GROUP 0 GENERAL PROVISIONS

References

0.1 American Bureau of Shipping Rules for Building and Classing Steel Vessels Under 90 Meters (295 Feet) in Length (as modified by Part 5, Addendum 1), current edition.

010 Vessel Performance/Capabilities

The vessel is to be a single-ended, passenger/vehicle ferry, outfitted for service between the Cedar Island, NC and Ocracoke Island, NC terminals.

The hull of the vessel is to be of all welded steel construction using a longitudinal system of framing.

Propulsion will be provided by two marine diesel engines. Drive will be through reversing reduction gears with shafting and propellers. Electric power requirements will be met by two marine diesel driven generators and one emergency power marine diesel generator.

The vessel shall be designed for transporting 50 standard vehicles and 300 passengers.

Design trial speed shall be 13 knots with a full load service speed of 12 knots at 2/3 power.

042 Regulatory Body/Classification Requirements

The vessel shall be designed and constructed to the requirements of Reference 0.1, except where specifically exempted in writing by the Owner. The vessel shall not be classed by ABS.

The vessel shall be inspected by the United States Coast Guard as a 46 CFR Subchapter "H", Passenger /Vehicle ferry. The Certificate of Inspection shall allow the ferry to operate with up to 300 passengers and 50 automobiles with one master, 1 chief engineer, 1 oiler, 1 ordinary and 2 able seamen.

Certificates, including Certificate of Inspection, Stability Letter, Certificate of Admeasurement, and USDH certificates shall be provided to the Owner (see Section 800). The vessel shall meet American Disability Act (ADA) requirements for access of disabled persons as it pertains to passenger access to the main deck and passenger decks only.

Regulatory gross tonnage (approximate): 800

060 Principal Characteristics

Dimensions:	
Length overall (molded)	220'-6"
Length on design load waterline	208'-0"
Breadth (molded) over guard	50'-0"
Depth (molded) amidships at side	12'-6"
Draft (molded) at DLWL	6'-6"
Capacities (approximate):	
Fuel oil (95%)	5,000 Gallons
Fresh water	5,000 Gallons
Lube oil	200 Gallons
Gear oil	200 Gallons
Dirty oil	200 Gallons
Power (approximate):	
Propulsion power (minimum)	2 × 1100 BHP
Bow thruster (minimum)	500 BHP
Ship's service generators (minimum)	2 × 200 kW
Ship's emergency generator (minimum)	1 × 125 kW

070 General Requirements for Design and Construction

The vessel shall comply with all the rules and regulations of the regulatory bodies as stated above. The vessel has been designed to meet the rules and regulations that are in effect at the time of the contract signing. In the event any changes occur in these applicable rules and regulations, all design and construction changes necessary to conform to the applicable rules and regulations shall be made by the Contractor.

078 Materials

All materials, machinery, equipment, and components shall be of good marine quality, in full compliance with these Specifications along with the requirements of the cognizant authoritative agencies, and suitable for service on the sounds of North Carolina.

This vessel is to be a sister ship to OSB hull 413. Fastenings throughout shall be 316 or 18-8 stainless steel unless otherwise specified, and in accordance with sizes required or shown on plans and listed elsewhere in these Specifications.

All hardware shall be made of best quality marine grade brass, bronze or 316 stainless steel unless otherwise specified. Bolts shall be fitted with lock washers, flat washers, and nuts. Nuts shall be drawn up tight. Screws shall be of highest quality stainless steel, with clean cut threads. All threads shall be coated with sealant (non-seizing) prior to installation. The use of nylon insert locking nuts in-lieu of double nut is acceptable.

085 Contract/Guidance Drawings

The vessel shall be constructed as depicted in below listed Contract Drawings and as described in these Specifications. ***Information contained in the Contract Drawings is not subject to alteration, by the Contractor unless pre-approved by the owner. For bid purposes, the contractor shall follow these drawings without deviation.***

Drawing list:

Drawing #	Created by	Drawing Title
09-060 101-011	OSB	Outboard Profile
09-060 101-024	OSB	General Arrangement
09-060 101-025	OSB	General Arrangement (new quarters layout)
09-060 101-030	OSB	Molded Line Convention
09-060 110-010	OSB	Scantling Plan, Bow to Fr. 35
09-060 110-020	OSB	Scantling Plan, Fr. 36 to Fr. 72
09-060 110-032	OSB	Scantling Plan, Fr. 73 to Stern
09-060 116-010	OSB	Construction Profile, Bow to Fr. 35
09-060 116-024	OSB	Construction Profile, Fr. 36 to Fr. 72
09-060 116-034	OSB	Construction Profile, Frs. 73 to Stern
09-060 117-010	OSB	Frames, Bow to Fr. 35
09-060 117-020	OSB	Frames, Frs. 36- 72
09-060 117-032	OSB	Frames, Frs. 73 - Stern
09-060 152-030	OSB	Bulwarks and Curtain Plates
09-060 163-013	OSB	Sea Chest
09-060 169-101	OSB	Gate Details
09-060 182-011	OSB	Main Engine Foundation
09-060 200-010	OSB	Machinery Arrangement
09-060 243-010	OSB	Shaft Arrangement
09-060 256-010	OSB	Engine Cooling Piping Schematic
09-060 261-010	OSB	Fuel Oil System Schematic
09-060 264-010	OSB	Lube Oil & Dirty Oil System Schematic
09-060 320-030	OSB	Electrical Misc.
09-060 506-02P	OSB	Fills, Vents and Sounds Layout & Arrangement
09-060 506-011	OSB	Fills, Vents and Sounds Schematic
09-060 521-011	OSB	Fire Main System Schematic
09-060 521-020	OSB	Fire Main System Arrangement
09-060 526-011	OSB	Weather Deck Drains
09-060 529-011	OSB	Bilge Oily Water Schematic
09-060 529-020	OSB	Bilge Oily Water Layout
09-060 533-010	OSB	Potable Water Schematic
09-060 561-010	OSB	Steering Arrangement
09-060 562-010	OSB	Rudder Arrangement
09-060 568-012	OSB	Bow Thruster Installation
09-060 581-010	OSB	Anchor Handling
09-060 612-010	OSB	Handrails & Ladders below main deck
09-060 839-011	OSB	Lines Plan
07069-001-1501	EBDG	Superstructure Details (preliminary-subject to change)
07069-001-2001	EBDG	Engine Room and Tank Room Arrangement (preliminary)
07069-001-2561	EBDG	Engine Cooling Schematic (preliminary)

07069-001-3301	EBDG	Lighting Plan (prelim-subject to change per 09-060 101-024
07069-001-5511	EBDG	Compressed Air Schematic (preliminary)
07069-001-5512	EBDG	Compressed Air Arrangement & Details (horizontal receivers)
Y10016M-01	EMI	Machinery Alarm System
Y10032C	EMI	Steering System

Note:

Bidders are advised that these Plans and Specifications may not be complete. *Allowances should be made in the bids for clarifications and corrections that may occur after the bidding process. More details shall be forthcoming during construction of the first vessel by Orange Shipbuilding Co. Inc. This shall be especially true for vendor equipment and USCG approvals. As the full extent of the interior finish has yet to be decided, the contractor shall allow for some upgrades in the type of seating and flooring to be used. Interior finish shall not be as is on existing NC State ferries. Panels shall be used on the walls that allow for some rigidness and sound abatement. The use of thin aluminum sheathing with vinyl finish will not be considered adequate. The overhead shall be planking type design for esthetics and ease of removal. Lighting and HVAC ducting shall be flush with ceiling panels and be esthetically acceptable. The flooring shall be tile or poured type flooring with cove base all around. The joiner system shall be using the same colors as on OSB hull 413.*

GROUP 1 STRUCTURAL

References

1.1. 09-060 110 Series Frames

1.2. 09-060 110 Series Scantling Sections

1.3. 09-060 101 Series Inboard Profile

1.4. 09-060 116 Series Longitudinal Bulkheads

1.5. 09-060 117 Series Main and Lower Deck Plating

1.6. (Under Development) Superstructure and Pilothouse Structure

1.7. 09-060 101-011 Outboard Profiles and Deck Arrangements

1.8. 09-060 839-011 Lines Plan

1.9. 09-060 169-010 Bow Gate Details

100 Structure – General Requirements

All steel shall be new, ASTM-A36 certified, and of U.S. manufacture and origin. The Contractor shall provide mill certification or ABS certification. See special provision for purchase of domestic steel products.

The Contractor is advised that References 1.1 – 1.7 being used to build the first ferry from this design, and that propulsion and other major equipment foundations have been designed. The Contractor shall be responsible to follow the detail design to the satisfaction of USCG and the Owner. No changes to the design will be allowed.

101 Material and Scantlings

The vessel shall be constructed on a longitudinal system of framing.

Longitudinal strength shall be maintained by ensuring continuity of main fore and aft members including the Main Deck, bottom and deck girders, and the shell plating. Where the strength of a main structural member is impaired by cuts or interruptions in continuity, efficient means of compensation shall be fitted.

Limber and vent holes, 1-1/2" radius minimum, shall be cut as necessary to ensure proper venting and drainage of tanks, compartments, pockets, and voids. Tanks shall have limber holes and vent holes of adequate size for full capacity flow to suction and vent lines.

All structural steel material, including forged components, are to be made of open hearth mild steel of uniform quality, the chemical and physical properties of which are to conform to the requirements of the ASTM-A36.

All scantlings shall meet or exceed the American Bureau of Shipping requirements and USCG technical notes. Where scantlings on the plans exceed ABS requirements, the increased scantlings shall be used.

Scantlings not specified by the plans, ABS or USCG are to be in compliance with the yard's practice.

Temporary access openings may be provided through shell, bulkheads, decks, etc. for convenience of workers and are to be reclosed in place by welding. All such openings shall have large radius corners for this purpose. Openings shall be positioned to utilize existing design butt welds and seams wherever possible.

Local reinforcements, for special loads and vulnerable areas subject to high wear, also compensation for penetration, doors, stairway openings, etc. shall be provided generally in accordance with ABS rules.

In general, doublers shall not to be used. Reinforcements shall be insert plates of increased thickness.

Except at the Main Deck, wherever there is a difference in adjacent plate thickness, the stiffener side shall be kept flush. At the Main Deck, the weather surface shall be kept flush.

Particular care shall be taken on all visible surfaces (i.e.: outside shell, deckhouse, etc.) to maintain a good appearance by means of suitable chamfers. Outside corners of steel material which passengers may contact shall be 1" minimum radius.

No rough edges shall remain where steelwork is cut. Penetrations shall be pre-cut by machine or neatly burned.

All steel material shall be shot blasted to coating manufacturer's recommendations at least to SSPC Sp 10 standard, and immediately thereafter coated with a suitable primer. The primer shall be of weldable type and fully compatible with ultimate coating system.

Design of steel structures shall allow clear heights as specified after allowing for passage of ducts, pipes, etc.

Unfairness of plating between frames, stiffeners, or deck beams shall not exceed 1/4".

102 Welding

Electric arc welding shall be used for assembly of all construction elements in hull, superstructures, stern, stem, meeting or exceeding ABS and USCG requirements. Automatic welding is to be used to the greatest possible extent.

Weld joints shall be prepared and welded in compliance with ABS requirements. Mill scale, rust, moisture, dirt, slag, and other alien substances shall be removed before welding is executed. After the welding, remnants of slag are to be removed.

Special care is to be taken in regard to welding sequence in narrow places or places having difficult access (i.e.: rudder, fore peak, etc.).

All welding shall be done after carefully scheduled sequences. The welding sequence shall ensure a minimum of strains of finished hull. Particular care is to be taken in the welding sequence to relieve stresses which might cause inherent weakness in the structure or excessive buckling of plates.

Vehicle deck longitudinal beams shall be welded with a minimum of 6" in 12" intermittent 5/16" fillet weld with a balanced 6" and wrapped fillet weld at the ends. Vehicle deck transverse girders shall be 5/16" fillet continuously welded on both sides. All other welds shall meet or exceed ABS requirements. All welding exposed to the weather shall be double continuous. A welding schedule shall be submitted for regulatory body and Owner's approval.

Good grounding connections shall be ensured for all welding, and care is to be taken with all welding to avoid undue stresses.

Electrodes shall be of the quality approved regulatory body type.

Internal scallops may only be used for air escape, drainage and in way of cross welds. Crossings shall be made with notch, or the first weld to be ground flush before the crossing element is installed.

Single side welding may be performed only on down-hand runs, generally to ABS requirements.

The welding shall be controlled by means of X-ray, ultrasound, and magna-flux methods. Random radiographs shall be made to regulatory body requirements. Magna-flux method shall be used for examination for cracks when appropriate. In the event that defects are found, rechecking shall be carried out after repair. See also Section 841 for testing requirements.

Back gouging, where necessary, shall be carried out by air gouging or pneumatic chipping.

Temporary welding shall be carefully removed by chipping and/or grinding and steelwork in way made good to the satisfaction of Owner's and regulatory body surveyors.

Direct attachment of fittings to oil-tight structures shall be by welding only. Such welds shall be tested for tightness.

103 Lofting

Hull lines shall be carefully faired and offsets determined.

110 Shell and Supporting Structure

Frames and girders shall be bracketed on both sides of oil-tight and watertight bulkheads, or slotted through watertight bulkheads and collared. Special attention shall be paid to the alignment of girders under the engines and reduction gears, and at the struts and rudders.

111 Shell Plating

Shell plating shall be constructed in accordance with Reference 1.1. Attention shall be paid to finish of exposed steel on outside shell and superstructure; welding shall be ground smooth where unsightly. It is not the intention to grind smooth all hand-made welding on the side shell plating.

Each overboard discharge through the shell plating shall be rigidly stiffened vertically and horizontally to the nearest structural members.

114 Tire Rail

Install a 3", schedule 80 steel tire rail as shown on References 1.6 and 1.7. Provide pipe caps to ends to prevent injury or damage. Tire rails shall be continuously welded.

115 Stanchions

Provide stanchions support longitudinal and transverse deck girders in accordance with References 1.1, 1.2, and 1.5. Minimize the number of stanchions in public areas.

As far as possible, supports for the various decks are to be arranged vertically above each other to form as stiff a construction as possible. The whole is to be designed to eliminate vibration to the greatest extent possible.

Heavy stanchions and girders shall be fitted in machinery spaces as needed to minimize vibration. Care is to be taken in the design of accommodation areas to ensure continuity of pillars, girders, bulkheads and webs so as to minimize vibration. Location of stanchions throughout, but especially

in passenger areas, shall be arranged as far as possible to suit the arrangement, function, and decoration of the spaces concerned.

116 Skeg

The skeg shall be tapered, hollow construction with widths (half breadths) as shown on Reference 1.8. The skeg shall be fitted with suitable transverse framing and made watertight.

Stainless steel half couplings shall be installed in bottom plating at each skeg void and shall be fitted with 2" brass flush plugs. Install liquid rust inhibitor in each skeg void after testing and welding in adjacent areas has been completed.

117 Framing

Framing shall be in accordance with ABS except where the plans specify heavier framing.

120 Hull Structural Bulkheads

Structural bulkheads shall be arranged as shown on the plans and generally in accordance with Reference 1.2 and ABS rules. Hull bulkhead plating shall be no less than 5/16" thick. Bulkhead stiffeners shall be arranged to line up with girders or other stiffeners.

All openings shall have rounded corners to the Owner's approval.

121 Center Vertical Keel

The center vertical keel shall vary in construction as shown on Reference 1.3. The CVK shall be continuous through bulkheads where the keel thickness on each side is identical.

130 Decks

The Main Deck and Lower Deck shall be fabricated as shown on Reference 1.5.

Insert plates with radiused corners shall be installed under bitts, cleats, pad eyes, and similar fittings. Main Deck insert plates shall be installed flush on the top side with surrounding plates.

Deck beams shall be either slotted through bulkheads and girders or bracketed each side. In way of tight bulkheads, slotted beams shall be collared.

Camber in the Main and Passenger Decks and tumblehome in the curtain plating shall be straight line.

Decks shall be reinforced in way of corners of large openings, breaks, etc., where required by regulatory bodies. Such reinforcement shall be by insert plates of increased thickness-doublers are not to be used – and by installation of heavy girders.

Steel or aluminum diamond plate shall be provided in machinery space walkways. Aluminum plates shall be installed except where steel is required by USCG regulations.

136 Upper Decks

The Passenger Deck and decks above shall be fabricated as shown on Reference 1.6.

The Passenger Deck and decks above shall have straight line camber, 6" in 50'.
Note that this camber is not shown on the plans.

150 Superstructure Bulkheads

Superstructure bulkheads and frames shall be fabricated in accordance with Reference 1.6 except that the Contractor shall verify and provide scantling sizes, connections and details in accordance with USCG Marine Safety Center Technical Note MTN 05-94 for racking requirements.

Superstructure exterior bulkheads shall be of flat and curved plate construction with welded stiffeners on the inside. Care shall be taken to ensure fairness and elimination of distortion of deckhouse bulkheads and house fronts. All deckhouse corners are to be well radiused.

Edges of the cutouts in the curtain plates shall be ground smooth to ensure good coating adhesion. Alternately; Contractor may install 3/8" round bars around the cutout perimeters, continuously welded both sides.

151 Bulwarks

The bulwark cap tube shall be internally coated with a preservative and seal welded to be watertight. Welding on the bulwark cap shall be ground smooth.

A bulwark gate shall be provided at the Main Deck, starboard side, in way of the rescue boat ladder access. Hinges and latches shall be heavy duty stainless steel. The gate shall swing outboard; latches shall be provided to secure the gate in both the open and closed positions.

Provide a double-hinged bow gate generally as shown on Reference 1.7 with details as on current NC DOT vessels. The bow gate shall lock securely in both the open and closed positions. Hinge pins and locking pins shall be 316 stainless steel. Hinges shall be fitted with stainless steel grease fittings. The bow gate shall be balanced so as to be easily operable by one crew member.

161 Deck Fittings

Cast steel cleats and chocks shall be provided on the Main Deck as shown on References 1.5, 1.6, and 1.7. Corners and weld bead shall be ground smooth to prevent chafing of mooring lines.

Bulwark chocks shall be 8"x12" closed type. Kevels shall be 36" chock.

Chafing protection, round bar, or pipe shall be provided on bulwark stiffeners where lines may lead from kevels or chocks.

Insert plates and local under-deck stiffening shall be provided to accommodate the kevel installation. Doubler plates are not acceptable.

163 Sea Chests

Both Seachests shall be of vertical design as on OSB Hull 413.

Sea chest strainer plates shall have a minimum cross section area of 2.5 times the total cross section of the piping attached to it. Strainers shall be 3/8" plate steel, hinged with 316 stainless steel pins and fasteners.

The bow thruster sea chest shall be 1/2" plate and shall be vented to the overhead of the Bow Thruster Room. The thruster sea chest strainer plate shall be hinged with 316 stainless steel pins and fasteners. The design and details shall be as per OSB hull 413.

167 Watertight Doors, Hatches, and Manholes

Steel hatches and doors shall be shot blasted and coated with one coat of inorganic zinc to all surfaces prior to assembly.

Bolted manholes (15" x 23" minimum size) shall be provided for each built-in tank and void. Where the lower edge of the manhole is more than three feet above the tank bottom or working platform, bent round bar rungs shall be provided for safe access. In addition, a bent round bar grab rung shall be provided above the manhole.

A bolted machinery removal hatch shall be provided in the Main Deck as shown on Reference 1.5. Provide flush stainless steel fasteners to provide watertight integrity to meet ABS requirements.

Six dog 26" × 75" quick acting watertight doors shall be installed at each transverse watertight bulkhead below the Main Deck, except the collision bulkhead as shown on References 1.2 and 1.7. Doors shall be quick-acting, hand wheel-operated. There shall be provisions for locking watertight doors using padlocks. All doors shall be labeled on both sides using engraved stainless plates in accordance with 46CFR 78.47-37 (a) and (b).

Flush deck watertight quick-acting hatches, 20" diameter, shall be installed in the Main Deck as shown on References 1.5 and 1.7 for access to compartments and voids. Hatches shall be model 2407-0003 with stainless steel mechanism, inside handle and stainless steel deck ring. Provide and install one (1) spring balanced, quick acting, 36" x 36" flush watertight hatch at frame 71 as shown on References 1.5 and 1.7. The hatch shall have a stainless steel label on the underside with arrows showing direction to rotate hand wheel to open.

168 Tanks

The interiors of all tanks and voids shall be thoroughly cleaned and coated to the satisfaction of the Owner.

After coating, the potable fresh water tanks shall be filled and flushed at least three times, the first time having sufficient chlorine dosage to ensure decontamination. Tanks shall be certified safe by competent authority.

The emergency generator fuel tank shall be in accordance with 46CFR 58.50-10. Vents shall be installed in accordance with 46CFR 56.50-75 and 56.50-85.

Fuel and lubrication oil tanks shall be thoroughly cleaned of all debris, weld splatter, flux, and other foreign matter and approved by the Owner prior to initial filling, and shall be kept closed thereafter until ready for use.

169 Special Purpose Closures

Where required by regulatory bodies, holes permitting fire hoses to be passed through interior fire doors shall be fitted at the hinge side.

Interior fire doors shall have electromagnetic hold backs which are automatically deactivated upon activation of the fire alarm, thereby allowing the fire doors to close. Local magnetic release switches shall be provided with central control of the release switches in the Pilothouse.

