###### LIST OF SPEC. VARIATIONS / QUALIFICATIONS

###### KOTC VERY LARGE CRUDE CARRIER

**Date : Apr. 25, 2008**

**Ref. No. : TK0804-DV(A)-R0**

**Total 39 Sheets incl. Cover**

**Note**

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

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



**DAEWOO SHIPBUILDING &**

**MARINE ENGINEERING CO., LTD.**

| **Ser.**  **No.** | **Spec. No/Page** | **Item** | **Owner’s Outline Specifications** | **Builder’s Specifications**  **(TK0804-FS-R0/Apr. 25, 2008)** | **Reason for Variation** | **Remarks** |
| --- | --- | --- | --- | --- | --- | --- |
| B-1 | 1.1.2.2 /  1-5 | Material of good quality | Stainless steel described without grade notation means SUS 316 throughout this Specifications. | Stainless steel without grade notation in the Specifications shall mean JIS SUS 304. | As per the Builder’s standards. |  |
| B-2 | 1.2.1.4 /  1-11 | Ambient Conditions | All machinery and equipment shall be designed for operation under the following ambient conditions unless stated otherwise in this Specification.  Winter :  Air temperature : -5 C  Sea water temperature : 5 C | Builder would like to propose as follows :  Winter :  Air temperature : 2 C  Sea water temperature : 5 C | As per the Builder’s standard VLCC design. |  |
| B-3 | 1.2.3/  1-14 | Trim and Stability | Water ballast exchange at sea is to be based on sequential method without any operating limitations. | Ballast water exchange procedure by sequential method to be based on ballast arrival condition with operating limitations such as propeller immersion, visibility, if any. | As per the Builder’s standard VLCC design. |  |
| B-4 | 1.2.5 /  1-18 | Model test | The ship’s model test to be conducted by the Builder and the test results to be submitted to the Buyer for review and approval.  ……  The model tests shall be comprise of but not to be limited to the following :  - Resistance tests at the ballast, design and scantling draughts  - Self propulsion test with stock propellers at service speed at the ballast, design and scantling draughts.  - Self-propulsion test with designed propeller at service speed at the ballast, design and scantling draughts at three trim conditions.  - Paint flow tests (streamline test) at service speed at design and scantling draught.  - Wake measurements 3-D at service speed at design and scantling draught.  - Propeller’s open water tests of designed propeller  - Cavitation test with designed propeller at service speed at ballast, design and scantling draughts. | The results of model tests with the following test scope already carried out in SSPA for the Builder's hull form shall be submitted to the Owner for reference :  - Resistance tests at the designed draft and ballast draft.  - Self-propulsion tests with the designed propeller at the designed draft and ballast draft.  - Streamline test with paint at the designed draft.  - Wake measurements at the designed draft and ballast draft.  - Open water tests with the designed propeller model.  - Cavitation tests at the designed draft and ballast draft.  - Seakeeping tests at irregular waves at the draft of 21.5 m and the ballast draft.  - Manoeuvring tests at the draft of 21.5 m and the ballast draft. | As per the Builder’s standard VLCC design. |  |
|  |  | - Cont’d - | - Propulsion test in irregular sea at ballast, design and scantling draughts.  - Optimum rudder/rudder horn neutral test.  - Propeller rotation direction (inward and outward over the top).  -Manouevring test at ballast, design and scantling draughts.  -Manoeuvrability evaluation (analytical).  -The IMO requirement IMO Res. MSC.137(76) standards for ship manoeuvrability to be fulfilled at the model test stage. |  |  |  |
| B-5 | 1.3.1/  1.21 | Classification | The Vessel shall also have the following service Classification Society notations and service items approved by Classification Society.   * Nauticus (operation), * ERS (Emergency Response Service), * SBM (Management of safety and Environment of Safety and Environment Protection in Ship Operation).   The Vessel including its hull, machinery and equipment to be built under the survey of Det Norske Veritas and to be Classed and registered as :  Det Norske Veritas : +1A1 Tanker for Oil ESP, CSR, E0, SPM, COMP-V (3), VIBR, NAUT-OC, VCS-2, HMON (G4, A1), CLEAN, PLUS, TMON, NAUTICUS (Operation), BIS. | The Vessel, including her hull, machinery, equipment and outfits shall be constructed under the survey of Det Norske Veritas, and shall be distinguished in the register by the symbols of :  +1A1, “Tanker for Oil ESP”, E0, CSR, PLUS, HMON(G4, A1), NAUTICUS(Operation), CLEAN, VCS-2, TMON, SPM, BIS, NAUT-OC. | As per the Builder’s standard VLCC design. |  |
| B-6 |  | - Cont’d - | The Vessel shall comply with the rules and requirements of other regulatory bodies with respect to the addition and amendments adopted at the signing of the Contract and which came into effect and became compulsorily applicable to the Vessel on or prior to the date of delivery of the Vessel. Compliance with such rules, regulations and requirements shall involve compliance with those in effect at the date of execution of the ship building contract as well as additions and amendments announced that are scheduled to come into effect prior to the contracted delivery date of the Vessel. | The Vessel shall comply with the Rules and Regulations that edition and amendments thereto which have been officially published and adopted/ratified at the date of signing the Contract and which come into effect and become compulsorily applicable to the Vessel on or before the date of delivery of the first Vessel of the series shall be applied. | As per the Builder’s standards. |  |
| B-7 |  |  | Builder should provide ‘construction monitoring plan’ to ensure that the identified critical locations on approved structure drawings are built to acceptable standards.  Plan to be submitted to the buyer for review and approval. Construction Monitoring to be in accordance with Lloyd’s notation ‘CM’ although notation will not be applied. | Not mentioned. | Construction Monitoring shall be applied to the Vessel in accordance with the DNV Rules. |  |
| B-8 |  | - Cont’d - | The Vessel shall in all respects comply with the SIRE. | Not mentioned. | Please be informed that SIRE program is a tanker risk assessment tool of value to charterers, ship operators, terminal operators and authorities concerned with ship safety and it is neither related with Vessel’s design nor construction.  Therefore, Builder recommends that SIRE be applied by the Owner for the purpose after the delivery of the Vessel. |  |
| B-9 | 1.3.2 /  1-24 | Rules and Regulations | OCIMF Guidelines and Recommendations for the Safe Mooring of Large Ships at Piers and Sea Islands, 1978 (For fixed fitting only). | Not mentioned. | Please be informed that “OCIMF Mooring Equipment Guidelines, 1997” instead of “OCIMF Guidelines and Recommendations for the Safe Mooring of Large Ships at Piers and Sea Islands, 1994” shall be applied due to the following reasons :  1) “OCIMF Mooring Equipment Guidelines, 1997” has been developed/improved to substitute “Guidelines and Recommendations for Safe Mooring…” i.e. the former is updated version of the latter.  2) Application scope of “Guidelines and Recommendations for Safe Mooring…” cannot be clearly defined because the Guidelines contain the author’s view in many areas, which are not the requirement to be complied with. |  |
| B-10 |  | - Cont’d - | Latest ISGOTT recommendation. | Not mentioned. | Please be informed that the purposes of the Guidelines are to provide information that will assist companies in the development of a Safety Management System to meet the requirements of ISM Code and operational advice to assist personnel directly involved in tanker and terminal operations.  In addition, it is not purpose of the Guidelines to make recommendations on design or construction of Vessels.  Therefore, the requirements of ISGOTT to be prepared and applied by the Owner after the delivery of the Vessel. |  |
| B-11 |  |  | ISO 6954-2000(E) Guidelines for the Overall Evaluation of Vibration in Merchant Ships. | ISO Draft Proposal No.6954 “Guideline for the Overall Evaluation of Vibration in Merchant Ships, 1984”. | As per the Builder’s standards. |  |
| B-12 | 1.4.1 /  1-29 | Vibrations | The Vessel to be constructed in compliance with the requirements of DNV VIBR.  The Vibration levels in living quarters including wheelhouse shall comply with and not be more than the requirements of DNV COMF-V(3) notation.  Full scale measurements~.  In accordance with the notation DNV COMF-V(3) and VIBNR~.  A global vibration analysis based on a global Finite Element Model~.  Local vibration analysis shall be carried out by the Builder and submitted to Buyer for review.  Where the vibration levels exceed the specified maximum limits of the notation, ~. | The vibration levels in living quarters (the spaces in deckhouse and ECR) normally occupied during normal operating condition shall be below the middle limit (6.5 mm/sec) of the “stippled zone” on the figure-“Guidelines for the evaluation of vertical and horizontal vibration in merchant ships (peak values)” in the ISO6954‑1984(E), “Mechanical vibration and shock - Guidelines for the overall evaluation of vibration in merchant ships” Vibration measurement shall be carried out during the sea trials in accordance with the sea trial procedure.  Where the measured vibration levels exceed the designated values in the Specifications, the Builder shall make necessary improvements to a practical extent, which shall be agreed between the Owner and the Builder. | As per the Builder’s standard VLCC design. |  |
| B-13 | 1.4.2/  1-30 | Noise | Necessary sound insulation and isolation shall be provided so as to keep the noise levels within the maximum limits specified in the DNV-V(3) notation. | Necessary sound insulation and isolation shall be provided so as to keep the noise levels specified in the Specifications at normal sea going condition. Noise limits not specified in the following Table shall be referred to the IMO Resolution A.468(XII) "Code on Noise Levels on Board Ships", except for swimming pool area, if arranged, where the noise level shall not be considered. | As per the Builder’s standard VLCC design. |  |
