**SONATRACH 173,400 M3 LNG CARRIER**

**LIST OF SPEC. DEVIATIONS**

**Date : Aug. 31, 2007**

**Ref. No. : LN0725-DV(A)-R0**

**Total 7 Sheets Incl. Cover**

**Note :**

**1. This document contains the major discrepancies between the Owner’s Specifications/requirements and the Builder’s Proposed Specifications.**

**2. It should be noted that minor deviations have not been included in this list. Builder may amend this list if in Builder’s sole discretion and unforeseen significant impact may result from a minor deviation.**



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**MARINE ENGINEERING CO., LTD.**

| **Ser.**  **No.** | **Code/**  **Page** | **Item** | **Owner's requirements**  **(Tender Spec. dated April 2006 )** | **Deviation/Clarification/Proposal** | **Remarks** |
| --- | --- | --- | --- | --- | --- |
| F-1 | 2.5/  45 | Bow thruster | Thruster shaft seal shall be able to be replaced without removing major part of the thruster. | According to the information from the manufacturers, it is not feasible to replace the whole shaft sealing device without removing major part of the thruster.  However, the shaft sealing ring and liner is able to be replaced without removing major part of the thruster. |  |
| F-2 | 2.7/  45 | Access and other hull outfittings | The access by inclined ladder in water ballast tanks, transverse cofferdams, bow thruster room and forward FO pump room shall be provided. | Builder would like to propose the following access ladders :  - Two(2) access ladders (one vertical ladder and one inclined ladder as far as practicable) shall be provided in water ballast tanks in cargo area.  - A vertical ladder to be provided in way of each manhole or hatch for transverse cofferdams.  - An inclined ladder to be provided for bow thruster/FWD pump room. |  |
| P-1 | 5.1/  49 | Cargo composition | Minimum and maximum range of the chemical composition as follows:  N2 : Min. 0.447 – Max. 1.106  CH4: Min. 87.7 – Max. 91.2  C2H6: Min. 7.5 – Max. 9.7  C3H8: Min. 0.63 – Max. 2.08  C4+ : Min. 0.004 – Max. 0.22 | Following typical LNG composition to be used for the designing of the cargo equipment  N2 : 1.0 mol%  CH4 : 87.7 mol%  C2H6 : 9.0 mol%  C3H8 : 2.08 mol%  C4+ : 0.22 mol% |  |
| P-2 | 5.2/  49 | Cargo tank filling limit | Lower filling limit : 10% of cargo tank length | Lower filling limit : 10% of cargo tank height  (according to the latest GTT recommendation)  . |  |
| P-3 | 5.2/  50 | Cargo manifold back pressure | The vessel shall be able to discharge the full cargo within 13 hours with the back pressure of 120 MLC at the manifold presentation flange. | As discussed on the last clarification meeting on Oct, 2006, the revised manifold back pressure of 100 MLC to be considered as the basis of the design. Thus the cargo pump head will be 170 MLC. |  |
| P-4 | 5.2/  50 | Warm-up operation | Warm-up of cargo tank from end of stripping to +5 deg.C on secondary barrier : 42 hours | Warm-up of cargo tank from end of stripping to +25 deg.C in tanks : 48 hours  (to avoid over-sizing of equipment) |  |
| P-5 | 5.3.5/  52 | LD compressor | Capacity control shall be done by means of variable speed driven by electric motor an inlet guide vane control. | Capacity control shall be done by means of 2 speed electric motor with DGV (defuse guide vane) according to the manufacturer’s standards. |  |
| P-6 | 5.3.6/  52 | Gas heater | Two gas heaters shall be provided. | One gas heater (HD heater) and one after cooler/heater (LD) shall be provided to meet the DFDE propulsion system. |  |
| P-7 | 5.3.8/  53 | Forcing vaporizer | Outlet temperature : -40 deg.C | Outlet temperature : -120 deg.C  (to meet required methane number of DF engines) |  |
| P-8 | 2.8/  44 | Hull piping specifications for fire & wash deck system | Fire & wash deck system :  Steel (Sch.80) with polyethylene lining internally. Piping located on deck shall be SUS316L and polyethylene lined internally. | Builder would like to propose the carbon steel (Sch.80) with galvanizing instead of polyethylene lining inside.  Classification Society has an opinion that the polyethylene lining is not practicable for fire lines because it may be melted and make the pipes clogging at the fire.  And also, the stainless steel also may not be proper material for the sea water service if suitable drain and rinsing with fresh water does not carry out after use. |  |