171 Masts

Navigation light masts shall be provided and located as shown on Reference 1.7. The navigation light masts shall be of aluminum construction, hinged, and counterbalanced for convenient and safe one-man operation. Hinging arrangement is intended to permit changing of navigation light bulbs without requirement for ladders.

Electrical cables on the navigation light masts shall be provided with watertight receptacles at each light fixture and adjacent to the mast base.

Flagstaffs shall be fitted with sheaves and brass cleats for halyards. Provide brass pulleys for each arm and gaff, three (3) complete with flag halyard of 1/4" nylon line with brass snap hooks secured to each end of halyard. Halyards shall be endless loop type, suitable for service intended.

180 Foundations and Struts

Contractor shall fabricate and install all necessary foundations and supporting structure. Foundations shall ensure rigidity, freedom from vibration in normal operation, and secure containment of the equipment in rough seas and crash stops (accelerations of at least 1.0 g in any direction). Flat bars shall be welded around the edges of top plates where they are necessary to retain possible leakage of oil or water, and drain plugs shall be provided to permit release of all drainage. Foundations shall extend a sufficient distance to distribute the load and to avoid excessive weight concentrations. Doublers or insert plates, girders, headers, and stanchions shall be fitted and under deck framing shall be otherwise reinforced to provide adequate support of the equipment. Top members of foundation girders shall be machined as necessary and drilled to suit the equipment base structure. Chocks and/or liners shall be fitted, machined as necessary to produce and maintain correct alignment and to permit adjustment of alignment.

The foundation (under deck structure) for the rescue boat davit (Reference 1.6 and Section 583.2) shall be designed with a safety factor of 4.5:1 based on the rescue boat test load of approximately 2,250 pounds.

182 Propulsion Plant Foundations

Foundations for the propulsion machinery shall be fitted as an integral part of the vessel's primary structure. Abrupt discontinuities shall be avoided by gradual tapers at the extremities of foundation structure.

The propulsion machinery foundations shall be of a height to suit the engine and reduction gear alignment chocks. The reduction gear foundations shall be a continuation of the main engine foundations. Brackets shall be installed at every frame, except where such brackets interfere with the engine bolting arrangements. Welding of engine and reduction gear foundations shall be continuous.

183 Generator Engine Foundations

The Owner-furnished generator sets will be furnished skid mounted. The engine rails shall be secured to the foundations using vibration isolation devices approved by the generator set manufacturer. Hull structure shall be locally reinforced to support the generator sets.

184 Navigation/Communications/Electronics Foundations

Welded steel foundations shall be provided as required for all navigation, communications, and electronics equipment and consoles.

185 Auxiliary Equipment Foundations

Appropriate foundations and support structure (brackets, etc.) shall be provided for all equipment, such as electrical panels and instrumentation, regardless of weight. Containment coamings shall be incorporated into the foundation around all equipment where oil leakage may occur. Design of foundations shall permit equipment access as required, and access for maintenance of foundations and adjacent hull structure. Foundations shall incorporate suitable supports so as to prevent excessive or unusual vibration under the normal range of vessel operating conditions.

Auxiliary foundations shall consist generally of angles and plate, adequately secured to frames and with top bars of suitable size for connection of the machine. Where drip pans are needed, such may be formed of flanged plates with welded corners, and acting as part of the foundations. All foundations shall be braced to reduce vibration. Floor plates shall not be extended to form part of the foundations.

Drip pans with drains and chocks shall be fitted where warranted by the nature of the equipment supported.

Care shall be taken to avoid sharp corners or projecting members that might be hazardous to personnel. Due consideration is to be given in the design of foundations to provide for ready access to the equipment and adjacent structure and fittings.

Foundations for davits, kevels, chocks and the like shall be designed to withstand the breaking strength of the cable or mooring lines attached.

186 Hull Bumper Pipe

Install a ½ of 8" schedule 80 pipe bumper at the side shell rub-strake from frame 0 to frame 92 port and starboard. The ends shall be bullet shaped with a length of at least 12" at each end of the bumper. The bumper pipe shall have a ¾" vent and drain plug at each end using a ½ coupling with a brass plug. Bumper pipes shall be air tested to 2 psi for 15 minutes.

GROUP 2 PROPULSION

References

2.1 09-060 256-010, Engine Cooling Piping Schematic

2.2 07069-001-259-1, Engine Exhaust Schematic

2.3 09-060 261-010, Fuel Oil Piping Schematic

2.4 09-060 264-010, Lube & Dirty Oil Schematic

2.5 09-060 243-010, Propulsion Shafting Arrangement and Detail

2.6 09-0600562-010, Rudder Arrangement and Detail

200 Propulsion Plant, General

The propulsion system is for a single-ended design, with two fixed-pitch stainless steel propellers at the stern, and a transverse thruster at the bow. The propulsion machinery installation will consist of two non-reversing, 4-stroke, turbo-charged diesel engines, each connected through reversing reduction gears to a propeller.

233 Main Engines

The main propulsion engines shall be minimum of 1100 hp arranged for keel cooling; see Reference A2-1 for details. The drawings are designed for *MTU* but specifications are the governing document in this matter**. Contractor shall be responsible for making any and all changes to engineering required to suit the choice of engine used for this vessel.**

Engines shall burn No. 2 diesel fuel having a flash point greater than 110°F.

Control of each propulsion drive train shall be achieved through the use of an engine throttle lever and independent clutch control pushbuttons.

Contractor shall install furnish and install main engines. Contractor shall provide all required fasteners, wiring, exhaust system flex connections, all piping, insulation, bedding materials, guards, gaskets, fittings, etc. for a complete and operational installation.

Contractor shall install six engine gauge panels, two each at the EOS Console, Pilothouse Console and Aft Control Station console. These may be part of the engine gauge panel if so provided.

Contractor shall fill engines with a mixture of freshwater and approved water treatment product. Amount of water treatment added shall be to manufacturer's recommendation for type and size of engines. Provide one water treatment test kit.

Contractor shall provide the services of an authorized technician to accomplish initial start up of main engines. Test Reports of initial start up shall be provided to the Owner.

Contractor shall provide the services of an authorized technician to accomplish a PAR test on all engines. See also Section 842.2 for test requirements.

236 Propellers

Provide two fixed-pitch propellers fabricated, machined, and balanced in compliance with ISO 484/2 class 1 standards. Design propellers to accommodate rope guards and lifting/pulling bolts. Propellers shall be thoroughly stress relieved prior to machining and finishing. Propellers shall be dynamically balanced and the trailing edges of blades shall be properly ground to prevent "singing". Propellers shall be secured to the tail shafts with propeller nuts, which upon final fitting and tightening shall be welded to the propeller. The propeller will be per OSB hull 413 for purposes of standardization.

Propellers shall be as follows:

Material	CF-3 Stainless Steel
Number of blades	5
Diameter	56.00"
Variable Pitch	To be determined @ (1100 hp)
Hydrodynamic P/D (0.60R)	0.902
Projected skew at tip	18.0°
DAR	0.800
PAR	0.682
Actual T_{max} at 0.25R	2.40"
T_{max} at 1.0R	0.403"
T/C at 0.25R	0.159
Total rake at tip	3.920"

237 Bow Thruster

The Contractor shall furnish and install one jet-pump, 360° azimuthing bow thruster, *Omnithruster model HT600* with a rated minimum 525 HP at 1800 RPM and a reduction gear having a ratio of 3.28:1. Engine shall be installed on resilient mounts approved by the Owner and the engine manufacturer. **Contractor is responsible for any and all engineering changes to drawings to suit engine choice.**

The Contractor shall provide all components for a complete and functional installations including, but not limited to reduction gear, Cardan shaft, couplings, guards, controls, etc.

The thruster shall be mounted on the forward side of the thruster sea chest. Appropriate lifting eyes shall be provided for removal of the thruster and the thruster engine.

The Cardan shaft shall be designed to allow removal of the thruster without disturbing the drive engine. Drive shaft shall be rated for the maximum input horsepower and speed. A protective shaft

cover for personnel safety and whip preventer designed to keep the shaft from whipping in case failure of universal joint shall be provided.

240 Transmission Systems

Two complete propulsion shaft systems shall be provided as described herein. The propulsion shafting system shall be in compliance with applicable USCG requirements including all regulatory documentation, failure modes analyses, and testing and verification procedures.

243 Propulsion Shafting

Propulsion shafting arrangement shall be generally as described on Reference 2.5.

After vessel is afloat, but in no case less than 24 hours, align shaft system with the reduction gears so that tolerance is no greater than 0.003" from true.

243.1 Reduction Gears

The main engine reversing reduction gears shall be *ZF model 7600* with a ratio of 3.26:1, arranged for keel cooling; see Reference A2-2. The gear shall be same as installed on OSB hull 413 for reasons of standardization. Output shafts shall be attached to line shafts with keyed couplings. Provide and install portable protective guards around coupling and shafts.

Contractor shall provide and install all necessary ancillary materials and equipment, including but not limited to all foundations, fasteners, guards, oils, fittings, hardware, etc. as required by the manufacturer for a complete and operational system.

243.2 Bulkhead Shaft Seals

Contractor shall provide and install *Wartsila # H6214000015240 PSE Seal 6" shaft seals*, Split-type for easy repair, arranged for sea water cooling. For standardization purposes, there is to be not substitution.

The Contractor shall provide two cooling pumps, arranged in parallel so that either pump can provide a minimum of 30 gallons per minute to each stern seal. Valves shall be provided to permit isolation of each pump and each shaft seal. A simplex strainer, bronze body with stainless steel basket, shall be provided on the suction side of each pump. A low-flow alarm shall be provided for each supply line.

The Contractor shall provide a stainless steel drip collection sump below each shaft seal. Provide a 1/4 HP centrifugal discharge pump at each sump. Pumps shall be float switch activated and shall discharge overboard just below the guard strake. Install a high level alarm in each sump.

Contractor shall provide and install all necessary ancillary materials and equipment, including but not limited to all foundations, fasteners, fittings, packing, lubricants, hoses, etc. for a complete and operational system.

243.3 Shaft Guards

Contractor shall provide and install shaft protective guards constructed of 2" × 2" × 1/4" angle frames and 1/4" aluminum diamond plate. Guards shall be attached to framing with 3/8" diameter stainless steel machine screws. Angle frames shall be drilled and tapped.

Rubber isolation material 1/8" thick shall be installed between angle and aluminum plating.

Hinged covers shall be installed in way of bearings and other equipment requiring periodic maintenance. Hinges shall be stainless steel.

252 Propulsion Control System

252.1 Main Engine Controls

Provide and install electronic engine controls for three (3) stations for each main engine from Engine Monitor Inc. to be located in the Pilothouse, Aft Control Station and EOS booth in the engine room. For standardization purposes, not substitutions will be allowed.

252.2 Bow Thruster Controls

Provide and install electronic engine controls for three (3) stations for the Bow Thruster engine from Engine Monitor Inc. to be located in the Pilothouse, Aft Control Station and EOS booth in the engine room. For standardization purposes, not substitutions will be allowed.

256 Engine Cooling

256.1 Main Engine and Ship's Service Generator Cooling

The cooling system for the main engines, reduction gears, thruster engine and ship's service generator engines shall be per Reference 2.1.

Jacket water piping shall include USCG-approved flexible connections to accommodate engine motions and thermal expansions, valves to minimize coolant loss when servicing the heat exchangers and instrumentation as required for monitoring and diagnosis, including jacket water temperature. Any high points in the jacket water system shall have valved vents. Provide an engine manufacturer-approved corrosion inhibiting antifreeze for all engines in sufficient concentration to protect against freezing.

All temperature sensors and level switches shall include hardware and signal conditioning devices for interfacing with the machinery monitoring and control system (see Section 436.2).

See Section 437 for tank level indication requirements.

256.2 Emergency Generator Cooling

The emergency generator shall be radiator cooled with attached jacket water pump, thermostat valve, belt driven radiator fan, and radiator. Provide a corrosion inhibiting antifreeze in sufficient concentration to protect against freezing.

The radiator fan shall ventilate the emergency generator room and the radiator air discharge shall be fit with a flexible connection to the outside.

259 Engine Exhaust Piping

Contractor shall provide and install complete exhaust system for all diesel engines as shown on Reference 2.2.

Hull penetrations shall be seamless Sch. 80, 316 stainless steel pipe. USCG-approved bulkhead penetrations shall be used where exhaust piping penetrates engine room bulkheads.

Install a stainless steel expanded metal safety guard around the portion of the emergency generator exhaust piping, which is located above the deckhouse top.

Insulation shall not be installed until systems have been tested to the USCG and Owner's satisfaction. Each system shall be insulated from the engine outlet flange to the weather connection.

Install crankcase vents with flame screens, if recommended by the engine manufacturer, to weather. Emergency generator crankcase vent (if required) shall terminate with a 180° gooseneck above the Deckhouse top.

Exhaust silencers on this vessel shall be "Cowl" flanged type as on all NCDOT ferries.

261 Fuel Oil System

Provide and install a complete fuel oil piping system to all diesel engines to consist of necessary supply lines, return lines, manifolds, ball valves, and all associated fasteners, fittings, etc. in accordance with Reference 2.3, 46CFR 56.50-75, and other applicable CFR sections.

Fuel tank shut-off valves shall be so arranged with stainless steel deck fittings as manufactured by *Stow Manufacturing Company, p/n 18389-612*, remote reach rods, valve connections, etc. to provide a station outside the Tank Room for closing the fuel supply. Deck sockets shall be located near main deck islands away from car lanes. For standardization purposes, not substitutions will be allowed.

See Specification Section 437 for tank level indication requirements.

Fuel oil tanks shall **not** be connected to the dirty oil system.

264 Lubricating Oil Systems

Provide a gear and engine lubricating oil system per Reference 2.4 for transfer of oil from the lubricating oil tanks to the main engines and generators.

Provide a dirty oil transfer system per Reference 2.4 for evacuating the main engine and generator oil to the dirty oil tank and for pump out of the dirty oil tank to the discharge station.

Provide pressure switches and/or transducers for alarms and automatic shutdown as described in Section 436 and as required by USCG.

Provide lubricating oil for initial start-up, tests and trials. All engines shall have lubricating oil levels at recommended maximums at time of delivery to Owner. Lube oil tanks shall be filled with Owner-approved oils at the time of delivery to the Owner.

Engine motions and thermal expansions shall be accommodated by USCG-approved flexible connections.

GROUP 3 ELECTRICAL

References

3.1 07069-001-101-1, Profiles and Deck Arrangements

3.2 07069-001-200-1, Engine Room & Tank Room Arrangement

3.3 07069-001-320-1, Electrical One-Line Diagram

3.4 07069-001-063-1, Electrical Load Analysis

3.5 07069-001-330-1, Lighting Plan

Addendums

300 Electrical System – General

The Contractor shall provide a complete electrical system, including wiring and equipment, as described in these Specifications.

All equipment, materials and workmanship shall fully comply with the following electrical standards:

- 46CFR Subchapter J, Electrical Engineering
- ABS Rules for Vessels Under 90 Meters

The electrical system shall be supplied with equipment quantities and ratings per Reference 3.3 and this Specification.

301 Electrical Equipment Arrangement

In general, equipment shall be located per References 3.1 and 3.2.

Each connection box in a damp or wet location shall be watertight, with terminal or stuffing tubes for cable entrance and external mounting feet. Each watertight connection box shall be mounted by the external mounting feet.

All electrical components installed in locations exposed to the weather shall be 316 stainless steel or bronze, as approved by the Owner.

302 Electrical Motors & Associated Equipment

302.1 General

Motors and controllers shall be supplied to suit the requirements of each application. Particular care shall be exercised in the selection of AC motors to ensure that each motor is not too large for the service intended, thereby avoiding the low power factor inherent in under loaded induction motors.

302.2 Motors

Unless otherwise specified, motors rated 2 HP or larger shall be AC squirrel cage, induction type, designed for 208 VAC, 3-phase, 60 Hz, continuous duty, with class B or F insulation. Motors of less than 2 HP rating shall be designed for operation on 115/208 VAC single phase or 208 VAC three phase. All motors in machinery spaces, including vent fans, shall be rated for 50 degree Centigrade.

Electric motors installed in the engine room, open decks, or otherwise exposed to weather shall be marine waterproof type; all other motors shall be TEFC and in accordance with all requirements of IEEE STD 45 (latest issue). Fan motors installed in ventilating trunks shall be TEAO type construction, with multi-speed windings if specified.

Except as otherwise specified, all integral horsepower motors shall have horsepower, speed, and torque characteristics that will best suit the intended application. All ratings shall be continuous duty unless the application definitely permits an intermittent duty rating.

Bearings shall be of the readily renewable anti-friction (ball or roller) type. Bearing housings shall be equipped with pressure and relief fittings for grease lubrication, and all such fittings shall be of a uniform type. Pressure fittings shall be located to facilitate lubrication. If necessary, they shall be extended to an accessible location with suitable piping to the Owner's satisfaction. In lieu of provided fittings, anti-friction bearings may be of pre-lubricated "sealed-for-life" type, provided that the lubricant is of a type guaranteed not to deteriorate during the guaranteed full life of the bearings, and that the seals and housings are of such design as will prevent entry of contaminants and/or loss of lubricant.

302.3 Motor Controllers

Each motor controller and protective device shall be suitable for a marine application and constructed in accordance with IEEE STD 45, and shall meet Article 430 of the National Electrical Code and UL 508, including the Marine Supplement.

The complete starter shall be housed in a marine type, corrosion resistant, self-ventilating, drip proof enclosure type SDW-21, suitable for bulkhead mounting where practicable. Control circuit voltage shall not exceed 120 volts (single phase).

All starters and control components shall be capable of satisfactory operation when inclined as much as 30 degrees in any direction.

Motor overload protection shall be provided by thermal overloads (melting alloy unless otherwise specified) in the motor controller. Motor overloads shall be sized in accordance with motor nameplate data and controller manufacturer's guidelines.

Integral horsepower motor controllers for motors requiring remote operators and/or pressure switches shall be of the combination type with local pushbutton operators and an external reset button mounted in the controller door. Controllers shall have LVP and a green run indication light mounted in the door unless otherwise specified.

Integral horsepower motor controllers for motors less than or equal to 10 HP which do not require remote and/or pilot operators shall be manual, across the line type, with pushbutton operators mounted in the controller face. Unless otherwise specified, all manual starters shall have low voltage protection (LVP), a run indication light, mechanism lock-off and shall be NEMA size 1 (M-1).

Reduced voltage starters shall be provided for motors of 20 horsepower or larger.

Manual starting switches may be used for all fractional horsepower motors, single phase or three phase. These switches shall have a "quick-make-break" mechanism and shall provide thermal overload protection to the motors, except where such protection is built into the motors. These switches shall be installed in waterproof corrosion resistant housings.

Each motor controller hinged door shall have door positioners and stops. Equipment mounted on a hinged door shall be constructed or shielded so that no electrically live part of the door mounted equipment is exposed to accidental contact by a person when the controller is open and the circuit energized.

Controllers for multi-speed motors shall include properly labeled speed indicating lights.

A complete wiring diagram, specific to the application, of each controller shall be attached to the inside surface of the control cabinet door and protected by a heat resistant transparent protective covering.

Each controller shall be provided with the necessary circuits and auxiliary contacts for energizing indicating lights, alarms, and illuminated push buttons as required. All field wiring shall terminate at terminal blocks.

Automatic controls shall have provisions for manual over-ride control through the use of 3-position switches, which can be set to "HAND", "OFF", or "AUTO" (HOA). The 3-position switch shall have spring return to "OFF" from "HAND". A blue automatic mode light and a green run indicating light shall be provided on any HOA motor controller.

All compressor, potable water pump, priming pump, etc., drive motors shall be interlocked as required for safety in the affected auxiliary system.

302.4 Pushbutton Stations

Starters shall be installed as conveniently near their respective motors as possible. If a starter must be installed at a point from which the motor served is not visible, separately mounted start-stop push-buttons shall be installed near the motor, in addition to those at the starter. These push-buttons shall be in waterproof bronze enclosures.

An emergency stop station with run indication shall be located on the open Main Deck outside of the Engine Room access. The station shall have a means to stop all main ventilation fans, fuel oil service and transfer pumps.

304 Cabling – General

Cables shall be selected and sized per ABS and USCG rules and shall meet the recommendations of IEEE STD 45. 208/120 VAC cables shall be rated for 600 VAC. The minimum size of conductors for power and lighting cables shall be #14 AWG.

All electrical power, lighting and low voltage control cables in interior areas and protected exterior areas shall be low smoke cable. Plenum-rated cabling may be used for specialty data and communications cabling.

All electrical communications and data cable in interior areas and protected exterior areas shall comply with UL 1581.

Voltage drop for motor and lighting circuits shall not exceed 5% from the switchboard to the last load in a branch. Cable sizes shown in the Reference 3.3 are estimates; the Contractor shall upgrade cables as necessary to meet voltage drop criteria based on the actual cable lengths. The Contractor shall also take and provide the actual voltages (under full load) at the load end for the longest run of each cable size to verify that voltage drops are not exceeded. Particular care shall be exercised for lighting circuits with multiple branches.

All electrical cable to deck mounted equipment and controls exposed on deck shall be adequately guarded for the full run from deck to terminal box with pipe or other substantial protection. Kick-pipes shall be arranged to permit movement of the deck relative to the terminal box.