| B-14 | 1.5.5/  1-37 | Sea Trials | Full sea trials, including speed trials shall be carried out at the design draft and ballast draft for each and every vessel. | Sea trials shall be carried out at the designed draft unless otherwise specifically described in the Specifications.  In addition, sea trials shall be carried out at the ballast draft for the first Vessel only. | As per the Builder’s standards. |  |
| B-15 | 1.5.5/  1-37 | Sea Trials | The speed trial result shall be computed and analyzed by QSTAP Software and must be in line with “Recommended Practice for conducting sea trial (STA-JIP-MARIN). | Results of speed trial shall be corrected to the calm water (no wind, no wave) according to ISO 15016 “Ships and Marine Technology – Guidelines for the Assessment of Speed and Power Performance by Analysis of Speed Trial Data” and the Builder’s practice. | As per the Builder’s standards. |  |
| B-16 | 1.6.2 /  1-43 | Finished Plans | Ballast water management plan and SOPEP shall be prepared by the Builder. | Ballast water management plan and SOPEP shall be prepared by the Owner and all relevant technical information shall be supplied by the Builder. | As per the Builder’s standards. |  |
| B-17 | 1.6.4 /  1-48 | Dry-Docking | If delivery takes place more than four(4) months after launching, the vessel to be dry-docked before delivery. The paint film to be repaired as per original system and final coat of antifouling to be applied. | Not mentioned. | Please be informed that the Vessel not to be dry docked in any case, however, If afloat period from launching before delivery exceeds four (4) months, visual inspection by diver to be performed and recorded on video in presence of the Owner.  Underwater scrubbing and cleaning of the hull and propeller to be done if deemed necessary and mutually agreed between the Owner and the Builder. | To be discussed at the Contract. |
| H-1 | 1.2.1.2/  1-10 | Design fatigue life | The vessel shall be designed and constructed for the “intended design life of twenty five (25) years continuous service and same shall be taken into consideration by the Builder during design, model testing and all stages of construction.  The fatigue life of the hull structure of the vessel shall be for a minimum of twenty five (25) years Winter North Atlantic trade, according to the fatigue life assessment procedures approved by DNV Classification Society notation PLUS.  Additional details to be evaluated for 25 years Winter North Atlantic trade:  -Lower hopper knuckles  -Transverse bulkhead stringer’s toes and heels. | Hull shall be of welded steel structure and shall be designed and constructed for the design life of 25 years in accordance with the requirements of the Classification Society and the Builder's practices.  Design fatigue life of longitudinal stiffener’s connections to transverse webs and transverse bulkheads to be min. 25 years based on the North Atlantic wave environment as per the CSR.  PLUS notation (based on North Atlantic wave environment) shall be applied.  The Builder shall include the following details in local fine mesh analysis as per the CSR:  i) Toes and heels on horizontal stringers of a transverse bulkhead where the screening criteria are not complied with  For lower hopper knuckles, bent knuckle between hopper plating and inner bottom, meeting CSR fatigue criteria, shall be applied. | PLUS notation & fatigue evaluation based on “Winter North Atlantic” wave environment is not available in the scope of the CSR.  And fatigue criteria of 25 years based on “North Atlantic” wave environment, with heavily increased corrosion addition of the CSR, is considered to be sufficient as compared with the pre-CSR fatigue criteria of 20 years, with light corrosion margin.  However, for enhanced fatiguecriteria as a practical & measurable approach, it may be proposed to apply PLUS analysis result for “North Atlantic” wave environment with increased fatigue life than 25 years, instead of applying winter North Atlantic wave environment, which is not included in this Builder’s Specifications for tender. |  |
|  | 2.1.1.1/  2-4 | - Cont’d - | Hull shall be of welded steel structure and shall be designed and constructed for the design life of 25 years continued service in accordance with the requirements of the Classifications Society.  The fatigue life of the hull structure shall be of minimum twenty five years (25) “Winter North Atlantic” Trade, according to the fatigue life assessment procedures approved by Classification Society (DNV). | - Ditto - | - Ditto - |  |
| H-2 |  | Asymmetric cargo loading in FE analysis | Asymmetric cargo loading in cargo tanks shall be taken into account in finite element analysis according to the requirement of the Classification Society. | Asymmetric cargo load case of harbour and tank testing load cases shall be taken into account in FE analysis as per the CSR. | As per the CSR, asymmetric cargo load caseof sea-going load cases shall be taken into account in FE analysis if there is asymmetric cargo loading in “Trim and Stability Calculation”, which does not exist for this type of vessel. |  |
| H-3 | 2.1.1.2/  2-4 | Specific gravity for scantling | All tanks shall be designed for liquid cargoes with specific gravity equal to sea water, i.e. 1.025 tonnes/m3. | A specific gravity (SG) of 1.025 is to be used for oil cargoes for the strength assessment of cargo tank structures (including fatigue strength assessment and sloshing pressure calculation). | As per the CSR |  |
|  | 2.1.1.2/  2-5 | - Cont’d - | Cargo density of 1.025 ton/m3 shall be used for design including 3-D finite element analysis, sloshing, and fatigue analysis. | For cargo tank FE analysis, however, a SG of 0.9 for cargo loaded conditions shall be used as per the CSR. | - Ditto - |  |
| H-4 | 2.1.1.2/  2-5 | Design still water bending moment & shear force | Design still water bending moments and shearing force shall be at least 10**%** margin above DNV minimum requirement, and the design still water bending moment and shearing for all conditions shall have a margin of 20**%** above the envelop of maximum values in “Preliminary Trim and Stability Calculation“ at design stage. | Design still water bending moment envelopes are at least 5**%** above the envelop of maximum values in “Preliminary Trim and Stability Calculation”.  Design still water shear force envelopes are at least 10**%** above the envelop of maximum values in “Preliminary Trim and Stability Calculation”. | As per the CSR recommendation. |  |
| H-5 | 2.1.1.2/  2-5 | Keel strake | Keel strake shall have no longitudinal weld seams in way of the usual location of dry dock keel blocks. | Not mentioned. | It is impractical to control the weld seam position considering the dry dock keel block arrangement. |  |
| H-6 | 2.1.1.2/  2-6 | Ballast water exchange with flow through method | Structure of ballast tanks shall be strengthened for flow through method for ballast water exchange at sea. | Not mentioned. | This item is an optional item No 1-3. |  |
| H-7 | 2.1.1.3/  2-6 | The effect of misalignment | i) Structural strength analysis shall include the effect of misalignment according to an acceptable standard agreed by Classification Society and the Buyer,  ii) and the possibility of buckling in all parts of the hull i.e. side shell longitudinal / transverse stiffeners and webs, longitudinal / transverse bulkheads etc. shall be considered in the local strength analysis. | i) Not mentioned.  ii) Buckling calculations for side shell longitudinal/transverse stiffeners and webs, longitudinal/transverse bulkheads etc. as required by the Classification Society shall be carried out. | The effect of misalignment is already considered in the CSR (prescriptive scantling requirements and design verification requirements). |  |
| H-8 | 2.1.1.3/  2-7 | Resulting stress and deflection | The resulting stress and deflection values shall be reviewed according to the criteria (including buckling) set up by the Classification Society. | Strength assessment (including stress assessment and buckling assessment) using finite element analysis shall be considered as per the CSR | Strength can be assessed via stress & buckling criteria.  In the CSR, stiffness criteria (web depth & moment of inertia) are be considered in lieu of the deflection assessment. |  |
| H-9 | 2.1.1.4/  2-7 | Hand grip and step/ladder in way of DB access openings | Handgrips and step/ladder shall be provided for the main access opening when height of the opening is greater than 600 mm.  For double bottom area all access openings shall be provided with hand grips and step/ladder. | Handgrips and step/ladder shall be provided for the main access opening of which sill height between bottom and lower edge of the opening is greater than 600 mm according to the Builder’s Practice. | Access opening without hand grip and step is recommended for access and quality of painting thereon. |  |
| H-10 | 2.1.1.6/  2-7 | Welding | All welding shall be continuous as far as practically possible. | In general, double continuous welding shall be applied to all fillet joints except for dry spaces in superstructures and deckhouse where intermittent or one side welding may be applied. | In dry space, intermittent or one side welding is recommended in order to minimize welding distortion. |  |
| H-11 | 2.1.1.6/  2-8 | Lifting lugs, staging pieces and etc. | Lifting lugs, staging pieces or other temporary pieces fitted to the hull structures for construction considered convenient for future service may remain in position, subject to approval form the Buyer. Other such pieces, lugs etc shall be removed and ground. All damages caused by such removal shall be repaired fully to the Buyer’s satisfaction. | Lifting lugs, staging pieces or other temporary pieces fitted to the hull structures for construction may be left according to the Builder's standards (DSQS) unless they are inconvenient for normal operation and maintenance of the Vessel.  In critical and highly stressed areas, lifting lugs shall be removed and ground smooth in accordance with the Builder’s standard (DSQS). | - As per the Builder’s standards which meets international shipbuilding practices |  |
