# GROUP 1

# SHIP GENERAL

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# 1 GENERAL

## 10 GENERAL PROVISIONS

### 101 General Clauses

It is the intent of the Specifications to describe and set forth the details of technical matters in the Contract i.e., design, performance, capacities, construction, equipment, materials, etc. of a Liquefied Natural Gas Carrier (hereinafter called the "Vessel") as compatible with the Specifications.

The following plans attached hereto shall form an integral part of the Specifications :

- General Arrangement

* Drawing No. : BPG-BPS-101-001, Rev. B
** Issued Date : Dec. 12, 2014

Details in design, construction, installation, inspection, test, workmanship, etc. not covered by the Specifications shall be in accordance with the Builder's current standards and practices.

Any items(s) which is not called for explicitly in the Specifications shall not be furnished nor applied by the Builder unless it is required by the specified Rules and/or Regulations listed herein.

Any modification(s) and/or change(s) to the Specifications shall be subject to the provisions of the Contract.

If any item(s) is mentioned twice or more in the Specifications, it shall be understood that such item(s) shall be supplied and/or applied only once, unless otherwise specifically indicated.

Should there be any discrepancy between the Contract and the Specifications, the Contract shall prevail. And should there be any discrepancy between the Specifications and the GA, the former shall prevail.

Should there be any conflict or inconsistency between the terms of parts of the Specifications, the hull part shall prevail in respect of hull items, the machinery part in respect of machinery items, and the electrical part in respect of electrical items.

The meaning of "the Buyer" in the Contract or "the Owner" in the Specifications shall be understood to be the same.

* The meaning of "Maker List" in the Contract or "Suppliers List" in the Specifications shall be understood to be the same.

* The meaning of "Draught" or "Draft" shall be understood to be the same.

Wherever in the Specifications the terms such as "or", "if necessary", "when considered", "may" and other similar expressions are used, their application shall be left to the Builder's discretion provided the result of such application remains compatible with the provisions of the Specifications.

**

The following units shall be used throughout the Vessel for design, manuals and operator interface :

| Parameter | Units | Parameter | Units |
|---|---|---|---|
| Pressure | bar, milibar | Temperature | °C |
| Weight | kg, metric tons | Distance | m, mm, nm (nautical miles) |
| Kinetic viscosity | cSt | Frequency | Hz |
| Ship speed | knots | Rotational speed | rev/min |
| Volume | cc, l, m3 | | |

Other parameters for design and construction of hull, machinery, equipment and cargo system, unless otherwise specified in the Specifications shall be expressed in International System of Units (SI).

All documents and drawings for design and construction of the Vessel which shall be submitted to the Owner, shall be prepared in English.

Name plate, caution plate and identification plate shall be written in English.

* Where a language other than English is required the translation from English shall be provided by the Owner and any costs incurred borne by the Owner. The type and style of name plates shall be approved by the Owner.



101.1 Numbering and Identification

* All units of equipment installed on the Vessel shall be identified by name and where multiple units are fitted, by name and numeral. The Builder shall ensure that the Classification Society's Master List reflects the equipment identification scheme described in this Specification. The numbering system for equipment shall be from forward to aft, port side to starboard side, upper level to lower.

* Generally, the allocation of numerals where two units are installed shall be as follows;

| | | | |
|---|---|---|---|
| Forward | No.1 | Aft | No.2 |
| Port | No.1 | Starboard | No.2 |
| Upper | No.1 | Lower | No.2 |

* A similar convention shall apply where more than two units are installed, e.g.;

| | | | | | |
|---|---|---|---|---|---|
| Forward | No.1 | Centre | No.2 | Aft | No.3 |
| Port | No.1 | Centre | No.2 | Starboard | No.3 |

* All machinery shall be fitted with a permanently attached nameplate carrying its identifying name and (where applicable) number.

* The nameplates on starters and other remote controls shall indicate the equipment name, number, e.g."Fire and Bilge Pump No.1 – Port".

* The numbering of the cylinders of reciprocating engines shall follow the manufacturer's convention. It is essential that the numbering of all records, mimic diagrams, etc. on board are aligned. The numerical identity of cylinders of all reciprocating engines shall be clearly marked on the engine.

## 102 Materials and Workmanship

Materials, apparatus and equipment shall be in accordance with the Korean Industrial Standards(KS) and/or the Japanese Industrial Standards(JIS) and/or the Builder's standards and/or the manufacturers' standards, unless otherwise specifically described in the Specifications.