Cable in crew's spaces shall be concealed. Where bulkhead construction makes concealment impractical, the wiring shall be neatly formed and installed on the surface, giving particular attention to appearance.

Cables are to be installed in the interior of the hull or superstructure insofar as possible. Where fixtures and equipment are fitted on exterior surfaces of the vessel, cable shall be run in 316 stainless steel pipe screwed directly into the light fixture, junction box, receptacle, shore power box, fan housing, sound powered telephone, etc. Stainless steel unions, type 316, shall be provided as close as practical to each fixture to facilitate easy removal.

Where cables are run to fixtures which are designed to be adjustable (such as spot lights; flood lights, and public address system speakers), stainless steel pipe shall terminate as close as possible to the fixture and a watertight simplex receptacle shall be provided. Short lengths of heavy duty "SO" Cord shall be provided with watertight plugs from each fixture to the receptacle. All fasteners used to attach fixtures or equipment to the vessel shall be stainless steel.

305 Equipment Label Plates

Labeling requirements for specific equipment/components are included in the following Specification sections.

Any equipment with multiple power sources shall be labeled with a warning placard (white letters on a red background); "WARNING – MULTIPLE POWER SOURCES" and include the circuit designations of all power sources.

Cable tags:

- All electrical cables shall be tagged with embossed aluminum tags on each side of a penetration, into and out of junction/connection boxes and/or equipment. The unique circuit designation, keyed to the various electrical plans, shall be embossed on the tag.

- All control wiring within control panels and consoles shall be identified with floaters.

311 Ship's Service Generators

The two (2) approximate 215 kW USCG approved marine generators will be furnished and installed by contractor in the engine room as shown on plans. Generators are designed to carry full load and shall be arranged for single genset operation at a time, not split-bus or parallel operation. **Contractor shall be responsible for any and all engineering and drawing changes to suit engine choice.**

Controls and control power for each generator shall be independent such that the loss of any control device, signal or power source will not affect more than one generator set.

The generators shall be located as shown on Reference 3.2.

Provide flexible hose of suitable length and all necessary fittings and valves to facilitate easy engine oil change. Installation shall be approved by engine manufacturer and the Owner.

All external moving or hot parts of engines and generators shall be provided with suitable guards to prevent personal injury. Turbocharger housing shall be insulated with removable thermal blanket.

Provide and install manufacturer-approved spring vibration isolators between foundations and generator mounting rails.

Contractor shall provide and install all necessary ancillary materials and equipment, including but not limited to all foundations, fasteners, wiring, piping, hoses, fittings, hardware, etc. for a complete and operational system.

312 Emergency Generator

The emergency generator shall be approximately 140 kW genset, furnished and installed by contractor. Generator engine shall be USCG-approved marine type, arranged for 24 VDC electric auto-start and radiator cooling. Contractor shall be responsible for any and all engineering and drawing changes to suit engine choice.

An emergency generator fuel oil tank shall be provided in the emergency generator compartment. The fuel oil tank shall be provided with a high level switch which shall shut down the fuel oil transfer pump. The fuel tank shall be sized to supply the emergency generator for a minimum of 12 hours at full load.

Contractor shall provide and install all necessary ancillary materials and equipment, including but not limited to all foundations, fasteners, wiring, piping, hoses, fittings, hardware, etc. for complete and operational system.

313 Batteries and Battery Chargers

Battery and charger installations shall comply with 46CFR115 (moderate battery installations) and ABS Sections 4-6-3/3.7, 4-6-4/5, and 4-6-4/7.19.

All batteries are to be 8D or equal, 12-volt, wired in series/parallel as required.

Battery connections shall be pressure type lugs. Battery cables shall be end sealed to prevent electrolyte entrance by creepage or spray. Each battery bank shall be contained in a battery box located adjacent to the served unit and securely mounted in a foundation to the Owner's satisfaction.

Battery chargers shall not be installed directly over the batteries.

Batteries and battery chargers shall be provided as follows:

313.1 Temporary Emergency Power (TEP) System

- One 24 VDC battery bank. The battery bank will consist of two (2) 12 volt batteries, one (1) *NewMar model 24-4800IC inverter/chargers* (4800 W, 24 VDC). Installation shall include a DC Energy Monitor (DCE) and remote control panel (ICR-2) mounted at each control station (Pilothouse, aft Wheelhouse and EOS).

313.2 Ship's Service Generator Engine Starting

- Two 24 VDC battery banks each of sufficient capacity for starting generator engines per manufacturer's recommendations and ABS Rules. Battery banks shall be provided with approved rotary type switch of proper capacity and shall be cross connected in such a manner as to be capable of starting either generator engine from either battery bank. Battery switch unit shall be arranged with a center off position and as shown on plans.
- One *NewMar model PT-24-40* (24 VDC, 40 A, 3-bank, 3-step) battery charger with Phase Three Monitor/Control Unit.

313.3 Emergency Generator Engine Starting

- One 24 VDC battery bank of sufficient capacity for starting generator engine per manufacturer's recommendations and ABS Rules.
- One *NewMar model PT-24-40* (24 VDC, 40 A, 3-bank, 3-step) battery charger with Phase Three Monitor/Control Unit.

Contractor shall provide and install all necessary ancillary materials and equipment, including but not limited to all foundations, battery boxes, cables of sufficient size to supply required amperage to all starters, solder type battery lugs, circuit breakers of proper size and type, wiring, hangers, etc. for a complete and operational system.

321 Ship Service System

Power distribution shall be provided per References 3.3 and 3.4.

324 Switchgear/Switchboards

The ship's service switchboard shall provide for the control and protection of the ship's service generators, ground detection, connection to the emergency switchboard and shore power, and distribution of 3-phase, 4-wire, 208/120 VAC electrical power to ship's service loads.

The emergency switchboard shall provide for the control and protection of the emergency generator, ground detection, connection to the ship's service switchboard, automatic starting and transfer to the emergency generator, and distribution of 3-phase/4-wire, 208/120 VAC electrical power to emergency loads.

Circuit breakers shall be commercial marine or equal. Circuit breakers shall be the same manufacturer as the panelboards.

326 Panels/Panelboards

Panelboards shall be dead front, circuit breaker type. Lighting and power panelboards shall be provided with at least one spare switching unit, complete and installed but not used, for every ten active units or fraction thereof installed.

Each panelboard door shall be provided with a combination catch and lock. Locks shall be keyed alike. Catch and lock shall be flush on the panels located in public areas.

Circuit breakers used in panelboards shall be commercial marine (or Owner-approved equal). All panelboards shall be of the same manufacturer.

208Y/120 VAC Power Panels:

- Panels shall be 3-phase, 4-wire, with bolt-on style circuit breakers.
- Panels shall be Main Lug Only (MLO), fully rated, with all copper current carrying parts and 20" wide cabinets.
- Circuit breakers for 120 VAC shall be double pole with switched neutral. Circuit breakers for 208 VAC circuits shall be two pole (single phase) or three poles (three phase).

327 DC Systems/Loads

12 VDC and 24 VDC systems shall be provided per Reference 3.3 and Section 313. Systems shall include batteries, cabling, disconnects, panels, breakers, inverters, chargers, transfer switches, power supplies, and monitoring devices.

Where loads are supplied from a 120 VAC panel and require 12 or 24 VDC, a *NewMar Heavy Duty Series power supply* will be utilized and located as close as possible to the load except for emergency power to Pilothouse, which shall be located in the machinery space.

328 Wireways

328.1 General

All wireways and cable installations shall be in accordance with IEEE STD 45 recommendations.

Cable wireways shall be segregated into two individual systems: power/lighting and low voltage (including data and communications). Electrical systems shall maintain a minimum of 6" separation in wireways and MCT's and shall cross at right angles to each other. Wireway hangers shall be color coded: red for power/lighting, and blue for low voltage, data, and communications.

All cable hanger material shall be steel with a corrosion resistant finish. Painting is acceptable as a corrosion resistant finish for interior hanger material. Bolts, nuts, and washers for use with painted hanger material shall be stainless steel.

Exterior hanger material and studs shall be stainless steel with stainless steel, brass or bronze nuts, bolts, and washers.

Each weld area at hangers and/or studs shall be wire brushed and coated immediately after welding and before the installation or any cables.

All electrical cable shall be banded to the wireway downcomers with stainless steel banding.

328.2 Wireway Penetrations

Openings in decks or platforms for the purpose of cable penetrations which do not require stuffing tubes or kickpipe protection shall have a collar continuously welded around the edge of the opening. This requirement particularly applies to cable openings in switchboard platforms and other deck structures where watertight integrity is not otherwise required.

Cable penetrations through bulkheads and decks, both watertight and non-watertight, shall comply with regulatory body requirements. Multi-cable, transit type penetrations may be substituted for stuffing tubes for all penetrations. Kickpipes shall be 9" high to the top of the stuffing tube. Built-in watertight boxes may be used in lieu of kickpipes. Transits using poured sealers or putty type packing shall not be used.

Multi-cable, transit type penetrations shall maintain segregation of power/lighting circuits and low voltage/data/communication circuits. The two different types of circuits shall not share the same multi-cable penetration.

Penetrations of fire rated structure shall utilize fire stops which maintain the fire protection level (Grade A, Grade B, etc.) associated with the fire zone penetrated.

329 Receptacles, Junction Boxes, & Misc. Distribution Devices

329.1 House/General Receptacles

Duplex receptacles, 20 A, 2 pole, 3 wire (U-ground) shall be furnished and installed throughout the vessel for maintenance and house services.

329.2 Shore Power Receptacles

Two shore power receptacles shall be provided and located per Reference 3.1. The shore power circuit breakers and generator circuit breakers shall be interlocked such that the shore power breaker cannot be closed at the same time as any of the generator circuit breakers.

The shore connection box/locker shall have a white Power Available indicator lamp which shall be energized via an auxiliary switch on the shore power circuit breaker deriving power from the load side of the breaker. An engraved phenolic placard with complete operating instructions shall be provided describing the operation of connection to shore power.

Shore power shall be monitored for loss of phase/improper phase rotation via a relay that shall trip the shore power circuit breaker via a 24 VDC shunt trip. Tripping of the relay shall be indicated by a red indicator in the vicinity of the shore power circuit breaker on the ships service switchboard.

329.3 Junction/Connection Boxes

Each junction/connection box in a damp or wet location shall be watertight, terminal, or stuffing tubes for cable entrance and have external mounting feet. Each watertight connection box shall be mounted on external mounting feet.

Watertight brass junction boxes shall have gaskets, etc. as needed.

All junction boxes shall be identified with phenolic tags, black with white lettering, which correspond with the unique circuit designation keyed to the various electrical plans.

330 Lighting Systems

Interior and exterior lighting fixtures shall be Owner-approved as shown on Reference 3.5. The Contractor shall prepare and submit a list of all lighting fixtures and control devices for approval by the Owner prior to purchasing any items.

Contractor shall provide and install all necessary ancillary materials and equipment, including but not limited to foundations, junction boxes, switches, cabling, hangers, etc. for a complete and operational system.

GROUP 4 NAVIGATION, COMMUNICATIONS and ELECTRONICS

References

4.1 07069-001-551-1, Compressed Air Piping Schematic

4.2 NC DOT List of Required Electronic Equipment

400 Navigation and Communications

Electronic systems shall be in accordance with the applicable regulations of the FCC (47 CFR Part 80), 46 CFR Subchapter "H", and ABS Rules. Installation and testing of equipment shall be supervised by the equipment manufacturer's representative. All antennae shall be installed to avoid interference with each other and provide maximum clear reception.

The Contractor shall be responsible for accomplishing FCC inspection and obtaining certification. The systems shall be considered complete only when the FCC inspection and certification has been accomplished. **The Contractor may need to apply for a temporary FCC license to get the vessel to North Carolina. The Ferry Division will assist the Contractor, as needed, to secure this license.**

The Contractor shall fabricate full-size mockups of the pilothouse consoles and aft control station console (the EOS console is addressed in Section 663). Mockups shall include all controls, switches, gages, screens, electronic components, etc. so that the Owner can review and make adjustments required to NC DOT satisfaction. Once the Owner has approved the console arrangements, consoles shall be manufactured by high quality metal console manufacturer approved by Owner.

Pilothouse Console

The following items are to be installed in the Pilothouse main control console:

1. Steering system controls, one (1) Full follow-up control lever and one (1) non-follow-up
2. Engine Throttles
3. Bow Thruster Throttle
4. Main Engine Gauge Panel (2)
5. Bow Thruster Gauge Panel
6. Navigation Light Panel
7. Alarm Panel

8. Magnetic 6" Compass
9. General Alarm Contact
10. Sound Powered Phone
11. Searchlight Controls (2)
12. Window Defroster Controls
13. Window Wiper Controls (5)
14. Depth Sounder Display
15. Starting Air Pressure Display (electric)
16. Radars (2 overhead)
17. Shaft Tachometers (2 overhead)
18. Air Horn Pull (overhead)
19. VHF Radios (2 overhead)
20. Vessel Loudhailer/Interior Communication Controls (overhead)
21. Fire Alarm Panel
22. GPS Display
23. Electronic Compass
24. Floodlights and Rescue Boat Light Switches
25. Remote Fire Pump Start
26. Remote Sprinkler Pump Start
27. Remote Ventilation Shutdown
28. Electronic Chart Display on Laptop Computer

Pilothouse Aft Console

The following items are to be installed in the Pilothouse aft control console:

1. Steering system control, one (1) non-follow-up lever
2. Engine Throttles (2)
3. Bow Thruster Throttle
4. Main Engine Tachometers (2)
5. Shaft Tachometers (2)
6. Bow Thruster Engine Tachometer
7. Alarm Panel
8. General Alarm Contact
9. Sound Powered Phone
10. Searchlight Control (1)

11. Window Defogger Control
12. Window Wiper Control
13. Vessel Loudhailer/Interior Communication Control

EOS Console

The following items are to be installed in the EOS console:

1. Steering System Control, one (1) non-follow-up
2. Engine Throttles (2)
3. Main Engine Gauge Panel
4. Bow Thruster Gauge Panel
5. Alarm Panel (Master Panel)
6. General Alarm Bell
7. Sound Powered Phone
8. ME Starting Air Pressure Display (electric)
9. Vessel Loudhailer/Interior Communication Talk-Back Speaker
10. Fire Alarm Panel

421 Non-Electrical Navigation Equipment

Magnetic Compass

Primary helm station shall be fitted with one 6" binnacle-mounted magnetic compass suitable for steel-hulled vessels. Built-in compensators and illumination shall be contractor furnished and installed.

Ship's Bell

Pilothouse shall be fitted with a 12" brass bell per USCG regulations. Bell shall have the ship's name and year built engraved, and include mounting bracket affixed to a varnished mahogany or teak plaque. The bell location shall be approved by the Owner.

Inclinometer

Pilothouse shall be fitted with an inclinometer with dual glass tube scales: 5-0-5 and 15-0-15. Location shall be approved by the Owner.

Whistle/Air Horn

Pilothouse shall be fitted with one dual trumpet to meet USCG requirements for range, polished brass air-horn with white signal light as shown on Reference 4.1. System shall include bronze whistle pulls, operating valves, air strainer, and moisture separator.

Bronze whistle pulls and solenoid/manual valves shall be installed as directed by the Owner to allow easy access by the operator from each control console. Air strainer shall be mounted inside Pilothouse console and drain piped to weather. A 30 gallon air receiver fitted with relief valve, air pressure regulator and remote air gage in pilothouse console, shall be located in the Pilothouse void area to supply adequate volume of air to the air horn.

Contractor shall provide and install all necessary ancillary materials and equipment, including but not limited to all foundations, metal grounds for whistle pulls, air supply piping from Engine Room to Pilothouse, cables, pulleys, wiring, fasteners, tubing, fittings, etc. for a complete and operational system.

422 Navigation/Search/Flood Lights

422.1 Navigation Lights

Provide and install navigation lights to comply with IMO COLREG requirements. Masthead, stern, and sidelight fixtures shall be dual-lens of cast brass construction. Navigation light fixtures shall be cast bronze and complete with lamps; all fixtures shall utilize the same lamp.

Provide and install navigation lighting panel with label plates so that all the lights can be controlled from the Pilothouse. Each circuit shall be supervised with light and buzzer alarm and silence button.

Contractor shall provide two (2) spare navigation light lamps and manufacturer's recommended spare parts for the navigation light panel.

422.2 Search/Flood Lights

Provide and install three 1000 watt, 12", halogen searchlights with non-vented drum, two on the Pilothouse top and one on the Aft Control Station top as directed by the Owner, with electrical remote operation from each Pilothouse station. Searchlights shall be *Carlisle & Finch model 125BC-2* (remote electric control) or equal, with indoor joystick controller #C8160, outdoor joystick controller #C1E5, and medium pre-focus lamp holder with vibration dampening base to use lamp #BTP.

Provide and install three (3) 500 watt, cast bronze, medium flood, quartz halogen, flood lights, one at each life raft launch station and one for rescue boat launching. Flood lights will be switched on the Pilothouse console, powered from emergency lighting panelboard, and include a wire lens guard, handle, and clamp.

Provide and install four 500 watt, cast bronze, medium flood, quartz halogen flood lights, two at each end of the vessel mounted on the Passenger Deck overhang and overlooking the vehicle loading zone. All flood lights shall be switched at the main Pilothouse console. Provide and install four 300 watt, stainless steel, quartz halogen, floodlights, two at each side of the vessel mounted on the Passenger Deck for security lighting when in port. Each pair of lights shall be separately switched in the Pilothouse.

423 Electronic Navigation Equipment

Required electronic equipment is provided in Reference 4.2. The Contractor shall furnish and install all specified equipment in accordance with manufacturer's instructions and in locations as directed by the Owner.

429 Environmental Monitoring Systems

Thermometer

Pilothouse shall be fitted with a polished brass 6" diameter face, marine grade thermometer with radiation shield on external sensor.

Barometer

Pilothouse shall be fitted with a polished brass, marine grade barometer to match thermometer.

Clock

Pilothouse shall be fitted with a polished brass, marine grade electric powered clock to match barometer.

Wind Instruments

Pilothouse shall be fitted with one wind speed/direction sensor mounted on the Pilothouse mast, and one display unit mounted at the Pilothouse console area.

433 Interior Communications

An integrated Interior Communications System (ICS) shall be furnished and installed by the Builder with owner approval of vendor and installation location.

The system shall integrate the telephone, public address (to include automated announcements, public and non-public zones), paging, talkback, loudhailer, elevator intercom, and alarm annunciation. Telephone stations shall be required in the wheelhouse and aft control station.

The system shall include an uninterruptible power supply (UPS); duplicate tone generators and redundant controls; speaker placement, wiring and zoning; as required to comply with USCG requirements for public address, talkback, fire, and general alarm systems.

436 Alarm Systems

436.1 Fire Detection System

Provide and install a fire detection system as required to comply with USCG requirements. The main alarm panel shall be mounted in the Pilothouse as directed by the Owner. A remote alarm panel shall be mounted in the EOS.

The fire detection/monitoring system will provide the following functions (automatic and Pilothouse manual control):

- Heat detection
- Smoke detection
- Sprinkler system monitoring
- Main ventilation system shutdown
- Detection of CO_2 system activation
- Watertight door closure status
- Interior fire doors at stair towers
- Alarm activation (interface with Interior Communications System)

Main Ventilation Shutdown:

- Provide, install and terminate all cable required for the automatic shutdown of the main HVAC system fans.

- Provide, install and terminate all cable required for the automatic closure of motorized fire dampers if required.

436.2 Machinery Monitoring & Alarm System (MMAS)

Provide and install an integrated machinery monitoring and alarm system. The system shall include level sensors, signal conditioning between all sensors and the system, control and display units, and interface with the ICS for ship-wide alarms (if required). Local and remote indication and alarm functions shall be provided for all tank and bilge levels, engines, generators, WT doors, and other auxiliary and electrical equipment as required by USCG.

