

# 275 Passenger Flagship ZEST Vessel Procurement

RFP 2509

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## Part B - Vessel Technical Specifications

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Revision 1



aurora  
marine  
design

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## 000 GENERAL REQUIREMENTS

### 020 PURPOSE

As part of its **Zero Emissions Sustainable Transportation (ZEST)** program, Flagship Cruises and Events, the "OWNER", is seeking procurement of two (2) passenger-only Zero Emissions Sustainable Transportation (ZEST) ferry "Vessels". The Vessels are intended for operation on existing routes in San Diego Bay. The terms "Vessel" and "Vessels" are used interchangeably throughout these Technical Specifications in both upper and lower case. The Technical Specification applies equally to all Vessels procured under the Agreement.

### 030 OVERVIEW

The OWNER requires a turnkey Vessel fully complete in every regard, built in compliance with applicable regulatory requirements, inspected and documented by the U.S. Coast Guard and ready for passenger service.

The Vessel must be a passenger-only 46 CFR Subchapter K catamaran, designed and constructed for efficient and reliable ferry service on existing routes between downtown San Diego and Coronado Island. The vessel is intended to serve the routes outlined in Section 061.

In general, the OWNER is seeking a Vessel with an overall emphasis on functional utility, high quality construction detailing, passenger comfort, ease of maintenance, ease of repair and longevity. High technology systems and equipment containing levels of control and automation that exceed regulatory requirements are neither required nor desired. The Vessel will contain the simplest, well-proven, and robust machinery, equipment, and control systems possible.

### 031 MAJOR PARTICIPANT ROLES & PROJECT FRAMEWORK

Recognizing the planning challenges associated with the simultaneous development of 100% battery electric vessels and compatible shoreside charging infrastructure, the OWNER has elected to complete significant design, engineering and planning work prior to the issuance of this RFP.

The OWNER has engaged the services of a Naval Architect, Aurora Marine Design, the "DESIGNER", to develop a contract level vessel design package that captures the OWNER's requirements and ensures compatibility with the shoreside infrastructure. This contract design package comprises this Technical Specification as well as the Contract Design drawings, reports and 3D CAD model provided in the Part B Appendices. The Contract Design is intended to provide the bidder, the "CONTR", with a sufficient level of detail to develop an accurate cost proposal to construct and deliver the Vessels.

After contract award, the DESIGNER will work with the selected CONTR to complete a Production Engineering package tailored to the CONTR's build strategy, methodology and preferences, while ensuring the OWNER's requirements and critical interfaces are maintained. The cost of the DESIGNER's Production Engineering work will be borne by the OWNER.

Upon completion of Production Engineering, the CONTR will be responsible for developing their manufacturing solutions and details consistent with the Technical Specifications and other requirements of the contract, including but not limited to, build strategy, shop drawings, and the identification, provision, and installation of all necessary materials and obtaining all regulatory approvals and certifications. The CONTR must utilize proven marine technology. This will be known as the Manufacturing Engineering phase

The transition from Contract Design to Production Engineering, and Manufacturing Engineering, and the roles of each party, are further detailed in Section 810.

Following approval and acceptance of the Production Engineering Phase, the CONTR will be responsible for constructing the vessel per the drawings and delivering it within the Weight and Centers of Gravity requirements that will be finalized and agreed on by all parties at the conclusion of the Production Engineering.

The DESIGNER will continue to assist the OWNER with Construction management and oversight during the construction, delivery and commissioning of the vessels.

#### **040 OWNER'S REQUIREMENTS vs. OWNER'S PREFERENCES**

The purpose of the OWNER's Requirements and Preferences is to convey to the CONTR what features and attributes the OWNER seeks in the new Vessel and the CONTR's responsibility to provide those features. Where no particular preference is stated, the CONTR should offer its best standard equipment and installation when considering regulatory requirements, good marine practice, past experience and quality.

#### **041 OWNER'S REQUIREMENTS**

Certain performance requirements and technical aspects of the design are considered critical and absolute. These will be referred to as the **OWNER'S REQUIREMENTS**. These requirements are of the highest priority to the OWNER and must be met to the fullest extent possible, without compromise. For the purpose of this document, OWNER's Requirements are generally preceded by the word "must". The OWNER's Requirements for critical machinery have been incorporated in the Contract Design Package.

#### **042 OWNER'S PREFERENCES / OPTIONAL ITEMS**

Certain features are desirable in a new vessel to maintain commonality across the vessels in the OWNER's fleet and/or improve the passenger experience. These features, equipment and configurations are referred to as the **OWNER'S PREFERENCES**. While not absolute requirements, The CONTR should incorporate these preferences, to the greatest extent possible, into the execution of the contract. Understanding the budget may not support all OWNER Preferences, the following Owner preferred features must be priced separately as OPTIONS as further defined in each SWBS section.

A	SWBS 240.5	Hydromaster Joystick Controls
B	SWBS 311	AC Backup Genset
C	SWBS 625.1	Bow Curtain Windows
D	SWBS 631.2	Paint – Hull Above Waterline
E	SWBS 631.3	Paint – Superstructure

#### **050 MISSION**

The Vessels will be operated as a commuter ferries that will serve a varied clientele including local residents and tourists. The primary mission of the Vessels is to provide safe, efficient, reliable and comfortable Zero Emission transportation.

#### **060 OPERATIONAL REQUIREMENTS**

The Vessels will operate in the inner harbor of San Diego Bay between the OWNER's existing ferry terminals shown in Section 061. The intended routes are characterized as short duration slow-speed trips. Highly variable passenger counts and passenger types present significant operational challenges, which are further described in Sections 061 through 063.

**061 ROUTES**

Flagship operates regular ferry service between existing terminals throughout San Diego Bay. The general location of the existing terminals (shown in dark blue) is provided for reference in Figure 061-1.

Inner harbor operations present significant operational and reliability challenges due to a high operating tempo, multiple maneuvering and docking evolutions, short duration transit speed segments and intermittent low speed segments due to traffic.

**Figure 061-1 Flagship Ferry System Terminals**



Table 061-2 150 PAX Vessel Terminals			
	Terminal	Abbreviation	Location
1	Broadway Pier	BP	Broadway Embarcadero - Flagship Cruises & Events, San Diego
2	Coronado Ferry Landing	CFL	Coronado Ferry Landing, Coronado Island
3	Convention Center	CC	Fifth Avenue Landing, San Diego

**062 LOAD PROFILES**

The inner harbor routes served by the Vessel are described below:

- Route A – Broadway Pier to Coronado Ferry Landing
- Route B – Convention Center to Coronado Ferry Landing

The vessels will be identical in every respect with the ability to be employed on either route at any time. The required operational profiles can be very demanding on the propulsion equipment and structure with the vessels operating approximately 5,000 hours/year with a high number of docking evolutions and constantly evolving maneuvering constraints in a busy marina.

A detailed powering and energy analysis of each of these routes has been performed by the DESIGNER and is included for reference in Appendix B1. This analysis includes the distance of each route segment, applicable operational speed restrictions, charging power availability at each dock, and total roundtrip time thresholds.

The vessels also operate different operational profiles on the same route. These “route profiles” are defined in Table 062-1. The route profiles are generally:

- A more relaxed Standard schedule tailored to tourists and general passenger transit
- A more aggressive Commuter schedule that requires a faster turnarounds and speeds

Table 062-1 - Transit Speeds and Times at Dock					
Route	Route Profile	Transit Speed to Coronado	Time Docked in Coronado	Transit Speed to Destination	Time Docked at Destination
		(kt)	(min)	(kt)	(min)
Route A - Broadway	<b>Commuter</b>	12	6	12	14
Route A - Broadway	<b>Standard</b>	7	15	7	15
Route B - Convention Ctr	<b>Standard</b>	8	7	12	9

The Operating Schedules and associated route profiles for each of the routes are shown in Tables 062-2 and 062-3 below

Table 062-2 – Route A Schedule			
Broadway - Coronado Departure Times			
Route Profile	Frequency	Depart Broadway	Depart Coronado

Commuter	Mon-Fri	4:50 AM	5:05 AM
Commuter	Mon-Fri	5:30 AM	5:45 AM
Commuter	Mon-Fri	6:10 AM	6:25 AM
Commuter	Mon-Fri	6:50 AM	7:05 AM
Commuter	Mon-Fri	7:30 AM	7:45 AM
Commuter	Mon-Fri	8:10 AM	8:25 AM
Standard	Daily	9:00 AM	9:30 AM
Standard	Daily	10:00 AM	10:30 AM
Standard	Daily	11:00 AM	11:30 AM
Standard	Daily	12:00 PM	12:30 PM
Standard	Daily	1:00 PM	1:30 PM
Standard	Daily	2:00 PM	2:30 PM
Standard	Daily	3:00 PM	3:30 PM
Standard	Daily	4:00 PM	4:30 PM
Standard	Daily	5:00 PM	5:30 PM
Standard	Daily	6:00 PM	6:30 PM
Standard	Daily	7:00 PM	7:30 PM
Standard	Daily	8:00 PM	8:30 PM
Standard	Daily	9:00 PM	9:30 PM
Standard	Fri/Sat	10:00 PM	10:30 PM

Table 062-3 – Route B Schedule			
Broadway - Coronado Departure Times			
Route Profile	Frequency	Depart Coronado	Depart Convention Center

Standard	Daily	9:10 AM	9:25 AM
Standard	Daily	9:40 AM	9:55 AM
Standard	Daily	10:10 AM	10:25 AM
Standard	Daily	10:40 AM	10:55 AM
Standard	Daily	11:10 AM	11:25 AM
Standard	Daily	11:40 AM	11:55 AM
Standard	Daily	12:10 PM	12:25 PM
Standard	Daily	12:40 PM	12:55 PM
Standard	Daily	1:10 PM	1:25 PM
Standard	Daily	1:40 PM	1:55 PM
Standard	Daily	2:10 PM	2:25 PM
Standard	Daily	2:40 PM	2:55 PM
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Standard	Daily	7:40 PM	7:55 PM
Standard	Daily	8:10 PM	8:25 PM
Standard	Daily	8:40 PM	8:55 PM
Standard	Daily	9:10 PM	9:25 PM
Standard	Daily	9:40 PM	9:55 PM
Standard	Fri/Sat	10:10 PM	10:25 PM
Standard	Fri/Sat	10:40 PM	10:55 PM

The required design service life of the Vessel is twenty-five (25) years or approximately 125,000 operating hours.

**063 LOADING FACILITIES FOR PASSENGERS**

ADA requirements must be met by the CONTR in accordance with the ADA Guidelines of Section 092.

Safety treads or non-skid material must be installed on the traffic areas of all boarding areas, see Section 634.

The CONTR must ensure that the Vessel being offered is compatible with existing and planned terminal facilities. The Vessel must be equipped with port and starboard aft embarkation stations that are located per the drawings in Appendix B1. The final Boarding Plan must be approved by the OWNER before the start of construction.

**064 START UP & SHUTDOWN**

All systems will be set up with efficiency in mind so that a single trained operator can start up or secure the Vessel in no more than fifteen (15) minutes including safety walkthrough, system alignment, propulsion system checks, controls and navigation, and auxiliary systems. The CONTR will demonstrate both a system start up and shutdown in the presence of the owner for final sign off. A system start-up checklist will be developed and provided by the CONTR.

**070 ENVIRONMENTAL CONDITIONS**

The CONTR must provide a Vessel suitable for operation in the weather and sea conditions regularly found in the San Diego Bay region of California.