Manufacturers' standard type, size and materials of machinery, equipment and fittings shall be adopted, unless otherwise specifically described in the Specifications.

If any of the materials or equipment described in the Specifications is not available, the Builder may supply other materials or equipment capable of meeting the requirements of the Classification Society and of the Rules and Regulations.
Substitution of the materials or equipment shall be subject to the provision of the Contract.

If any of the specific description for the machinery or equipment in the Specifications is not consistent with the finally selected manufacturers' standard specifications, such description shall be readily corrected to follow the manufacturers' standard specification with prior agreement of the Owner.

Asbestos, PCB(Poly-Chlorinated Biphenyl)s, CFCs and HCFCs materials shall not be used.

* PVC materials shall not be used except the following items.
- The material for sanitary discharge pipe and the toilet space sewage and grey water drains.
- Multi core tube outside sheath material as per manufacturer's standard.
- Maker’s cable in/on the equipment
- PVC film wall panel in accommodation area.

* The level and items of toxic smoke producing material shall be in compliance with the SOLAS.

* All paints shall be lead-free.

SUS without grade notation in the Specifications shall mean JIS SUS 304.
* However, for the drip tray and the vents masts, JIS 316L shall be used.

Grease nipples shall be of ball type (JIS B 1575 PT 1/8").

All works shall be executed in accordance with the Builder's current shipbuilding practices, which shall be approved by the Classification Society where required.

* Where a Supplier's standard does not meet the Owner's requirements or differs from that required by the main specification, the Builder shall highlight the gap to the Owner at the plan approval stage who shall appraise each item on a case-by-case basis.

* The equipment and systems shall be capable of operating the designed performance at Vessel's trim conditions covered by the Trim and Stability booklet.

* Material handling study for ensuring all materials, including spare parts, consumables, stores, machinery valves and equipment requiring repair can be safely and efficiently moved around the Vessel by provision of adequate routing, fixed and portable lifting appliances, access hatches, etc., shall be carried out by the builder and the results shall be submitted to the Owner for review.

103 Spare Parts, Tools and Accessories

* The Builder shall supply sufficient spare parts, tools and accessories required for the equipment manufacturer's recommended inspections, maintenance and overhauls for two (2) years normal vessel operations. Where multiple identical units are fitted, the spare parts shall be sufficient for two (2) years normal operation for all units.

The spare parts, tools and accessories shall be properly identified, protected and stored in a way which guides easy access and control depending on its type and size.

If any additional spare parts other than those mentioned in the Specifications are provided on board the Vessel by the Owner's arrangement, on-board storing provision including seats shall be on the Owner's account.

* "Spare Parts List" shall be submitted for approval with the relevant drawings, and shall include spare parts covering all areas of the ship, including the engine room, deck, cargo and accommodation. Upon vessel delivery, a current version shall be provided on a discipline basis in PDF format. These Spare Parts Lists shall include spares from all makers, whether or not they are included on other plan approval submissions or final drawings.

* Spares parts (including depot) requiring Classification Society certification shall be supplied with the appropriate certification.

* Hydraulic tools shall conform to the European Pressure Equipment Directive and shall be supplied directly from the Original Equipment Manufacturer (OEM).

* All hydraulic tools shall be provided with a test certificate which clearly states the maximum working pressure of the assembled tool system.

## 104 Ship-shore Compatibility

** The Vessel shall be compatible with the terminals listed below based on SIGTTO "Port Information for LNG Export and Import Terminals, 4th Edition, March 2000" intended for this size of vessel :

< Table A : Except Gangway Requirement>

| Country | Terminal |
|---|---|
| Algeria | Bethioua (berth 2, 3, 4 & 5) |
| Angola | Soyo |
| Australia | Darwin, Whitnell Bay (berth 1 & 2)<br>Pluto |
| Belgium | Zeebrugge |
| Canada | Canaport(berth 1) |
| Chile | Mejillones, Quitnero |
| China | Guangdong , Shanghai |
| Egypt | Damieta, Idku |
| Equitorial Guinea | Equitorial Guinea (Punta Europa) |
| France | Fos Cavaou , Montoir (berth up & down) |
| India | Dahej, Hazira, Dabhol |
| Indonesia | Bontang(berth 3) |
| Japan | Chita (berth L-1), Futtsu (berth 2),<br>Higashi Ohgishima, Negishi,<br>Ohgishima, Oita,<br>Senboku (berth 1), Sodegaura (berth 3),<br>Yanai |
| Korea | Gwangyang, Inchon(berth 2),<br>Pyeongtaek(berth 2), Tongyeong(berth 2) |
| Mexico | Altamira, Costa Azul (Sempra) |
| Netherlands | Gate 1 |
| Nigeria | Bonny(berth 1 & 2) |
| Oman | Qalhat |
| Portugal | Sines |
| Qatar | Ras Laffan(berth 1, 2, 3, 4, 5 & 6) |
| Singapore | Singapore LNG |
| Spain | Barcelona(New), Bilbao,<br>Cartegena(New), Huelva (berth 2), |