Installation shall consist of the following minimum components:

Engineer's Control Console

One main alarm and monitoring panel complete with "POWER ON" light, LED display, test/silence push buttons and internal horn. System shall be configured to monitor the following active alarm points:

1. Port main engine low oil pressure
2. Port main engine high water temperature
3. Port main engine low cooling water level
4. Port main engine high lube oil temperature
5. Port main engine overspeed
6. Port main engine low 24VDC
7. Port main red. gear low oil pressure
8. Port main red. gear high water temperature
9. Port main red. gear low cooling water level
10. Port shaft seal cooling pump low flow
11. Port shaft sump high level alarm
12. Port propulsion control system on emergency power
13. Port control power failure
14. Port control system failure
15. Port generator low oil pressure
16. Port generator high water temperature
17. Port generator low cooling water level
18. Port generator high lube oil temperature
19. Port generator engine overspeed
20. Port generator low 24VDC
21. Stbd. main engine low oil pressure
22. Stbd. main engine high water temperature

23. Stbd. main engine low cooling water level
24. Stbd. main engine high lube oil temperature
25. Stbd. main engine overspeed
26. Stbd. main engine low 24VDC
27. Stbd. reduction gear low oil pressure
28. Stbd. reduction gear high water temperature
29. Stbd. reduction gear low cooling water level
30. Stbd. shaft seal cooling pump low flow
31. Stbd. shaft sump high water level
32. Stbd. propulsion system on emergency power
33. Stbd. propulsion system power failure
34. Stbd. propulsion system failure
35. Stbd. generator low oil pressure
36. Stbd. generator high water temperature
37. Stbd. generator low cooling water level
38. Stbd. generator high lube oil temperature
39. Stbd. generator engine overspeed
40. Stbd. generator low 24VDC
41. Emergency generator low oil pressure
42. Emergency generator high water temperature
43. Emergency generator high lube oil temperature
44. Emergency generator engine overspeed
45. Emergency generator low fuel tank level
46. Emergency generator high fuel tank level
47. Emergency generator low 24VDC
48. Steering compartment high bilge level
49. Aft void high bilge level
50. Port engine room high bilge level
51. Stbd. engine room high bilge level
52. Tank room high bilge level
53. Galley high bilge level
54. Forward void high bilge level
55. Bow thruster room high bilge level

56. Forepeak high bilge level
57. Forward fuel tank high level
58. Forward fuel tank low level
59. Aft fuel tank high level
60. Aft fuel tank low level
61. Port potable water tank low level
62. Stbd. potable water tank low level
63. Gray water tank high level
64. Black water tank high level
65. MSD high level
66. Steering compartment wt door open
67. Aft engine room wt door open
68. Stbd engine room wt door open
69. Forward tank room wt door open
70. Forward crew quarters wt door open
71. Bow thruster compartment wt door open
72. Bow thruster bearing high temperature
73. Bow thruster hydraulic unit failure
74. Main engine low starting air
75. Elevator power failure
76. Gray water discharge pump running
77. Black water discharge pump running
78. Bow thruster low 24VDC
79. Pilothouse electronics panel low 24VDC
80. Alarm system on battery power
81. Alarm system on normal power
82. Alarm system on emergency power

Pilothouse Console and Aft Control Station Console

Provide two (2) remote alarm and monitoring panels, complete with "POWER ON" light, test/silence push buttons, LED display, internal horn and dimmer control.

Pilothouse and aft control stations shall be configured to monitor the following active alarm points:

Same as above

Install one 24 VDC operated electric horn and one 24 VDC rotating beacon with blue transparent hood. Beacon and horn shall be installed to operate simultaneously with local alarm horn in engineer's console and be secured by silence button in alarm panel.

Main Deck

Install on main deck superstructure at frame 62 one 24 VDC operated electric horn, for alarm notification.

General Requirements

Each panel shall be sized for spare places for future growth in alarm points (both analog and digital).

Contractor shall provide and install all necessary ancillary materials and equipment, including but not limited to all foundations, enclosures, wiring, fasteners, relays (for systems interface), all switches (ungrounded, normally closed in the normal operating condition) for A/C cooling water and watertight door positions (alarm in open position), hangers, watertight bulkhead and deck penetrations, etc. for a complete and operational system.

Provide and store on board vessel as directed by Owner, one set of manufacturer recommended spares for each panel installed and three sets of manuals for each panel.

Contractor shall provide the services of a manufacturer factory representative to verify the installation of all alarm system components and perform initial start up test and procedures.

System shall interface with the interior communications system (Section 433) as required for alarm annunciation.

437 Tank Level Indication

Unless otherwise indicated, all level transmitters shall interface with the Machinery Monitoring and Alarm System (MMAS) for remote tank level indication (TLI), alarms, and pump control when required. See section 436.2 for list of tank indicator alarms.

The cooling water expansion tanks shall each have a level indicator and a level transmitter interface with the MMAS. The emergency generator fuel tank shall have a level indicator and a level transmitter interface with the MMAS. The black water and gray water tanks shall have an ultrasonic non-contact type tank level transmitter with input to the MMAS. Remote TLI shall be provided at the EOS and next to the black water pump controllers. The level transmitter (or MMAS) shall provide input to the black and gray water pump controllers for pump actuation. See section 436.2 for list of tank indicators and alarms.

441 Radio Systems

441.1 VHF Radio System

Required radio equipment is provided in Reference 4.2. The Contractor shall furnish and install all specified equipment in accordance with manufacturer's instructions and in locations as directed by the Owner.

441.2 AIS System

Not Applicable

NC DOT LIST OF REQUIRED ELECTRONIC EQUIPMENT

EQUIPMENT	MAKE	MODEL	DETAILS	NOTES
RADIOS	Furuno	FM3000	12vDC/25w DSC	
RADARS	Furuno	FAR2117	12KW with 8' open array	To be connected to gps/chart overlay
		FAR2137S/12	30KW with 12' open array	To be connected to gps/chart overlay
RADAR DISPLAYS	Furuno	MU231CR	21"-23" marine LCD or equivalent	SXGA video
SOUNDER	Furuno	LS6100		Bronze reducer with temp/thru hull
GPS	Furuno	GP1850WD	with chartcard	
ELECTRONIC COMPASS	Furuno	SC50	electronic compass	Available outputs for autopilot, radar (chart overlay)

NOTE: All electronics will be interfaced with the radar to provide information on the flat panel radar screen or each individual device as required by the Department. A Department furnished laptop computer will also be installed on the console for electronic chart maps.

GROUP 5 MECHANICAL SYSTEMS

References

5.1 09-060-101-026, General Arrangement
5.2 09-060-200-010, Machinery Arrangement
5.3 09-060-264-010, Lube Oil, Dirty Oil System Schematic
5.4 09-060-506-011, Fills, Vents & Sounds Schematic
5.5 09-060-506-011, Fill, Vents & Sounds Arrangement & Details
5.6 09-060-521-011, Fire Main Piping Schematic
5.7 07069-100-522-1, Sprinkler Piping Schematic (preliminary)
5.8 07069-100-522-2, Sprinkler Piping Arrangement & Details
5.9 09-060-526-011, Weather Deck Drains
5.10 07069-100-528-1, Sanitary Drains/Sewage Treatment System Schematic
5.11 09-060-529-011, Bilge & Oily Water System Piping Schematic
5.12 09-060-533-010, Potable Water Piping Schematic
5.13 07069-100-551-1, Compressed Air Piping Schematic
5.14 07069-100-150-1, Superstructure and Pilothouse Structure
5.15 07069-100-256-1, Engine Cooling Piping Schematic
5.16 09-060-561-020, Steering Schematic
5.17 09-060-152-030, Bulwark and Curtain Plates
5.18 09-060-562-010, Rudder Arrangement and Detail
5.19 09-060-581-010, Anchor Handling
5.20 09-060-163-011, Sea Chest

500 Auxiliary Systems - General

Mechanical and Piping Standards:

- ASTM F-1155-88 Standard Practice for Selection and Application for Piping System Materials. Commercial Ship Design and Construction. Malleable iron fittings ASTM 195 are acceptable as indicated on the plans.
- ASTM Standard Section 1 Iron and Steel Products, Volume 01.07 Shipbuilding.
- CFR 46Subchapter F, Marine Engineering.
- ASHRAE Ventilation Standards.

Except as otherwise described in these Specifications or drawings referenced by these Specifications, piping materials shall be in accordance with ASTM Standard F1155, Standard Practice for Selection and Application of Piping System Materials.

Interiors of all piping systems shall be cleaned by high velocity flushing or other Owner-approved method to a degree suitable to their service. Particular care shall be exercised for fuel, lubricating oil, compressed air, hydraulic, and potable water piping, which shall be cleaned to a degree that when the flushing medium is passed through a temporary filter, no contamination is detected by unaided human senses.

Templates, gauges and jigs required for the proper machining and assembly of components and furnished by the Contractor shall become the property of the Owner at the conclusion of the work. Templates shall be made of 3/8" steel plate fitted with not less than two removable hardened steel drilling guide bushings for drilling flange holes and other drilling in the components. All such items shall be accurately and substantially made in a manner to retain their accuracy under repeated use and with proper care and handling. At the completion of the work, all patterns, templates, jigs, and gages shall be cleaned and all metal parts given a suitable coating of anti-corrosive grease. The equipment shall then be delivered in first class condition to the Owner. A tag containing the name of the equipment and the purpose of the template, etc., shall be attached securely to the item.

500.1 Piping

All piping shall be as set forth below and elsewhere in these specifications and shall be arranged to obtain optimum operating conditions and shall be compatible with the machinery or equipment served.

Piping shall be led as directly as practicable. Piping shall include valves, unions, and fittings necessary to isolate any piece of equipment for repairs without disrupting the entire system. Unions and flanges shall be used to facilitate installation and subsequent replacement with minimum labor and materials. Flexible connections to machinery components, where vibration may be encountered, shall be threaded or flanged on 2" diameter and above. Piping shall be kept clear of switchgear insofar as practicable.

Piping shall be secured by supports and hangers so as to avoid excessive strains; avoid the weight of the piping being transmitted to valves and fittings; minimize the effects of vibrations, shock, pitching, and rolling of the vessel consistent with the kind of service in which the vessel will be normally exposed; and permit proper thermal expansion and contraction by changes in direction of pipe runs or by use of expansion bends, joints, loops, or offsets. Hangers for copper pipe to be lined with molded rubber or nylon.

To minimize galvanic corrosion, valves and fittings in salt water lines shall be of the same composition as adjacent piping, unless otherwise specified. Where joining of dissimilar metal piping cannot be practicably avoided, 12" long steel waster pieces shall be installed adjacent to nonferrous valves or fittings.

Galvanizing destroyed by welding or other activity shall be replaced. Where welding destroys the galvanizing not more than 6" from the end of the pipe, pipe shall be repaired with approved method per owner approval. All steel piping, regardless of size, shall be hot dipped galvanized when welding or other activity is such that galvanizing has been destroyed more than 6" from the end of ends of a pipe section.

Joints for steel piping shall be screwed for size 1-1/2" and below and welded for sizes 2"and above, except hydraulic, vents, and sounding pipes. Vent and sounding pipes shall be welded for all sizes. Hydraulic piping at each directional control valve and hydraulic cylinder shall be flanged using 3000# (4) bolt flange "anchor" or equal. All burrs shall be removed from the ends of all piping. Pipe ends shall be dressed with a reamer before installation.

Where not otherwise specified, valves shall be of the flanged or union nut bonnet type. Materials shall be corrosion resisting for the service conditions to which they may be subjected. Valves shall be of the rising stem type. Where three or more valves are located together for the same service, they shall be combined into a manifold. Shutoff valves shall be provided in fuel supply lines, one as close to each tank as practicable, and one as close to each fuel pump as practicable. A brass plate secured by the handwheel nut shall be attached to the handwheel of each valve and inscribed to indicate its function. Valves shall be readily accessible. Where installation conditions do not permit ready access to valves, reach rods shall be provided for operating the same.

All valves to be installed to close against the pressure.

Where pipes are carried through watertight bulkheads, decks, or tank tops, the watertight integrity of the structure shall be maintained. Heat sensitive materials shall not be used in piping systems which penetrate watertight sub-divisions where deterioration of such materials would, in the event of fire, impair the watertight integrity of such sub-divisions. Hydraulic steel tubing and all copper tubing shall penetrate watertight bulkheads and decks using suitable compression type sleeves. Where overboard discharge lines are attached to the inside of the hull, the hull shall be reinforced by a doubler or heavy insert plate, to maintain the original strength and integrity. Piping systems shall be designed in accordance with 46CFR 56.50.

All piping, pipe fittings and applicable equipment shall be thoroughly cleaned after fabrication and prior to shipboard installation. After complete shipboard installation each system shall be thoroughly cleaned and flushed of all foreign matter with the applicable system's medium or an approved substitute. System flushing shall be conducted at the applicable system's maximum operating pressure and where practicable, above the normal line velocity. However, prior to flushing operations, items having in line mechanisms capable of trapping or being affected by the carry over of foreign matter shall be either removed or blanked off and bypassed. **Flushing of the piping systems shall be witnessed and approved by the Owner.**

Reducing valves and all other pressure and flow control devices shall be provided with a strainer at the inlet, a relief valve and a pressure gauge in the discharge side, and a valved bypass. Fittings shall be free from fins and burrs. Joints shall be made with approved pipe joint compound applied to male threads only and all exposed threads on pipes mopped to prevent rust. Threads to be full cut.

Flanged joints shall be fitted and made up with suitable gaskets and steel bolts.

500.2 Overboard Discharges

Hull discharge connections shall be installed in accordance with 46CFR 56.50-95.

500.3 Guarding of Machinery

Provide and install guards to prevent injury to operating personnel. Installation of guards shall be fitted on but not limited to such items as belts, motor pump connections, pulleys, etc. Propulsion shafting guards are described in Section 243.5.

500.4 Drip Pans

Provide and install drip pans under all engines, constructed of 20 gauge galvanized sheet metal, with minimum 2" flanged sides properly sealed to prevent leakage of engine oil into the bilges or on deck. Drip pans shall be provided with necessary supports to restrain movement and shall be easily removable for cleaning and maintenance.

Provide and install stainless steel plate drip pans under all pump installations with drains running directly to bilge.

502 Auxiliary Equipment

Provide and store on board as directed by Owner the following:

Two self-retracting air hoses complete with male and female quick disconnect fittings or equal. Quick disconnect fittings shall be compatible with fittings required in Section 3.10 (b).

One lever-handle blowgun with male quick disconnect fitting.

Three (3) 30 gallon capacity hot dipped galvanized steel garbage cans.

506 Fills, Vents, Sounding Tubes, and Overflows

Fills, vents, sounding tubes, and overflows shall be provided per Reference 5.4, the system specific diagrams, and these Specifications.

Vents shall be provided for tanks and inaccessible spaces below the Main Deck.

Vents to the weather shall penetrate the Main Deck as shown on References 5.4 and 5.12. Vent terminals shall be located just inboard of the bulwarks with the goosenecks located 30" above the deck. All vents, sounds and fill pipes shall be 316 stainless steel above the main deck and 6" below.

507 Label Plates and Markings

Valves:

- Provide label plates for all valves whose function is not obvious. Where practicable, fasten label plates to the handwheel or operating lever of the valve. In locations where such labels would not be visible during normal operation, or the valve is a type where such attachment is not practical, attach the label plate to another part of the valve or nearby the valve. Valve label plates shall be engraved and filled with black paint, except fire main and $C0_2$ fire extinguishing system valves which shall be filled with red paint.
- Valve label plates shall be brass with 1/8" lettering attached to valves or pipe with stainless steel wire.

Piping:

- Exposed piping shall be stenciled or clearly marked with pressure sensitive markers to indicate the medium contained in the system and the normal direction of flow. Each pipe shall be marked at least once between take down joints, on each side of bulkhead penetrations, and in no case less than once in each compartment through which the pipe passes or is contained.
- The stenciling or pressure sensitive marker letters, numerals, and direction arrows shall be proportional to the diameter of the pipe but need not be larger than 1" letters. The color of the lettering and arrows shall be same as indicated on pipe color chart section 602.3.
- Each stencil or marker shall be applied so as to be readily visible from adjacent decks, floorplates, or walkways.
- Fill, vent and sounding pipes shall be provided with engraved 316 stainless steel plates identifying the function. Letters shall be filled with enamel.

508 Pipe Insulation

General:

- Insulate piping as required for safety, energy conservation, to protect from freezing where exposed to weather, to prevent condensation where damage or discomfort may occur due to condensation on pipe exterior, and where required to meet structural fire protection requirements.
- All materials and installations shall be USCG-approved.
- Materials, insulation thickness, and installation methods shall be in accordance with ASTM Standard F683, Standard Practice for Selection and Application.
- ***No paint shall be applied to insulation blankets on exhaust system.***
- Provide conveniently removable sections of insulation on all exhaust lines and engine exhaust flex connections.

The Contractor shall develop a piping insulation schedule and submit it to the Owner for approval.

Provide insulation including, but not limited to, the following:

- Insulate the exhaust piping, including silencers, to the extent described in Section 508.
- Insulate hot potable water piping with foam type insulation to prevent sweating and heat loss.
- Insulate main and generator engine jacket water piping above the floor plates and where necessary with blanket type insulation to prevent injury to personnel and equipment.
- Insulate chilled water piping as required to prevent condensation on pipe exterior using water resistant type insulation.
- Insulate various systems where necessary to prevent freezing. Systems such as dry fire main and sewage discharge piping shall not require insulation if installed with proper drainage to prevent freezing.

- Insulate various systems containing cold fluids where necessary to prevent condensation where damage or discomfort may result from moisture on the pipe exterior.
- Insulate piping penetrating decks and bulkheads where necessary for structural fire protection as required by NVIC 6-80.

All hot and cold water piping, air conditioning piping and tubing, including valves, shall be insulated as necessary to prevent heat transfer, sweating and/or freezing. Where insulation is subject to damage it shall be covered with removable aluminum sheet metal guards.

512 Ventilation System

Provide mechanical supply to all public spaces, offices, and crew spaces; provide mechanical exhaust from all toilet spaces. Louvered inlets and outlets shall be in accordance with 46CFR 72.15-15 (a), and shall be provided for all mechanically ventilated spaces. Louvers shall be removable and of all 316 stainless steel construction, including 1/8" square mesh bird screens. Louver shall be sized for a maximum air velocity of 1500 feet per minute and assuming a 50% blockage due to louvers and screens.

513 Machinery Space Heating, Ventilation, and Air Conditioning

Definitions: For the purposes of ventilation and heating, the following are defined as machinery spaces:

- Bow Thruster Room
- Tank Room
- Engine Room
- Engineer's Operating Station (EOS)
- HVAC Fan Room #1
- Emergency Generator Room

Provide electric 5 kW unit heaters, with adjustable thermostats, in sizes, quantities, and locations, so that machinery spaces are no less than 40° F in the following conditions:

- Generators not running
- Machinery space ventilation fans not running
- Outside air temperature 30° F
- Outside water temperature 46° F

Provide a fan coil cooler unit for the EOS, using chilled water from the system described in Section 514. The EOS cooler shall be capable of maintaining a temperature of 80° F dry bulb, 70° F wet bulb, with an engine room temperature of 120° F.

513.1 Ventilation - Engine Room

Engine room ducts shall be constructed of 22 gauge galvanized sheet metal, with necessary transitions, laterals, adjustable terminals, screens, etc. generally as shown on Reference 5.2. Curved vanes shall be installed to provide even flow of air through bends. Joints shall be made airtight.

Fan requirements and sizing shall be up to the engineering firm used by the contractor.

One main exhaust plenum shall be installed in the engine room for removal of hot air and exchange of air required in compartment. The exhaust plenum shall be provided with one exhaust fan. Fan housing shall be epoxy coated.

Supply ducts shall each be fitted with a marine duty fan/fans as shown on machinery arrangement. Fans shall be furnished with an inlet bellmouth and housings shall be epoxy coated.

Manual operators shall be provided on all louvers. Louvers installed on the outside of bulwarks shall have manual operators provided on the inside of bulwark.

513.2 Emergency Generator Room Ventilation

The aft bulkhead shall be fitted with a louver/louvers as required per Section 512. Louvers shall be fitted with 120 VAC motor operated gear boxes which shall be configured to open louvers on generator engine start and close on generator stop.

514 Heating, Ventilation, and Air Conditioning

General:

- Provide HVAC for all public spaces, offices, crew break room, the lounge, ship's office, crew lounge, crew staterooms, crew galley, passage ways, interior stairways (except machinery space access), aft control station and Pilothouse in accordance air conditioning standards for marine passenger vessels. ***The contractor is allowed to submit an alternate proposal for HVAC to the owner for approval. The specifications of this section shall be used as a guide to engineer the HVAC system.***
- Provide and install vent fans in each toilet space, sized in accordance with good marine practice to properly ventilate the space. Minimum size for fans shall be 300 cfm.
- Provide fans, ductwork, air filters, chilled water air coolers, electric heaters, chilled water pumps and piping, chilled water refrigeration system, condenser cooling pumps and piping, condensate collection sump tank, pump, and piping, duct and pipe insulation, controls, electrical power supplies, engineering, testing and startup, and operation and maintenance manuals.
- Air-conditioning components shall be types that are currently in production and supported by a parts distribution network supplying replacement parts to North Carolina in no more than 24 hours.

Space heating and cooling shall be provided with all necessary automatic and manual controls, electrical installation, fans, etc. to provide heating and cooling as shown in Reference 5.15.