The Vessel must be able to meet all contract obligations for route turnaround time, seakeeping, and maneuverability under the following environmental conditions:

- Significant wave height: 5 feet
- Wind velocity: 10 knots with gusts to 30 knots
- Minimum ambient air temperature: 30°F
- Maximum ambient air temperature: 105°F
- Minimum ambient sea water temperature: 55°F
- Maximum ambient sea water temperature: 80°F

**080 VESSEL REQUIREMENTS**

The key performance requirements and characteristics for the Vessel are described in Sections 081 through 089.

The Contract Design package provided in Appendix B1 describes the vessel in detail and includes renderings, a 3D CAD model, lines plan, detailed weight estimate, structural calculations (to DNV), structural drawings, electrical drawings, machinery drawings, and systems drawings.

**081 PRINCIPAL CHARACTERISTICS**

Principal characteristics for the Vessel are outlined below:

Table 081-1 – Principal Operating Characteristics		
Characteristic	Threshold	SWBS #
Hull Form	Catamaran	-
Hull & Superstructure Materials	Aluminum	101 & 151
Regulatory Tonnage	Less than 100 GRT	091
Classification	Structure designed & built to class rules, vessel will not be subject to classification	091
Regulatory	United States Coast Guard – Subchapter K	091
Length (molded hull)	90'-7"	-
Beam (molded)	27'-11"	-
Maximum Draft (including appendages) <sup>1</sup>	5'-11"	-
Freeboard <sup>1</sup>	4'-11"	064
Enclosed Decks	1	601
Main Propulsion	Battery driven all electric propulsion	Group 200 & 300
Energy Storage System	292 kWh LTO	223
Propulsors	2 × 300 kW L-drive thrusters	247
Service Speed – Standard Transit <sup>2</sup>	7 knots	082
Service Speed – Commute <sup>2</sup>	12 Knots	082
Max Speed <sup>2</sup>	15 Knots	082
Passengers	275	084
Interior Seats	86	084
Exterior Seats	132	084
Crew	3	085
Bicycle Capacity	36	672

1. In the Fully Loaded (Departure) Condition.
2. Measured in the Trials Loading Condition

**082 SPEED**

The Vessel must operate efficiently at several speeds as described in Section 062. The service speeds are identified in Table 081-1. These service speeds must be attained while the Vessel is in the Trial Condition described in Section 841.1.

**083 APPEARANCE**

The Vessel will be a modern, simply styled vessel that enhances the overall passenger experience and public perception of the service. A primary focus for this vessel is providing an elevated passenger experience by maximizing the views of the city, accessible through a range of indoor and outdoor seating options.

**084 PAYLOAD/CAPACITIES**

The Vessel will have both interior and exterior seating capacities in accordance with Table 081-1. The vessels rarely operate at rated capacity and routinely operate at or below 50% capacity. Seating capacity has been designed with this in mind to offer a variety of seating options with ample flex space as defined in Section 645.

**085 CREW**

A USCG approved vessel arrangement that allows for minimal required crew is desirable. The CONTR will work with the DESIGNER and OWNER to approve, deliver, and certify a vessel that operates with no more than three (3) crew:

- One (1) licensed master
- One (1) senior deckhand
- One (1) deckhand

**086 SEAKEEPING & MANEUVERING**

The Vessel will operate in a busy, highly trafficked inner harbor and is therefore subject to highly variable sea conditions, primarily due to vessel wakes and wind. The vessel has been designed to minimize undesirable motions and characteristics such as wet deck slamming, bow diving, bow steering, lateral instability or excessive vertical accelerations.

The Vessel must accomplish a high number of complex maneuvering events each day as efficiently as possible. The propulsion system has been selected to provide the highest level of control and efficient thrust for rapid, safe and controlled docking in all weather and current conditions. The CONTR must work with the propulsion vendor(s) to maximize the efficient control and operation of the propulsion system during the commissioning and setup of the vessel. The goal is to minimize the energy consumed on each trip to the greatest extent possible.

**087 MAINTAINABILITY**

The CONTR will develop a comprehensive Preventative Maintenance program to include all Vessel equipment and systems which will enable the OWNER's staff to handle the routine maintenance of the Vessel. The Preventative Maintenance program must be provided in a searchable, electronic format and address not only the OEM equipment, but most importantly the operational considerations of the custom system installations that are unique to this Vessel.

The CONTR must ensure all daily service and inspection items are provided with clear and unobstructed access.

All equipment and machinery will be mounted so that it is accessible for all necessary maintenance and inspection and so that components are removable for replacement with a minimum amount of interference. This includes keeping the overhead, propulsion equipment, and other maintenance intensive areas in way of equipment free of pipe or cable runs. The CONTR will provide lifting padeyes and rails for equipment removal to the OWNER's satisfaction. All soft patch hatches for equipment removal will be designated and maintained as "Interference Free Zones." The transit path for equipment and machinery to and from these hatches will also remain interference free. Special attention will be paid to providing the most economical and efficient means possible to remove equipment.

The CONTR must make every effort to ensure the main propulsion equipment is located for the best possible maintenance access. The CONTR must install the structure, propulsion drive train, electrical wireways, electrical equipment, piping and insulation such that the maximum possible clearance is achieved for maintenance and access to the propulsion equipment.

The Vessel must be configured to allow the complete removal and replacement of batteries, electric motors, propulsors, and switchgear within a forty-eight (48) hour period. All equipment removal strategies must provide for equipment removal while Vessel is waterborne. Hatches must be sized for the transit of all electrical propulsion system components.

All access will be through bolted access plates, hatches or similar openings. CONTR will ensure minimum clearances factored in for maintenance and repair of all equipment as per OEM recommendations with minimal intrusion into passenger spaces.

## 088 NOISE & VIBRATION

Noise and vibration criteria apply to calm water operation of the Vessel in Trial Condition from light load through full load with the propulsion prime movers operating through all power levels (minimum to maximum), with concurrent operation of all normally operating support systems (such as heating and ventilation).

The OWNER will employ a third-party firm or firms specializing in marine acoustics, vibration analysis and sound measurements aboard marine vessels during builder's trials to take measurements in all areas defined by the criteria below.

### 088.1 Noise Criteria

Acoustic insulation will be installed as required to meet the noise criteria. CONTR will not exceed the following sound pressure level standards in the proposed locations\*.

NOISE LEVEL <sup>1</sup>		dB (A)	
DECK	ZONE	REQUIREMENT	PREFERENCE <sup>3</sup>
PILOTHOUSE	Pilothouse	65	55
2 <sup>nd</sup> DECK	Forward interior	72	60
	Aft interior	72	60
	Aft exterior <sup>2</sup>	80	70
MAIN DECK	Forward interior	70	60
	Aft interior	75	65
	Aft exterior <sup>2</sup>	85	75

\*CONTR will provide a location drawing to be reviewed and approved to the OWNER during the design and engineering phase.

#### NOTES:

1. Underway conditions – through the vessel speed range, full HVAC at normal settings, supply/exhaust fans on. Dockside conditions – propulsion secured, full HVAC at normal settings, supply/exhaust fans on.
2. Aft Exterior dB (A) readings – taken in areas where apparent wind is less than 10 knots.
3. These values shall be an average of multiple meter readings in each of the spaces (with the microphone no closer than 1 meter to a hard surface).

Sound damping coatings to propulsor spaces and resiliently mounting piping have proven effective at reducing sound.

### 088.2 Vibration Criteria

CONTR must not exceed the following overall frequency weighted RMS value standards:

Vibration Limits in mm/sec peak for single frequency components (1 Hz bandwidth) between 5 and 100 Hz		
	U/W @ 10 kts	U/W @ Service Speed
Interior Passenger Spaces	1.5	2.5
Exterior Decks	1.5	3.0

Vibration Limits in mm/sec <sup>2</sup> peak for single frequency components (1 Hz bandwidth) between 2 and 5 Hz		
	U/W @ 10 kts	U/W @ Service Speed
Interior Passenger Spaces	75	100
Exterior Decks	75	100

Under all service conditions, the entire propulsion system shall be free of harmful vibrations throughout the entire operating range. Harmful vibration is defined as vibration capable of damaging primary or connected ancillary equipment and as specified by the equipment manufacturers. The OWNER shall enlist a third-party firm to measure and report vibration utilizing ISO 20283-2:2008 Code for the measurement and reporting of shipboard vibration data.

Harmful vibrations in any part of the system shall be corrected by the CONTR at no cost to the OWNER.

## 089 EMISSIONS

The Vessel must meet all the emissions requirements of Flagship's Zero Emissions Sustainability Transportation (ZEST) program; vessel as defined by the State of California Air Resources Board (CARB).

## 090 VESSEL REGULATORY REQUIREMENTS

The vessel must be designed and constructed in accordance with the regulatory requirements summarized in Sections 091 and 092 and invoked throughout this specification. This specification also contains additional requirements that augment and/or exceed those of the regulatory agencies. In no case must the requirements of this Technical Specification supersede or compromise the regulatory requirements.

## 091 REGULATORY

The Vessel will be designed and built to DNV class rules, but not classed. The vessel must be inspected and certificated by the United States Coast Guard (USCG) according to 46 CFR, Subchapter K for small passenger vessels (less than 100 gross regulatory tons). The vessel must meet all regulatory requirements to attain a lakes, bays, and sounds route upon the waters of San Diego Bay.

The CONTR must obtain and furnish all certificates, licenses, documents, and letters of compliance as may be required and/or issued by the USCG, and other regulatory bodies as required for this class of vessel, route and service.

All certificates and letters of compliance required and/or issued by the regulatory bodies that are required to be displayed must be mounted on the Vessel behind framed clear Plexiglas at locations consistent with such requirements or, if no such requirements are stated, at locations specified by the OWNER.

For any and all cases in which applicable regulatory language states or implies that the OWNER must provide or perform a task, it must be understood that, as part of this contract, such items and tasks must be provided/performed by the CONTR on behalf of OWNER.

The USCG requirements invoked have precedence over other regulatory requirements, and this Technical Specification, where conflict exists. Where rule interpretations vary between USCG districts, the CONTR must ensure that the Vessel certificates must be valid in San Diego Bay.

Other regulatory requirements invoked in this specification are as follows:

- Rules of the applicable Classification Society (DNV-GI)
- Federal Communications Commission (FCC) Rules for Radio Transmitters
- Institute of Electrical and Electronic Engineers (IEEE) Publication No. 45
- Occupational Safety and Health Administration (OSHA)
- U.S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB)
- U.S. Public Health Service (USPHS)
- County health regulations applicable to San Diego Counties
- Americans with Disabilities Act (ADA) Passenger Vessel Accessibility Guidelines and Supplementary Information. Americans with Disabilities Act (ADA) PL101-336 as further described in Section 092
- All regulatory requirements as detailed in Appendices to Part B – Technical Specifications

## **092 ACCOMMODATIONS FOR PASSENGERS WITH DISABILITIES**

The CONTR must make all accommodations and outfit the vessel in compliance with the requirements of the Agreement section on accessibility of vessels for person with disabilities. The goal of this section is to ensure the vessel is 100% compliant with ADA regulations as outlined in the Agreement, Part C Section 30 of this RFP.

In addition to the standard passenger seating, the vessel will have the following provisions:

- Two (2) designated interior wheelchair spaces on the accessible deck with companion seating .
- Three (3) exterior wheelchair spaces with companion seating.