| | | |
|---|---|---|
| | Reganosa, | Sagunto |
| Taiwan | Yung An | |
| Trinidad & Tobago | Point Fortin (berth 2) | |
| UK | Dragon, | South Hook |
| USA | Cameron,<br>Elba Island, Freeport,<br>Lake Charles, | Covepoint<br>Golden Pass,<br>Sabine Pass(East) |

** The Vessel shall be compatible with the following terminals except the items listed.

< Table B >

| Country | Terminal |
|---|---|
| Dominican Republic | AES Andres (L < 294.0 m) |
| Indonesia | Bontang(berth 1 & 2) (L < 285.0 m) |
| Japan | Chita (berth L-2) (L/A), Futtsu (berth 1) (L < 293.0 m),<br>Himeji (L/A), Kawagoe (L/A, B < 45.8 m),<br>Niigata(B < 45.0 m), Sakai (L/A),<br>Senboku (berth 2)(L/A),<br>**Sodequara(berth 2)** (L < 293.8 m) |
| Norway | Snohvit (Melkoya) (L/A) |
| UAE | Das Island(berth 4) (L/A) |

** Following Terminals shall be investigated the ship-shore compatibility study if the terminal information is available.

< Table C >

| Country | Terminal |
|---|---|
| ~~**Canada**~~ | ~~**Canaport (berth 2)**~~ |
| China | Dalian, Jiangsu, Tangshau,<br>Tianjin, Hainan, Zhejiang,<br>Zhuhai |
| India | Kochi |
| Indonesia | Jakarta Bay FSRU |
| ~~**Italy**~~ | ~~**Offshore Livorno**~~ |
| Japan | Joetsu, Naoetsu,<br>Toden Ogishima(Tepco) |
| Kuwait | Kuwait Gas Port |
| Malaysia | Malacca |
| Mexico | Manzanillo |
| Netherlands | Gate 2 |
| Peru | Melchorita |
| Taiwan | Taichung |
| Turkey | Alaga |
| Thailand | PTT |
| UAE | Dubai |
| UK | Grain Jetty (berth 8 & 10) |
| USA | Pasacagoula |

**Following Terminals have been added by owner's request. These terminals shall be investigated the ship-shore compatibility study if the terminal information is available.**

**< Table D >**

| Country | Terminal |
|---|---|
| Italy | Adriatic LNG(Berth1) |
| Eqypt | Ain Sokhna |
| Jordan | Aqaba |
| Brazil | Bahia Blanca |
| Malaysia | Donggi |
| Argentina | Escobar |
| China | Fujian (Berth 1) |
| Australia | Gladstone (Berth 1) |
| | Gorgon (East/West) |
| Brazil | Guanabara (East) |
| Spain | Guayanilla |
| Japan | Ishikari |
| Japan | Mizushima (Berth 1) |
| Brazil | Pecem (Berth 1) |
| Poland | Poland LNG |
| China | Quingdao |
| Brazil | Salvador de Bahia |
| Korea | Samcheok (Berth 1) |
| Japan | Sodeshi (Berth 1) |
| Indonesia | Tangguh (Berth 1) |
| Japan | Tobata (Berth 1) |
| Japan | Tokyo Gas Ohgishima (Berth 1) |
| China | Zhejiang Ningbo (Berth 1) |



* The following information shall be included in the ship-shore compatibility study of the vessel at the above listed LNG terminals as far as available.

- Mooring force calculation, layout and including fender reaction force (shore mooring lines may be used for a specific terminal, if mooring force calculation requirement requires more mooring line than the mooring line described in this specification and shown on General Arrangement plan.)
- Parallel middle body with fender contact area matching in ship's conditions
- Gangway landing position and envelope
- Cargo manifold arrangement and loading & discharging arm's envelope
- Ship/shore communication (including Optical Fiber Data Link)
- Emergency shutdown system
- Fire Fighting
- Storage and crane, etc
- Any special navigation or working light requirements on the ship

It shall be assumed that the Principal Dimensions including hull form of the Vessel shall not be changed due to the restrictions of the listed terminals.