The Contractor shall provide and install ventilation system fire dampers as required by USCG regulations for structural fire protection. Fire dampers shall satisfy the following minimum requirements:

- Hot-dipped galvanized body and blade, 11 gage minimum body
- Non-corroding pivot points
- Capable of closing against air flow from either side of the bulkhead or deck
- Activated by CO_2 fire suppression system, 165°F fusible link, and manually
- External manual activation and reset
- Closure status visible outside the duct
- Access for service or cleaning

- Flow direction arrow outside the fire damper body

Engineering:

- Contractor shall provide all final design calculations, drawings, test result documents, operation and maintenance manuals (except as described below) and shall be prepared under the direction of a Professional Engineer who will stamp and sign all HVAC engineering documents. Exception to this requirement shall be component drawings of equipment supplied by an established manufacturer.
- Contractor shall provide engineering necessary to assure compliance with applicable regulations; compliance with the requirements of the contract; efficient, timely production of HVAC systems; coordination with other systems to provide interfaces and eliminate interferences; to direct testing and startup to assure proper operation of HVAC systems; and to provide operation and maintenance manuals including all necessary parts lists for the long term successful performance of HVAC systems.
- Contractor shall coordinate selection of equipment and colors with the Owner for items such as diffusers and registers which will not be hidden.
- HVAC engineering documents shall include the following (minimum):
    - summer heating load calculations
    - winter cooling load calculations
    - ventilation duct diagram
    - ventilation duct pressure drop calculation
    - ventilation duct arrangement
    - chilled water system diagram
    - chilled water piping arrangement and details
    - heating electrical equipment arrangement and details
    - refrigerant piping schematic
    - condenser cooling water diagram
    - condenser cooling water arrangement and details
    - condensate discharge system diagram
    - condensate discharge system arrangement and details
    - control system schematic
    - power system schematic
    - test results book
    - operation and maintenance manual

Design Conditions:

Summer

- Outside air: 90° F at 80% RH
- Inside air: 72° F at 50% RH
- Sea water: 85° F
- 175 people in lounge area

Winter

- Inside air: 68° F at 50% RH
- Outside air: 30° F at 60% RH
- Sea water: 46° F
- 175 people in lounge area

Smoke

- No smoking in any enclosed spaces

Ventilation:

- Provide mechanical supply to all public spaces, offices, and counting rooms; provide mechanical exhaust from toilet spaces in accordance with Reference 5.15.
- Ventilation shall be in accordance with ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality.
- All outside air shall be filtered with replaceable or washable filters.
- Duct elbows shall have, in general, center radius of one and one half times the breadth of the duct in the plane of the turn. Where necessary to use a lesser radius, turning vanes shall be installed to provide quiet and efficient operation.
- Unless sound attenuation devices are used, air flow velocities shall not exceed 1500 feet per minute.
- Ducts shall be galvanized steel sheet metal. Duct thickness shall not be less than the following:

Duct size	Thickness
6" or less	22 Ga (0.0336")
6" to 12"	20 Ga (0.0396")
12" to 24"	18 Ga (0.0516")
larger than 24"	16 Ga (0.635")

- Use thicker duct material where required for structural fire protection, strength, or resistance to panting.
- Stiffen ducts where necessary to prevent panting.
- Heating/cooling supply ducts through unconditioned spaces shall be insulated with at least 2" thick insulation. In conditioned spaces, all heating/cooling return and supply ducts shall be insulated with at least 1" thick insulation.

Air Conditioning:

- Air conditioning shall be accomplished with chilled water cooling of duct coils in each of the ventilation supply systems (air handlers, fan coil units, etc.) in accordance with Reference 5.15.

Chilled Water System:

- Provide and install two self priming marine grade centrifugal pumps with close coupled motors for raw water cooling circuit for A/C system as shown in Reference 5.15. Provide and install in-line with suction side of pumps, one bronze duplex strainer w/stainless steel trim and 1/16" perforated stainless steel baskets. Installation shall be complete in all respects including foundations, piping, valves, wiring, motor controllers, hardware, etc. as shown on plans.
- Chilled water piping may be either Sch. 40 black steel pipe with malleable iron fittings or copper water pipe with wrought copper solder fittings.
- Penetrations through fire zone boundaries shall be in accordance with USCG regulations.
- Insulate chilled water piping for energy conservation, to prevent objectionable condensation on pipe exteriors, and for structural fire protection, as described in Section 508.
- Treat the chilled water with a corrosion inhibiting antifreeze to a concentration which will prevent freezing to 0° F.

Water Chillers and Refrigerant Piping:

- The total cooling loading for the vessel has been estimated to be 60 tons. The system shall be designed with two chiller units (main and standby).
- Provide a quantity of one dual circuit, reciprocating marine chiller unit, water cooled. Chiller unit shall be approximately 60 tons, two stage type. The chiller condenser shall be a self cleaning tube brush type.
- Refrigerant shall be R-404A. Bidders may propose use of alternate refrigerants; however, no refrigerant with less health or environmental safety, or significantly lower thermodynamic efficiency, will be accepted.
- The chiller unit shall include compressor(s), purging connection, refrigerant fill connection, expansion valve, controls, water cooled condenser, and instrumentation as required for monitoring and diagnostics.

Condenser Cooling System:

- Provide a sea water circulating system to cool the refrigerant condensers circuit.
- Provide two identical self-priming marine grade condenser cooling pumps. Condenser cooling piping shall be Sch. 40 316 stainless steel, with butt welded fittings, except for piping outboard of sea chest and overboard valves, and piping routed through tanks shall be Sch. 80.
- Sea chest connections and overboards shall be in accordance with 46CFR 56.50-95.

Condensate Discharge System:

- Condensate extracted from cooling coils shall be discharged overboard.
- Provide stainless steel or aluminum drip trays under all cooling coils. Route drain pipes, each with a trap, from each condensate drip tray. Drip trays shall be sufficient to drain and not overflow when the vessel has a 5° list to port or starboard.
- Drains from cooling coil, located above the Main Deck, may be routed overboard via gravity. This may be accomplished, where appropriate, by discharging the condensate drain pipe into weather deck drains.
- Provide a condensate sump tank with a float switch activated pump for air handlers and fan coil units. Alternately, condensate from units below the Main Deck can drain to the gray water tank.
- Condensate discharge piping shall be Sch. 40 black steel pipe and malleable iron fittings.
- Overboard discharges shall be in accordance with 46CFR 56.50-95.

Heating:

- Provide electric duct heaters as necessary to accomplish the performance specified. Heating shall be in accordance with Reference 5.15.

Electrical Power Supplies:

- Provide electrical power to equipment per IEEE Standard 45 requirements.

Controls:

- Provide an electronic/electrical control system including adjustable thermostatic control of coolers and heaters, on/off/automatic control of water chillers, and manual start/stop of fans and circulating pumps.
- Each main Air Handling Unit (AHU) shall be controlled by an individual electronic panel with return and supply sensors, return dehumidistat, outside air sensor for preheating outside air and starting components for fan motors.
- Each Fan Coil Unit (FCU) controller shall have a speed switch for the fans and temperature setting with lockable cabinet.
- Each central exhaust fan controller shall provide interlock exhaust with each AHU.

Noise and Vibrations:

- Mount fans and reciprocating equipment on vibration isolators and provide flexible connections to duct, piping, and other equipment.
- Observe duct air velocity limits described in Section 514.
- Size louvers, cooling coils, heating coils, registers, grilles, etc. in accordance with accepted practice, so that noise due to excessive velocities does not occur.

Testing:

- Test and balance all HVAC systems to assure compliance with applicable regulations, the Contract, and the Specifications. The Contractor shall use an independent agency certified by Nation Environmental Balancing Bureau or American Air Balance Council to test and balance the system. The Contractor will supply a testing and balance report of

all measured flows, velocities, pressures, etc. versus design data for the HVAC system. **The Contractor will conduct random tests throughout the vessel with the Owner after the test report is issued.**

Regulations and Standards:

- All HVAC components and installations shall be in accordance with USCG requirements and applicable standards of the American Society of Heating, Refrigerating, and Air Conditioning Engineers and the Sheet Metal and Air Conditioning Contractors' National Association.

521 Fire Main System

Shipyard shall provide a fire main system as described by these Specifications, Reference 5.6, and as required by USCG, particularly 46CFR Support 76.10.

The fire pumps shall be capable of remote starting from the Pilothouse. Fire pump run light indication and pressure indication shall be provided in the Pilothouse.

Contractor shall provide and install fire pump motor controllers which shall be reduced voltage, auto-transformer type, closed transition with two step timed acceleration. Fire main system shall consist of fire stations with fire hose fitted with combination nozzles and brass couplings. Threads for hoses and nozzles shall be 9 threads per inch. Provide and install 1 ½" valves at each fire hose station. Adapters between hose and valve are not permitted.

Fire hose shall be stowed on a rack adjacent to each fire plug, so that it may remain connected at all times. Suitable clips shall be provided to secure the nozzle and spanner wrench at each station.

Install in fire pump suction line a bronze strainer with stainless steel trim including yoke screws and stainless steel strainer basket.

522 Sprinkler System

Shipyard shall provide a vehicle deck sprinkler system per Reference 5.7 and 5.8.

526 Scuppers and Weather Deck Drains

Provide weather deck drains as described by these Specifications, Reference 5.9, and as required to drain objectionable accumulations of water on weather decks to overboard discharge.

Overboard discharges shall be in accordance with 46CFR 56.50-95.

528 Plumbing Drains and Sewage System

Shipyard shall provide sanitary drains and a sewage treatment system per Reference 5.10 and these specifications.

Sanitary flushing water to all water closets shall be supplied by a pressure set drawing from the fresh water tank. Piping, valves and fittings shall be 316 stainless steel. The sewage unit shall be as noted on the machinery arrangement.

Contractor shall provide and install sanitary pressure set pump. Pump delivery capacity shall be approximately 300 GPH. Provide and install bladder type, 30 gallon captive air stowage tank, or equal, fitted with pressure-operated switch set to start pump motor at 30 psig and stop at 50 psig.

Contractor shall provide and install all necessary ancillary materials and equipment including but not limited to all valves, unions, fittings, wax seals, nuts, bolts, lockwashers, hangers, foundations, etc. All hardware shall be stainless steel.

529 Bilge System

The bilge system shall be capable of pumping out all compartments below the Main Deck as shown on Reference 5.11. Bilge piping shall be as straight as feasible with a minimum number of bends and elevation changes.

Bilge suctions shall be located as close as possible to the lowest point of the space served. Overboard discharges shall be located in the side shell just under the guard strake.

532 Keel Coolers, Engine Cooling

Provide and install *Fernstrum keel coolers* for the main engines, reduction gears, ship service generator engines, and thruster engine as shown on Reference 5.15. Installation shall be complete, including but not limited to, all valves, hull fittings and guards, piping, hardware, etc.

Coolers shall be surface-mounted on the bottom shell plating. Provide guards for each cooler; guard design shall be approved by the Owner and *Fernstrum* prior to fabrication.

Contractor shall provide and install an engine cooling water make up system for all main and ship service generator engines. System shall be supplied from ships fresh water system. Use appropriate size copper tubing and ball valves at each engine expansion tank.

533 Potable Water System

The potable water system shall be provided as shown on Reference 5.12 in accordance with the requirements of the USCG, U.S. Public Health Service, and World Health Organization.

Potable water shall be stored in two 2500 gallon steel tanks independent of the bottom, deck, and side hull plating but common to transverse bulkhead #44.

Piping in spaces with lining shall be concealed behind ceiling panels or bulkhead liners. Piping shall be run as directly as possible using a minimum of fittings. Install cut-off valves below each lavatory and drinking fountain in supply piping to allow repairs without securing the system.

Provide and install hose reels and high quality reinforced rubber hose in 50 foot lengths, 3/4" diameter commercial grade, with permanently attached brass couplings and brass nozzles at all seven hose bibs.

The water filters for the Passenger Lounge and Crew Galley coffee stations shall be ½" npt.

551 Ship's Service Air System

Contractor shall provide and install a ship's service air system per Reference 5.13. Air receivers shall be USCG-approved and stamped. ***Certificates for each shall be supplied to the owner.***

One compressor shall be supplied from the emergency generator. Installation shall be complete with all necessary foundation, brackets, flexible connectors, control cable (wiring), pressure switches, relief valves, etc. Compressor motor controllers shall be arranged for "off", "auto" and "manual" operation.

555 Fixed Fire Extinguishing Systems (see Section 683 for portable extinguishers)

The vessel shall have two independent CO2 fixed fire extinguishing systems. One system shall be installed to protect the Engine Room and the other shall protect the Emergency Generator Room. The systems shall include all CO2 cylinders, nozzles, sensors, alarms, wiring, engine shutdowns and discharge actuators. The system shall be designed, fabricated, and installed to meet USCG regulations 46CFR Subchapter H (Passenger Vessels), Part 76.15 and NVIC 6-72.

The CO_2 cylinders for the Engine Room fire extinguishing system will be stored in the CO_2 Room on the Main Deck. The CO_2 cylinder for the Emergency Generator Room fire extinguishing system shall be stored in the adjacent HVAC space.

The system shall be designed and installed such that the number, type, and location of the discharge nozzles shall be positioned for a uniform distribution of CO_2 throughout the protected spaces. Nozzle placement shall preclude the possibility of blockage of the discharge pattern by obstructions.

The system shall be designed such that the minimum quantity (85%) of CO_2 required to flood each space protected can be discharged completely within two minutes.

The Engine Room system shall be designed for remote manual actuation of release of CO_2 gas from two (2) locations outside the compartment. One control shall be at the Main Deck access to the Engine Room; the other shall be in the Tank Room adjacent to the EOS access door. Actuation devices shall have "break glass" boxes.

The Emergency Generator Room system shall have automatic actuation. The system shall provide a pneumatic detection and control system for the space that complies with 46CFR 76.15-10.

Both systems shall include switches for ventilation fan shutdown. This shall include automatic closure of ventilation louvers in the Emergency Generator Room. A method for weighing the CO_2 cylinders in place shall be provided.

Each system shall have engraved phenolic or brass instruction placards at all actuation devices, valves and alarms. Each system shall have means for automatically giving audible warning of the release of fire extinguishing gas into the protected spaces. Alarms shall operate for 30 seconds before the gas is released. The audible CO_2 power sirens shall be located in the space being flooded. Visual alarm indicators shall be part of the fire/smoke alarm system and located at the Pilothouse fire alarm panel and the engineer's remote monitor.

Provide instruction books/technical manuals for the ship's crew in operating, maintaining, and repairing the equipment supplied. The books/manuals shall include, but are not limited to, operating instructions, parts breakdown with descriptions and parts numbers, assembly drawings, piping and wiring diagrams, troubleshooting procedure, and test procedures.

All repairable components shall be fitted with suitable nameplates. Nameplates shall depict manufacturer and model. Each interface with a shipboard system shall be suitably labeled to facilitate component installation.

All components, except generic materials such as piping and cable, shall be from the same manufacturer.

559 Environmental Pollution Control

Sewage system shall be installed in accordance with Reference 5.9 as well as CFR 33, Part 159 Subpart A, Regulation 159.3(S). Installation shall be complete in all respects including all foundations, piping, wiring, valves, etc. for a complete operational installation.

Oily water system shall be in accordance with Reference 5.10 as well as CFR 33, Part 155, Subpart B, Regulations 155.330(A), 155.350(a)(2), and 155.360 (2)(c).

561 Steering System

The steering system shall be in compliance with all applicable USCG requirements including all regulatory documentation, failure modes analysis, and testing and verification procedures. **FMEA and DVTP shall be provided for these systems and submitted to USCG MSC as part of the steering and engine throttle systems.** Tillers shall be connected with a rectangular tube section tiller bar (designed to handle rudder torque) so that the two rudders act together. **Provide calculations on detail drawing submitted to USCG for approval, see Reference 5.16.**

The steering system shall have both full follow up and non follow up controls at the two (2) upper control stations and a non-follow up control in the EOS console adjacent to the engine throttle controls. Refer to console layout for locations.

Starting and stopping of the steering system shall be made by the operator from the main console in the wheelhouse. Three rudder angle indicators shall be installed, one in the Pilothouse console and one on the aft control station console and one in the EOS console. Angle indicators shall be back lighted with red bulb and brightness control rheostat mounted in steering control panel. Face of indicator shall be minimum 4 inch diameter.

561.1 Steering System Performance Requirement

With any one hydraulic power unit serving two hydraulic cylinders, the steering system must be capable of moving the rudder from 35° port helm to 35° starboard helm, hard-over to hard-over in less than 15 seconds. Mechanical stops shall be placed at 35° port and starboard of centerline plus ¼". The steering gear shall meet the performance requirements set forth in 46 CFR 58.25-10. The steering system shall be capable of moving, stopping, and holding the rudders at any angle within their operating range with the vessel speed at 14 knots ahead or 6 knots astern.

The steering system shall be provided with the following major components and any others as required to meet USCG requirements:

Qty	Item	Comments
2	Dual acting steering cylinders	ABS & USCG rules apply,
2	Split-type, straight bore steering tiller	Located in steering compartment
2	Valve body unit	Located in ER aft
2	Dual hydraulic power unit	Located in ER aft
2	Rudder feedback unit	Located in steering compartment
3	Non follow-up lever	Located in EOS, WH & Aft Sta.
2	Full-follow up lever	Located in Wheelhouse & Aft Sta.
2	steering control amplifier	
3	rudder angle indicators	Located in EOS, main console & aft

		steering station console
2	Control panel	Located in ER & EOS
3	steering gear alarm panels	Located in EOS, main console & aft steering station console
2	Steering power unit control starters	Located in ER near power unit
2	Steering system placard	Located near control valves

561.2 Electrical Installation

Power for the control elements of the steering gear systems shall be derived from the vessels 24 VDC power supply. Power for the hydraulic unit shall be 208 volt 3 phase. Electrical cables for power and control functions of the steering system shall not be run adjacent to each other but separated as far as possible in the electrical cable tray run.

561.3 Steering Gear

A clamp type tiller shall be provided for each rudder. Mechanical stops shall limit rudder angle to 35° to each side of centerline. Tiller assemblies shall be steel construction complete with mechanical tubing hub, 1 inch (minimum) steel plate arm. Stainless steel (316) tiller pins shall connect jockey bar to tillers with brass bushings and grease fittings. Cylinders shall be designed to operate to a minimum of 37° to each side of centerline and shall have tie-rod type construction with SAE straight thread o-ring ports. Cylinder pins shall be same design ands size as jockey bar pins, designed for expected loads. Cylinder rods shall be hard chrome plated. Steering cylinders shall meet ABS and USCG regulations. Cylinder test certificates shall be required. A copy of all material certificates as required by USCG shall be provided in the operation manual and the material certificate binders as required elsewhere in the specifications.

561.4 Valves and Piping

Shutoff valves shall be located at the aft engine room bulkhead near the hydraulic power unit. All hydraulic piping shall be steel with socket weld fittings except where long radius bends can be installed to eliminate weld fittings. Hoses shall be installed in the steering compartment and engine room to isolated steering cylinders and hydraulic power unit. Elbow end fittings shall be used to prevent kinking of hoses.

561.5 Instructional placard

An instructional placard shall be located near the shutoff valves to provide a system layout and written instructions per USCG requirements. This placard shall be at least 11"x 17" size mounted with stainless steel screws so that it can be removed to allow painting of the machinery space. Vendor shall provide a duplicate copy of this placard at vessel delivery to NC DOT engineering department. Placard shall be on stainless steel sheet metal with permanent etching to prevent tampering.

562 Rudders

The Contractor shall design fabricate and install spade rudders and a steering system in accordance with Reference 5.16. Rudder shall be double-skin, airfoil cross-section. Drain plugs shall be installed to permit Contractor to protect the interior with liquid anti-corrosive after rudder fabrication is complete.

Tillers and the steering system shall be designed by the Contractor. Tillers shall be connected with a tie rod.

581 Anchor Handling and Stowage

One 1000 lb *Danforth*-style anchor shall be provided and stowed on the port side bulwark generally as shown on Reference 5.13. Suitable clips and securing fittings for quick and simple deployment shall be provided. Eighteen fathoms of 3/4" diameter galvanized proof-coil chain, with shackles and swivel, shall be attached to the anchor and stowed in a self draining metal box port side on the inboard of the bulwark adjacent to anchor. A davit shall be supplied to assist in deploying the anchor, see Reference 5.18.

The bitter end of the chain shall be secured to a pad installed on the Main Deck near the chain box and the other end to swivel and shackle of anchor. The deck padeye shall be designed to 1.5 times the breaking strength of the chain.

582 Mooring

Provide four mooring lines, 1 1/2" diameter double braid nylon rope, 50 feet long, each with a four foot spliced eye in one end and with the other end seized. Mooring lines shall not be used during construction.

583 Rescue Boat and Davit

The rescue boat and davit installation shall be installed to the satisfaction of the U.S. Coast Guard OCMI representative. See *Global Davit* drawing 1-2035 / 06-133 for boat/davit installation. Point of contact for the boat/davit is Scott Waltrip, *Marine Equipment Inc.*,, P.O. Box 73049, Houston, TX 77273, Tel: (281) 447-8597, E-mail: marineequipment@att.net. The ferry Division is using these rescue boats exclusively on its Sound and River Class Ferries. They are currently the only USCG approved for installation on our ferries. **No substitution is allowed.**

583.1 Rescue Boat

A 6-person capacity rescue boat shall be provided and installed as shown on Reference 5.1. The unit shall be a Fassmer model RR 4.2.

Boat shall be stowed on a cradle with quick release securing and arranged to allow the outboard motor to remain in normal upright position.

Provide and install *one (1) 25 HP, 2 stroke EVINRUDE E-TECH* outboard motor with 20" lower unit length and orange color prop guard. Guard may need to be modified to suit engine lower unit.

Provide all gear required by rescue boat crew and a suitable fiberglass stowage locker located near the davit. The locker shall be self-draining and shall be securely bolted to a foundation at least 3" above the deck.

Provide and install a boat cover complete with securing devices/straps, color white.

583.2 Rescue Boat Davit

A rescue boat davit shall be provided and installed as shown on Reference 5.1 and the vendor drawing. The unit shall be a *Global Davit GmbH model Rhs.11/3.5*, rated for 11 kN and 3.5m reach. Davit shall be supplied by 208 VAC, 3-phase power from the emergency switchboard.

585 Elevator

Shipyard shall furnish and install one elevator in the vessel as shown on Reference 5.1. The unit shall be an electric or electro-hydraulic powered marine duty elevator (Owner approved), rated for 6-persons to also meet new ADA requirements (no assistance required access). Interior and fixtures shall be brushed stainless steel. Telephone and backup battery power supply shall be included with the elevator. Unit shall be powered at 208VAC, 3-phase from the emergency switchboard. Elevator will be accessible to all passengers including ADA. Owner requires that manufacture be able to provide long term maintenance agreement for elevator including labor and material as part of owner approval of vendor.