## 100 STRUCTURE

The CONTR must supply all necessary labor, material, skills, and equipment required to complete and test the construction of the vessel.

Anything inadvertently omitted from the plans and specifications deemed necessary and usual to a complete vessel, must be supplied as a part of this Contract. Materials used and the workmanship thereon must be of the best description and quality throughout and of adequate sizes to accomplish the purpose intended. The work, in every respect, must be carried out under the supervision and to the complete satisfaction of the OWNER and its Representatives in accordance with good marine practice. Defects appearing at any stage of the work must be cause for rejection even though the piece in question may have previously been passed as satisfactory.

The structure must be fair and within the new construction tolerances of the selected Classification Society.

## 101 STRUCTURAL MATERIALS

Section 830 of this specification contains the principal requirements for materials used in construction of the vessel. Aluminum alloys used in the Vessel must be as per Table 101-1 unless otherwise noted.

Table 101-1 Structural Aluminum Material Schedule	
Components	Materials
Plate $\geq \frac{1}{8}$ "	ASTM B928 5083, 5086, 5383, 5059, 5456-H116 or H321
Plate $< \frac{1}{8}$ "	ASTM B928 5083, 5086, 5456-H116 or H321, or 5052 of SAE AMS-QQ-A-250/8
Extrusions	ASTM B221 6061-T6, 6082-T6, 5086, 5083, 5456-H111 or H112

Non-structural items of trim and outfit such as window and doorframes, castings, and hardware items may be alloy 6063 or alloy 6061 of ASTM B221, or alloy 356.1, 356.2 or A356.2 of ASTM B179. Alloy 6061-T6 of ASTM B241 may be used for pipes as structural components. If so used, allowable stresses will be analyzed by the DESIGNER based on the zero temper condition.

Brasses and bronzes must be mixtures of virgin material of proper proportion for the purpose intended and must be clean, smooth castings, uniform in texture and finish. Galvanizing must be done by the "hot dip" process. Electro-galvanizing will not be accepted. Unwelded fasteners, pipe, tube, sheet metal, or plates and shapes of stainless steel will be grade SS 316. Where stainless steel is welded, grade SS 316L must be used unless otherwise specified. In areas of extreme corrosion, the use of duplex stainless steel grade SAF 2205 or SAF 2507 must be used. If the CONTR proposes the use of any specialty materials (inconel, duplex stainless steel, titanium, et cetera) they must obtain approval in writing from the OWNER for the application and welding procedures.

## 102 WELDING AND FITTING

All welding must conform to the requirements of the USCG, DNV, and the special requirements of this specification. In addition, all welding must be performed by USCG and/or classification society certified aluminum welders with current certification. Welder qualification certificates must be provided to the OWNER prior to a welder performing welding on the Vessel.

Special attention must be provided to joint design and welding procedures in high stress areas in recognition of the high life cycle service which this Vessel will experience.

All lap welds and fillet welds must be continuous with ends wrapped around snipes, edges, limber holes, et cetera. All crater cracks must be repaired in process.

Intermittent welding is permitted where, and only where, allowed by USCG and classification society rules. Special attention must be paid to the length of both the weld and the interval, and the uniformity of the weld.

All welds in the Propulsor Rooms shall be double continuous throughout the space with the exception of the overhead deck, intermittent welding is permitted where, and only where, allowed by USCG.

The CONTR must submit a plan for the non-destructive testing of structural welds. The plan must designate the inspection plan, the acceptance criteria, and the resolution plan if defective welds are discovered. The CONTR must provide the plan to the OWNER for review at least thirty (30) days prior to start of welding.

The CONTR must provide a written welding procedure for the isolation and protection of sensitive equipment when welding occurs onboard.

## **111 HULL STRUCTURE**

All hull structure must meet USCG requirements and conform to the classification society rules of the CONTR's choice as listed below. The Vessel will not be classed. See Section 101 regarding the use of hull materials other than aluminum.

Det Norske Veritas (DNV) has been used for structural design and construction. Combinations of regulatory rules from separate classification societies is not acceptable; the vessel hull structure must be designed to one set of rules in their entirety, and the design must be approved by the USCG.

All overboard discharges and local structural reinforcement must be constructed using insert plates. Doubler plates will not be allowed unless specifically approved by the OWNER.

A high level of structural detailing must be used throughout the Vessel. Structural connections have been integrated into the framing design wherever possible to avoid brackets. Lap jointed brackets and stiffeners must not be used unless required by class or approved by the OWNER. Stiffener end terminations must be softened and/or well integrated.

The rub rail must be robust and designed for the high number of daily landings associated with the intended routes. Attention must be given to the rub rail fabrication and installation to facilitate the future replacement of damaged sections.

All framing must provide for proper limbering in all sections to allow the flow of water to the appropriate bilge suction lines. All limbering holes must be large enough to not be clogged by small bilge debris. The CONTR must work with the DESIGNER during Production Engineering to ensure appropriate limber holes are integrated in the production design

All structure IWO of the propulsors must be accessible for maintenance. Side framing IWO of the tight sides of the equipment or machinery must be minimized to provide the best clearance possible. All such structural considerations for maintenance access must not compromise the structural design of the vessel or the standards to which the other elements in the vessel are designed to.

**126 TANKS**

The CONTR must provide tankage in accordance with Table 126-1.

<b>Table 126-1 – Vessel Tankage</b>		
<b>QTY</b>	<b>Service</b>	<b>Capacity</b>
1	Potable and Fresh Water Storage	200 gallons
1	Sewage Holding	200 gallons
2	Expansion & Fill Tanks for Equipment Cooling Systems See Section 255	5 gallons
2	Propulsion Drive Seal Head Tank Hydromaster provided	2.6 gallons

All tanks must meet USCG and the selected classification society's structural requirements. Potable water, fresh water, and sewage tanks and associated systems must comply with United States Public Health Service (USPHS) requirements. All tanks under pressure must comply with the ASME Boiler Code.

Potable water and sewage tanks must be coated with an approved coating system applicable to the fluid being stored. Tanks will be fabricated from rolled or chip broken aluminum plate, frames and stiffeners. Coating system must be designed for the 25 year life of the vessel and approved by OWNER.

All tanks must be independent of the hull shell and must have sufficient space between the tank and shell structure for inspection and maintenance of the shell and the tanks. All tanks must be supported on foundations to support the tanks under all load conditions. All tanks must have bolted access openings for inspection, cleaning, maintenance, and repair.

If the CONTR proposes the use of plastic tanks in any locations it must ensure the fire load in that space meets USCG requires for fire load in a void space without SFP.

Tanks must have fills, vents, and sounding provisions in accordance with Section 506. Fills and vents must be clearly labeled as to their service.

**151 SUPERSTRUCTURE**

The enclosed passenger deck areas shall be constructed as outlined in Appendix B1. It shall be well insulated from exterior weather, noise, and odors of the machinery plant.

**163 SEACHESTS**

The CONTR must provide an independent seachest per demi-hull that is suitably arranged for maintenance, repair, and coating of the seachest and the connecting pipes. The seachests are located in the thruster rooms. The seachests must be sized to meet all regulatory requirements and to allow the fire pumps to operate at rated volume simultaneously with all other seawater services. The final design and arrangement of the seachests must be determined in the Production Engineering and Design phase.

Piping connections and flanges connected to the seachests must be of AL 5086. All sea valves must be flanged and isolated from dissimilar metals with flange isolation kits.

Seawater inlets must be covered with a bolted strainer plate, faired with the exterior of the hull. The strainer plate must be attached to the seachest with 316 stainless steel fasteners. Seachest material must match the hull.

The seachests must be fitted with large zinc anodes for cathodic protection. The anodes must be ZHC-42 or equivalent. The anodes must be mounted as per the requirements of Section 633.

The seachests must be installed such that there are no pockets that can accumulate marine growth and debris. They must also be designed such that coating systems and repair of the coating systems can be completed easily by shipyard workers during drydockings.

Each seachest must be fabricated with a valved vent line that terminates overboard above the main deck. Each seachest must have a valved quick-disconnect air hose connection for clearing debris with a portable air compressor. The vent valves must be flanged; no direct threaded fittings in the sea chest piping are allowed.

### **167 HULL DOORS, HATCHES, & MANHOLES**

Weathertight doors must be aluminum quick acting. Exterior joiner doors must be gasketed, of hollow aluminum construction, thermal insulated, meeting USCG requirements for structural fire protection where applicable. Exterior doors into the passenger cabin must be of sturdy construction, as manufactured by Fabtek or OWNER approved equal, and of the hinged type. Following Sea Trials and prior to Delivery, all doors must be tested for proper closure and tightness and deficiencies must be corrected. The OWNER must approve the door schedule prior to ordering any doors.

Doors and hatches in passenger areas must meet the ADA requirements of Section 092 and incorporate fairings or be installed flush to eliminate all tripping hazards. All doors must have closers and hold open latches, using marine grade materials.

Provide secondary means of escape from all equipment, machinery, and other compartments as required by USCG. The hatches must be hinged and manufactured by FREEMAN MARINE EQUIPMENT. Minimum deck hatch dimensions must be oval 19" x 26" at a minimum but 24" square should be used as outlined in Appendix B1. The final arrangement, ingress and egress details will be finalized in the Production engineering and design phase. Handholds and latches must be provided to ease personnel ingress and egress from all deck hatches.

Hatches must hinge towards bulkheads, trunks, stanchions, or similar structures to provide for positive hold open via latches; and for installation of handholds. Install handholds on the underside of hatches or on the latch mechanism to aid personnel in transiting the hatch. Under no circumstances will hatches be allowed to hinge open 180° to the deck. Handholds must allow for ease of the transition from standing at the hatch, to entering the hatch, and to moving onto the ladder and down into the space.

Doors and hatches that are required to be closed at sea must be so marked.

Hatches must meet structural fire protection regulatory requirements.

### **171 MASTS**

A main mast must be installed as required for proper positioning of antennas and navigation lights, see the various Group 400 sections for more information. Platforms for antennas and lights must be installed as required. Ladder rungs or equal access arrangements must be fitted as required for personnel access to perform maintenance, repairs, and inspections on the mast and components installed thereon. Mast design and positioning will be defined during the Production Design and Engineering phase.

## 200 MAIN PROPULSION

The Vessel's powertrain was designed and developed to be 100% battery electric. The following manufacturers provide the propulsion system components that must be installed by the CONTR:

1. McKay must be contracted to develop the system control and user interface, including but not limited to:
  - Energy and Power Management System (EPMS)
  - Cabling and sizing
2. Danfoss must be the primary powertrain provider, including but not limited to:
  - DC-link cabinets designed with a 750VDC bus
  - Permanent magnet, synchronous motors for propulsion
  - Power conversion equipment (inverters, converters, transformers, etc.)
3. Echandia Marine US, LLC must be the provider of the battery energy storage system (BESS), including but not limited to:
  - 292 kWh lithium-titanium-oxide (LTO) BESS
  - Battery management systems (BMS)
4. Hydromaster Propulsion BV must be the provider of the thruster units, including but not limited to:
  - L-Drive thruster units with reduction gear
  - Steering gears
  - Steering motors
  - Propellers
  - Control systems consisting of control panels, control heads, and wing stations

Further specifications for each system are outlined in subsequent Sections.

All equipment and machinery must be mounted so that they are accessible for maintenance and that components are removable for replacement with a minimum amount of interference. This includes keeping the overhead in way of battery racks, switchboards, and propulsors free of pipe or cable runs; and the installation of lifting padeyes and rails to support the longitudinal, transverse, and vertical movement of battery racks, equipment, and machinery.