The Builder shall provide possible loading conditions information by adjusting volume of

cargo or bunkers to be loaded, if the above terminals have any restrictions on displacement, draft, etc.

104.1 Supply of information for loading/discharging terminals

The following data of loading/discharging terminals listed in Section 104 shall be supplied by the Owner prior to finishing the initial design (eight(8) months prior to the steel cutting) in order that the Builder shall design the Vessel compatible to the terminals:

- Operating envelope of loading arm (high/low), detailed arrangement of loading arm.
- Working range of gangway (high/low), detailed arrangement of gangway.
- Breasting Dolphin(BD) layout including equipment.
- Mooring Dolphin(MD) layout including equipment.
- Fender type, size and performance, detailed arrangement of fender.
- Location of gangway landing position from the spot line of vapor return arm.
- Shoreside communication system specification.
- ESD system specification (electric, optic and pneumatic)

* - Side of Vessel alongside terminal (Port and/or Starboard)

- Tidal level (high/low) of terminals
- Maximum size of vessel (LOA, Breadth, Displacement, Cargo volume, Air draft)
- Other information of terminals (depth of water, weather criteria, terminal contact point, etc.).

** With regard to the Table C above, the technical and commercial consequences for the modifications of the Vessel, if any, shall be mutually agreed after receiving the information from the Owner.

Should the information about the terminals is not fully supplied by the Owner by the above mentioned period, the Vessel may not be compatible to the terminals and it shall be, in such case, the Owner's responsibility.

104.2 Flat of Side

The Vessel shall have a flat of side above the ballast waterline, extending at least from approx. 75.0 m aft to approx. 55.0 m forward of the center of the vapour return line.

# 11 GENERAL DESCRIPTION AND PARTICULARS

## 111 General Description

The Vessel shall have a continuous upper deck with aft sunken deck, a raked stem with a bulbous bow, a transom stern with open water type stern frame, two (2) DSME full spade rudders with rudder bulbs, a bow thruster and two (2) fixed pitch propellers driven by duel fuel slow speed diesel engines (ME-GI engine).

The propulsion machinery and living quarters including navigation bridge shall be located aft as shown on the GA.

The Vessel shall be built to have four(4) membrane cargo tanks which shall be able to retain BOG up to 0.35 barg by adopting structurally strengthened Sealed LNG Carrier(sLNGc®).

Cargo containment system shall be of GTT NO96-GW.

* The designed draft shall correspond to the even keel loaded departure condition with **98.5%** cargo (S.G.=0.44), with HFO allowing the cruising range of 8,000 nautical miles without use of BOG, plus three (3) days margin at 20.0 knots and 50% supplies of MGO, FW and 100% supplies of other consumables. The cruising range is to be calculated using the reference DFOC for both main and auxiliary engines as contained in Section 116.2 of the Specification.

* Under trunk deck, passageways shall be provided port and starboard. These passageways shall additionally be used as cable and pipe passages.

* Ballast Tanks are to be 'J tanks' divided port and starboard.

* A cargo compressor room and motor room shall be provided on the trunk deck.

* A duct keel shall be arranged in the center of the double bottom tank in way of the cargo area.

* Deck/Cargo Gear store shall be provided near to the mid-ship's cargo manifold.

* The distance between cargo tanks and the side shell shall meet the requirements of the IGC code coming into force in January 2016.

* The cargo area to be protected by double hull ballast tanks, double deck and transverse cofferdams forward and aft of the cargo tanks.

* A water tight double bottom void space shall be provided across the entire length of the engine room. Tanks may be incorporated into the double bottom area. The depth of the void space below the tanks shall not be less than 760mm, except for the bilge holding tank and clean drain tank which may border the shell. The void height may be locally reduced to 500mm in way of suction wells.

* Fuel oil tanks shall be provided at the forward and engine room area of the vessel, as per the GA.

* Fuel oil and lub. oil tanks shall not be arranged in the ER double bottom except ME system oil sump tank, FO overflow tank and waste oil tank, **Stern tube LO tank, FO drain tank and bio degradable oil storage tank**.