| P-9 | 2.8/  44 | Hull piping specifications for water spray system | Water spray system :  Steel (sch.80, Seamless) with polyethylene lining internally.  Piping located on deck shall be SUS316L and polyethylene lined internally. | Water spray system : Cu-Ni/90-10  In order to comply the new DNV notation of F-AMC, non-ferrous material such as Cu-Ni or stainless steel to be used for whole piping for water spray system on deck and in engine room as well. |  |
| M-1 | 1.7.1/  34 | SFOC | SFOC shall include additional +2% NOx emission allowance | +5% tolerance in accordance with the engine manufacturer’s standards |  |
| M-2 | 6.2.3.1/  61 | DFD engine | Two 100% duty electrically driven centrifugal pumps (one running and one standby) shall be provided for each DFD engine lubricating oil system. | One(1) set of engine driven LO pump is provided for each engine in accordance with the engine manufacturer’s standards. |  |
| M-3 | 6.2.1.3/  60 | Reduction gear and coupling | One(1) double input, single output reduction gear shall be designed. | Two(2) gear unit, each with single input and single output shall be provided. |  |
| M-4 | 6.2.1.3/  60 | Reduction gear and coupling | A gravity tank capable of supplying oil for a minimum 20minutues... | The Builder considers that a gravity tank for 10 minutes will be enough for the purpose. |  |
| M-5 | 6.2.2/  60 | Steam generating plant | Steam is produced by heat recovery boilers fitted on each Main generator engines exhaust gas and by oil fired boiler. | Heat recovery boiler (exhaust gas economizer) shall be provided only for two(2) sets of big engines (12V50DF). |  |
| M-6 | 6.2.2/  60 | Steam generating plant | At least 5 m3 exhaust gas economizer soot collect tank | The exhaust gas economizer is smoke tube type which accumulates smaller amount of soots than water tube type, so the water seal as proposed is an enough way to handle drains from exhaust gas economizer. |  |
| M-7 | 6.2.4/  61 | GCU | ...with refractory lined chamber / exhaust. | Refractory lining shall be provided in accordance with the GCU manufacturer’s standards. |  |
| M-8 | 2.8/  44 | Piping specification | Compressed air for general service & control air in ER  : Stainless steel (SUS316L) | Steel ERW STPG370 (Sch.40) in accordance with the Builder’s standards. |  |
| M-9 | 6.5.1/  63 | Piping specification | Drinking water pipes :  stainless. | Seamless copper from the downstream of sterilizer in accordance with the Builder’s standards. |  |
| M-10 | 6.8.1/  65 | Fuel oil system | The fuel system shall be designed to handle following fuels :  Heavy fuel oil : RMH55  Marine diesel oil : DMB, DMA  Marine gas oil : DMX | To be applied as follows :  Heavy fuel oil : RMK45  Marine diesel oil : DMC  Marine gas oil : DMA |  |
| M-11 | 6.8.1/  65 | Fuel oil system | Each engine shall have a fuel oil metering system and gas metering system for flow monitoring. | Each engine shall have a fuel oil flow meter. And fuel gas flow meter shall be provided one(1) for each pair of engines.  . |  |
| M-12 | 6.8.1/  65 | FO purifying system | FO purifiers, each having a nominal throughput equal to 1.5 times the fuel consumption at the engine’s maximum output. | Three(3) sets of FO purifiers, each covers 50% of all engines, are provided. |  |
| M-13 | 6.7.1/  64 | LO purifying system | The purifiers shall be capable of being used on the main propulsion machinery and also on auxiliary machinery, including the stern tube oil. | LO purifying system shall be provided for main GE LO system and stern tube LO system. |  |
| M-14 | 6.7.1/  64 | LO purifying system | Two(2) LO purifiers shall be provided. | Four(4) LO purifiers, one(1) for each main generator engine, are provided. |  |
| M-15 | 6.11/  67 | Compressed air system | Two refrigeration type dryers of 100% capacity each shall be provided for machinery equipment control and one duplex absorption type air dryer of 100% capacity shall be provided for cargo equipment control. | Two(2) regenerative (absorption) type dryers of 350 m3/h capacity shall be provided for machinery equipment control and cargo equipment control. |  |
| M-16 | 6.11/  66 | Compressed air system | Four(4) equally sized electric driven screw type air compressors shall be provided...  Three(3) reservoirs shall be used each for control air for cargo part, engine room and general service. | Three(3) equally sized electric driven screw type air compressors shall be provided for control air system and service air system.  One(1) service air reservoir and one(1) control air reservoir shall be provided. |  |
| M-17 | 6.11/  67 | Compressed air system | The capacity of one(1) air reservoir can start four(4) DFD engines, each six(6) times. | The total capacity of main air reservoir can start four(4) DFD engines, each three(3) times, as per the Class requirements. |  |