Propulsor rooms, switchboard rooms, and battery rooms must be configured for unmanned operation with remote control of all propulsion functions located in the pilothouse. Local operating panels must be provided in each propulsor room.

## 205 ELECTRIC PROPULSION SYSTEM INTEGRATION

### 205.1 Electric Propulsion System Integration Manager

The CONTR must provide a dedicated Electrical Propulsion System Integration Manager for the project. The Manager will be solely responsible for managing, coordinating, and overseeing the integration, analyses, installation, alignment, testing, shipyard commissioning, documentation, and orientation of all aspects of the all-electric propulsion system, and ensure that the requirements of each component manufacturer are met.

Vendors will be responsible for obtaining regulatory body certifications for all propulsion system machinery within their scope of supply, unless noted otherwise. The manager must be responsible for coordinating and obtaining regulatory body certifications for complete the installed propulsion system.

The CONTR will be responsible for supplying all auxiliary equipment and material that is not provided in the scope of supply of the electrical propulsion system vendors listed in this section, and is required to ensure a complete and operating propulsion system for the vessel Supporting equipment includes, but is not limited to the following:

- Battery cooling systems
- Battery room cooling and ventilation systems
- Propulsion system component cooling systems
- Propulsion system component interconnection cables, including cable sizing and cable installation

Prior to commencing work on the propulsion system, the manager shall schedule a propulsion system kick-off meeting to establish roles, responsibilities, interface requirements, frequency of subsequent meetings and communication protocols between the various propulsion equipment manufacturers, the CONTR, the manager, the DESIGNER and the OWNER. Representatives from propulsion equipment manufacturers and the OWNER's Representatives shall be in attendance. Subsequent progress meetings shall be held on a periodic basis as required to coordinate the parallel engineering efforts of the propulsion system vendors. Progress meetings must be held throughout the Production design of the propulsion system, meeting frequency must be no less than every other week (bi-weekly).

The integration and installation of the propulsion controls, drives, propulsion motors, propulsion batteries, and all other ancillary propulsion components must be coordinated and approved by the manager with support from the equipment vendors, DESIGNER, OWNER and the CONTR.

The manager must prepare monthly progress reports summarizing the status of the propulsion system development, integration, and installation. Progress reports are to include current, upcoming, and recently completed propulsion system tasks, and describe known issues and risks and actions to address or mitigate them.

### **205.2 Energy & Power Management System Design**

The Energy & Power Management System (EPMS) must manage the energy flow between generators, batteries, and propulsion to integrate the Electric Propulsion System. This includes the: entire propulsion system, propulsion system automation and control, and propulsion system energy management systems.

McKay has been identified as the preferred vendor for the EPMS and will leverage their existing EPMS system experience on similar vessels.

The EPMS will comprise the hardware and software to control all Danfoss components and the IO interfaces from the shore side rapid charging unit to the electric propulsion motor. McKay is responsible for ensuring that all propulsion system components operate together as an integrated system, and that the system is functional and reliable as described within this Specification.

The design, plans, specifications, functional description and complete I/O list of the EPMS are to be provided by McKay. Cabling and sizing, are to be provided by McKay to the OWNER's Representative for review, prior to being finalized for procurement and installation.

Care must be taken by McKay to develop motor control programming to ensure compatibility with and safe operation of the propulsors. Propulsor limits, such as maximum RPM, maximum shaft torque, and maximum rate of change of torque over changes in RPM, must be identified by the Propulsor Vendor and the CONTR and provided for review by the OWNER. These values are to be used by McKay for motor control programming. There must not be any barred speed range.

All necessary cabling, wiring, connectors and all other equipment, material, and labor necessary for the complete installation and commissioning of the propulsion system should be specified by McKay. Any equipment not

specified within this Specification, that is not otherwise provided by McKay, shall be the responsibility of the CONTR.

McKay contact information is:

Andreas Zaugg  
[Andreas.Zaugg@mckay.co.nz](mailto:Andreas.Zaugg@mckay.co.nz)  
+64 9 579 0104

## 220 ELECTRIC POWERTRAIN

The backbone of the Vessel's electric propulsion system is the Danfoss powertrain. The Danfoss powertrain is responsible for all power conversion processes – controlling the electric propulsion motors, charging the propulsion batteries, and generating 208VAC ship service power.

CONTR must provide and install the Danfoss powertrain equipment as outlined in Appendix B1. Installation of equipment must also adhere to Danfoss guidelines. Any equipment or materials not provided by Danfoss for the powertrain installation are the responsibility of the CONTR.

The ability for the Danfoss equipment to be able to back-feed power from ship service to the DC-link cabinets for purposes of charging and otherwise maintaining the propulsion battery systems while connected to low voltage shore power is to be discussed during Production Engineering.

The propulsion and ship service systems must operate satisfactorily with the total harmonic distortion (THD) present due to the effects of the vessel power converters. The THD in the voltage waveform in the AC ship service switchboard is not to exceed eight percent (8%).

Automatic, thermostatically controlled electric heaters must be installed in converter cabinets to prevent condensation forming if required by any Danfoss equipment. Power for electric heaters must be from 120VAC or 208VAC ship service power.

Danfoss contact information is:

Mike Shafar  
[mike.shafar@danfoss.com](mailto:mike.shafar@danfoss.com)  
+1 847 219 8298

### 220.1 DC-Link Cabinets

Danfoss must provide two (2) DC-link cabinets, one (1) per demi-hull. The DC-link cabinet is the main propulsion switchboard that houses the 750VDC bus and breakers for the interconnection of power conversion equipment (Section 220.3).

The DC-link cabinets are to be installed in the Vessel as shown in Appendix B1.

The DC-link cabinets are air cooled and have an ingress protection of IP23.

### 220.2 Propulsion Motors

Danfoss must provide two (2) permanent magnet, synchronous motors for use as the propulsion motors. The propulsion motors are rated for 300 kW at 1700 rpm and nominal voltage of 500VAC. The propulsion motors are liquid cooled and must be connected to the freshwater cooling circuit as described in Section 255.

The propulsion motors must be vertically mounted to the Hydromaster thruster unit (Section 240).

If required, propulsion motors must have 208VAC or 120VAC space heaters with a thermostat to prevent condensation forming when the motor is shut down. Space heaters must only be energized when the motor is de-energized.

Each motor must have PT100 winding temperature sensors in each phase of the stator windings and in motor bearings. Each propulsion motor must employ motor shaft tachometer encoders for speed feedback to the motor inverters.

### **220.3 Power Conversion Equipment**

Danfoss must provide all the power conversion equipment necessary for the system to input and/or output AC and/or DC power, the critical items of which are highlighted below:

- The Danfoss heavy duty converter (part EC-C1200). This converter is designed to act as a motor inverter, active front end, or as a converter. Several of these units are provided by Danfoss for the Vessel's powertrain. These units are liquid cooled and must be connected to the freshwater cooling circuit as described in Section 255.
- Hotel transformer to provide 208VAC power for the Vessel's AC switchboard. This unit is air cooled with an ingress rating of IP23.
- Inductor for the heavy duty converter when used as a DC/DC converter for the BESS. This unit is liquid cooled and must be connected to the freshwater cooling circuit as described in Section 255.

Further components include AC isolators, battery connection boxes, and junction boxes.

With regards to susceptibility to external EMF interference, the converter units (also called drives) must meet either IEEE Standard No. 518 or IEC 61800-3.

The drives and associated electronics must not produce radio interference exceeding the requirements of the FCC, or interfere with properly installed ship's radios, radar or other navigational systems, public address, and interior communication equipment.

Inverter and transformer throughput and protective settings must be designed and sized to coordinate with protective devices on the ship service switchboard. With respect to motor starting current, the power conversion equipment and their connection to ship service must have sufficient capacity with respect to the largest essential motor on the vessel's ship service bus so that the motor can be started and the voltage drop occasioned by its starting current must not cause any already running motor to stall or control equipment to drop out or malfunction.

## **230 MAIN PROPULSION BATTERIES**

CONTR must purchase and install two (2) complete marine battery energy storage systems (BESS), one (1) in each demi-hull. The BESS must be purchased from Echandia Marine US, LLC. Technical specifications and budgetary information for the BESS is found in Appendix B1.

BESS chemistry is lithium-titanium-oxide (LTO) in order to handle the significant number of charge and discharge cycles that are required for maintaining a robust ferry service.

The total BESS capacity for the Vessel is 292 kWh. Each demi-hull must have one-half the total installed capacity, or 146 kWh.

The battery racks must be installed as outlined in Appendix B1, in a manner that allows for both ease of personnel access for routine inspection, and for future battery rack replacements at the end of their useful life. The battery racks must be air cooled as outlined in section 513 with forced ventilation and have a minimum ingress protection of IP44.

CONTR must use the Battery Management System (BMS) units that are supplied by Echandia. These units are tailored specifically to Echandia's battery systems to measure and monitor the voltage, current, and temperature of every cell.

CONTR must detail the BESS and the BMS in their FMEA, DVTP, and PSTP. See Section 800.

Echandia contact information is:

Ray Scott  
ray.scott@echandia.com  
+1-360-721-5811

## 240 PROPULSORS

The CONTR must provide a complete L-drive high speed thruster package from Hydromaster Propulsion BV with one (1) thruster per demi-hull.

Technical specifications and budgetary information for Hydromaster can be found in Appendix B1. Any equipment or materials not provided by Hydromaster are the responsibility of the CONTR.

Installation of the thruster must be in accordance with Hydromaster's guidelines.

Hydromaster contact information is:

Jan Terlouw  
jan.terlouw@hydromasterpropulsion.com  
+31 (0) 157630560

### 240.1 Thruster Unit

Hydromaster must provide Series D thruster units for the Vessel. This is an L-drive thruster unit that incorporates a vertical stem section with a foundation for a vertically mounted electric motor and a lower gearbox fitted with a pair of spiral bevel angled reduction gears. The unit is rated for 300 kW at 1700 rpm input speed.

A 5-blade, high skew, pulling type propeller is designed for the Vessel and will be included with the Hydromaster thruster unit. The thrusters must **not** have reverse propulsion capability. The propellers must be handed, i.e. the port thruster shall be counterclockwise viewed from aft, and the starboard thruster shall be clockwise viewed from aft. Propellers must be manufactured from Ni-Al Bronze, and must be dynamically balanced.

### 240.2 Flexible Coupling

Hydromaster to provide a flexible coupling that is required between the propulsion motor output shaft and the thruster's vertical drive shaft.

### 240.3 Control System

Hydromaster to provide a complete control system for the thruster unit, including but not limited to:

- Electronic control units that are mounted on the thruster units
- Control panels for independent control and monitoring of each thruster (to be installed in the pilothouse)
- Two (2) wing station control panels

The CONTR is responsible for the installation of a fully integrated propulsion controls system. The control system must also be integrated into the Vessel's alarm and monitoring system per Section 438.

Propulsor controls for throttle, steering, thrust, and alarm panels must be provided in proximity to each control lever. Drop-in panels for monitoring the thruster direction must be installed at each control station in the pilothouse. Installations will be subject to OWNER review and approval.