| H-12 | 2.1.1.7/  2-8 | Edge preparation | Sharp edges of all structural members and holes (slots, scallops, drain holes, air holes, etc.) in cargo tanks, ballast tanks, void spaces, tanks in engine room and weather deck areas shall be treated by three pass grinding with radius not less than 2mm. | Sharp edges of structural members and holes (slots, scallops, drain holes, air holes, etc.) shall be treated by means of edge milling, roller pressing or the following grindings by stone disc grinder depending on the facilities and practices, except for rolled sections :  - 1C: Coated parts in cargo and slop tanks, weather exposed deck, sea chests  - 2C: Fresh water tanks, distilled water tank, drinking water tanks, swimming pool  - Three(3) pass: Water ballast tanks (including peak tanks) | - Three (3) pass grinding is required in water ballast tanks as per the PSPC.  For other areas, 1C/2C is applied as per the Builder’s standard and practice. |  |
|  | 2.8.1.4/  2-41 |  | Sharp edge of structural members and holes (slots, scallops, drain and air holes, etc.) in cargo tanks, void spaces, ballast tanks, tanks in engine room and the weather deck areas shall be treated by three (3) pass with radius not less than 2 mm. | - Ditto - | - Ditto - |  |
| H-13 | 2.1.2/  2.9 | TMCP steel | Should the Builder propose the use of high tensile steel manufactured by TMCP (Thermo-Mechanical Controlled Processing) in certain areas then the request is to be made in writing to the buyer for approval. Corrosion, strength, properties etc. of the material shall be provided by steel maker in such circumstances. | TMCP (Thermo Mechanically Controlled Process) steel may be used at the Builder's discretion. | - Builder is not able to control the supply of TMCP steel due to the steel market situation. |  |
| H-14 | 2.1.3.1/  2-10 | Structural strength test | Structural strength test shall be carried out for each vessel by filling of sea water into the tanks and performing the test as per Classification requirement. | For the subsequent Vessel(s), the hydrostatic tests may be replaced by the air tests subject to the agreement with the Classification Society unless the hydrostatic tests for the first Vessel of the series show structural defects. | Structural strength test for each vessel is not necessary unless the hydrostatic tests for the first Vessel of the series show structural defects. |  |
|  | 2.1.3.3/  2-10 |  | Hydrostatic tests (stagger test) shall be carried out for all bulkheads of cargo and ballast tanks including peak tanks for all vessels by sea water filling as per Classification Society requirement. | - Ditto - | - Ditto - |  |
| H-15 | 2.3.3/  2-20 | Thickness of sea chest | Thickness of plate forming sea chest boundary shall be increased and stiffened to that of the adjacent shell plate. | The thickness of plate forming the sea chest boundary excluding shell plate shall be increased by 5 mm above the rule requirements. | As per the Builder’s practice. |  |
|  | 2.7.2.2/  2-32 | - Cont’d - | The thickness of plate forming the sea chest boundary (excluding shell plate) including boundary plates between sea chest and bunker tank, if any, shall be increased by 5 mm above that of the adjacent shell plate. | - Ditto - | - Ditto - |  |
| H-16 | 2.4.1/  2-20 | Wing cargo tank design | In the design of cargo tanks, items covering effective tank cleaning shall be considered. Wing tanks shall be designed with smooth surfaces. | In general, longitudinal bulkheads shall be longitudinally stiffened with transverse webs outside of wing cargo tanks. | On-deck stiffeners and transverse webs and associated brackets outside cargo wing tanks are not feasible in VLCC design & operation. |  |
|  | 2.4.5/  2-25 |  | Side longitudinal bulkheads shall be longitudinally stiffened with transverse webs inside ballast tanks.  Cargo oil wing tanks shall be free of internal structure. | - Ditto - | And brackets connecting longitudinals bulkheads and inner bottom are inevitable for strength.  And a few stiffeners / platforms shall be provided inside wing cargo tank for the PMA purpose and building convenience. |  |
| H-17 | 2.1.2./  2-6 | Sloshing | Structure of cargo and ballast tanks shall be strengthened with no restriction in filling height for all attainable draught in seagoing conditions. Minimal draft shall be agreed with Owner prior to sloshing analysis. | Sloshing pressure calculation and reinforcement shall be as per the CSR.  Structure of cargo and ballast tanks shall be strengthened with no restriction in filling height in accordance with the requirements of the Classification Society as far as the hull girder longitudinal strength and the stability allow. | - Calculation for sloshing resonance range is not available in the CSR. |  |
|  | 2.4.1/  2-21 |  | Sloshing resonance range shall be calculated and a copy of the calculation result shall be submitted to the Buyer for review and approval. | - Ditto - | - Ditto - |  |
| H-18 | 2.4.2.1/  2-22 | Hopper knuckle | Connecting welds between lower hopper plate and inner bottom in way of transverse webs (Minimum +- 300 mm from transverse web) shall be smoothly ground. | For lower hopper knuckles, bent knuckle between hopper plating and inner bottom, meeting CSR fatigue criteria, shall be applied. | In case of bent type knuckle connection, there is no connection to be ground thereon. |  |
| H-19 | 2.4.2.1/  2-22 | Enhanced scantling of cargo suction well | The side plate and bottom plating thickness of suction well of cargo tanks shall be increased by 50% in thickness above the requirement of the Classification Society. | The thickness of cargo suction well boundaries (excluding inner bottom plate, but including recessed flat bottom) shall be increased by 5 mm above the rule requirements. | As per the increased CSR corrosion addition than the pre-CSR, 5 mm increase is considered to be sufficient. |  |
|  | 2.7.2.3/  2-32 |  | The thickness of the suction well to be increased by 5 mm above the Class rule requirement. | - Ditto - | - Ditto - |  |
| H-20 | 2.4.3./  2-23 | Upper deck camber | Camber shall be kept to minimum value and must not exceed 1.3 to 1.5 meters.  No camber to be allowed on the aft part of the engine casing. | Upper deck camber shall be 1.5 meters.  Sunken deck camber (including aft part of the engine casing) shall be 0.8 meters. | Without camber on main deck, poor drainage might happen thereon. |  |
| H-21 | 2.4.4/  2-24 | Swash bulkheads | Transverse swash bulkheads of adequate height to be provided to reduce the sloshing in tanks. | Transverse swash bulkheads of approx. half height shall be provided to reduce the sloshing in tanks as shown on the GA. | Transverse swash bulkhead design/construction is as per the CSR. For details, refer to the “Conceptual Midship Section”. |  |
| H-22 | 2.5.4.2/  2-27 | Manhole to chain locker | Two (2) manholes shall be provided on chain locker wall for access into the chain locker using foot hole.  Locations to be as per builder’s design and presented to owner for approval. | Two (2**)** manholes shall be provided on chain locker wall for access into the chain locker using rope ladder. | The chain locker having foot hole is easy to suffer mechanical coating damage on foot hole itself and uneasy to maintain and repair after delivery. Then, access into the chain locker using rope ladder is recommended. |  |
| H-23 | 2.6.1.1/  2-28 | Painting lug | Painting lugs and access ladders shall be provided for the underneath of the bridge wings. | The bottomof bridge wings shall be closed**.**  Eyes for painting or maintenance shall be provided on the inside of bulwark of the bridge wings. | Access ladder underneath of the bridge wings is considered to be uneasy to use. Then, eyes for painting or maintenance shall be used in lieu of the access ladder. |  |
| H-24 | 2.6.1.1/  2-28 | Opening for doors and windows | All openings for doors and windows shall have rounded corners. | All openings for doors and windows shall have rounded corners or square corners with corner holes. | - As per the Builder’s standards  - Rounded corners are to be generally applied and square corners with corner holes is to be applied to internal cabin door. |  |
| H-25 | 2.6.1.3/  2-28 | Cargo gear locker wall stiffening | Side wall of the cargo gear locker shall be stiffened plan type. | Side wall of the cargo gear locker shall be of vertically or horizontally stiffened plane or swaged type. | - As per the Builder’s practice. |  |
| H-26 | 2.7.6/  2-36 | Gutter bar & spill coaming | Aft part of sheer strake will be stiffened along upper edge in accordance with rule requirement. | Aft part of sheer strake shall be stiffened along upper edge where necessary in accordance with Class rule requirement. | - As per the CSR. |  |
| H-27 | 2.8.1.1/  2036 | Surface flaw | After blasting or discing, care shall be taken to ensure that all grit, dust, weld slag and spatter is removed before any coating or touching is commenced. | Detailed design and construction works, which are not subject to the requirements of the Classification Society, shall be carried out in accordance with the Builder's standard (DSQS). | - As per the Builder’s standards. |  |
|  | 2.8.1.2/  2-40 | - Cont’d - | Weld spatters, weld beads and surface irregularities must be removed. | - Ditto - | - Ditto - |  |
|  | 2.8.1.4/  2-41 |  | Welding slag and loose splatters clung to the surface on / around welding beads to be painted shall be removed by chipping hammer and / or chisel after welding. | - Ditto - | - Ditto - |  |
|  | 2.8.1.5/  2-42 |  | The use of putty or other forms of filler materials will **not** be accepted as a repair method for filling pin-holes or other forms of steelwork defects found during the inspection of secondary surface preparation. | - Ditto - | - Ditto - |  |
|  | 2.8.1.6/  2-43 |  | The use of epoxy putty can only be accepted as a repair method for filling pin-holes. | - Ditto - | - Ditto - |  |
| C-1 | 2.8.1.1/  2-36 | Finish coat | Finishing coats shall not be carried out more than one month prior to delivery. | Not mentioned. | Finishing coats shall be applied prior to the delivery of the vessels according to the Builder’s shipbuilding schedule. |  |
| C-2 | 2.8.1.1/  2-37 | Wash and store for blocks transported by sea | Blocks fabricated by approved sub-contractors, when transported by sea, shall be freshwater washed in the presence of owners representative to remove any chlorides. Completed blocks shall be stored / located away from corrosive sea environment. | Not mentioned. | Blocks fabricated by approved sub-contractors, when transported by sea, shall be freshwater washed and stored in accordance with the Builder’s practice.  Regarding the presence of Owner’s representatives, refer to Ser. No. C-3. |  |
