades can vessel segregate?</b> | 2 |
|--|---|

|  |   |
|--|---|
| <b>Indicate systems</b>  | (Tks 1+3) and (Tks 2+4) or (Tks 1+3+4) and (Tk 2) |
| <b>Is vessel able to load/discharge two or more grades simultaneously?</b> | Yes   |
| <b>Can vessel sail with slack tanks?</b>                                   | Yes   |
| <b>Is vessel fitted with purge tank?</b>                                   | No  |



**ARRANGEMENT OF CARGO MANIFOLD**



|  |         |
|--|---------|
| a) Height of manifold above deck             | 2.110 m |
| b) Height of manifold above tray             | 1.388 m |
| c) Distance manifold to Rail *               | 4.250 m |
| d) Distance manifold to ships side *         | 4.250 m |
| e) Dist. waterline loaded to manifold        | 12.29m  |
| f) Dist. waterline ballast to manifold       | 17.41m  |
| g) Dist. 1 <sup>st</sup> stander to manifold | 0.39 m  |

\* without reducer

**PARALLEL BODY LENGTH**

**LOADED CONDITION**