### 240.4 Steering System

Hydromaster to provide the electric steering system for their propulsor unit, including but not limited to:

- Electric motor(s) for controlling steering of the planetary gearbox
- Cardan shaft for installation between steering motor and thruster steering gear
- Frequency converter for steering motor

### 240.5 (OPTION) Hydromaster Joystick Controls

CONTR must provide an option to add Hydromaster's joystick control system to each of the three control stations on the vessel. Each control station would have one joystick capable of proportionally controlling the simultaneous movement of the vessel in all directions from a single lever. The Joystick control system option would augment the standard control system, not replace it. It must be priced as a complete system including all hardware, software and commissioning.

## 255 FRESHWATER COOLING

A closed loop freshwater cooling system must be installed in each demi-hull as outlined in Appendix B1. The freshwater system is designed to provide cooling for propulsion equipment and other equipment as required. Equipment to be cooled by the freshwater cooling system includes, but is not limited to:

- Propulsion motors
- Power conversion equipment

The coolant must be a glycol solution, as specified in Appendix B1 and to be verified compatible with the final selection of system components. Solution must have adequate glycol to prevent freezing and must be treated with corrosion inhibitors. The Vessel must be supplied with operating fluids in accordance with the requirements of Section 298.

All valves and materials must be in accordance with Appendix B1. All valves must be easily accessible and operable, with visual feedback of the valve orientation. All piping must be in accordance with the general piping requirements of Section 505 and Appendix B1. System pipe flow must be analyzed to ensure that the maximum flow velocities are within industry accepted standards for the piping material.

Transducers required for operational parameters are to be finalized during Production Engineering.

**256 SEAWATER COOLING**

A seawater cooling system must be installed in each demi-hull as outlined in Appendix B1. The seawater system is designed to remove heat from the closed-loop freshwater cooling system as described in Section 255 by passing through a plate-style heat exchanger. Each demi-hull must have a fully independent seawater cooling system as described below.

A suction pipe must be installed in the seachests in each demi-hull, with a simplex strainer. Strainers must be isolated using lug-type butterfly valves. The seawater cooling system must pump seawater from the seachest, through a heat exchanger, and discharge it overboard. Through-hull connections must be coated in accordance with Section 631.

All valves and materials in the seawater system must be in accordance with Appendix B1. All valves must be easily accessible and operable, with visual feedback of the valve orientation. All piping must be in accordance with the general piping requirements of Section 505.

Transducers required for operational parameters are to be finalized during Production Engineering.

**298 OPERATING FLUIDS**

Upon completion of all work defined in this contract, any operational fluids required for all installed machinery and equipment will be topped up with manufacturer approved fluids. The Vessel must be trialed and delivered with all equipment ready to operate according to OEM recommendations. The following systems are included:

- Azimuth L-drive thruster lubricating oil system
- Electric propulsion motor cooling system
- Power conversion equipment cooling system

## **300 ELECTRICAL SYSTEMS**

### **301 ELECTRICAL LOAD ANALYSIS**

An electrical load analysis has been prepared by the DESIGNER and must be maintained by the CONTR after approval of the Production Design and throughout the vessel's construction program. This analysis must be updated whenever actual purchased equipment data becomes available or when major service load changes occur. Each revision must be updated and submitted to the OWNER.

### **302 NON-PROPULSION ELECTRICAL MOTORS**

Motors incorporated in the design must be of standard commercial marine type, meeting the applicable requirements of the USCG and IEEE-45. For propulsion motors including those responsible for azimuthing control of propulsion thrusters, see Section 225.

#### **302.1 Motor Ratings**

Unless otherwise defined in this Specification or the Exhibits when describing specific equipment motors, three-fourths ( $\frac{3}{4}$ ) horsepower and larger must be 3-phase, 208VAC, 60Hz and must not exceed 1800 RPM. Motors smaller than one-half ( $\frac{1}{2}$ ) horsepower may be single phase, 120VAC, 60Hz. Motors, unless otherwise defined, must be AC squirrel cage induction type, designed for continuous duty.

Motors in frequent or near continuous operation must meet or exceed NEMA Premium Efficiency ratings.

#### **302.2 Electrical Characteristics**

All motors must be suitable for full voltage across the line starting. Locked rotor and breakdown torque and locked rotor currents must be as specified in the NEMA standards for the design application. Motors must be inverter duty rated when controlled by variable frequency drives. If a motor is to be controlled by a variable frequency drive (VFD), then the motor must be compatible with the VFD operation in all respects, including having isolated bearings or other shaft-current mitigation technologies and be inverter rated with insulation of a sufficient voltage rating to handle voltage spikes and dV/dt.

#### **302.3 Mechanical Characteristics**

Motors must be TEFC unless located within axial fans, where they may be TEAO. Motors must have a marine grade corrosion resistant coating. Motors must be of the ball-bearing type and must be designed such that the requirement for periodic lubrication is kept to a minimum.

#### **302.4 Nameplate Data**

Each motor must be fitted with a nameplate of corrosion resistant material marked permanently with the information required by Article 430 of the NEC (NFPA 70).

### 303 NON-PROPULSION ELECTRICAL MOTOR CONTROLLERS

Non-Propulsion motor controllers must be marine type, complying with the requirements of Underwriters Laboratories (UL) or other OSHA approved Nationally Recognized Testing Laboratory (NRTL), and the requirements of USCG. Controllers must be supplied by one manufacturer, Square D or equal. For propulsion motor controls including those responsible for providing power to the propulsion thrusters, see Section 225 and Appendix B9.

Operating controls must be mounted in the front of the enclosure. Indicator lights must be LED type. All motor controllers must indicate: Motor Running; Speed (if applicable); and Direction (if applicable). They must be fitted with "LOCAL/OFF/AUTO" controls as appropriate.

Motor controllers must be corrosion resistant NEMA 12 type except where located in the Pilothouse. The enclosures must be supplied without knock out sections.

All controllers supplying motors over one (1) horsepower in size must incorporate an instantaneous-only circuit breaker that opens all phase conductors. An external disconnect suitable for lock out must be provided on each motor controller. An overload or fault on any conductor must open all phase conductors. Each conductor must be provided with long-time (thermal) trip protection inside the controller.

Overloads must be of the ambient temperature self-compensating, adjustable range type or an adjustable electronic type.

Motor controllers and their pushbutton stations in machinery spaces or damp or wet locations must be drip proof NEMA 12; if exposed to the weather they must be watertight NEMA 4X.

Controls must be near the controlled motor, as far as practicable

#### 303.1 Nameplate and Wiring Diagram

Controllers must be marked with the following information on a corrosion resistant nameplate:

- Service
- Manufacturer, type and serial numbers
- Voltages and phases
- Current or horsepower
- Operating instructions, if any
- Circuit Designation

A plastic laminated copy of the wiring diagram of each controller as installed must be permanently mounted inside the cover.

### 305 NAMEPLATES & LABELS – ELECTRICAL EQUIPMENT

Nameplates and markings must be provided in accordance with 46 CFR requirements.

Nameplates must be fitted on all circuit breakers, distribution panels, shore receptacles, and connection boxes. Nameplates must show equipment designation used on vessel electrical drawings. Nameplates must show feeder circuit designations and for branch circuits their designations, destinations and trip settings.

Plastic laminated circuit directory cards must be provided inside power panels and on the exterior of switchboards to identify the as-built state of equipment and service supplied from each circuit including breaker amperage. A 8½" × 11" (maximum) one-line diagram must be provided inside or on the exterior of panel boxes and on the exterior of switchboards showing that portion of the power system.

Label plates must be made from laminated phenolic, white text on black background. Inscriptions must be clear and concise. Standard marine abbreviations must be used. Lettering must not be less than one-eighth inch (⅛") in height.

All nameplates must be adhered to the equipment with a permanent marine adhesive, 3M™ 5200 or approved equal.

### **311 (OPTION) AC BACKUP GENSET**

The CONTR must install a backup genset and associated support systems as outlined in Appendix B1 if option is selected. The backup genset shall be complete as specified in Appendix B1 with its dedicated exhaust, fuel (including tank), ventilation and seawater cooling systems.

### **313 PILOTHOUSE BATTERY SYSTEMS**

The CONTR must incorporate complete battery systems to support all Pilothouse system DC loads.

All batteries must be marine, commercial-grade sealed valve-regulated lead acid type; and be maintenance free. Lightweight, power dense batteries such as Northstar must be used.

The battery systems must include a twenty-four volt DC (24VDC) and twelve volt DC (12VDC) design, unless otherwise directed in these specifications, these are to be located in the Pilothouse void space underneath the console. These must be sized to support all the DC loads in accordance with the requirements of these Technical Specifications.

The batteries must directly feed the 24VDC and 12VDC distribution panels located in the Pilothouse. Passing through normally-closed disconnect switches, contactors and fuses would still be considered a direct connection. The batteries must be charged by a Mastervolt AC battery charger that is powered from an AC circuit fed from the main AC switchboard. Chargers must be sized to fully charge batteries within eight (8) hours. The batteries and associated charger which supplies power for DC distribution must meet this requirement while the normal distribution load is being supplied. Battery chargers must be sized to stay under the 2 kW threshold avoiding the requirements for large battery installations per 46 CFR 120.352 & 46 CFR 120.354. The Pilothouse 24VDC systems must be split into independent port and starboard subsystems and split further if necessary to avoid such power thresholds.

A bi-directional ammeter must be installed in the battery circuits supplying navigation electronics loads, to determine net current flow. The status of Pilothouse batteries must be monitored and alarmed by the shipboard alarm and monitoring system as described in Section 438.

Special care must be taken to properly size the battery that powers the VHF radios as required by Section 441. In order to support both depth of discharge and voltage drop limits. The reserve battery capacity must be ample to support all normal loads on the 12VDC panel and pass normal radiotelephone standard tests.

Batteries supplying the DC loads of the Pilothouse must be sized to operate for at least thirty (≥30) minutes under normal cruise load after the failure of the associated battery charger or its electrical feed.

The Pilothouse batteries must be securely mounted in vented USCG approved battery boxes with covers that are securely mounted to the deck. Ensure that the location of these batteries allows for ease of personnel access to accomplish periodic inspection and battery replacement.

## 321 CABLES & CABLE INSTALLATION

Cables must be low smoke zero halogen IEEE 45 approved. Cables must be Tricab BV or DV for power or control circuits, Tricab RC, RS, EW or EG series for instrumentation circuits or other type approved by the owner. Wiring and cabling must meet the requirements of USCG. Power distribution cabling for circuits of 120V or higher must be sized for a maximum voltage drop of five percent (5%). Circuits of less than 120V must be sized for a maximum voltage drop of ten percent (10%). It is the responsibility of the CONTR to calculate circuit voltage drops and determine final wire size to comply with IEEE-45 requirements, based on actual cable lengths.

VFD drives must have their wiring isolated or shielded from other cables to prevent electrical noise problems. VFD cable must be selected by McKay for propulsion circuits 400V and above, and Tricab DF series for circuits under 400V or other type approved by the OWNER. Control, instrumentation, sensing and data cables must be sufficiently separated from power cables.

### 321.1 Cable Installation

Wireways must be arranged to facilitate the operation, maintenance, and future retrofits to the vessel. The wireways and banding must incorporate off the shelf components manufactured from aluminum and stainless steel that are light weight. Custom cross tier or tray wireways must be reviewed and approved by the OWNER for future design phases.

Wireways in the machinery spaces must be located such that the wireways do not affect access to the machinery or equipment for operation and maintenance. Wireways in machinery and equipment spaces must also be located such that they do not represent a hazard to tall crew members. Cable must not be run on the tight side of the propulsion motors and thrusters or in areas where such cabling will impact maintenance access. See Section 225 for further requirements.