* Fuel oil tanks shall be designed as follows:
  - Fuel oil tank deckheads shall not be placed under accommodation deckhouses or casings.
  - Fuel oil tanks and any other oil storage tank shall be separated from the shell by a void or water ballast tank.
  - Void spaces shall be possible to inspect.
  - The void or ballast tank shall be a minimum of 2m wide (measured perpendicular to the shell) but may be locally reduced to 1.2 m in way of hopper corners.
  - Tanks should be placed longitudinally at the sides of the engine room.

* Distilled and potable fresh water tanks and shall not share a boundary with any other tank. The tank internal structure shall be minimised. If the side shell forms a boundary of the tank, the base of the tank shall be located above the deepest waterline

* A helicopter winching zone shall be provided on the trunk deck.

* The Emergency fire pump is to have flooded suction at all operating draughts, including at the draught corresponding to the docking arrival condition.

Cargo tanks, WB tanks, aft peak tank, FO tanks, FW tanks, etc., shall be arranged as shown on the GA.

## 112 Principal Dimensions

| | | | |
|---|---|---|---|
| * | Length overall, moulded | Max. 294.9 | m |
| | Length between perpendiculars | 282.9 | m |
| | Breadth, moulded | 46.4 | m |
| | Depth, moulded | 26.5 | m |
| | Designed draft, moulded | Max. 11.5 | m |
| | Scantling draft, moulded | 12.5 | m |
| | Freeboard deck | Sunken deck | |
| | Freeboard type | "B" | |

Air draught restriction of 54.0m for departure from Montoir in the normal ballast departure condition shall be met.

## 113 Deck Heights, Camber and Sheer

### 113.1 Deck heights at center line, moulded

| | | |
|---|---|---|
| Upper deck to A deck | 4.0 | m |
| A deck to B deck | 3.25 | m |
| B deck to C deck | 3.0 | m |
| C deck to D deck | 3.0 | m |
| D deck to E deck | 3.0 | m |
| E deck to nav. bridge deck | 3.0 | m |
| Nav. bridge deck to compass deck | 3.1 | m |



### 113.2 Camber and sheer of decks

| | |
|---|---|
| Camber for trunk deck | approx. 0.2 m |
| for upper deck(E/R fwd - fore end) | approx. 0.5 m |
| for upper deck(E/R aft – E/R fwd) | approx. 0.25 m |
| for others | nil except straight camber for bridge wings and exposed deck |
| Sheer for upper deck | due to camber only |
| for superstructure | nil except compass deck and navigation bridge deck of exposed aft part |
| for mooring deck(aft end – E/R aft) | approx. 0.35 m |

* Funnel top to be provided with camber or sheer.

## 114 Deadweight and Capacities

### 114.1 Deadweight

* The deadweight of the Vessel shall be 81,850**(Actual: 82960.8)**metric tons at the designed draft of 11.5 m, without trim, with the Vessel afloat in SW with SG of 1.025.

* Deadweight at the scantling draft of 12.5 m : approx. 93,350**(Actual: 94558.4)**metric tons.

### 114.2 Capacities (100% full)

Cargo tanks excluding dome space

(Approximate)

| Tank No. | Capacity (m3) | |
|---|---|---|
| | 100% | **98.5%** |
| NO.1 Cargo Tank | 24,620<br>**Actual: 24,674.5** | **Actual: 24,304.4** |
| NO.2 Cargo Tank | 50,180<br>**Actual: 50,272.3** | **Actual: 49,518.2** |
| NO.3 Cargo Tank | 50,180<br>**Actual: 50,260.3** | **Actual: 49,506.4** |
| NO.4 Cargo Tank | 48,420<br>**Actual: 48,515.8** | **Actual: 47,788.1** |
| Total | 173,400<br>**Actual: 173,722.9** | **Actual: 171,117.1** |

* Others

(Approximate)

| Category | Capacity (m3) |
|---|---|
| WB tanks including aft peak tank | 60,000<br>**Actual: 61,648** |
| HFO and LSHFO tanks including settling and service tanks | **4,400**<br>**Actual: 4,575** |
| LSMGO storage tank including service tank | **1,000**<br>**Actual: 1,094** |
| FW tanks | 400<br>**Actual: 421** |

* Tank capacity for HFO and MGO:
- HFO : sufficient passage between Singapore to US Gulf via Cape Good Hope at NCR and 20 knots, plus 3 days margin and with the vessel at the designed draught.
- MGO: sufficient for 8 days at 20 knots without safe margin and with the vessel at the designed draught. HFO tanks to be capable of conversion to MGO post 2020.