| C-3 | 2.8.1.2/  2-39 | Buyer’s attendance | The Buyer’s representatives will carry out surface profile check and surface chloride testing at any stage of the construction i.e. surface preparation / blasting and painting etc. | In general, the Owner’s representatives shall have free access to monitor the in-progress workmanship if they so wish to, provided it does not disturb the work in progress nor result in an incurrence of cost increase to the Builder. | Painting works including surface preparation and painting inspection shall be carried out in accordance with the Builder's practice and standard (Quality & Inspection Standard for Ships Painting, QISSP) and the paint manufacturer's recommendation. |  |
| C-4 | 2.8.1.2-  2-39 | Allowable soluble salt | Maximum allowable chloride readings shall be less than 30 mg/m2 (as NaCl) according to Bresle conductrimetric method. | The maximum chloride readings shall be less than 50 mg/m2 (as NaCl) according to the Bresle conductrimetric method. | The salt limit shall be set at max. 50 mg/m2 (as NaCl) in accordance with PSPC. |  |
| C-5 | 2.8.1.3/  2-.9 | Secondary surface preparation | Cargo tanks, slop tanks and residual oil tanks  At block stage : SIS Sa 2.5  In P.E. & hull stage : SIS Sa 2.5 | Cargo tanks (deckhead & below down to upper part of the uppermost inspection walkway) and slop tanks  At block stage : SIS Sa 2.5  In P.E. & hull stage : SIS St 3  Cargo tanks (tank bottom & up to 0.5m)  At block stage : SIS St 3  In P.E. & hull stage : SIS St 3 | Considering the general corrosion environment and shipbuilding process of crude oil tanker, power tool cleaning shall be applied at PE and hull stage. |  |
| C-6 | 2.8.1.3/  2-40 | Intact shopprimer | Intact shop-primer in cargo tanks, slop tanks, ballast tanks and residual oil tanks shall be sweep blasted to Sa 2.5  Fabrication / shop-primer shall be removed by minimum 80% of total area blasted. | Intact shopprimer in WB tanks, peak tanks and slop tanks shall be sweep blasted to Sa 2. | Intact shopprimer removal shall be limited to seawater immersion area, considering corrosion environment.  Intact shopprimer shall be sweep blasted to Sa2 instead of Sa2.5 which is near white metal grade.  . |  |
| C-7 | 2.8.1.5/  2-41 | The number of finish coats for outfittings | Epoxy primer with two(2) coat of finish paint shall be applied to the out-fittings and pipes. | The Builder's standard epoxy primer shall be applied to the outfitting and pipes in accordance with the Builder's standard. | Subsequent one(1) or two(2) coats after application of epoxy primer shall be applied as same as the surrounding coating system. |  |
| C-8 | 2.8.1.5/  2-41 | Stripe coats | In these areas three (3) additional stripe coats should be applied after the first coat has been applied to ensure film thickness is achieved. Care should be taken not to apply paint in over thickness. However, minimum thickness of stripe coat in these areas shall be minimum 80% of total film built.  ~  Cargo tank, slop tank and residual oil tank will be coated in the following manner: first stripe coat A, first full coat color A, second stripe color B, second full coat color B, third stripe color A. | Stripe coat shall be applied after application of each full coat at the edges of small holes (slots, scallops, drain holes, air holes, etc.), corners of flame burnt free edges of structural members and manual welding seams in WB tanks, peak tanks, cargo tanks where to be coated, slop tanks and FW tanks. | Considering possibility of over thickness, stripe coats are restricted to two(2) coats in general.  In order to prevent flash rust on blasted surface, full spray coat shall be applied after completion of inspection for surface preparation.  And stripe coats with contrasting color to the full coat shall be applied after application of each full coat.  However, in order to achieve the smart finish condition, the second stripe coat will be applied with the same color to the second full coat. |  |
| C-9 | 2.8.1.5/  2-42 | DFT measurement | The dry film thickness specified in the painting schedule to be attained on at least 90% of the measuring pints.  At least 90% of specified thickness to be attained on remaining 5% of the measuring pints.  No single spot measurement in tanks shall be more or less than the specified dry film thickness of the manufacturer. | The DFT specified in the painting schedule shall be attained on at least 90% of the measuring points. At least 90% of specified DFT shall be attained on remaining 10% of the measuring points. | Builder would like to correct the wordings according to 90/10 rule. |  |
| C-10 | 2.8.1.5/  2-42  2.8.1.6/  2-42 | DFT measurement for outfittings | Measurements of dry film thickness include all machinery, equipment, outfitting and pipes including those with nominal diameter of 250mm and below.  DFT shall be measured for machinery, equipments, out-fittings, and pipes with nominal diameter 250mm and below, pipe supports, seats, welding beads and edges of structural members. | DFT shall not be measured for machinery, equipments, outfittings, pipes, pipe supports, seats, welding beads and edges of structural members. | DFT measurement for outfitting shall be carried out by the Builder’s QM. Due to the large number of outfitting, it is not feasible to apply the Owner’s inspection. |  |
| C-11 | 2.8.1.5/  2-42 | Right to monitor work process | Buyer’s representatives shall have the right to attend all inspections with regard to steel surface preparation and paint application including stripe and inter-coat inspection.  The Buyer’s representatives shall have free access to monitor the in-progress workmanship at all stages of work. | Refer to Ser. No. C-3 | - |  |
| C-12 | 2.8.1.5/  2-42 | Inspection schedule | Inspection schedule shall be informed to the Buyer at least twenty-four(24) hours in advance of the inspections, to enable Buyer’s representative to make arrangements to attend. | Inspection schedule shall be informed to the Owner at a reasonable time period in advance of the inspections, to enable the Owner’s representative to make arrangements to attend. | In general, inspection schedule is informed one(1) day in advance.  However, the actual inspection schedule is changeable depending on weather conditions and actual work progress. |  |
| C-13 | 2.8.1.5/  2-42 | Pinhole test | Pinhole detection after the first coat to be inspected and approved by the paint manufacturer, in the ballast tanks. | Not mentioned. | Paint inspection for WB tanks shall be as per PSPC. |  |
| C-14 | 2.8.1.5/  2-42 | Final coating check | All ballast and cargo tanks should be immersed and / or washed during seal trials and thoroughly inspected for corrosion spots and paint film defects before delivery. | Not mentioned. | Final coating check shall be completed before sea trial in order to prevent safety hazard during the inspection after sea trial. |  |
| C-15 | 2.8.1.9/  2-43 | Galvanizing | The galvanizing to be done by hot dip method to the thickness of about 150 microns except bolts, nuts, screws, etc. which are normally to be electroplated. | The galvanizing shall be done by hot dip method to the average thickness of about 75 microns except thin plate (thickness : 1.2 mm and below), bolts, nuts, screws, etc. which are normally to be electroplated. | 75microns of galvanizing will provide enough anti-corrosion service life during ship operation. |  |
| C-16 | 2.8.1.9/  2-44  2.9.3.3/  2-59 | Coating system on galvanized surface | All items that are galvanized are to be top coated as per surrounding areas, using coatings as per below:  1 x Galvanic primer 25  1 x Pure epoxy 150  1 x Polyurethane (P.U.) topcoat 75 | 1 x Epoxy primer 100  (+ one(1) or two(2) coats as same as the surrounding coating system) | In order to achieve good paint adhesion, one coat of epoxy primer instead of galvanic primer shall be applied. |  |
| C-17 | 2.9.2/  2-52~54  2.9.3/  2-55~57 | Machinery space and accommodation inside | 1 x Epoxy primer 150  1 x Alkyd finish 60 | 1 x Epoxy primer 100  1 x Alkyd finish 60 | In consideration of build up property and mild corrosion environment, the Builder would like to propose Epoxy primer 100micron instead of 150micron for accommodation and engine room inside. |  |
| C-18 | 2.9.2/  2-52 | Behind insulation (accommodation inside) | Behind insulation (Accommodation inside)  1 x Ceramic zinc silicate 25 | Behind insulation, wall and ceiling panel in accommodation  No painting  (Welding beads and damaged parts of shopprimed surfaces shall be cleaned to SIS St 2, and touched up with the Builder’s standard touch-up primer) | The surface behind foam type insulation shall not be coated in accordance with insulation maker’s recommendation. |  |
| C-19 | 2.9.2/  2-52 | Steel deck below deck covering | Steel decks below the vinyl flooring / carpet  1 x Ceramic zinc silicate 50 | Steel decks below the deck covering  No painting | No painting is recommended by deck covering manufacturer. |  |
| C-20 | 2.9.4/  2-58 | Cargo tanks | From tank bottom upwards x 2.5m, however shall be above cargo pipe level.  From tank top downwards x 2.5m  (Cargo pipes, pipe supports, longitudinals, brackets etc., and tank bottom / top transverse web frames where coating to be extended 300mm beyond end of web frames brackets toes where they are welded to the longitudinal bulkheads and all horizontal stringers top & bottom. Both sides of stringer decks and horizontal members)  2 x Tar free epoxy 300 | Cargo tanks (deckhead & below down to upper part of the uppermost inspection walkway)  1 x Tar free epoxy 200  Cargo tanks (tank bottom & up to 0.5m)  2 x Tar free epoxy 250  Cargo tanks (except above)  No painting  Outfitting and pipes  Same as surroundings | Considering the general cargo loading height, depth of retained sea water and PMA in cargo tanks, optimized coating area has been proposed. |  |
| C-21 | 2.9.4/  58 | Cargo tanks and slop tanks | Tank coating shall be carried out after completion of hot works and tank testing. | Not mentioned. | Block painting procedure of crude oil tanker shall be applied.  . |  |
| C-22 | 2.9.4/  2-58 | Surface preparation of cargo tanks | Damaged parts of shop-primer and welded beads shall be blasted to SIS Sa 2.5(DGB-21/2). However, intact shop-primed surfaces shall be treated in accordance with paint manufacturer’s recommendation. | Not mentioned. | Refer to Ser. No. C-5 and No. C-6. |  |