GROUP 6 OUTFITTING

References

6.1 09-060-101-012, Outboard and Inboard Profile
6.2 09-060-101-026, General Arrangement
6.3 09-060-200-010, Machinery Arrangement
6.4 09-060 635-013, Structural Fire Protection Boundaries
6.5 07069-001-801-1, Life Saving Equipment Arrangement (preliminary see G & A)

600 General

Outfitting shall be provided and installed by the Contractor as described herein. All materials supplied under this item shall be constructed, applied or stowed in accordance with the authorized regulatory bodies.

602 Label Plates and Hull Markings

602.1 Hull Markings

The name of the vessel shall be approximately 12" high, cut from 1/4" plate, and welded to the forward bulwarks as shown on Reference 6.1. The vessel's name and hailing port, welded to the aft bulwarks port and starboard, shall be approximately 12" and 6" high respectively and cut from 1/4" plate. All welding shall be continuous.

Bow thruster location indicators shall be cut from 1/4" plate and installed port and starboard as shown on Reference 6.1.

Name boards of 2" thick varnished hardwood (mahogany or teak) shall be provided on the pilothouse handrails, port, and starboard. Eight inch letters shall be routed out and painted white.

The vessel's official number shall be center punched and painted black on the aft engine room bulkhead. Letters and numbers shall be 3" high.

The Builder's nameplate shall be approximately 24" long and shall be engraved on polished bronze plate and with enamel filled letters. The nameplate shall be mounted on 3/4" thick varnished hardwood (mahogany or teak) pad, and shall be located in the Passenger Lounge as directed by Owner. Builder's nameplate shall include the following:

VESSEL NAME
Keel Laid: (e.g. December 2, 2010)
North Carolina DOT - Ferry Division
Beverly Eaves Purdue, Governor
Eugene J. Conti Jr., Transportation Secretary
Designers: Elliott Bay Design Group
and Garino & Cox, LLC.
Builder's name, Hull No. 414
(Official No. 000000000)

602.2 Labeling

Life rings, life preservers, IBA's, rescue boat, oars, fire axes, fire hoses, fire extinguishers, and other lettering shall be accomplished as normally required for a vessel of this class and as required by 46 CFR Subchapters "H" and "W" if not specifically covered elsewhere herein.

All valves and operating gear shall be labeled to indicate the service used. Labels shall be brass material, machine engraved, with 1/8" letters to suit condition and easy legibility. Labels shall be secured to handwheels using stainless steel wire tie.

All wiring cables shall be labeled with embossed metal tags secured to cable at sufficient intervals to allow ready identification of cable and circuit if it should become necessary to trace circuits after shipboard installation is complete.

Label plates marking the centerline and six foot mark above baseline shall be fitted on the after side of the engine room forward bulkhead.

Paint lines to indicate vehicle runways and safety zones on decks, colors, and markings as specified by the Owner and Reference 6.1.

Provide "No Smoking" signs as required by 46CFR78.40-10 and per Reference 6.6.

Provide "General Alarm" identifications as directed by 46CFR 78.47-5 and 78.47-7.

Watertight doors as required by 46CFR 78.47-37 (a) and (b) all other doors shall be marked as required by 46CFR 78.47-35.

Provide fire station labels as required by 46CFR78.47- 20 (minimum 2" letters).

Provide "E" on all emergency and exit lights as required by 46CFR 78.47-33.

Provide signs to indicate location of life jacket stowage.

Centerpunch and paint the frame number on forward and aft side of each watertight bulkhead, 3" high, in black.

Provide label entrances to Passenger Lounge, Toilets, Emergency Generator Room, etc.

Provide and install 3/16" stainless steel, deeply engraved labels adjacent to each sounding plug, remote valve operator, fuel fill and vents, fresh water fill and vent, lube oil fill, bilge discharge line, quick acting hatches, watertight doors and joiner doors. Labels shall identify service and/or space served and be continuously welded in place.

All signs, notices, and labels required to be placed on vessel shall be fabricated of vinyl unless otherwise specified herein. All signs, notices, and labels, required to be painted shall be produced by a qualified sign painter or shipyard sign shop approved by the Owner.

Contractor shall provide and install, as directed by Owner, all notices required by USCG such as station bills, stability letter, radio station license, etc. Notices shall be installed in glass faced frames of brushed aluminum, which shall complement the vessel's interior finish.

Contractor shall mount four (4) **Owner-furnished** decals, about 36" x 36", on 1/8" thick aluminum plate. Each decal shall be installed on vessel with six 1/4" stainless steel studs and nuts equally spaced, length as required to stand decals 1" off from superstructure. **Owner will supply pattern for locating the studs.**

Mounting location on vessel shall be as directed by the Owner and shall be installed to facilitate easy removal for future maintenance.

Provide and install an oil waste discharge placard suitably photo-etched or epoxy painted on anodized aluminum, 5" × 8". Placard shall be fixed adjacent to bilge pump control station in a conspicuous place and be in accordance with 33CFR 155.450.

Provide and install six garbage dumping placards, located as directed by Owner. Placards shall comply with the dimension, lettering and information requirements of 33 CFR 151.59.

602.3 Labeling And Identification of Hand Wheels and Piping

All valve hand wheels and actuator handles shall be coated with glossy enamel using the following color codes.

SYSTEM	COLOR FED.STD.NUMBER	
Fire main	Red	11105
Fresh water	Blue (light)	15200
Fuel oil	Yellow	13538
Compressed air	Orange	12246
Bilge	Black (dk.gray)	16081
Hydraulic	Purple	17141
Sea water	Green	14062
Sewage	Gray (light)	16376

All piping in the engine room shall be color coded, using the same scheme as above, by painting an arrow pointing in the direction of flow at sufficient intervals to allow ready identification. **All fuel oil, hydraulic oil, and fire main piping shall be marked in the same manner throughout the vessel.** Provide and mount in frame in EOS, one 8 ½" × 11" color code key plan.

603 Draft Marks

Draft marks shall be cut from 1/4" plate and installed fore and aft, port and starboard as shown on Reference 6.1. Numerals shall be expanded so that the vertical projected height of each numeral is 6" and shall be painted white.

604 Locks, Keys, and Tags

Spaces to be fitted with lockable doors are the Pilothouse, aft control house, ship's office, and the crew storeroom. Lockable doors shall be capable of being unlocked from inside the space without a key.

Door hardware shall be provided for all doors including the following:

- Lock sets provided for crew spaces are to be stainless steel handle type door latch marine hardware. Lock sets shall be keyed alike.
- Latch sets provided for public spaces and crew spaces are to be stainless steel handle type door latch set (not round knobs) marine hardware.
- Door closures as required by USCG.
- Emergency panic bars on all passenger exit doors.
- High security locks for the Pilothouse and aft control station doors.
- Magnetic hold backs as required by USCG.

Hardware shall be heavy duty marine-type brass, bronze or stainless steel.

605 Rodent and Vermin Proofing

The crew galley and dayroom shall be constructed in accordance with U.S. Public Health Service *"Standards for Rat-proof Construction."*

611 Docking Plugs

Stainless steel docking plugs with bronze 1-1/2" socket head plugs shall be provided for voids to permit proper drainage during drydocking of the vessel. The docking plugs shall be fabricated and installed in accordance with ASTM F991M. Docking plugs shall be labeled with weld bead on the hull identifying the void it drains.

612 Rails and Stanchions

Rails and guards shall be provided and installed to meet USCG requirements, and as shown on Reference 6.1. All rails shall be 1 1/4" Schedule 40 stainless steel pipe, smooth and free of abrasions, sharp corners, and defects which could injure persons sliding a hand on or along the same.

Hand rails shall be three-course, provided around the perimeter of the Passenger Deck. The rails shall be fabricated of 316, stainless steel, 42" high, and shall be fitted with #9 flattened stainless steel expanded metal between the courses. See reference 6.1.

Hand rails around the house top shall be three-course, 39-1/2" high.

A handrail gate shall be provided in way of the rescue boat and davit. Hinges and latches shall be heavy duty stainless steel. The gate shall swing outboard; latches shall be provided to secure the gate in both the open and closed positions.

Storm rails of l-1/4" Schedule 40 stainless steel pipe shall be fitted around the perimeter of the casing at the Main Deck, the Pilothouse and Deckhouse, and outboard of the curtain plate adjacent to the rescue boat access opening. Storm rails shall be set 4" out from bulkhead.

612.1 Safety Barriers

Contractor shall provide and install a 42" high, 6" × 6" mesh nylon web barrier at each end of the Main Deck between bulwark stanchions. Barrier shall be fabricated from MIL-W-23223 nylon 1-3/4" wide, minimum 0.075" thick material. Barrier shall be fabricated with a minimum three loops at each end to facilitate attachment to bulwark stanchions. Attachment to bulwark stanchions shall be accomplished by using minimum 3/8" chain shackles at one side and a series of three short lengths of 3/8" chain attached to barrier on the opposite side. A minimum three 3/8" chain hooks shall be welded to bulwark stanchions at each end of Main Deck, spaced to accommodate loop spacing in barrier to allow attachment of 3/8" chain to bulwark stanchions. Provide and install two equally spaced portable 2" Sch. 40 stainless steel pipe stanchions at each end of the Main Deck in line with bulwark stanchions to support net barriers. Stanchions shall be fitted with 1/2" stainless steel round bar hooks to hold net barriers in place. Provide and install reinforced stainless steel pipe sockets recessed in the Main Deck to support portable stanchions. Provide stainless steel pipe sockets, total of 4, on the Main Deck adjacent to bulwark stanchions to be used to store portable stanchions when net barriers are open.

614 Fixed Ballast

Contractor shall calculate the required fixed ballast necessary to produce a light ship heel and trim condition of zero degrees with all consumables and stores and all rigging, trim, and equipment on board.

Fixed ballast, if required, shall be pig lead of approximately 59 lbs per pig.

Fixed lead ballast shall be supported on adequate foundations to carry the loads and shall be restrained against movement under conditions of 5° pitch (fore and aft) and 25° roll (port and starboard). The vessel structure shall be protected from contact with the fixed ballast by a layer of 3/4" plywood in all areas which may come in contact with fixed ballast. Plywood shall be treated and coated to the Owner's satisfaction to prevent encroachment of moisture fire proofing.

Fixed lead ballast shall be coated in accordance with engine room finish coatings.

621 Joiner Bulkheads, Linings, and Ceilings

Bulkheads, whether flat side or stiffener side, and overheads in the following spaces shall be sheathed with panels approved by the owner:

- Pilothouse
- Ship's office
- House top passageway
- Passenger lounge and restrooms
- Interior stairways above the Mid Deck
- Crew staterooms, quarters, day room and passageway

Colors and finishes shall be approved by the Owner. There will no painted smooth steel bulkheads allowed in the passenger lounge area. All surfaces shall be sheathed with wall panels to provide a pleasant and attractive finish. This shall also pertain to the finish around windows and doors.

The lower 48" of toilet space bulkheads and boxing around windows shall be 18 gauge polished stainless steel.

Removable panels shall be installed in areas concealing piping or electrical systems wiring.

All exposed metal doors, frames, etc. shall be spray painted to the satisfaction of the Owner using matching colors to the surrounding paneling.

622 Floor Plates and Gratings

Contractor shall develop necessary drawings for the installation of deck plates in the Engine Room, Tank Room, forward and aft voids, Bow Thruster Room, and Steering Gear Room.

Deck plates shall be installed to provide complete coverage of Engine Room and Tank Room except directly below machinery and manifolds. Deck plates shall be installed to provide walkways and convenient access to and around machinery in the voids, bow thruster room and steering gear room.

Grating shall be diamond plate supported by 3" × 2" × 1/4" angles (beams and stanchions). Steel floor plates shall be installed only where required by USCG regulations. Grating shall be portable type bolted down with 3/8" diameter socket flat head countersunk stainless steel machine screws. Angle frames shall be drilled and tapped. Install 1/8" thick rubber between angles and aluminum decking. Flush hinged plates shall be provided for quick access to valves and bilge suction foot valves located below grating line. Hinges shall be stainless steel.

Two course galvanized pipe handrails shall be provided around the perimeter of floor plates where a drop off of more than 12" exists.

623 Ladders and Stairways

All ladders and stairways shall be constructed in accordance with 46CFR 72.05-20.

Install vertical ladders for access to all voids on bulkheads at each manhole.

- Vertical ladders shall be provided for access to the bottom of voids, tanks, house tops, and elsewhere, as required. Vertical ladders shall be portable, secured with 5/8" stainless steel fasteners, and constructed with 3" × 3/8" flat bar stringers and 5/8" square bar rungs spaced 12" apart. The minimum ladder width shall be 16" between stringers. Where independent ladder rungs are required, they shall be fabricated with a 3" drop center to prevent a foot from slipping off an open side. Rungs shall be aligned vertically.
- Ladders and independent rungs shall provide a foothold of 7" minimum depth. Ladders shall not be recessed under the deck more than is reasonably necessary to keep the ladder clear of the access opening.
- Vertical ladders shall be portable where installed at all escapes and elsewhere as required for access to compartments.

Inclined ladders shall be portable and secured with stainless steel fasteners. Inclined steel ladders shall have MC 10" × 8.4 # channel side stringers, with MC 10" × 6.5 # channel treads with 8" × 24" and 8" × 36" × 9/32" aluminum safety treads. Safety treads shall be attached by stainless steel, flat head countersunk machine screws. Aluminum shall be insulated from steel by 1/8" thick, rubber gasket material. Special care shall be taken that tread heights vary no more than 1/4" – **any variation greater than this will be cause for rejection.**

624 Doors

Tops of doors shall be at least 6'-8" above the finished deck. Doors shall be operable from both sides and shall be furnished complete with latches, locks, key hooks, holdbacks, bumpers, and closers as required for each particular door. Reinforcing plates shall be provided in way of door closers. Door locks are described in Section 604.

Exterior surfaces of all doors shall be coated with same coating system as on adjoining structure.

Weather doors shall have watersheds over them where not otherwise protected.

Weather doors shall be filled with fibrous glass thermal insulation. Fire-rated doors shall be filled with USCG-approved structural insulation necessary to comply with the structural fire protection requirements. All doors to weather from the Passenger Lounge, stair towers or other fire escape paths shall be fitted with panic bars and magnetic holding devises as required by USCG.

Engine Room, Tank Room, and Crew Day Room access doors from the Main Deck shall be quick acting, watertight doors.

Joiner doors shall be flush with stainless steel hardware. All joiner doors and door frames shall be of welded steel construction.

All doors shall be fitted with hooks with bumpers to secure them in the open position, except watertight doors. The passenger toilet and passenger cabin doors shall be fitted with heavy duty all stainless-steel door closures, marine type.

Joiner and weather tight doors shall be installed with 1/4" diameter, hex head, stainless steel, machine screws with nuts and lock washers spaced on 3" centers.

Joiner doors opening to the weather shall be stainless steel with window, fitted with weather and fume tight frames, Four sided sill designed for bolted installation with maximum 2" bottom sill. Apply sealant between frame and structure before bolting in place.

Toilet space doors, frames, and sills shall be stainless steel construction. Doors shall be fitted with stainless steel hinges and lever type lock sets. Doors shall be fitted with sills meeting that of the latest ADA rules.

The EOS joiner door shall be stainless steel construction with weather and fume tight frame. Door shall have thermal and acoustic insulation, and shall be fitted with stainless steel hinges and stainless steel lever type mortise lock set (without lock). Door shall be fitted with flush sill. An 18" x 30" window shall be fitted in the EOS door. Where required to A60 windows may be omitted to meet fire rating requirements as needed.

Two weather tight exterior mounted, sliding doors shall be installed at the Emergency Generator Room as shown on Reference 6.2. Door, frame, and sill shall be stainless steel construction. Doors shall be fitted with stainless steel guide, bronze sheaves and track and lever handle mortise lock set. Door shall be fitted with flush sill. Modify bottom door track by installing 1" × 3/16" flat bar on inboard side to prevent water from entering space.

625 Windows and Window Wipers

Five (5) windows at the Pilothouse front and one window at the aft control station shall be fitted with pantograph wipers. Owner shall have final approval of brand of manufacture.

Pilothouse and aft control station windows shall be of size and at locations as shown on plans and shall be stainless steel construction with clamp-in type installation properly sealed to prevent leakage.

Lounge windows shall be of size and at locations as shown on plans and shall be 1/2" thick tinted laminated safety plate glass and shall be stainless steel construction with clamp-in type installation, properly sealed to prevent leakage.

626 Window Defogger

A window defogger shall be furnished and installed with outlets at all forward pilothouse windows. The outlets should be installed at the base of the windows to furnish hot air across the window surface. Control for the defogger shall be located on the console including fan speed and heat control. The ducting shall be covered using the same material as used for wall covering with screws to provide easy removal and maintenance.

631 Coating Systems

Final color selections shall be determined by the Owner at a later date. The Contractor shall provide and install custom color trim similar to other vessels in the NC DOT fleet. *The choice of manufacturer is due to the use of this paint system throughout the ferry division. This allows the matching of paint for repair purposes.*

631.1 Surface Preparation

Surface preparations and coating as specified herein shall be accomplished in strict accordance with and as recommended by the Steel Structure Paint Council, *Jotun Marine Coatings Company*, and the Owner. The Owner reserves the right to select the standards used.

Where structure, machinery, or equipment will cover other structure in a manner that prevents access for maintenance, both structures shall be cleaned prior to installation of the covering structure and both coated with one (1) coat of inorganic zinc followed by the applicable paint schedule as applied to the surrounding area as specified elsewhere herein.

All grease, dirt, and other contaminating properties shall be removed from surfaces before painting: All loose, blistered, cracked paint, all rust and mil scale shall be removed from surfaces to be painted by appropriate methods as specified elsewhere herein, and spot primed with appropriate primers prior to subsequent coatings.

Zinc primers shall be fully cured and all oxidation removed prior to subsequent coatings.

All coats of paint applied must be compatible with primers and other paints.

Sufficient time for proper drying or tacking shall be allowed between coats.

All painting shall be accomplished to protect all surfaces liable to water, immersion, seepage, or condensation.

The vessel shall be shifted on blocks so that complete painting of the bottom area may be accomplished. Areas in way of block spots shall be shotblasted and coating system brought up as specified herein.

631.2 Type Coating

All paints used, unless otherwise specified, shall be of the best quality for marine application and applied in strict accordance with *Jotun* recommendations as directed by "*Jotun*" and the Owner.

Provide the Owner's representative with one (1) copy of painting report prior to each application of paint.

The Owner reserves the right to approve the manufacturer of the coating system used and all paint for work not described or called for in this section but which is required and shall be accomplished using a paint schedule designed for the purpose intended and within the applicable standards.

631.3 Weather Conditions – Minimum Standards

No paint shall be applied when weather conditions are below the minimum recommended standards as prescribed by *Jotun* product data sheets. Contractor shall provide a factory authorized applications technician to accept or reject surface preparation and environmental conditions prior to paint applications. In the event of uncertain or unfavorable weather conditions, the Contractor shall advise and discuss conditions and paint applications with the Owner prior to applying paint.

Conditions of the hull such as condensation will prohibit paint application. The Owner shall stop or delay all painting operation until more favorable weather conditions exist.

631.4 Paint Application

Paint may be sprayed, brushed, or rolled on as the Contractor select except as described below. Paint may not be thinned, except as approved by the Owner. Any coat applied without measurement or inspection of previous coats by Owner will not be recognized as applied.

The Contractor shall repair, as specified elsewhere herein, any areas damaged due to the use of destructive testing techniques, if used.

Protect all hull anodes, transducers, propellers, and bearing surfaces from paint coatings.

The final coat of finish paint above the water line shall not be applied until all other work has been completed and the vessel is otherwise ready for delivery. The final coat shall be applied by spraying only.

Should the vessel remain undelivered, excluding delivery time, three (3) months after launching, it shall be dry-docked, surface prepared and one (1) additional coat of anti-fouling paint applied.

The 6'-6" waterline shall be defined by intermittent weld bead of 1" in length on 4'-0" centers.

631.5 Blasting

All steel surfaces on the exterior of the hull, the entire interior of the hull, including all void spaces, the engine room, steering gear compartment, entire superstructure, main deck, overhang, bulwarks, etc. shall be blasted to near white metal, SSPC-SP-l0.

Immediately after blasting, all blast material shall be completely removed from surfaces by sweeping and blowing with dry compressed air or other suitable means and one coat of inorganic zinc applied to prevent rusting. All blast material shall be completely removed from surfaces prior to any coating being applied.

Following general directions shall be accomplished for the preparation of surfaces to receive the self curing inorganic zinc coatings:

- Round off all rough welds and sharp steel edges, remove weld spatter.
- Dry-abrasive blast all pits and depressions, remove all mill scale, rust, rust scale, grease, paint or foreign matter. Surface profile from abrasive blasting should be similar to that obtained with fresh steel grit (G-40 size), steel shot (S-230 size), graded flint or silica sand (30-60 mesh), under nozzle pressure of 100 psi. If abrasives are reused they shall be cleaned of contamination. Do not reuse sand or flint abrasives.
- Apply inorganic zinc coating as soon as possible to prevent blasted surfaces from rusting.
- Keep surfaces moisture-free until coated. Keep oil, grease or other organic matter off surface before coating.
- Spot blast to remove any contamination. Do not solvent-wipe.
- During blasting operations, seal off all deck machinery, ventilation fans, and any other equipment which could be subject to damage from sandblasting operations. The Engine Room and all openings thereto are to be sealed off prior to blasting if any machinery is installed, and kept sealed for the duration of blasting operations.