All wireways shall be designed to provide proper support to the cable runs. The CONTR shall also pull all cables in the construction of these vessels so as to not damage the cables when they are pulled through the vessel. Where hard corners are encountered or extreme friction could occur while pulling cables through the vessel the CONTR shall install temporary measures to protect the cables from any damage from pulling activities. Where mechanical damage is possible the cables shall be protected as per 46CFR120.340(b).

The CONTR must create a detailed wireway drawing showing the routing and materials used for the wireways. The drawings must also show the standard attachment details and cable transit details. Cable transit details must show transits through A class, C and C' class bulkheads in addition to any watertight transits. The drawing must show standard details for those different types of transits including but not limited to the construction of the transit frame, the systems used to pack the transits, and the Bill of Material (BOM) showing the materials that would be ordered for the different packing systems. The BOM for the transits does not need to show quantities but must be used to ensure the transits are being packed properly and used for all future maintenance and alteration work to ensure the repair yards repack the transits with the same materials.

Cables must be concealed in passenger and crew spaces that require lining. The wireways in the superstructure must be reviewed to ensure the least amount of ceiling tiles need to be removed to pull new cables from the Pilothouse to the propulsion spaces and the switchboards. The design will be refined during the detail & manufacturing design phases to ensure no unneeded jogging of the wireways or other oddities will take place.

All cables must be concealed from weather to the maximum extent possible. Special cable may be used for electronic equipment as recommended by the equipment manufacturer.

Cable connections must be made within equipment enclosures or standard approved appliances with terminal blocks. Terminal blocks must be non-combustible moisture proof phenolic or plastic with barriers between terminals. Connections must be of the solderless type with conductor ends solder dipped or ferruled before attaching. The lugs must be of a type that will prevent turning.

Cables must be tagged with their identification at each point of connection and at both sides of bulkhead and deck penetrations. Cable tags must be non-corrosive with embossed figures. Conductors must be provided with identifying floaters composed of embossed plastic sleeves, at terminals and other points of termination.

## **322 SHORE POWER CONNECTIONS**

### **322.1 Ship Service System**

One (1) 208VAC, 3 $\phi$ , 4 Wire, 200A shore power supply receptacle must provide electrical supply to the Vessel when moored shoreside. The exact location of the receptacle is to be reviewed and approved by the OWNER during Production Engineering. The transfer from ship's power to shore power and the reverse must be bumpless and be accomplished via remote automation control from the pilothouse (see Section 438), and locally at the ship service switchboard. The shore power circuit must have safety interlocks to prevent damage to the vessel's electrical distribution system.

A galvanic isolator must be installed to serve the shore power receptacle.

### **322.1 Rapid Charging System**

CONTR must install two (2) DC charging cabinets in the Vessel, one (1) on port and one (1) on starboard, with appropriate receptacles to accept power from the shoreside DC charger.

Design and engineering of the DC charging cabinets is to be performed by McKay during Production Engineering.

The DC charging cabinets must be connected to the Danfoss powertrain through appropriately sized cables and circuit protection devices. The cabinets must enable fast DC charging of both port and starboard BESS simultaneously when the shoreside DC charger is plugged into one cabinet.

The DC charging cabinets must be accessible from the dock on both sides of the vessel. The receptacle chosen for the cabinet design must have ingress protection of IP67. While the Vessel is underway the receptacle must be protected from water ingress by use of watertight seals and compression latches. The cabinets must have an integrated appearance into the superstructure side shell.

The DC charging cabinets must permit the manual connection of shoreside plugs to be accomplished within one (1) minute of Vessel arrival at the terminal. The cabinet must also permit the manual disconnection of shoreside plugs to be accomplished within one (1) minute of Vessel departure from the terminal.

CONTR is responsible for supplying cabling for the DC charging cabinets – power cabling and control/communication cabling. All cabling to be specified by McKay during Production Engineering.

CONTR and McKay must perform factory acceptance testing (FAT) of the DC charging cabinets to verify performance and safety when handling the power required to charge the propulsion batteries.

## **324 ELECTRICAL SYSTEMS – SHIP SERVICE SWITCHBOARDS**

CONTR must provide two (2) ship service switchboards for the control and distribution of 208/120VAC, 3 $\phi$ , 60Hz, 4 wire electrical power. One must be located on port side and one on starboard side. Each ship service switchboard must be in accordance with Appendix B1.

Each ship service switchboard must be minimum IP22, enclosed, and dead front. All operating controls and indicators must be front mounted. Non-conducting grab rails must be provided across the entire front of each switchboard. Non-conducting rubber matting must be provided by the CONTR in front of all switchboards.

All bus bars must be copper. Bolts, washers, and nuts used for bus and stud connections must be corrosion resistant. All bus connections must be provided with mechanical locking to prevent loosening. Solderless compression lugs must be used for all cable connections, or an approved compression type tunnel lug on circuit breakers and other equipment installed in each ship service switchboard. All bolts in bus connections must be torque wrench tightened to an appropriate uniform value for each size bolt and marked across all joints with permanent marker or paint pen. The main bus must be braced to handle maximum available short circuit current. CONTR must ensure that proper coordination is achieved for all operating modes despite possible constraints of minimum short circuit current available from the offgrid converters.

The neutral of the 208/120VAC system must be solidly connected at each ship service switchboard's neutral bus and the neutral bus must be connected to ground. The ground connection must be accessible for checking insulation resistance of the power system to ground. A bus-tie circuit breaker must be supplied in both port and starboard switchboards to allow them to be operated in either open or closed bus. Only one point of the neutral system must be connected to ground for either case of open or closed bus. A ground fault detection system must be provided that can operate properly in either case of open or closed bus.

Ship service switchboards must have electrically operated breakers with manual override capability. Circuit breakers must be quick-make, quick-break, trip free, with tripping mechanisms capable of safely opening the circuit they protect while subjected to the maximum fault current. All poles must be opened simultaneously by a common trip mechanism.

Switchboards must be provided with local instrumentation for monitoring voltage, current, phase, and frequency of ship service and shore power. All rotary type instrument, control and circuit breaker switches must be clearly labeled for function. Instrument fuses must be accessible from the front of each ship service switchboard through hinged panels containing the instruments and controls they protect. Indicating lights must be long-life LED type. Components mounted on the front of each ship service switchboard must be provided with nameplates that clearly indicate their use.

Instrument and control wire must be fitted with a permanent sleeve type wire number. Grommets must be provided to protect wiring where it passes through metal panels. Components required to be interconnected with external equipment must be wired to terminal boards that are readily accessible and clearly marked for shipyard cable terminations. Wiring duct, cable tie mounting devices, clamps, and clips must be permanently fastened. Any adhesives used must be epoxy or OWNER approved equal. Foam tape must not be used.

The capability must be provided for operator selection of local control from either switchboard or automated remote control from the Pilothouse.

Each ship service switchboard must have sufficient reserve electrical capacity to support ten percent (10%) future growth.

### **331 ELECTRICAL SYSTEMS – SWITCHBOARD DISTRIBUTION**

Electrical equipment and components must be located in a manner that facilitates ease of maintenance.

Power distribution panels must be assembled into a single interior unit mounted in a steel enclosure, consisting of a box, interior bus with circuit breaker connections, and front, all designed to be mounted on a bulkhead. The panels must be of the dead-front type.

Panel enclosures must be classed NEMA 12 in machinery spaces.

Each panel must be identified with its voltage and panel number on the exterior of the enclosure. Circuit directory frames and cards, fitted with a clear plastic covering, must be provided on the inside of each panel door.

Branch circuit breakers in electrical distribution panels must be the molded-case type with thermal-magnetic trips or electronic trips with long-time and instantaneous settings. Circuit breakers must be the quick-make, quick-break type and must trip free upon overload or short circuit.

Within each panel, one spare circuit breaker and space for an additional circuit breaker must be provided for every ten active circuits, or fraction thereof.

A base layout of the switchboards has been provided in Appendix B1. CONTR should plan for these to be updated throughout the detail and manufacturing design process and plan for minor changes as the design is refined.

### **332 ELECTRICAL SYSTEMS - LIGHTING**

The CONTR must provide LED lighting throughout the vessel.

Lighting fixtures must comply with USCG Regulations. Fixtures must bear the UL Marine classification label suitable for the location where they are utilized. General lighting in the passenger areas must be flush mounted, LED down lights fitted with reflectors. Where possible, lighting fixtures must be manufactured by one manufacturer, and must have interchangeable components to the extent possible. Equipment and fixtures exposed to weather or dampness must be watertight, with metallic parts made of stainless steel or non-metallic.

The lighting systems must be designed and arranged to allow only the crew to control lighting in the passenger seating areas via group lighting controls in the Pilothouse. Docking and boarding lights must be operable from the Pilothouse center helm station with fully backlit and dimmable to black dual position switches.

All stairways must be adequately lit to provide safe passenger movement and support CCTV surveillance. Stairwells must have approximately fifty percent (50%) more lighting than general areas.

Availability of spare parts must be considered when selecting lighting equipment. Equipment with interchangeable parts must be selected when practicable.

#### **332.1 Interior Lighting**

Interior lighting in passenger areas and below deck spaces must be arranged in groups in such a way that if one circuit is out the others will give lighting coverage. One of the groups must be a "night light" system to provide minimal but adequate lighting at night for the security cameras when the boat is non-operational and secured. This lighting must also provide adequate lighting for the safe movement of crew and maintenance staff. The machinery space lighting must be controlled from outside the space access point. The Pilothouse overhead lights must have a switch mounted at the entry door.

All other cabin lights must be controlled from a Pilothouse AC power panel.

Interior lighting will be a mix of warm white LED puck and strip style lighting in the passenger areas and LSS360-MILX6 IP67 LED fixture from LED Lighting Solutions for below deck spaces.

Final lighting layout will be determined during the production design & engineering phase.

#### **332.2 Exterior Lighting**

The Vessel must be outfitted with exterior lighting of adequate capacity and locations to ensure passenger safety. All exterior light fixtures and junction boxes must be heavy-duty marine grade items.

Exterior floodlights must be controlled from a switch panel located in the pilothouse overhead. Lights must be grouped and switched in zones to be determined during the detailed design and engineering phase.

Exterior located as follows:

- One each to illuminate the port and starboard side boarding stations from above
- One docking light at each boarding station
- One deck light to illuminate the rapid charging operations
- One foredeck light to illuminate the low voltage shore power connection
- One foredeck light to operate the anchor
- One deck light for each line handling area

Two remotely-controlled marine searchlights, Color Light CL25-11, must be provided on the top of the pilothouse mounted on pedestals Port & Stbd. Remote controls must include adjustable focus (spot or flood), elevation (tilt) up, down, left and right. Port wing must have controls for the port searchlight, Stbd must have controls for the Stbd searchlight and the center helm station must have controls for both searchlights.

CONTR and OWNER will agree upon lights and locations during the manufacturing design and engineering phase.

### **332.3 Emergency Lighting**

Emergency DC lighting must be provided in all spaces, including the machinery rooms, which at a minimum provide lighting at the top and bottom of any ladder and over the switchboards. Emergency lighting in the passenger cabins must be sufficient so that loss of AC power will not create a condition that might evoke passenger concern. The lighting called out below, properly applied may provide for distributed low level of lighting that must be noticeable to the passengers but not concerning. Emergency lights must be powered from a dedicated 24VDC distribution system. Emergency lights power sources must be sized to provide lighting for at least ninety ( $\geq 90$ ) minutes.