| C-23 | 2.9.6/  2-61 | FO, DO tanks coating | Fuel oil and diesel oil tanks  Storage tanks:  Tank top if below main deck  From tank top downwards x 2.5m  2 x Pure epoxy 200  Rust inhibitive oil  (All welding beads and loose rust which is not tightly adhered to, shall be cleaned to SIS St 3, and touched up with ceramic zinc silicate shop-primer) | HFO and DO tanks  Storage tank (deckhead & below down to 2.5m)  1 x Tar free epoxy 200  Except above  No painting  (Welding beads and loose rust which is not tightly adhered to, shall be cleaned to SIS St 3, and touched up with ceramic zinc silicate shopprimer) | Rust inhibitive oil is not recommendable for FO and DO tanks due to lack of durability which causes re-rusting earlier before actual bunkering.  According to the Builder’s experience, it is recommendable for FO and DO tanks to remain shopprimed surface with touch-up for welds and loose rusted areas. |  |
| C-24 | 1.10/  1-53 | Optional Items  - COAT-2 | COAT-2 notation | Not mentioned. | Please kindly understand that COAT-2 notation for VLCC is not applicable due to its heavy impact on general shipbuilding process.  In order to meet the requirement of COAT-2 notation, approximately more than 40 blocks shall be come into the blasting cell and painting shelter. And it will impact on the limited capacity of facilities and tight construction schedules. |  |
| C-25 | 2.10/  2-64 | Optional Items  - Silicone A/F application | SPC to be IMO approved silicone based coating | Tin free self-polishing anti-fouling  Note:  The lifetime of anti-fouling paint is 60 months (The anti-fouling system shall be decided in accordance with the selected paint manufacturer’s recommendation). | Please kindly understand that the silicone A/F is not applicable to this project due to its serious problems of silicone dust and impact on shipbuilding process. |  |
| P-1 | 1.2.1.1/  1-9  &  3/  3-3  &  3.1.3.1/  3-12 | Cargo segregation | Two(2) valves segregation between each group during loading, discharging, crude oil washing and stripping of the three grades to be possible in any sequence. | Two(2) valves segregation during the normal cargo loading and discharging, but excluding the stripping/drainage mode, the crude oil washing and other unusual operating stages. | As per the Builder’s standards |  |
| P-2 | 3/  3-3  &  3.4.4.2/  3-50 | Crude oil washing system | Crude oil washing system shall be able to wash each segregated group independently without interfering with other group. | One(1) tank cleaning main line shall be arranged on the upper deck and branched to each cargo oil tank and slop tank as sub-main line system with a manually operated butterfly valve. | It is the Builder’s understanding that it is not necessary to arrange separate tank cleaning main line for each segregation in case of crude oil tanker. |  |
| P-3 | 3.1.3.2/  3-13 | Cargo suction well | Each cargo oil tank to have suction well for the main and stripping suctions. | Each cargo oil tank except slop tanks shall have a cargo suction well to accommodate the main and stripping suctions. | Slop tanks have narrow bottom shape not to have enough space to arrange suction well. |  |
| P-4 | 3.1.3.2/  3-13 | Size of main cargo suction branch for center cargo oil tanks | The branch pipe and suction valves of center tanks will be sized for full pump capacity than the while wing tanks will be sized for 50 % of pump capacity. | Main cargo suction branch line for center cargo oil tank shall be sized based on two(2) cargo oil tanks service by one(1) cargo pump. | In basis of the trim & stability calculation of the Vessel, no cases are considered to discharge one center cargo oil tank by one(1) cargo pump during unloading. |  |
| P-5 | 3.1.3.4/  3-17 | Portable bilge pump for drip tray | Two(2) sets, 20 m3/h each | One(1) set, 20 m3/h each | As per the delivered vessels(H5289/90/5269) as-built specification |  |
| P-6 | 3.1.4.4/  3-21 | Automatic cargo stripping system | Three(3) vacuum pump units | One(1) vacuum pump unit (two(2) vacuum pumps) | There is not enough space to install three(3) vacuum pump units, total six(6) vacuum pumps, in pump room trunk. |  |
| P-7 | 3.1.4.5/  3-22 | Pump room bilge pumping system | In addition to bilge pumping system by cargo stripping pumps one(1) air driven diaphragm pump with capacity 20 m3/h shall be provided in pump room for drainage of water in the pump room bilges. | Additional bilge pumping system for pump room shall not be provided. | As per the Builder’s standards. |  |
| P-8 | 3.3.3/  3-36 | Separate purge pipe for WBT | Each double bottom ballast tank shall be provided with one(1) purge pipe of ND 300 mm. | Separate purge pipe shall not be provided inside WBT. | As per the Builder’s standards. |  |
| P-9 | 3.4.1.9/  3-42  &  3.4.4.4/  3-51 | COW machine monitoring system | Remote readout of COW machines, their operational status, nozzle angle, mode of cycle in use and time of completion, etc to be provided for all fixed machines. | Remote monitoring for tank cleaning machines shall not be provided. | To be discussed after selection of manufacturer.  SAAB has developed the remote monitoring system for tank cleaning machines together with SCANJET.  Therefore, only SAAB with SCANJET can offer the monitoring system. |  |
| P-10 | 3.4.3.1/  3-46 | Location of solenoid valve box | One(1) solenoid valve cabinet shall be provided for the remote operated valves located in forward and middle part of cargo oil tanks and water ballast tanks.  This cabinet shall be situated in the bosun’s store at the forecastle area. | For the remote operated valves located in cargo oil tanks, slop tanks and WB tanks, the intrinsically safe type local solenoid valve boxes shall be provided on upper deck, where necessary. | As per the Builder’s standards and the delivered vessels (H5289/90/5269) as-built specification. |  |
| P-11 | 3.4.3.1/  3-46 | Remote controlled valve | The following valves shall have the throttling function with intermediate position indicator so as to be stopped at any desired position between full open and full closed:  - Cargo pump main discharge valves  - Ballast pump main discharge valves  - Tank cleaning main discharge valve  - Cargo tank main suction valves in tanks  - Cargo stripping eductor driving valves  - Ballast tank main suction / stripping valves in tanks  - Manifold valves  - Ballast pump sea suction valves | The following valves shall have the throttling function with intermediate position indicator so as to be stopped at any desired position between full open and full closed:  - Cargo pump main discharge valves  - Ballast pump main discharge valves  - Tank cleaning main discharge valve  - Cargo tank main suction / stripping valves in tanks  - Cargo stripping eductor driving valves  - Ballast tank main suction / stripping valves in tanks | As per the delivered vessels (H5289/90/5269) as-built specification. |  |
| P-12 | 3.4.4.4/  3-51 | Material of tank cleaning machines | Body/Cleaning head in tank  : Stainless steel (SUS316)  Nozzle in tank  : Stainless steel (SUS316)  Stand pipe in tank  : Stainless steel (SUS316) | Body/Cleaning head in tank  : Bronze (BC)  Nozzle in tank  : Bronze (BC)  Stand pipe in tank  : Mild steel coated with galvanizing | It is a high grade material to apply crude oil tanker. |  |
| P-13 | 8.1.1/  8-4 | Name plate | All name plates and caution plates on exposed area to be made of stainless steel (SUS316) and the material of those in non-exposed area shall be of brass, while the welding bead marking shall be provided on the deck plate for the sounding caps on weather deck. | All name plates and caution plates on exposed area shall be made of stainless steel (SUS 316) and the material of those in non-exposed area shall be of as per the Builder’s practice, while the welding bead plate type shall be provided on the deck plate for the sounding caps on weather deck in accordance with the Builder’s practice. However, those provided by the manufacturer of equipment shall be in accordance with the manufacturer’s standard. | Clarification |  |
| P-14 | 8.1.12/  8-18 | Expansion loop for cargo pipes in tanks | Expansion loops shall be applied for cargo pipes in cargo tanks. | Expansion joint coupling shall be applied for cargo pipes in tanks. | As per the Builder’s standards and the delivered vessels (H5289/90/5269) as-built specification |  |
| P-15 | 8.2.3/  8-36 | Ballast stripping eductor | Body : Bronze  Nozzle : SUS316 | Body : Ductile cast iron  Nozzle : SUS316 | As per the Builder’s standards. |  |
| P-16 | 8.2.4/  8-38 | Doubling plate under the bellmouth in WBT | Doubling plate with approx. 12 mm thickness shall be fitted under the ballast suction and stripping bell mouth in double bottom ballast tanks, size of doubling plate shall be approx. 50 % bigger than that of bellmouth. | Doubling plate with approx. 10 mm thickness shall be fitted under the ballast suction/ stripping bellmouth in double bottom ballast tanks except peak tanks, and size of doubling plate shall be approx. 10 % bigger than that of bellmouth. | As per the Builder’s standards. |  |
| P-17 | 8.5.3.2/  8-49 | Permanent high pressure washing system | A permanent high pressure fresh water washing system complete with piping and accessories shall be provided in the engine room for washing of engine room, accommodation and upper deck. | A high pressure fresh water washing system shall not be provided for washing of engine room, accommodation and upper deck. | - As per the Builder’s standards and the delivered vessels (H5289/90/5269) as-built specification. |  |
| F-1 | 4.2.2.6/  4-10 | Suez searchlight davit | Jib rest for Suez searchlight davit shall be provided for securing at sea. | The davit shall be rested with polypropylene rope in the aft direction of the Vessel. | As per the delivered vessels (H5289/90/5269) as-built specification. |  |
| F-2 | 4.2.2.10/  4-11 | Portable lifting device | To be provided. | To be clarified and give us a detail information. | Detail information to be  provided. |  |