631.6 Disturbed Surface Repairs

Any painted surface that is disturbed during construction or outfitting shall be restored to suit the adjacent area as follows:

- Remove any damaged coating system by sanding to a sound anchor profile.
- Sand surrounding paint to present an even contour with edges feathered and at least two of the three underlying coats separately visible and distinct from each other. Each layer or coat shall be a minimum of 2" wide.
- Where the disturbed area has penetrated through to the substrate any scarred or damaged metal shall be repaired and a proper anchor profile renewed.
- Restore damaged epoxy coatings systems to a finished surface profile equal to adjacent and surrounding areas. Each coat to be as specified elsewhere herein.
- Apply top coats as required elsewhere herein.

Finished paint shall blend with adjacent areas and present a smooth even profile free of runs, contamination, or other unsightly coating defects.

631.7 Clean-Up

After all construction and outfitting has been completed and just prior to vessels departure/delivery, Contractor shall remove all paint from all windows, slides, and free up moving sashes.

Contractor shall remove paint from all glass and bright work. All bright work shall be polished after all other work has been completed and vessel is otherwise ready for delivery.

Remove all paint and paint over-spray from machinery components, machinery label plates, signs, threads of wing nuts, and bolts used for securing vent and storm covers etc., hinge pins, shafting, door knobs, latching mechanisms, actuator rods, valve stems, etc.

Vessel shall be thoroughly cleaned throughout including but not limited to the removal of all dust, grit, grease, solvents, and lint from all spaces, machinery, components, structure, void vents, drains, bilges, paneling, furnishings, and deck coverings.

Wash down with fresh water and dry all decks, superstructure and bilges prior to final delivery of vessel.

Ferry will have special trim stripes painted on superstructure, and bulwarks. Contractor shall assume that at least two different colors of paint will be applied. Special trim is based on colors of a North Carolina University to be selected at a later date. **Accent strips shall be as per OSB hull 413.**

631.8 Paint Schedule

Coat No.	Product	Mils DFT
1	Jotun Muki Z WB 50 Pre-construction primer	1
2	Jotacote Universal Prime coat	7 +/- 1

Steel surfaces shall be finished as described below. Special care shall be taken to apply full thickness of coatings behind flanges. Failure to apply full coating thickness at any locations shall be remedied prior to application of successive coats.

Exterior hull to waterline

No.	Product	Mils DFT
1	Safeguard Universal gray	5 +/- 1
2	Hydroclean antifouling, Light red	4 +/- 1
3	Hydroclean antifouling, Dark red	4 +/- 1

Exterior hull above waterline and bulwarks

No.	Product	Mils DFT
1	Jotamastic lt gray	7 +/- 1
2	J-Kryl black	5 +/- 1

Exterior decks

No.	Product	Mils DFT
1	Jotamastic lt gray	7 +/- 1
2	J-Kryl gray	5 +/- 1

Add heavy nonskid to final coat on all exterior decks.

The ADA path and 6" wide lane stripes on the Main Deck shall be painted yellow. Paint large numerals "1", "2", and "3" at each end of the port side traffic lanes as directed by the Owner.

Superstructure and house exterior

No.	Product	Mils DFT
1	Jotamastic lt gray	7 +/- 1
2	J-Kryl white	5 +/- 1

Interior exposed bulkheads and overheads

No.	Product	Mils DFT
1	Jotamastic lt gray	7 +/- 1
2	J-Kryl white	5 +/- 1

Interior decks (except where vinyl tile is installed)

No.	Product	Mils DFT
1	Jotamastic lt gray	7 +/- 1
2	J-Kryl gray	5 +/- 1

Bilges

No.	Product	Mils DFT
1	Jotamastic lt gray	7 +/- 1
2	J-Kryl white	5 +/- 1

Potable water tanks

No.	Product	Mils DFT
1	Epoxy Tank Lining 550, Buff	7 +/- 1
2	Epoxy Tank Lining 550, White	7 +/- 1

Fuel, dirty oil, and lube oil tanks

No.	Product	Mils DFT
1	Oil	N/A

Black and gray water sumps are polyethylene and shall not be coated.

Aluminum deck plates and stainless steel railings shall not be coated.

633 Cathodic Protection

Sacrificial high purity zinc anodes shall be provided and installed in accordance with the recommendations of the Society of Naval Architects and Marine Engineers (SNAME) PNR R-21, *Fundamentals of Cathodic Protection for Marine Service*. Anodes shall be installed with the long axis fore and aft, attached by welding to the hull, equally divided port, and starboard.

634 Deck Coverings

Deck covering shall not be installed under built-in furniture or under equipment with enclosed foundations.

Before any deck covering is installed, the decks shall be free of rust, grease, oil, scale, loose paint, and other extraneous matter. Attachments to, and penetration of, the structure to be covered shall be complete and the structure tested, as required, before applying coverings.

Before vinyl tile is installed, the deck shall be faired with underlayment in way of laps, depressions in plating, and weld seams. Underlayment shall be applied only to the minimum extent required to fair.

All deck coverings shall be applied in accordance with manufacturer's recommendations.

Deck covering in Pilothouse, Ship's Office, Passenger lounge, Passenger restrooms, Crew Staterooms, Crew Day Room, Crew Store Room, and Crew Galley shall be 12" × 12" vinyl tile. Tile color shall be selected by the owner at a later date. The Contractor shall install a 4" high vinyl cove base wherever tile ends at a vertical boundary.

The entire EOS deck shall be covered with black diamond pattern insulating switchboard matting meeting the requirements of ASTM D-178 and MilSpec M-15562F.

635 Hull Insulation

The Contractor shall furnish and install thermal insulation in accordance with Reference 6.3 and 46 CFR Subchapter H. Installation of all types of insulation shall be per manufacturer's recommendations.

Exterior weather boundaries and boundaries separating air conditioned spaces from non-air conditioned spaces to be insulated with a minimum 3" of thermal USCG-approved insulating material.

Acoustic faced insulation shall be 2 pound /cubic foot, 2" thick, or equal and installed at the Engine Room overhead, Engine Room companionway, and on the exterior of all EOS boundaries (except insulation shall be on the underside of the Main Deck). Insulation shall be sheathed with factory-finished aluminum color perforated, 18 gage sheet metal, to all bulkheads and overhead complete with trim.

Where structural fire protection insulation is not required, thermal insulation shall be provided on all weather boundaries in ventilated passenger and crew spaces, with the exception of the Engine Room. In addition, the space under the Pilothouse shall receive thermal insulation on its weather bulkheads and underside of the deck in way of the Passenger Cabin.

Seams of cloth back insulation shall be covered with glass tape so as to present a smooth surface. Coat exposed cloth backed insulation with vapor-barrier sealer after installation and prior to bulkhead liner installation and/or paint application.

636 Hull Dampening and Vibration Control

The following measures will be taken by the Contractor to control vibration:

- Generator sets shall be mounted on marine isolators. Manufacturer and types shall be per engine manufacturer's recommendation.
- Fans and compressors shall be mounted on marine type isolation mounts, and connected to ducting through flexible joints.
- Piping connections to equipment mounted on vibration isolators shall be through flexible connections.

640 Furniture and Furnishings

Furniture and furnishings shall be provided as shown on Reference 6.2 and shall be good marine quality, installed so as to present a complete and pleasing package satisfactory to the Owner.

644 Sanitary Spaces and Furnishings

Bulkhead mounted stainless steel countertops and lavatories shall be provided in the toilet spaces. Piping and drains under the lavatories shall be fitted with removable preformed insulating pads in accordance with ADA requirements, or shall be fitted with removable stainless steel plate guards.

There shall be no sharp edges or corners on the countertops or its supporting structure that may cause injury to passengers. Install a self-closing solid brass chrome plated faucet, stainless steel soap dish and 12" × 18" commercial grade mirror with stainless steel frame at each lavatory. Provide one ADA-compliant lavatory and mirror in each passenger restroom.

Toilet partitions shall be stainless steel (vandal-resistant finish) and shall be firmly affixed to the deck, overhead, and bulkhead with tamper-resistant stainless steel fasteners.

Each passenger toilet shall be fitted with grab rails 30" to 36" long. Rails shall be stainless steel tubing securely attached with vandal-resistant stainless steel fasteners.

Toilets shall be ADA-compliant vitreous china, deck mounted, white flush valve (brass, chrome plated). Toilet seats shall be commercial high impact Polystyrene open front with stainless steel hinge. Provide and install one commercial grade toilet paper (roll) holder in each toilet stall. ***Owner shall have final approval of manufacturer.***

Provide and install one commercial grade toilet paper (roll) holder in each toilet stall.

645 Passenger Lounge

Provide and install units generally as shown on Reference 6.1. Seats shall be provided with powder coated aluminum pedestals and unpadded powder-coated aluminum grab rails. Seats shall be secured to deck with stainless steel studs welded to deck and secured with stainless steel acorn nuts and lock washers. Upholstery shall be transit grade, flame retardant vinyl and foam. Provide and install settees generally as shown on Reference 6.2. Settees shall be provided with powder coated aluminum pedestals and shall be secured to deck with stainless steel studs welded to deck and secured with stainless steel acorn nuts and lock washers. Upholstery shall be transit grade, flame retardant vinyl and foam. Seat coverings shall be vinyl with quality and color decided by the owner.

Contractor shall provide and install fourteen rectangular, 29" high tables as shown on reference 6.1. Table sizes shall be as shown on Reference 6.1.

Provide and stow two 20 gallon trash receptacles with self-closing stainless steel door and galvanized steel inner liner. Receptacles shall be 36" high x 15" diameter, 20 gallon, and color tan.

Provide and install one officer's license frame, suitable to display six licenses. Locate as directed by Owner.

Provide and install one (1) bulletin board, 28" × 42" with satin chrome finish and plexi-glass front. Location as directed by Owner.

Provide and install a coffee service cabinet module with adjacent duplex electrical outlet. Cabinet module shall be sized about 16" × 36" with doors and storage shelf below. Cabinet colors shall be selected by the Owner. Provide a high quality owner approved coffee maker with 8-cup capacity stainless steel decanter. The coffee maker shall be securely affixed to the counter top as directed by the Owner. A water filter furnished with the potable water system shall be installed inside the cabinet.

Contractor shall provide and install two free-standing water coolers with a capacity of 14.0 gph at 50° F. One unit shall be ADA-compliant. Install coolers in accordance with manufacturer's recommendations.

Provide and install four 20" flat screen television units in the passenger lounge at locations selected by the Owner. Duplex electrical outlets for these units shall be provided in the overhead immediately adjacent to the mounting location with 110 power and cable plug. Provide rigid powder coated, tamper-resistant foundations for these units.

Provide a DVD player in the ship's office wired to all four (4) television monitors.

645.1 Passenger Deck Exterior Seats

Provide and install bench seating on open passenger deck as shown on Reference 6.1. Seats shall be constructed of aluminum with approval by Owner. Seats shall be mounted to the deck with stainless steel studs welded to the deck, size to suit. Seat bottoms shall be arranged to avoid water entrapment.

651 Vending Machines

Vending machines shall be furnished by the Owner and installed by the Contractor generally as shown on Reference 6.1. Unobtrusive but secure strapping shall be provided to prevent vending machines from movement. This shall be accomplished by use of corner clips at the deck and flatbar straps at the top without using fasteners to the vending machines.

654 Cleaning Gear Locker

The cleaning gear locker shall be equipped with the following as approved by the Owner:

- Deep slop sink, FRP construction and mounted to the bulkhead.
- Two stainless steel shelves with sea rails over the slop sink.
- Four stainless steel hooks on the bulkhead for hanging brooms, mops, etc.

655 Crew Galley

The crew galley shall be arranged generally as shown on Reference 6.2. Counters shall have drawers under along with upper and lower cabinets (with shelves as directed by the Owner) as well as full backsplashes. Cabinet doors and drawers shall be equipped with latches to prevent opening in a seaway.

Additional equipment (to be Owner-approved) shall include:

- Stainless steel deep double sink with high quality faucet and sprayer
- Heavy duty overhead household style microwave oven, 2.0 cu ft capacity minimum.
- Four burner electric range/oven, with white finish house hold style.
- Refrigerator/freezer, 20 cu ft with ice maker, white finish house hold style.
- Four slice toaster, white finish
- Automatic coffee maker, high quality 12-cup capacity with stainless steel decanter per owner approval.

656 Crew Day Room

The Crew Day Room shall be arranged generally as shown on Reference 6.2. All furniture shall be such as is available in a high quality consumer furniture store.

Furniture (colors and styles to be Owner approved) shall include:

- One rectangular dining table
- Six side chairs or combination chairs and bench to provide seating for (8) crew.

Tables shall be secured to the deck with stainless steel fasteners in locations approved by the Owner.

657 Crew Staterooms

Each crew stateroom shall be arranged generally as shown on Reference 6.1. Berths shall be enameled steel, double case bunks with curtains and drawers. Lockers shall be enameled steel.

658 Crew Toilet Spaces

Toilet shall be vitreous china, deck mounted, white with Sloan 110-3 flush valve (brass, chrome plated). Toilet seat shall be commercial high impact Polystyrene open front with stainless steel.

Provide and install one commercial grade toilet paper (roll) holder in each toilet stall.

Shower shall be high quality stainless steel Owner-approved with built in shelves for soap and shampoo, and a built in grab rail. Stalls shall be complete with all fixtures, curtain rods, curtains, etc. Shower shall have wood grating for drainage and provide for non-slip surface.

661 Ship's Office

The ship's office shall be furnished with the following commercial grade furniture:

- Desk with regular two drawers and two hanging file drawers
- Straight leg arm chair
- Two 4-drawer legal size file cabinets
- DVD shelves with storage
- Book shelf with four shelves
- Double bunk
- File cabinet
- Adjacent head for use by Captain (see reference 6.2 General Arrangement)

Except for the chair, all furniture shall be secured to the deck or a bulkhead.

The book shelf and file cabinets shall be affixed to a transverse bulkhead. Furniture selection and arrangement shall be as approved by the Owner.

662 Pilothouse Outfit

662.1 Console

The Pilothouse and Aft Control Station shall be fitted with consoles generally as shown on Reference 6.2 and as described in Section 400.

Consoles shall be totally enclosed manufactured of steel with suitable stiffeners to support equipment installation. Hinged doors or removable panels shall be installed to provide access. Door sills shall be portable or removable. Stowage, equipment mounting surfaces, shelves, louvers, etc. shall be provided.

Equipment and instruments listed elsewhere herein shall be installed in consoles to provide complete operational control centers.

662.2 Furniture

The Pilothouse shall be furnished with the following commercial grade furniture and items:

- Two pilot chairs with aluminum base and vinyl seat and back, adjustable. Color shall be Owner selected.
- Chart table of enameled steel construction with a single 5" deep chart drawer and cabinets below. Chart table shall be furnished with an acrylic panel surface and red light for night use. Provide two duplex electrical outlets at the chart table.
- Book shelf with three shelves designed to fit below windows
- Settee with vinyl covered seat and back. Storage shall be provided below removable seat.
- Two USCG approved adult life preservers in storage rack overhead as directed by Owner.
- Cabinet for "Ferrymon" electronic equipment to include computers and monitors.

662.3 Window Tenting

Contractor shall provide and install window tenting on windows located on both sides and aft end of pilothouse meeting USCG rules for visibility.

662.4 Window Defrosters

See section 626

662.5 Window Washers

Not applicable

663 Engineers Operating Station (EOS)

Provide and install five double pane, 1/4" safety plate glass windows generally as indicated on Reference 6.2. Glass shall be installed with 2" air space between panes. Glass shall be set in self locking rubber channel and shall provide maximum visibility of Engine Room space.

Provide and install the following generally as shown on Reference 6.1:

- One legal size, four drawer, non-locking file cabinet
- One metal frame guest type chair without arms (office furniture) brown vinyl seat and back.
- Two (2) USCG adult size life preservers and storage rack as located by the Owner
- One marine clock, non-striking, 6" dial electric movement in polished brass case with wood base for bulkhead mounting as directed by the Owner
- One white four (4) cu ft refrigerator to located by Owner
- See section 436.2 for console equipment listing

665 Machinery Spaces Outfit

Provide and install one workbench with four (4) drawers on each side and heavy metal top with 6" vise as shown on Reference 6.2.

Provide and install one flammable liquid storage cabinet per Owner approval. Provide adequate foundations and install unit as directed by the Owner.

Provide and stow in the Engine Room, one 30 gallon, galvanized steel, oily waste can.

Provide and install padeyes over main engines, reduction gears, generator engines, thruster and thruster engine, to suit lifting arrangements and capacity of equipment installed. Padeyes shall be securely attached to ship's structure including any additional stiffeners required. Contractor to provide calculations showing design of padeye is sufficient for service intended. Padeyes are to be load tested to 150% of maximum intended load of equipment to be lifted and witnessed by Owner or Owners representative.

671 Lockers

Contractor shall provide and install six (6) metal storage cabinets generally as shown on Reference 6.2. Lockers shall have adjustable metal shelves and lockable handle, all keyed alike. Lockers shall be securely attached to the deck and adjacent bulkhead.

672 Store Rooms

The crew store room shall be fitted with three-tier shelving all around except in way of the door. Shelving shall be of all stainless steel wire construction with sea rails on each tier. Shelving shall be well secured to the deck and to bulkheads.

680 Life Safety/Emergency Equipment

Life rafts, life preservers and other equipment shall be marked with vinyl letters in accordance with the U.S. Coast Guard regulations in effect at time of contract. Life preserver stowage shall be marked as required showing number of adult and child life preservers at each location. Contractor shall provide 300 life jackets in addition to the crew life jackets stored elsewhere.

The quantity, location and installation of life saving appliances are subject to final approval of the local OCMI at Cedar Island, North Carolina. Lifesaving plan shall be submitted to the local OCMI at Sector North Carolina for approval of quantity and location. Equipment used shall be indicated by the use of IMO symbols in the bill of material and drawing plans. Exits and passenger egress shall be indicated along with staging areas in case of fire. Instructional placards shall be installed at IBA, Rescue Boat and Life Jacket Storage areas.

681 Life Rafts/Buoyant Apparatus

Provide and install six USCG-approved, 50-person, Inflatable Buoyant Apparatus (IBA). IBA's shall be located on Pilothouse Deck as shown on References 6.2.

Provide and install six IBA galvanized launching devices.

682 Personal Life Saving Equipment

Provide, install, and stow as required the following equipment:

- Three hundred and ten (310) USCG approved vinyl adult life preservers with vessel name.
- Thirty five (35) USCG approved vinyl children's life preservers with vessel name
- Eight (8) life rings w/ life ring brackets and vessel name
- Two (2) man overboard lights
- Two (2) man overboard light brackets

Contractor shall stow life preservers in fiberglass stowage lockers as shown on Reference 6.2. Provide a wood grating in each locker; finish shall be natural with varnish sealant. Adult and children's life preservers shall be separated by a divider. Provide and install stainless steel, brass, or

aluminum ventilation grills in each locker. Hinges for the lockers shall be 316 stainless steel. Lockers shall be securely mounted to 3"x 2"x1/4" 316 stainless steel foundation angles.

Contractor shall stow life rings and man overboard lights as shown on Reference 6.4. Final stowage locations shall be approved by the Owner.

Contractor shall provide and install on each Main Deck life ring, 100 feet of 5/16", braided, orange, polyethylene rope. Contractor shall provide and install four (4) of the eight (8) life rings stowed on the Main Deck, 6 feet of 5/16", braided, orange, polyethylene rope with one end spliced to the life ring and other end spliced to a man overboard light. The remaining four (4) life rings shall be located on the passenger deck, two (2) forward and two (2) aft.

Contractor shall provide and install all necessary ancillary materials and equipment, including but not limited to all stainless steel fasteners, lashing twine, rope, etc. for a complete and operational system.

683 Emergency Equipment

Emergency equipment shall be provided and installed generally as shown on Reference 6.5 and as described herein. A fire / safety plan shall be frame mounted in the hallway aft of the pilothouse. Size of plan shall be approximately 24" x 36 hardwood frame with 1/8" acrylic panel. Safety items shall be noted using international symbols and bill of materials showing quantities. Exits shall be marked along with passenger debarkation areas.

683.1 Rescue Equipment

Contractor shall provide and stow on board vessel as directed by the Owner the following rescue equipment:

- One stainless steel medical rescue litter, w/ orange flotation collars.

Contractor shall provide and install one gear storage locker. The locker shall be installed on the Navigation Bridge Deck as directed by the Owner.

Contractor shall fabricate one aluminum rescue ladder fabricated of 2" × 3" × 1/8" wall rectangular aluminum tube rails spaced 18" apart and 1 1/2" × 1" C-shaped rungs spaced 12" apart. Ladder shall be approximately 9 foot long and shall be hinged at the main deck. The ladder shall be secured by latching pin in the vertical position when not in use. Access door at the ladder shall be 30" wide with latching devise to keep closed.