At a minimum emergency lighting must be provided in the following places:

- All doors
- Pilothouse (Red)
- Top and bottom of all stairwells
- Egress paths
- Low voltage shore power plug
- Snack bar
- Heads
- Switchboards
- All propulsion equipment space access ladders
- Emergency escape hatches

Final layout of Emergency Lighting will be determined in the production design & engineering phase.

### **332.4 Battery Room Lighting**

Battery Room Lighting shall meet the same requirements as the machinery space lighting with the addition of intrinsically safe housings.

**333 ELECTRICAL SYSTEMS – RECEPTACLES**

The CONTR must provide at a minimum the receptacles listed in Table 333-1. Locations of all receptacles are subject to OWNER approval. Watertight receptacles with ground fault interruption must be provided in the heads, electrical propulsion equipment spaces, propulsor room, exterior decks and other wet areas. Exterior and propulsion equipment space receptacles must be fitted with weathertight covers. All receptacles must be duplex. All passenger and pilothouse receptacles must include USB charging ports.

<b>Table 333-1 – Receptacles</b>		
<b>QTY</b>	<b>Volts - Amps</b>	<b>Location</b>
20	120-15	Passenger use, in bulkhead or integrated into furnishings
6	120-15	General use, such that any location can be serviced by a 20’ extension cord
8	120-20	Bar area
3	120-20	Pilothouse
9	120-20	Exterior Decks (2 × aft, 1 x front, 6 x upper)
1	120-15	Sanitary space
4	120-20	Propulsion Room (Lazarette) (2 × each)
4	120-20	DC Switchboard Room (2 × each)
4	120-20	Battery Room (2 × each)

## 400 COMMAND & MONITORING

### 401 PILOTHOUSE & CONSOLE ARRANGEMENT

The Pilothouse must be configured with a primary control and monitoring station located on the centerline of the vessel. The CONTR must take all reasonable measures to maximize the line of sight from the operators seat to the forward passenger boarding areas, line handling areas, and Jason's Cradle rescue locations.

The Pilothouse arrangement must provide the best possible all-round visibility free from window reflections and refractions. Pilothouse windows must meet the specifications of Section 625. Pilot house arrangement is depicted in Appendix B1.

The Pilothouse displays must be routed through a central KVM type processor switch capable of storing multiple preset configurations. The intent is to reconfigure the display arrangement via console mounted buttons to display appropriate information on any of the three (3) primary displays during both docking and transit activities. The information to be displayed as desired includes:

- Radar 1
- Radar 2
- ECS Chart plotter
- Wartsila Control, Alarm and monitoring Panel
- Vessel CCTV
- Port boarding Camera
- Starboard Boarding Camera

#### 401.1 Pilothouse Arrangement

The Pilothouse is a secure space with no public access and must be provided with locking doors. The pilot house must be laid out as outlined in Appendix B1. The CONTR must plan for OWNER and OPERATOR reviews and adjustments. The review may result in changes to the Pilothouse structure, window sizes, et cetera. Prior to the start of construction of the Pilothouse structure, the Pilothouse arrangement must be mutually agreed upon by the CONTR and OWNER.

The Pilothouse must at a minimum be outfitted with the following equipment and features:

- Raised platform for helm with lit and visibly marked steps.
- Power receptacles per Section 333
- HVAC per Section 514
- Retractable sun glare window shades
- Windows and shades in accordance with Section 625
- Storage for charts, publications, flares, and a first aid kit
- Storage for miscellaneous equipment
- Ship's bell, fire axe, and all other USCG-mandated equipment and furnishings

### 401.2 Console Arrangement

The console arrangement must be of an ergonomically correct configuration, incorporating at a minimum, the specific equipment as outlined in Appendix B1

The console must be fitted with the following features:

- The console must have a flat deck and an angled back panel
- The deck, back panel, and all other such surfaces in the Pilothouse must be provided with a matte black finish to prevent glare
- Provide foot and knee recess at the helm station
- The console must incorporate a 4" x 4" toe kick where it meets the deck
- Personnel access to the inside of the console
- Power receptacles per Section 333
- HVAC to maintain temperature under console per Section 514
- One (1) binocular box convenient to the chair, location subject to OWNER approval
- One (1) keyboard tray convenient to each chair, location subject to OWNER approval

Final layout to be agreed upon by OWNER and CONTR during Manufacturing Design Phase

All instrument lighting (LCD, displays, and status/alarm indicator lights, et cetera) must be equipped with physical dimmer controls for night operation and to minimize reflections. Dimmer range must be infinitely variable from lights off through to full illumination. The console must be equipped with glare shields for all displays to prevent direct sunlight and glare from shining on the display faces. The number of separate dimmer switches must be kept to a minimum.

### 401.3 Captain's Chair

The CONTR must provide and install one (1) metal, vinyl upholstered, captain's chairs in the Pilothouse. The chairs must be of rugged construction using quality materials. The design of the chairs must be ergonomically compatible with the duties of the operator. Chairs must be approved by the OWNER.

The chairs must be fully adjustable in the longitudinal position, seat height, backrest angle, and lumbar support. The chair locations must be fully integrated with Pilothouse equipment including vessel controls, radars, and VHF radiotelephones.

**413 WiFi****413.1 Vessel WiFi Internet Access**

The Vessel must be delivered complete with an enterprise level dual 5G cellular based internet connection and WiFi system to support crew, passenger, and Electrical Propulsion System's internet access needs. The Vessel must be equipped with the following:

- (2) Ubiquiti USW-Pro-HD-24-PoE, UniFi 24-Port PoE Rack Switches, installed in pilot house rack
- (1) Ubiquiti UXG-Max UniFi WAN Gateway, installed in pilot house rack
- (1) Peplink MAX-BR1-PRO-5GN-T-PRM Mobile 5G Router installed in pilot house rack
- (1) Cisco ANT-5-5G4G1-O, 5-in-1 Wideband 617–5925 MHz Antenna, mounted on pilot house roof
- (2) Ubiquiti U7-Pro-Outdoor, WiFi 7, IP67, PoE, Mounted on both decks for full coverage
- (1) Ubiquiti U7-Pro, WiFi 7, PoE, installed centrally on ceiling of main deck

The CONTR must use subcontractors for the design and installation of the WiFi system for successful compatibility. Antennas, WiFi access points, routers, and modems will be determined by ESS and CME to best suit the arrangement of the proposed vessel. Final layout and equipment selection to be approved by owner before purchase. All network cabling shall be CAT6A, or that specified by the manufacturer, suitable for marine installation with labeled termination.

**413.2 Electrical Propulsion System's Communication via WiFi & Ethernet**

Provide cabling from electrical propulsion and energy storage systems, to the 5G cellular modem noted above, to support: a) Electrical Propulsion Systems's remote monitoring and support (RMS) of the Vessel's onboard systems for performance monitoring and troubleshooting. This connection must be fully encrypted to safeguard the Vessel and its onboard systems. Minimum bandwidth for these two connections is approximately 256 kbits/s.

In addition to the WiFi system noted above, the CONTR must install completely independent router modem and antenna systems that support communication between the Vessel and the shoreside charging floats via cabled Ethernet connections. Install routers and antennas to enable wireless communication between both EPMS & IAS 1 and EPMS & IAS 2, and landside charging installations. These routers will be specified during the PEP and will be mounted on the Vessel exterior near the shore battery charging stations port and starboard, in a location to be approved by the OWNER.

**421 NAVIGATION & SIGNALING EQUIPMENT**

The Vessel must be delivered complete with all supplementary navigation and signaling equipment required by the USCG, to include but not be limited to:

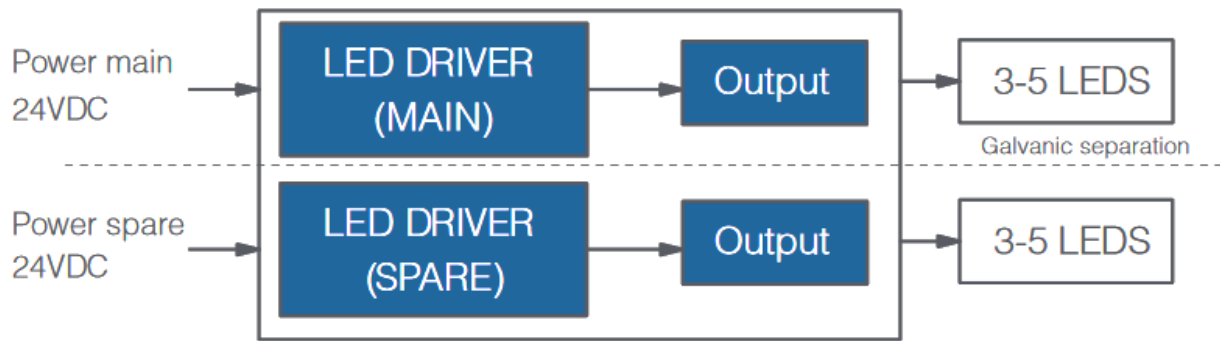
- One (1) ship’s bell meeting regulatory requirements must be mounted as directed by the OWNER.
- One (1) magnetic compass Ritchie HB-741-24V or equal with light installed in the Pilothouse overhead above the steering station or positioned low and on centerline for ease of visibility by the helmsman. The compass card must be selected for maximum visibility. Magnetic compass lighting must be red for night operation and fully dimmable to black. The compass must be swung during sea trials and a deviation card provided.
- One (1) complete satellite compass installation per Exhibit B4, integrated as detailed throughout the Group 400 technical specifications.
- NOAA Chart 18649.
- Required publications including COLREGS, Coast Pilot, and Light Lists (at the OWNER’s discretion these can be provided via the Rosepoint Electronic Charting System, see Section 426).
- Day shapes.
- Flares in waterproof container.

Table 421-1 provides specifications for equipment. The proposed equipment must have equal or better specifications.

Table 421-1 – Navigation & Signaling Equipment		
Binoculars	West Marine	2 Raiatea Waterproof 7 × 50 Center-Focus Binoculars, with installed holders
Clock and Barometer	Chelsea	Newport 4½"
Magnetic Compass	Ritchie	Helmsman liquid beaded 3¾"

**422 NAVIGATION LIGHTS**

Navigation lights must be provided in accordance with the USCG Navigation Rules, COMDTINST M16672.2D (COLREGS) applicable to the Vessel's size and intended service. Provided the vessel proposed is less than fifty (50) meters in length the DHR 60 series lights must be used. The DHR lights have primary and spare LED drivers and LEDs, both must be wired to the JBOX lighting panel.



LED Navigation lights must be controlled by a JBOX Inc. lighting control panel for LED navigation lights #NLFM5DUG24DCSP-PFA. The panel must have both primary and backup lighting circuits wired to the fixtures.

**423 NAVIGATION ELECTRONICS**

Navigation and communications equipment must conform to USCG requirements, and be augmented by the following requirements:

- The following integrations must be made:
  - Radars: compass, GPS, AIS
  - Electronic Charting System (ECS): AIS (bi-directional), compass, GPS
  - AIS: compass, external GPS, ECS (bi-directional)
  - VHF: GPS powered from the same 12VDC power source as the VHF
- Man Overboard (MOB) button on dash that is integrated to the ECS and GPS
- AC voltage ship navigation, communications and safety systems must have backup DC power using marine inverters, batteries, and chargers per Section 313

The installations must be free of electromagnetic or other interference and provide for superior performance.