| F-3 | 4.4.4/  4-18 | Mooring winches | The mooring winches shall be provided as follows :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Locat  -ion | No. | Rated capacity  (MT x m/min) | Combinat  -ion | | | Moor-  ing drum | War-ping head | | Upper deck forward | #2  1 | 30% MBL of mooring rope x 15 | 2  2 | 2  2 | | Upper deck mid | 4 | 30% MBL of mooring rope x 15 | 2 | 2 | | Aft mooring deck | 3 | 30% MBL of mooring rope x 15 | 2 | 2 |   Minimum rated winch pull to be minimum 30% MBL of mooring wire and all winches to be split drum type. | The mooring winches shall be provided as follows :   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Locat  -ion | No. | Rated capacity  (MT x m/min) | Combinat  -ion | | | Moor-  ing drum | War-ping head | | Upper deck forward | #2  1 | 30 x 15  30 x 15 | 2  2 | 1  1 | | Upper deck mid | 4 | 30 x 15 | 2 | 1 | | Aft mooring deck | 3 | 30 x 15 | 2 | 1 | | - In order to follow the Owner’s requirement on the rated capacity of 30% MBL of mooring rope, the rated capacity to be of 35MT.  However, 35MT mooring winch is too big to use for the merchant vessel and only has been used for offshore vessel according to the maker.  Therefore, rated capacity of 30MT has been proposed for this project.  - It is impracticable to provide the two(2) warping heads on FWD and AFT deck due to the narrow deck space.  Therefore, the Builder would like to propose as per the Builder’s and maker’s standards. |  |
| F-4 | 4.4.5.1/  4-20 | Fixed mooring fittings | The mooring fittings shall be provided which will be in compliance with the OCIMF-MEG 1997 edition, Exxon mobile and comply with requirements of ports for world wide trading.  Markings on all moorings and fittings shall be as per OCIMF guide lines and recommendations. Additionally as mentioned in these guidelines, other information and details pertaining to the fittings shall be provided in the mooring fitting booklets.  The foundations for mooring fittings shall be provided where necessary and shall be of superior strength to withstand pull loads from modern escort or multi-role tugs.  The fixed mooring fittings shall be designed to satisfy the OCIMF recommendation as for “Recommended SWL, load position, safety factor and test load listed / prescribed in the OCIMF Mooring Equipment Guidelines, 1997, Chevron requirements and Exxon Mobil Requirements. | The fixed mooring fittings and their supporting structure shall be designed based on the requirement of Rules of Classification society.  The strength and safe working load including SWL marking of all mooring fittings and their supporting hull structure shall be based on the minimum braking load of the mooring rope in compliance with the Rules of Classification Society.  The load test for mooring fittings onboard shall not be provided. | Builder would like to inform the Owner that the fixed mooring fittings and their supporting structure to be designed based on the requirement of Rules of Classification society.  Therefore, the strength and safe working load (including SWL marking) of all mooring fittings and their supporting hull structure shall be based on the minimum braking load of the mooring rope in compliance with the Rules of Classification Society. |  |
| F-5 | 4.4.6/  4-22 | Loose mooring equipment | Polypropylene mooring rope, 80mm x220m, 4 sets and messenger rope to be provided.  Each of the mooring rope shall be stowed on each mooring drum. | Steel wire rope, 42 mm dia. (6x37 IWRC) x 300 m, 20sets and heaving Line, Polypropylene rope, 10mm x 20m, 6 sets shall be provided.  The mooring ropes other than mentioned above shall be supplied by the Owner. | Loose mooring equipment to be provided as per the delivered vessels (H5289/90/5269) as-built specification. |  |
| F-6 | 5.1.3  5-7 | Lifesaving equipment & loose fire fighting equipment | Lifesaving equipment and loose fire fighting equipment to be provided. | Lifesaving equipment and loose fire fighting equipment to be provided based on H.No.5289/90/5269. | As per the Builder’s standards and the delivered vessels (H5289/90/5269) as-built specification. |  |
| F-7 | 5.3.1/  5-22 | Hose handling cranes | Each crane shall be controlled from the control stand fitted inside cabin, and necessary control and safety devices shall be provided in compliance with the Rule.  The cranes shall be designed to operate at the ambient air temperature between -10°C and +55°C.  Jib rest shall be arranged at cargo manifold area in fore and aft direction.  Area in way of the crane to be provided with save all coaming of 75mm high. | Each crane shall be controlled from the control stand with protection cover on crane body without cabin, and necessary control and safety devices shall be provided in compliance with the Rules and the manufacturer's standards.  The cranes shall be operable at the ambient air temperature between -10°C and +45°C.  Jib rests shall be arranged on the top of cargo gear locker at cargo manifold area.  Area in way of the crane pedestal shall be provided with save all coaming of 75mm high. | As per the Builder’s standards and the delivered vessels (H5289/90/5269) as-built specification. |  |
| F-8 | 5.3.2/  5-24 | Provision cranes | Each crane shall be controlled from the control stand fitted inside cabin, and necessary control and safety devices shall be provided in compliance with the Rule.  Area in way of the crane to be provided with save all coaming of 75mm high. | Each crane shall be controlled from the control stand with protection cover on slewing platform without cabin, and necessary control and safety devices shall be provided in accordance with the manufacturer's standards.  Area in way of the crane pedestal shall be provided with save all coaming of 75mm high in accordance with the Builder’s practice. | As per the Builder’s standards and the delivered vessels (H5289/90/5269) as-built specification. |  |
| A-1 | 5.6.1.2/  5-36 | Panel | The lining and partition panel for the galley, pantry and cold chamber shall be of stainless steel (SUS 316L). | The lining and partition panel for the galley, pantry and cold chamber shall be of stainless steel (SUS 304). | As per the Builder’s standards |  |
| A-2 | 5.9.1/  5-60 | Catering furniture | All tables, sinks, shelves, lockers and drawers etc. shall be of stainless steel (316L). | The catering furniture shall be of SUS304, in accordance with the Manufacturer’s standards. | As per the manufacturer’s standards |  |
| A-3 | 5.10.1/  5-66 | Elevator | Travelling  From navigation deck to engine control room deck  Machine room  In ER | Travelling  From captain’s deck (D-deck) to engine control room deck  Machine room  In accommodation | To comply with Visibility requirements (NAUT-OC).  Due to narrow space in ER. |  |
| A-4 | 5.11.1.3/  5-71 | Air-conditioning system | Compressor  Piston type, 2 sets x 50% for each condensing unit | Compressor  Screw type, 1 set x 100% for each condensing unit | Due to big size of piston compressor, it is impossible to install two(2) CDU in ER. |  |
| A-5 | 5.11.1.5/  5-74  7.9.1/  7-83 | Package type air-con. units | ER spaces  2 - ECR  1 - Engineer’s workshop  1 - Electrical workshop  1 - ER store | ER spaces  2 - ECR (common use for Electrical workshop)  1 - Engineer’s workshop (common use for ER store) | For cost saving |  |
| A-6 | 5.12.1.2/  5-77 | Sanitary supply equipment | Hydrophore tank  : Made of stainless steel.  Calorifier, re-hardening filter  : SUS 316 | Hydrophore tank  : Made of mild steel with pure epoxy inside coating  Calorifier, re-hardening filter  : SUS 304 | As per the manufacturer’s standards |  |
| M-1 | 6.1/6-2 | Ambient air temperature | The control air dryer shall be designed based on the ambient temperatures of 0 – 55ºC | The control air dryer shall be designed based on the ambient temperature of 50oC | As per the delivered vessels(H5289/90/5269) as-built Specification. |  |
| M-2 | 6.1/6-3 | Inspection | Manufacturing, testing, erection/installation, commissioning and trials of main engine shall be carried out under the supervision of engine manufacturers service engineer and Buyer appointed third party engineer(if required and agreed upon by Buyer and Builder) | Manufacturing, testing, erection/installation, commissioning and trials of main engine shall be carried out under the supervision of licenser's service engineer. | As per the delivered vessels(H5289/90/5269) as-built Specification. |  |
| M-3 | 6.1.3/  6-7 | GE overhaul inspection | After the shop tests, the overhaul inspection shall be carried out in accordance with the engine manufacturer's standards, and the scope of the overhaul inspection, as a minimum, shall be two (2) cylinder units for each engine plus two(2) main bearings. | After the shop tests, the overhaul  inspection shall be carried out in accordance with the engine manufacturer's standards, and the scope of the overhaul inspection shall be one(1) cylinder unit for each engine. | As per the Builder’s standards. |  |
| M-4 | 6.1.4/  6-8 | Auxiliary boiler | Boiler’s safety device including alarm function test, and auto stop confirmation test to be carried out under working condition not by simulation. | The hydrostatic pressure test at the assembled condition shall be carried out at the manufacturer's shop. | As per the manufacturer’s standards. |  |
| M-5 | 6.1.10/  6-14 | On board test | Auxiliary engines crankcase visual inspection and hammer/spanner test of bolts and nuts to be carried out after the trials. | After the main diesel engine, diesel generator engines, auxiliary machinery and electrical equipment are installed onboard and relevant piping and wiring are fitted, these machines shall be operated and examined to check whether their functions are satisfactory. | As per the Builder’s standards.  The visual test and hammering test is not necessary in case the engine running time is in the allowable range. |  |
| M-6 | 6.3.1/  6-19 | Propeller and shafting | The torsional and axial vibration calculation shall be subject to Buyer’s appointed third party verification and approval. | The torsional vibration calculation shall be submitted to the Classification Society and the Owner for approval. | As per the delivered vessels(H5289/90/5269) as-built Specification. |  |
| M-7 | 6.3.1/  6-19 | Propeller and shafting | Shaft alignment calculation/detailed analysis and propeller fitting calculations shall be carried out and submitted to the Classification Society and the Buyer for review and approval. Shafting alignment shall be carried out with the Vessel afloat condition.  The alignment should be checked in ballast and loaded condition with main engine hot.  Shaft alignment (gap. sag) and jack up test shall be carried out and submitted to the Classification Society and the Buyer. | Shaft alignment calculation/detailed analysis and propeller fitting calculations shall be carried out and submitted to the Classification Society and the Owner for review. Shafting alignment shall be carried out with the Vessel at block and in afloat condition.  Shaft alignment (gap. sag) and jack up test shall be carried out and submitted to the Classification Society and the Owner for evaluation. | As per the delivered vessels(H5289/90/5269) as-built Specification. |  |