683.2 Defibrillator

Contractor shall provide and stow one (1) *Lifepak 500, P/N 3011790-B automatic external defibrillator as manufactured by Medtronic Physio-Control, P.O. Box 97006, Redmond, WA, (425-867-4000) or equal.* Unit shall be bulkhead mounted in the passenger lounge as directed by the owner. *It is preferred that the unit be of the same type currently used by NCDOT Ferry Division, as this is a stock item.*

683.3 Fire Axes

Contractor shall provide and install four fire axes with stainless steel mounting brackets in locations as directed by the Owner and in accordance with 46CFR 76.60.

683.4 Fire Extinguishers Hand Portable

As a minimum, the Contractor shall provide and install hand portable fire extinguishers, USCG-approved type in following locations:

▪ Engine Room	4	15 # $C0_2$
▪ Tank Room	2	15 # $C0_2$
▪ Steering Gear Room	1	15 # $C0_2$
▪ Bow Thruster Room	1	15 # $C0_2$
▪ Emergency Generator Room	1	15 # $C0_2$
▪ Main Deck Bulwarks	4	15 # $C0_2$
▪ Main Deck Superstructure	2	15# $C0_2$
▪ Engine Room Access Trunk	1	15 # $C0_2$
▪ Passenger Lounge Interior	2	2 Gallon foam
▪ Pilothouse	1	10 # ABC Type II
▪ Crew quarters	2	2 Gallon foam
▪ Spares	6	15 # $C0_2$
▪ Spare	1	10 # ABC
▪ Spare	1	2 Gallon foam

$C0_2$ extinguishers shall be contained in truck style mounting bracket. ABC extinguishers shall be mounted with tension type bracket to prevent movement. Spares shall be mounted in like manner and stowed in the tank room mid-ship with final location as directed by the Owner.

Contractor shall provide and install one (1) B-III, 35#$C0_2$ hose and reel extinguisher in the engine room as directed by the Owner.

GROUP 8 TESTING, INSPECTION, & DELIVERY

800 Tests and Inspections

841 Tests

Tests of structure, piping, machinery, and electrical systems shall be accomplished in accordance with applicable classification societies and regulatory agency test requirements.

This vessel shall be inspected in accordance with title 46 Code of Federal Regulations, Subchapter "H", and applicable classification society rules incorporated by reference therein. All tests shall be witnessed and approved by the Owner.

Three copies of all test records signed and dated by the Contractor, Owner, and USCG (as required) shall be delivered to the Owner prior to the vessel leaving the Contractor's location. These records shall be bound in 3" D-style ring binders and properly labeled. Binders shall be black in color with clear cover to hold a label of 8-1/2" × 11" with the vessel's name, Contractor's name, and hull number. Three copies of the documents shall also be provided on CD.

Tests and trials shall be conducted by the Contractor at the Contractor's expense. Any deficiency recorded during the trials shall be corrected and given another trial similar to the original.

841.1 Welding

Welding shall be subject to inspection at any point in the process from fit-up to finish. Non-destructive inspection of all welds shall be performed at any point in the welding process at the discretion of the Owner.

Final welds shall be subjected to radiographic inspection in accordance with ABS Rules for Non-Destructive Inspection of Hull Welds, latest edition. Additional radiographs shall be taken for each failed radiograph, if any, in random locations designated by the Owner on a one-for-one basis.

All welds shall be subjected to visual inspection by the Owner to assure that they are free from surface discontinuities which might prove detrimental to the weld, such as undercut, porosity, cracks, melt through, burn through, etc.

841.2 Structural Tests

Voids and compartments below the Main Deck shall be proven watertight by testing at 1.5 PSI. While compartments and voids are under pressure, all boundaries shall be soaped to identify any leaks. Leaks shall be repaired by completely removing non-tight welds by grinding or other suitable

means and re-welded to the satisfaction of the Owner. No repair welding shall be accomplished while the compartment is being tested.

Watertight boundaries above Main Deck shall be proven by hose testing using a stream of water of at least 50 PSI directed at the boundary being tested to prove the boundary tight.

Any additional test to prove the integrity of the vessels structure which may be required by the USCG shall be performed as a part of this contract.

841.3 Piping System Tests

All tests of piping systems required by the USCG shall be performed as a part of contract.

All piping systems shall be tested using the medium normally carried in the system to a pressure of 1 1/2 times the system MAWP (Mean Actual Working Pressure), but in no case less than 50 PSI.

Hydraulic system shall be flushed only, as the owner has chosen to use stainless steel tubing on the OSB hull 413. The sister vessel shall be fitted likewise.

Fuel system piping shall be flushed using diesel oil.

Initial installation test of $C0_2$ system piping shall be free from any leaks and shall maintain required test pressures for five minutes with no drop in pressure.

Test pressures shall be held for a minimum of thirty minutes to allow inspection of the entire piping system. After inspection of the system under pressure, the test pressure shall be monitored by a calibrated gauge, with a mid point range within 10% of the test pressure, for a minimum of one hour without any drop in pressure. The test gauge shall be at the opposite end of the piping system from the source of the test medium.

841.4 Electrical System Tests

Electrical systems shall be tested as prescribed in IEEE Standard #45 Section 46, ABS Rules for Building and Classing Steel Vessels Sections 35.161.2 and 35.161.3; and 46CFR 110.30.

The generators and switchboard shall be tested for the full anticipated load during an emergency condition. This shall include pumps, steering, lighting, rescue davit, and any other expected loads as required by the USCG. The list of items to be loaded on the switchboard shall be pre-approved by the Owner and the USCG before test can begin.

The emergency generators and switchboard shall be tested for the full anticipated load during an emergency condition. This shall include pumps, steering, lighting, rescue davit, and any other expected loads as required by the USCG. The list of items to be loaded on the switchboard shall be pre-approved by the Owner and the USCG before test proceeds.

841.5 Machinery Tests

Each piece of machinery shall be operated for a period sufficient to indicate satisfactory performance and operational acceptability, but not less than two hours. Each piece of machinery shall have its own test page or pages as required to record data with place for date, time, and witnesses to test. Anticipated test results shall be pre-approved by the Owner.

841.6 Electronic Equipment Tests

All other machinery and equipment shall be tested to prove its satisfactory operation and performance to the satisfaction of the Owner and the USCG.

841.7 Alarm System Tests

A pretest of all alarm points shall be conducted to verify alarm point settings and dependability of system. The test shall be conducted by the manufacturer so any adjustments can be made by the manufacturer and noted in the warranty paperwork.

Any adjustments shall be documented and become part of the vessel trial records.

842 Dock and Sea Trials

Dock trials shall include, but not be limited to, Sections 801.5 through 801.8.

A pre-approved agenda shall be used to conduct all dock trials. This document shall be signed by Contractor and by the Owner at the conclusion of each test.

Sea trials shall be conducted to check operation of steering gear and all equipment. The Owner and the USCG shall be present to witness the trials. A minimum of two weeks notice shall be given by the Contractor to all parties involved as to the date(s) and time of the sea trials.

842.1 Main Engines, Generators, and Bow Thruster Engine

Each propulsion engine and generator shall receive a sea trial audit in accordance with manufacturer requirements. Main and auxiliary engines shall be tested using manufacture provided testing equipment as required to provide an accurate PAR test, providing a baseline for future testing of equipment by the Owner.

842.2 Bow Thruster Test

The bow thruster shall be tested with the vessel at the dock. The bow thruster shall be tested in both directions with engine at low, medium, and high RPM ranges.

The thruster will be checked at sea to record the time to rotate the vessel through 90°, 180°, 270°, and 360° of rotation with the engine at low, medium, and high RPM ranges for at least 15 minutes.

842.3 Endurance Test

This trial shall consist of a run of at least four hours, two hours each in opposite directions, during which the following tests shall be conducted:

1. Full speed run for thirty minutes to record vessel speed. This test is to be conducted in both directions.
2. Speed runs at maximum speed, 12 knots, 10 knots, 6 knots, and at idle speed in both directions for a minimum of fifteen minutes each. During this time vibrations shall be recorded.
3. Full ahead for ten minutes to stop and stop to full speed. This test is to be conducted in both directions.
4. Full ahead for 10 minutes to full astern. This test is to be conducted in both directions.
5. The vessel shall be steered hard over ahead and astern. During this time vibrations shall be recorded.
6. The vessel shall be steered hard over to record the turning radius with radar and GPS at four points of the compass.
7. All machinery equipment shall be tested during sea trials with the performance recorded in the test records to be turned over to the Owner.
8. ***The bow thruster unit shall be tested during these trials for a period of not less than 15 minutes.***

842.4 Vibration Analysis

The Contractor shall provide the services of a reputable company experienced in conducting analysis of vibration induced by fluid-structure interaction, structure-machinery interaction, and/or by the propeller. The completed vessel shall be examined to determine extent of vibration at operating conditions and speeds. A detailed report shall be provided to the Owner.

843 Stability Test

After dock trials are completed a stability test, as prescribed by the USCG, shall be conducted by the Contractor. Contractor shall supply weights, crane, or other means of shifting weights, labor as required, and cribbing for weights. Note: A deadweight survey may be conducted if vessel can be considered a sister ship by the USCG MSC, Washington, DC.

856 Instruction Manuals, Drawings, Delivery, and Certificates

856.1 Manuals

Three sets each of the manufacturer's operating and maintenance manuals shall be furnished for all machinery and equipment furnished by the Contractor. Manuals shall contain operating, maintenance instructions, and a list of parts. These manuals, along with the test records, shall be delivered to the Owner prior to the vessel leaving the Contractor's facility. The Owner shall approve all departure documents which shall include all deliverable items at the time of departure.

856.2 Drawings

The Contractor shall provide **as-built** drawings on CD in **AutoCAD format** to the Owner prior to sea trials. The drawings shall include contract plans, as-built plans, a copy of all USCG stamped approved plans in **pdf format** and all other plans noted herein required to construct the vessel including vendor detail drawings, schematics, and bill of materials.

856.3 Launching Ceremonies

In accordance with the Contractor's standard launching policies and procedures to properly launch a vessel of this size and type, the Contractor shall provide all necessary facilities, personnel, bunting, etc. The Owner reserves the privilege to invite up to 20 guests.

856.4 List of Certificates to Be Provided

1. Builder's Certificate
2. Documentation Certificate
3. Admeasurement Certificates (Regulatory and International)
4. Stability Letter with stability data and other stability documents as required (USCG stamped)
5. Radio License
6. Compass Deviation Card
7. Life Raft (IBA) Certificate for (6) 50 person rafts
8. Certificate for CO_2 system installation
9. Local testing lab certificate for potable water tanks
10. Certificate of Financial Responsibility (furnished by Owner)
11. Certificate of Inspection

856.5 Progress Payment Schedule

The payment of event #2 is contingent on USCG approval of drawings prepared by Contractor.

New Ferry Payment Schedule (milestone events)

EVENT	PERCENTAGE
1. Signing of contract	10%
2. Completion of engineering and as built drawings	5%
3. Keel laying (40 tons of steel fabricated and erected)	5%
4. Completion of 50% of hull and house steel	5%
5. Fabrication, erection, and welding of 100% of hull steel	10%
6. Fabrication, erection, and welding of all superstructure	10%
7. Installation of propulsion machinery and elevator	10%
8. Complete installation of all machinery, electrical, and electronics	10%
9. Completion of all joiner below and above main deck	5%
10. Completion of all outfitting and painting	5%
11. Satisfactory completion of sea trials	10%
12. Delivery of vessel to Manns Harbor, NC	10%
13. Five percent to be held for 30 days after delivery to Manns Harbor, NC	5%
Total	100%

857 Final Acceptance of Vessel

The vessel shall be delivered complete to the North Carolina Department of Transportation, Ferry Division, NC State shipyard in Manns Harbor, NC. The Owner shall accept the vessel pending a final inspection on dry dock of the vessel at its shipyard in Manns Harbor, NC. The contractor shall provide for repairs of any and all damage to vessel structure, propellers, rudders, anodes and/or paint due to damage occurred during trip to Owner's facility or during launching at contractors facility.

PROJECT: WBS 38683.3.1 TIP F-4004A

NEW CONSTRUCTION SOUND CLASS PASSENGER/VEHICLE FERRY

INSTRUCTIONS: Contractor shall complete each item below by inserting the appropriate value for each. Lump Sum per vessel shall be equal to the total of individual item cost. Please use pen for completion.

ITEM	*DESCRIPTION*	*COST (Labor & Material)*
1.	Engineering & As-built	_____
2.	Stability	_____
3.	Hull Steel	_____
4.	Superstructure	_____
5.	Bulwarks & Tire Guards	_____
6.	Machinery	_____
7.	Piping	_____
8.	Electrical	_____
9.	Joiner (Passenger Lounge & Crew Quarters)	_____
10.	Elevator	_____
11.	Stairways, Ladders & Handrails	_____
12.	Outfitting	_____
13.	Doors, Windows & Manholes	_____
14.	Shafting	_____
15.	Rudders & Steering	_____
16.	Electronics	_____
17.	Fire, Safety & Rescue Boat	_____
18.	Painting	_____
19.	Names & Tags	_____
20.	Testing & Trials	_____
21.	Delivery	_____
22.	Bonding	_____
23.	Profit	_____

PROJECT: WBS 38683.3.1 TIP F-4004A

NEW CONSTRUCTION PASSENGER/VEHICLE FERRY

***** LUMP SUM BID *****

C202619

Amount to complete plans, construction, testing and delivery of **one (1) passenger/vehicle ferry** in accordance with the plans and specifications.

Lump Sum $_____

*** NOTE ***

All bidders shall specify, in the space provide below, the **physical location of the construction facility**, which will be used for the construction of this project.

This information shall be used by the Board of Transportation when award is made to the Lowest Responsible Bidder. Any substitution of construction site after award of contract shall be approved by the Department. The Contractor shall submit any request for substitution through the Marine Engineer of the Ferry Division, and the request must provide a valid basis or reason for proposed substitution.

FACILITY LOCATION

_____

_____

_____

PROJECT: WBS 38683.3.1, TIP F-4004A

NEW CONSTRUCTION PASSENGER/VEHICLE FERRY

LABOR AND MATERIALS	*PER HOUR COST*
a. Price of Chipper	$_____
b. Price of Shipfitter	$_____
c. Price of Machinist	$_____
d. Price of Carpenter	$_____
e. Price of Electrician	$_____
f. Price of Rigger	$_____
g. Price of Pattern Maker	$_____
h. Price of Pipe Fitter	$_____
i. Price of Welder	$_____
j. Price of Sheet Metal Worker	$_____
k. Price of Painter	$_____
l. Price of Welder Helper	$_____
m. Price of Pipe Fitter Helper	$_____
n. Price of Electrician Helper	$_____
o. Price of General Labor (helper)	$_____
p. Price of Crane Operator	$_____
q. Price of Crane Service (overhead shop crane)	$_____
r. Price of Crane Service (crawler crane)	$_____
s. Price of Metal Prep (sand blasting or shot blast)	$_____
t. Price of Welding (per linear foot /pass)	$_____
u. Price of Galvanizing (hot dip process)	$_____

The price charged as itemized opposite each of the above listed artificers will, except as noted, include the cost of materials and tools such as gas, electricity, heat, compressed air, torches, air hammers, forges, welding equipment, welding iron, and all other materials normally employed by artificers in performing operations under their trades, but will exclude the cost of any other materials actually used by the artificers in these processes. When welding is performed, the required number of passes over one (1) foot of seam shall constitute one (1) linear welded foot. Materials used in work, if purchased from the Contractor, shall be priced at his invoiced cost, plus 15 %.

LISTING OF MBE & WBE SUBCONTRACTORS

Sheet _____ of _____

FIRM NAME AND ADDRESS	MBE OR WBE	ITEM NO.	ITEM DESCRIPTION	(*) AGREED UPON UNIT PRICE	DOLLAR VOLUME OF ITEM

(*) The Dollar Volume shown in this Column shall be Actual Price Agreed Upon by the Prime Contractor and the MBE and/or WBE Subcontractor, and these prices will be used used to determine the percentage of the MBE and/or WBE participation in this Contract.

Dollar Volume of MBE Subcontractor.....$ _____

MBE Percentage of Total Contract Bid Price..... _____%

Dollar Volume of WBE Subcontractor .....$ _____

WBE Percentage of Total Contract Bid Price..... _____%

THIS FORM MUST BE COMPLETED IN ORDER FOR THE BID TO BE CONSIDERED RESPONSIVE AND BE PUBLICLY READ.
BIDDERS WITH NO DBE PARTICIPATION MUST SO INDICATE THIS ON THE FORM BY ENTERING THE WORD OR NUMBER ZERO.

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

CORPORATION

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

_____
Full name of Corporation

_____
Address as Prequalified

Attest _____ By _____

Secretary/Assistant Secretary
Select appropriate title

President/Vice President/Assistant Vice President
Select appropriate title

_____
Print or type Signer's name

_____
Print or type Signer's name

CORPORATE SEAL

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the

_____ day of _____ 20__.

NOTARY SEAL

_____
Signature of Notary Public

of _____County

State of _____

My Commission Expires:_____

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

PARTNERSHIP

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

_____
Full Name of Partnership

_____
Address as Prequalified

_____ By _____
Signature of Witness Signature of Partner

_____ _____
Print or type Signer's name Print or type Signer's name

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the **NOTARY SEAL**

_____ day of _____ 20__.

_____
Signature of Notary Public

of _____County

State of _____

My Commission Expires:_____

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

LIMITED LIABILITY COMPANY

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

_____
Full Name of Firm

_____
Address as Prequalified

_____ Signature of Manager _____
Signature of Witness Individually

_____ _____
Print or type Signer's name Print or type Signer's Name

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the **NOTARY SEAL**

_____ day of _____ 20__.

_____
Signature of Notary Public

of _____County

State of _____

My Commission Expires:_____

Contract No. C202619 Rev. 7-12-10

County : Hyde

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION
JOINT VENTURE (2) or (3)

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

Instructions: **2 Joint Venturers** Fill in lines (1), (2) and (3) and execute. **3 Joint Venturers** Fill in lines (1), (2), (3) and (4) and execute. On Line (1), fill in the name of the Joint Venture Company. On Line (2), fill in the name of one of the joint venturers and execute below in the appropriate manner. On Line (3), print or type the name of the other joint venturer and execute below in the appropriate manner. On Line (4), fill in the name of the third joint venturer, if applicable and execute below in the appropriate manner.

(1) _____
Name of Joint Venture

(2) _____
Name of Contractor

_____
Address as Prequalified

_____ By _____
Signature of Witness or Attest — Signature of Contractor

_____ _____
Print or type Signer's name — Print or type Signer's name

If Corporation, affix Corporate Seal and

(3) _____
Name of Contractor

_____
Address as Prequalified

_____ By _____
Signature of Witness or Attest — Signature of Contractor

_____ _____
Print or type Signer's name — Print or type Signer's name

If Corporation, affix Corporate Seal and

(4) _____
Name of Contractor *(for 3 Joint Venture only)*

_____
Address as Prequalified

_____ By _____
Signature of Witness or Attest — Signature of Contractor

_____ _____
Print or type Signer's name — Print or type Signer's name

If Corporation, affix Corporate Seal

NOTARY SEAL
Affidavit must be notarized for Line (2)
Subscribed and sworn to before me this
_____day of_____ 20___

_____
Signature of Notary Public
of _____County
State of _____
My Commission Expires:_____

NOTARY SEAL
Affidavit must be notarized for Line (3)
Subscribed and sworn to before me this
_____day of_____ 20___

_____
Signature of Notary Public
of _____County
State of _____
My Commission Expires:_____

NOTARY SEAL
Affidavit must be notarized for Line (4)
Subscribed and sworn to before me this
____day of_____ 20____

_____
Signature of Notary Public
of _____County
State of _____
My Commission Expires:_____

Contract No. C202619 Rev. 7-12-10

County : Hyde

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

INDIVIDUAL DOING BUSINESS UNDER A FIRM NAME

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

Name of Contractor _____
Individual name

Trading and doing business as _____
Full name of Firm

_____
Address as Prequalified

_____ _____
Signature of Witness Signature of Contractor, Individually

_____ _____
Print or type Signer's name Print or type Signer's name

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the **NOTARY SEAL**

_____ day of _____ 20__.

_____
Signature of Notary Public

of _____County

State of _____

My Commission Expires:_____

EXECUTION OF BID

NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

INDIVIDUAL DOING BUSINESS IN HIS OWN NAME

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

Name of Contractor _____

Print or type Individual name

_____

Address as Prequalified

_____

Signature of Contractor, Individually

_____

Print or type Signer's Name

_____

Signature of Witness

_____

Print or type Signer's name

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the

NOTARY SEAL

_____ day of _____ 20__.

_____

Signature of Notary Public

of _____ County

State of _____

My Commission Expires: _____

DEBARMENT CERTIFICATION

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation filed with the Department, or has become erroneous because of changed circumstances.

2. The terms *covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal,* and *voluntarily excluded,* as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.

3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.

4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal-Aid Provision titled *Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR* 1273) provided by the Department, without subsequent modification, in all lower tier covered transactions.

5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.

6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this provision. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and

d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion affidavit and debarment certification will result in the prequalified bidder's bid being considered non-responsive.

☐ Check here if an explanation is attached to this certification.

Contract No: C202619

County: Hyde

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

_____
State Contract Officer

_____
Date

Execution of Contract and Bonds
Approved as to Form:

_____
Attorney General