| M-8 | 6.3.1/  6-20 | Shaft | The builder shall ensure interchangeability of all(working and spare) propellers and shafts without scrapping and with a minimum contact ratio of 80%. | One(1) spare propeller excluding the nut and cap shall be provided for the series of the Vessels, and shall be stored on the upper deck of the first Vessel.  Spare propeller shall have the scraping allowance of 0.15 mm at inner surface of hub for final machining. | As per the Builder’s standards with scrapping allowance 1.5 mm for spare propeller shaft and propeller. |  |
| M-9 | 6.5.1/  6-27 | Diesel generator engine | Electrical panels for engine controls and wiring shall be mounted on bulkheads or on separate stands and not on the engine itself, to avoid problems due to vibrations. | The construction and materials of the diesel generator engine shall be according to the engine manufacturer's standards in compliance with the requirements of the Classification Society. | As per the manufacturer’s standards. |  |
| M-10 | 6.5.2/  6-29 | Emergency generator engine | [Basic]  - No. of sets : One(1)  - Rated output : Approx. 500 kW  at 1,800 rpm  - Alternator output : 400 kW  [Option]  - No. of sets : One(1)  - Rated output : Approx. 1,800 kW  at 1,800 rpm  - Alternator output : 1,700 kW | - No. of sets : One(1)  - Rated output : Approx. 500 kW  at 1,800 rpm  - Alternator output : 400 kW | For limited installation space.(option) | Chapter 6,  Option 6) item |
| M-11 | 7.1.1.2/  7-5 | Pipe joints | All steel slip-on flanges shall be seal welded on the pipe inside in addition to external weld attachment. | Flange joints shall be used for valve, equipment and where considered necessary according to the Builder's standards. | As per the Builder’s standards. |  |
| M-12 | 7.1.1.3/  7-6 | Galvanizing or aluminizing | The thickness for galvanizing or aluminizing shall be at least 150 microns. | Where the galvanized piping is specified, galvanizing shall be carried out after fabrication of pipes in principle.  Where the aluminized piping is specified, aluminizing shall be carried out after fabrication of pipes in principle. | As per the Builder’s practice.  : 75 microns |  |
| M-13 | 7.1.1.4/  7-6 | Pipe support | All under slung pipes of any size shall have second locking nut to prevent slackening of single nut due to vibration. U bolts used for pipe clamping shall have clearance of 1-3 mm for steam, heavy fuel oil system, cargo line etc. | The single nut shall be used for all pipe  supports in ER except for the heating  coil in tanks, where the double nut  shall be used. | As per the Builder’s practice. |  |
| M-14 | 7.1.1.7/  7-8 | Valves and fittings | Local position indication to be provided for all manual and remotely operated valves. | Not mentioned. | As per the Builder’s standards, local position indication to be provided for shipside valves. |  |
| M-15 | 7.1.2.6/  7-20 | Exhaust gas piping | The exhaust gas pipes after the turbocharger of main generator engine, uptake of auxiliary boiler and incinerator shall be insulated with E-Glass insulation. | The exhaust gas pipes after the turbocharger of main generator engine, uptake of auxiliary boiler and incinerator shall be insulated with rock wool, fastened by galvanized steel wire and finished with galvanized steel sheet. | As per the Builder’s standards. |  |
| M-16 | 7.1.3.1/  7-22 | Pumps, General | Flexible coupling shall be applied for the pumps. | Rigid or flexible coupling shall be applied for the pumps according to the manufacturer’s standards.  The vertical type centrifugal pump except deepwell type pumps and FW hydrophore pumps shall be so constructed that the rotating members can be overhauled / inspected without disconnecting the attached pipes. | As per the Builder’s standards. |  |
| M-17 | 7.1.3/  7-23 | Gear/screw pump | Gear/screw pumps to be so constructed that the rotating members can be overhauled / inspected without disconnecting the attached pipes, motors and accessories. | Not mentioned. | As per pumps manufacturer’s standards.  Because of the configuration of pump itself and piping arrangement, the attached pipes, motors and accessories of gear/screw pumps to be disconnected for overhauling and inspection. |  |
| M-19 | 7.2.4/  7-32 | DO purifier, heater, pump | 1 – DO purifier, self-clean, no gravity disc type, min. 6.9m3/h x 60/98ºC  1 – DO purifier heater, hori. tubular, steam heated  1 – DO purifier feed pump | Not mentioned | Because of the very limited ER space the MDO purifier cannot be installed.  Two(2) HFO purifiers of each 100% capacity to be provided and the separate DO piping led to HFO purifiers to be arranged as well.  Both HFO purifiers shall be arranged also for DO purification. |  |
| M-20 | 7.2.4/  7-35 | LSDO tanks | 1 - Low sulphur DO service tank,  50 m3  1 - Low sulphur DO settling tank,  20 m3 | Not mentioned | Difficulties in arrangement due to limited ER space. |  |
| M-22 | 7.3.2/  7-45 | LO system | 2 - Main LO cooler, each 100% cap.  2 - ME T/C LO cooler, FW cooled, each 100% capacity | 1 - Main LO cooler, 100% capacity  1 - ME T/C LO cooler, FW cooled, 100% capacity | As per the Builder’s standards. |  |
| M-23 | 7.4.2/  7-54 | Cooling water system | Cooling water system configuration is as below ;  1 - Main cooling SW pump, 100%  2 - Vacuum condenser cooling SW pump, 100%  2 - Ejector pump for FW generator  2 - LT cooling FW pump  1 - Port use LT cooling FW pump  1 - FW booster pump for package type air con.units for wheelhouse  2 - FW booster pump for package type air-con units for galley(1 stand-by)  2 - Air con cooling SW pump for accommodation(1 stand-by)  2 - ME jacket cool. FW cooler, each 100%  2 - Central FW cooler, 100% | Cooling water system configuration to be as below ;  2 - Main cooling SW pump, 50%  1 - Main/Vacuum condenser CSW pump, 50%  1 - Vacuum cond. CSW pump, 50%  2 - Ejector pump for FW generator  3 - LT cooling FW pump, 50% cap.  3 - LT cooling FW pump, 50%  1 - ME jacket cool. FW cooler, each 100%  2 - Central FW cooler, 100% | Difficulties in installation due to limited ER space. |  |
| M-24 | 7.4.2/  7-55 | MGPS | 30% excess than theoretical maximum demand of sea water, Anode fitted on SW strainers, life: 5 years(5.0 years lifetime with 100% spare anodes) | Anode fitted on SW strainers, Life: 5 years(2.5 years life time with 100% spare anodes) | As per the delivered vessels(H5289/90/5269) as-built Specification. |  |
| M-25 | 7.4.5/  7-58 | Cooling water system | The size of main sea water crossover pipe shall be determined to cater for maximum demand for sea water plus adequate reserve. The figure of reserve to be determined after the sea water system is agreed upon and approved by the Owner. | The size of main sea water crossover pipe shall be determined to cover the theoretical maximum demand of sea water in accordance with the Builder’s standards. | As per the Builder’s standards. |  |
| M-26 | 7.4.5/  7-59 | Cooling water system | The air from the ME jacket cooling FW system shall be led to the expansion tank. | The deaerating valve shall be installed on ME for ventilation of air ME jacket cooling FW system | As per the Builder’s standards. |  |
| M-27 | 7.5.2/  7-61 | Compressed air system | Total capacity of main air compressors shall be designed to have 150% capacity for charging both main air reservoirs from atmospheric pressure to full pressure in one hour.  The system configuration is as below ;  3 - Main air compressor  2 - service air compressor, air cooled screw type, 400m3/h x 7 bar g.  1 - GE starting air compressor  2 - Main air reservoir  1 - Service air reservoir  1 - Control air reservoir  1 - Aux.engine starting air reservoir  2 - control air dryer  2 - control air filter | The total capacity of main air reservoirs charged by the main air compressors within one(1) hour shall be capable of providing 12 consecutive starts of the main engine without replenishment.  The system configuration to be as below ;  2 - Main air compressor  1 - service air compressor, air cooled screw type, 300m3/h x 8 bar g.  1 - GE starting air compressor  2 - Main air reservoir  1 - Service air reservoir  1 - GE starting air reservoir  2 - Control air dryer  2 - Control air filter | As per the Builder’s standards and Classification Society requirements. |  |
| M-28 | 7.6.3/  7-67,  7.6.5/  7-69 | Exhaust gas system | Spark arrestor mesh of stainless steel shall be provided if recommended by the engine manufacturer.  The spark arrestor of wire mesh (SUS 316) type shall be fitted at the end of the exhaust gas pipe for auxiliary boiler and incinerator. | Spark arrestor shall not be provided. | As per the Builder’s standards.  Due to the bad experience of the Builder’s lots of delivered projects, spark arrestor shall not be provided. |  |
| M-29 | 7.8.1/  7-77 | Fresh water generator | Separate and independent steam/water separator(as per turbine makers standard) to be provided before ballast pump turbine and each cargo oil pump turbine in addition to one in the common line. | The materials and construction of the FW generator shall be in accordance with the manufacturer's standards. | As per the manufacturer’s standards. |  |
| M-30 | 7.8.1/  7-77 | Fresh water generator | Strainers shall be provided in the sea water inlet side of the condensers to prevent sea shells entering the plates.  All the heat exchangers for the fresh water generator system shall have titanium plates fitted with Nitrile seals glued to the plate surface(not clipped on). | The material and construction of fresh water generator shall be in accordance with the manufacturer’s standards. | As per the Builder’s standards.  Strainers to be provided in main sea water suction pipe commonly. |  |
| M-31 | 7.8.3/  7-80 | Bilge water separator,  bilge system | The system configuration is as below ;  1 - Static type, 5m3/h, 5 PPM  2 - Bilge water separator pumps  1 - Bilge water holding tank, 70m3 min. | The system configuration to be as below ;  1 - Gravity separation type with high oil content alarm, 5m3/h(15PPM)  1 - Bilge water separator pump,  5 m3/h x 4 bar g  1 - ER bilge pump,  5 m3/h x 4 bar g  1 - Clean drain pump, hori. mono type, 10 m3/h x 4 bar g  1 - Bilge water holding tank, 50m3  1 - Clean drain tank, 50m3 | For cost saving and Builder’s standards |  |
| M-32 | 7.9.3/  7-85 | Engineer’s workshop | One(1) pneumatic/electric hoist with capacity of 3.0 tons SWL to reach engine room platform below the I-beam, fitted on a gear trolley, shall be provided to transfer parts to and from engine room and workshop. | A lifting I-beam with a trolley (2 ton, plain trolley) shall be provided for overhauling the ME turbochargers, in case that the ER crane can not be arranged to be utilized for this purpose. | As per the Builder’s standards. |  |
| M-33 | 7.9.5/  7-87 | Engine room store | The minimum floor area of the storage space shall not be less than one hundred and twenty (120) square meters, and split deck levels shall be provided where appropriate. However the final floor area for storage space will be decided after the machinery arrangement in engine room has been agreed upon and approved by the Buyer. The store shall be divided in two(2) sections, for electrical and mechanical spares. One permanent table with computer and printer, net working facilities shall be provided. | Not mentioned | The area for engine room store shall be decided in accordance with machinery arrangement in ER.  For Owner’s information, present store space is approximately ninety(90) square meters. |  |
| M-34 | 7.9.6/  7-88 | Engineer’s general tools and equipment | The Builder shall supply various general tools as per the prevailing industry practice.  All general tools supplied must be of high quality and of western European or Japanese origin. | Engineer’s tools and outfitting shall be furnished onboard in accordance with JIS F7602-1989 and equipment manufacturer’s standards, and the item shall not be supplied in duplicate. | For clarification. |  |
| M-35 | 7.9.7/  7-90 | Material handling study | The Builder shall provide Material Handling Study with all possible machinery handling and lifting scenarios for service and overhauling normally exercised onboard. | Not mentioned. | As per the Builder’s standards.  The arrangement has been well proven in lots of the Builder’s delivered projects. | Chapter 7,  Option 6) item |
| M-36 | 7.9.7.2/  7-91 | Overhauling of auxiliary machinery | Space with seats to be provided for stowing of the following additional main engine spare parts   * 2 cylinder liners * 2 pistons with rod assembly * 2 cylinder heads * 3 exhaust valves * 1 piston crown * 2 main bearings * 2 big end bearings   - 2 small end bearings | Not mentioned. | The detail items to be clarified. |  |
| M-37 | 7.9.8/  7-93 | Floor, grating and ladders in ER | The main access ladders shall be arranged with the inclination of 50o and width of 600 mm. | The main access ladders shall be arranged with the inclination of 55o and width of 600 mm. | As per the Builder’s practice and limited ER space. |  |
| M-38 | 7.9.9/  7-95 | Ventilation fan | The temperature rise of 8C shall be applied for the calculation of the ER supply fan capacity at outside temperature of 50oC. | The temperature rise of 12.5oC on 'ISO 8861' shall be applied for the calculation of the ER supply fan capacity. | As per the Builder’s practice. |  |
| M-39 | 7.9.9/  7-95 | Ventilation fan | To obtain a correct supply of air for the ME’s combustion process, about 50% of the ventilation air should be blown in at the top of the ME, near the air intake to the turbochargers. | The total capacity of the ER supply fans shall be calculated according to 'ISO 8861 Shipbuilding - Engine room ventilation in diesel engine ships - Design requirement and basis of calculation (1998(E))'. | As per the Builder’s practice.  According to the Builder’s lots of experiences, approximately 60~75% supply of required ME total combustion air to be provided near the air intake to the turbochargers.  For Owner’s information,  Annex A of ISO 8861 is for information only as stated. |  |
| E-1 | 9.2.7.3/  9-16 | Computer network system | A ship local area network (LAN) based on foiled twisted pair (FTP) is to be provided at locations on board as follows:  - Wheelhouse - chart table  - Radio console in wheelhouse  - CCR  - ECR  - Captain's office  - Chief engineer's office  - Owner's day room  - Ship's office  - Senior officer's office (2)  - Library / conference room  - Officer and crew recreation  rooms  - Electrical engineer's cabins  - ER store  …..  ….. | Fifteen(15) sets of personal computer with software, connection devices and necessary accessories including peripheral appliances such as printer, hub, router, UPS, etc. shall be supplied by the Owner and installed by the Builder.  Implementation of data input and commissioning for good working order shall be carried out by the Owner.  Each one(1) set of wireless access point shall be supplied and installed by the Builder in the following locations :  - Wheelhouse  - ECR  - Each deck in accommodation  The computer location shall be as follows:  - Wheelhouse (chart table)  - Radio space  - CCR  - ECR  - Captain's office  - Chief engineer's office  - Owner's day room  - Ship's office  - Senior officer's day room (2)  - Conference room  - Officer's recreation room  - Crew's recreation room  - Electric engineer's room  - ER store  The network cables shall be in accordance with the ISO, IEC-11801, foiled twisted pair (FTP), category 5.  The system shall be interfaced with Satellite communication system. | As per the Builder’s standards |  |
| E-2 | 9.7.3.3/  9-61 | Transformers | Two(2) sets of three phase, output power of each should be sufficient to deliver all loads + 25% reserve power main 220V AC load, 440/220V transformer ….  One(1) set of three phase, AC 440/230V transformer to be provided in the forward space with output power rating at least 125% of the sum total of all loads connected.  Two(2) sets of three phase, output sufficient enough to deliver all emergency load + 25% reserve power, AC 440/230V transformer …. | Each transformer to be sized for maximum operating load out of each operating condition defined in the electric load analysis, plus a 10% margin.  Two(2) sets of three phase, AC 440/230 V transformer to be provided in the engine room for the AC 220 V normal supply system (one is st-by).  One(1) set of three phase, AC 440/230 V transformer shall be provided in the forward space.  Two(2) sets of three phase, AC 440/230 V transformer to be provided in a cubicle in the emergency generator room (one is st-by). | As per the Builder’s standards & delivered vessels (H5289/90/5269) as-built specification |  |
| E-3 | 9.7.4.2/  9-64 | Starter | Local starters or control panels in the machinery spaces are to be of IP 44 rating. | Local starters or control panels in the engine room, steering gear room and bosun store are to be of IP 44 rating. | As per the Builder’s standards |  |
| E-4 | 9.7.4.2/  9-64 | Starter | Each starter panel to be provided with:  …..  …..  Running hour meter, interfaced to IAS | Each starter panel to be provided with:  …..  …..  Running hour meter for automatic stand-by start motor as mentioned in Section 963.4 and for motors of 3 kW and above. Running hour to be indicated on the TFT-LCD of CAMS. | As per the delivered vessels (H5289/90/5269) as-built specification |  |
| E-5 | 9.7.5.1/  9-66 | Electric Cable | Halogen free flame retardant cables to be used for normal service as per recommendations of Classification Society and other regulatory bodies. | Flame retardant cables in accordance with IEC publication No. 60332-1 shall be used for normal service. | As per the Builder’s standards & delivered vessels (H5289/90/5269) as-built specification |  |
| E-6 | 9.7.5.1/  9-66 | Electric Cable | Power cables and signal cables to be run keeping distance as per recommendation of cable manufacturers to avoid any interference from power cables to signal cables. | The following circuit cables shall be separated from power circuit cable (AC 440V and above) in accordance with Builder’s practice and manufacturer’s recommendation except cables installed inside electric cable pipe on the upper deck :  - The signal cable for hydro acoustic equipment  - Data communication lines (LAN, Ethernet)  - The others, if required by manufacturer  Intrinsically safe circuit (Ex-i circuit) cables shall be separated from other cables in accordance with Builder’s practice. | As per the Builder’s standards & delivered vessels (H5289/90/5269) as-built specification |  |
| E-7 | 9.7.5.2/  9-66 | Cable application | The application of special cables are to be as follows:  …..  …..  Halogen free PVC insulated cable to be used for internal connections in MSB, consoles, etc. | The application of special cables are to be as follows:  …..  …..  Flame retardant cables in accordance with IEC publication No. 60332-1 shall be used for internal connections in MSB, consoles, etc. | As per equipment Manufacturer’s standards & delivered vessels (H5289/90/5269) as-built specification |  |
| E-8 | 9.8.3.2/  9-72 | Application of illumination | |  |  | | --- | --- | | Position | Illumination level (Lux) | | Working position in galley, Writing desk in cabin | 400 | | ECR console, CCR console | 300 | | Workshop | 400 | | Cabin, Pantry, Hospital | 150 | | Galley, Smoking room, Navigation locker, Office, ECR, CCR | 200 | | Electric equipment room, Engine room, Steering gear room, Cargo pump room including instrument panel, Emergency generator room, Cargo manifold station | 200 | | Recreation room, Air condition unit room, Fire control station | 150 | | Wheelhouse, Bath room, On deck, Inner passage, Gymnasium, Ref. chamber and dry provision store, Toilet | 100 | | Bosun store, Locker and store | 100 | | Spaces of windlass, Pump room | 200 | | Outer passage around accommodation space | 100 | | |  |  | | --- | --- | | Position | Illumination level (Lux) | | Working position in galley, Writing desk in cabin | 300 | | ECR console, CCR console | 200 | | Workshop | 200 | | Cabin, Pantry, Hospital | 100 | | Galley, Smoking room, Navigation locker, Office, ECR, CCR | 100 | | Electric equipment room, Engine room, Steering gear room, Cargo pump room including instrument panel, Emergency generator room, Cargo manifold station | 50 | | Recreation room, Air condition unit room, Fire control station | 50 | | Wheelhouse, Bath room, Inner passage, Gymnasium, Ref. chamber and dry provision store, Toilet | 50 | | Bosun store, Locker and store | 30 | | Spaces of windlass, Pump room | 30 | | Outer passage around accommodation space | 20 | | As per the delivered vessels (H5289/90/5269) as-built specification |  |