All systems must be in accordance with all USCG and FCC requirements. Navigation and communications design and installations must be overseen by an engineer with a FCC GMDSS inspector's license with a radar endorsement. Integrations must be performed by a technician with factory training on navigation systems (e.g., radars, AIS, satellite compass, et cetera).

The CONTR must plan, design, engineer, procure, and install all new navigation, electronics, and communications systems. The proposed equipment must be agreed upon by the CONTR and OWNER during the manufacturing design & engineering phase. All electronics must be interfaced to the maximum extent possible. All integration devices (e.g., multiplexors, buffers, or data converters) must be type approved.

**426 GLOBAL POSITIONING SYSTEM (GPS) & ELECTRONIC CHARTING SYSTEM (ECS)**

The CONTR must provide complete GPS and ECS systems with a MOB button mounted on the dash, with the type and location to be approved by OWNER. The GPS must be interfaced with other navigation displays, at a minimum with the radars, VHF radios, and Electronic Charting System. GPS antennas must be installed in accordance with best practices for antenna spacing (e.g., clear of radar beams, on a different plane, and at least 5 feet from cellular antennas).

A GPS (or other position source) that provides continuous vessel position updates to the VHF radios must be powered from the 12VDC panel located in the Pilothouse.

The CONTR must provide a complete personal computer (PC) based hardware with MS Windows and software installation to support independent electronic charting. Provide signal inputs from the GPS, AIS, MOB button, and compass. Provide electronic charts for complete coverage of the routes to be served. Provide electronic charts for full coverage of the delivery voyage if the Vessel is to be sailed to San Diego for delivery.

The PC must:

- be an industrial, fan-less unit with a solid state hard drive operating on DC power
- automatically power on with its breaker
- have integrated Bluetooth 5 support or better
- have integrated WiFi 802.11ac support or better
- have an integrated Ethernet port
- be connected to vessel internet via a shielded CAT 6e cable

The PC and its CPU, graphics and memory must exceed the minimum hardware requirements of the navigation software, providing capacity for future software upgrades. OWNER will provide the chart plotting software and they will provide a software installation key through their fleet account. The PC must have at least three ( $\geq 3$ ) built in RS422 ports to directly connect GPS, AIS, and compass data sources without converters.

The PC will be operated by a panel mounted marinated track ball directly connected to a port on the charting computer without adapters or converters. The keyboard must be directly connected to a port on the charting computer. All data connections must be made without converters.

Mounting and location of all electronic charting components will be subject to OWNER review and approval.

**433 PUBLIC ADDRESS & MESSAGING SYSTEM**

The CONTR must install a rack mounted Public Address/General Alarm (PA/GA) system on the bridge in accordance with USCG regulations. System will consist of PA/GA microphone & message control panel and PA/AV computer. Provide network integration, audio routing and system redundancy as required. Adequate space and slide rails must be provided for connections and maintenance.

Commercial/residential grade connectors and receptacles must be replaced with hard-wired connections wherever possible. Where non-marine specific equipment is used, extra care must be taken to secure electrical connectors, components, and receptacles to prevent disconnection from vibration and vessel dynamic loads; and provide for maintenance access. All cables to the racks must be arranged in an open mesh loom, properly secured to the rack and vessel structure.

Jacks and microphones must be provided at the Pilothouse console and crew stations. A general alarm contact maker must be provided at the Pilothouse console in conjunction with the central public address microphone station.

All speakers must be high quality marine units. All exterior loudspeakers, junction boxes, and fittings must be stainless steel or non-metallic, watertight, heavy-duty marine grade equipment with terminations sealed for protection against the effects of wind and water. Rotating lights must supplement the audible general alarm in main propulsion and machinery spaces and appropriate visual notification must supplement audible general alarms in passenger spaces.

There must be (10) interior speakers and (12) exterior loudspeakers located throughout the Vessel to meet the minimum requirements for sound pressure levels per USCG for PA/GA. Make/Model to be agreed upon by CONTR and OWNTER. Speakers must be arranged in zones with individual zone volume control. The anticipated zones are:

- Foredeck
- Main Deck cabin forward
- Main Deck cabin aft
- Exterior Decks
- Pilothouse

A standard announcement and pre-recorded messaging system must be used for transmission of typical announcements/information throughout the Vessel. This system must be integrated with the video digital messaging system described in Section 448. The system must be arranged to receive user configurable, synchronized audio and visual announcements via a network, USB, SD or equal interface. The standard announcement and messaging panel must have individual buttons to select one of eight (8) standard announcements. Message selection buttons must be provided with protective measures to prevent accidental initiation. The standard announcement and messaging panel must be located at the Pilothouse console and general alarm station, within reach of the helm station, backlit, and fully dimmable.

The audio PA system must be designed to provide uninterrupted operation in the event of damage to a portion of the Vessel or system. The PA/GA system must be connected to a dedicated inverter with a DC power backup source.

#### **436 GENERAL & BATTERY FIRE ALARM SYSTEMS**

The general fire detection and alarm system and the battery fire and gas detection systems must operate completely independent of each other, with distinct audio and visual alarms systems so that the crew can readily distinguish between the two systems.

### **436.1 General Fire Detection and Alarm Systems**

The CONTR must provide and install a USCG approved fire detection and alarm system, in accordance with 46CFR Subchapter K regulations. The system will include rotating red beacons in machinery spaces, and strobe lights in the passenger areas. In accordance with regulations, the system will allow for activation via smoke or heat detection, and manual pull stations. Thermal and optical detection is preferred for machinery spaces.

The fire detection system's monitoring must be divided into zones, so that the location of an alarm can be quickly and clearly communicated to the crew. Zones must not span multiple decks. Final zone layout will be subject to OWNER approval.

The CONTR must install a General and Fire alarm system in accordance with USCG requirements. Rotating lights must supplement audible alarms in machinery rooms and appropriate lights must supplement audible general alarms in passenger spaces.

### **436.2 Battery Fire and Gas Detection Alarm System**

The CONTR must furnish and install a USCG approved gas detection system set to alarm gases produced by battery room fires including LTO lithium-ion batteries. This detection system is outlined in Appendix B1.

The sensors in the propulsion battery rack exhaust ducts shall automatically operate the dampers in the ductwork so that the gases from that battery bank are exhausted to atmosphere and start the emergency ventilation fan. The gas detection system shall be alarmed and displayed on the IAS.

## **438 INTEGRATED AUTOMATION SYSTEM & ENERGY AND POWER MANAGEMENT SYSTEM (IAS/EPMS)**

The CONTR must work with an Integrated Automation System Integrator to plan, design, engineer, and install a complete IAS/EPMS systems to consolidate and support all vessel and propulsion control, alarm, and monitoring functions. Additionally, the IAS/EPMS must be capable of gathering, storing, and displaying trends for all propulsion related parameters. Integrator will work with McKay to integrate the energy and power management system.

The IAS/EPMS must be based on standard components, with PLC process stations and PC operator stations. All process stations must be connected by Ethernet networks, configured to ensure redundant communication. Process control is distributed in PLCs located in local field termination cabinets (FTC), close to the equipment to monitor and control. PLCs contain software for control and safety functions, while PCs contain the graphical user interface and storage of historical alarm and trend data. Redundant PC servers ensure that no single PC failure will result in loss of monitoring and control of the system. Advanced network switches with diagnostic data and protection functions are used for the process network.

EPMS is a group function and comprises control and surveillance of electric power production and consumption. The system controls and monitors the batteries, switchboards, and power consumers.

The EPMS should be fully integrated in the IAS. This means that operation of IAS and EPMS will be uniform and unambiguous. Basic functionality like alarm systems, trend systems, command control, diagnostic functions, et cetera must be common for both IAS and EPMS.

The EPMS must be based on intelligent control principles to monitor and control the overall efficiency and availability of the power onboard the vessel. IAS and EPMS must be installed in combined field termination cabinets (see below).

The main functions for the EPMS are to control and monitor all basic functions of the DC-bus, propulsion motor and thruster, including:

- battery systems
- DC link control for the inverter system
- charging control
- load control of propulsion drives to prevent overload on the batteries
- calculation of remaining time in current vessel speed an in the case of a worst case failure
- remote monitoring and control of auxiliary switchboard
- load sharing of connected grid converters
- synchronizing shore power connection and slow charging through grid converters
- data management
- management of vessel systems as noted in this Section

#### **438.1 Alarm Systems**

The alarm systems must contain all features needed for a vessel-wide alarm system. Alarms must be divided into alarm groups. The system must contain alarm pages for presentation of active alarms and for presentation of historical alarms. Alarm pages must have advanced filter functionality. From alarm pages it must be possible to navigate directly to process pictures that contain the component that generates the alarm. For alarms related to field signals, termination information from I/O-list must be displayed.

#### **438.2 Trend Systems**

Analog values must be logged in time series format. Sample rate will depend on the characteristics of the value to sample. Fast fluctuating values must be sampled every 1-5 seconds. Historical data for alarms and trends must remain securely stored for at least 12 months.

#### **438.3 Trend and Alarm Analysis**

The system must contain an advanced system for viewing trends in real time and for analyzing historical data. User pages are to be configured freely with a combination of trend values and alarms in the same picture. Configurations can be saved for later use. It must be possible to navigate directly from process pictures to a trend picture and view the trend for the selected process value. User pages must be developed by IAS contractor for review and approval by the OWNER.

#### **438.4 IAS Functionality**

The IAS contains control, alarm, and monitoring for the Energy Management System (fully integrated on the same operator stations) along with the Vessel Systems, see Table 438-1 for a listing of systems and functions that are to be controlled, alarmed, and monitored.

#### **438.5 I/O Signals**

The IAS/EPMS input/output signals for all equipment supporting main propulsion (Energy & Power Management Systems) must be provided. In addition, the CONTR must provide up to 600 hardwired and 300 series signals for the Vessel Systems as listed Table 438-1.

#### **438.6 Operator Stations & Human/Machine Interfaces**

The CONTR must provide (2) operator stations (OS) including fully integrated IAS and EPMS human/machine interfaces. The stations must be located as follows: one (1) in the Pilothouse centerline console for use while underway by the crew and (1) located in the Pilothouse on the aft bulkhead, primarily used for dedicated battery charging monitoring. All locations will be subject to final review and approval of the OWNER.

The OS at the Pilothouse centerline console and the SWBD Room must be equipped with trackball and touch screen pointing devices, compact keyboards, and panel computer display size must be nineteen inches (19") with an aspect ratio of 5:4. UPS power supply for the OS must be 208VAC or 24VDC, 78.4W (type) – 200W (maximum).

#### **438.7 Field Termination Cabinets**

The CONTR must provide cabinets for IAS and EPMS controllers. The cabinets must be located in crew-only spaces. The final size of the cabinet must be determined when numbers and types of I/Os are confirmed during the manufacturing design and engineering phase. Alarm strings must be displayed at all OS stations.

#### **438.8 Critical Alarm Panel (CAP)**

Provide (3) critical alarm panels to annunciate and display critical propulsion related alarms to the captain. One will be located at the centerline console position and (2) additional located at each exterior wing station. Exterior mounted alarm panels must be rated for exterior marine use.

#### **438.9 Communication Connection to Shore**

See Section 413 for requirements concerning WiFi and Ethernet installations onboard the Vessel.

#### **438.10 Battery Local Control Panel**

Provide two (2) separate bulkhead mounted cabinets for local battery control in each Battery Room. These panels must be capable of controlling the batteries independent of the remote control systems. The cabinets must be rated for IP44 ingress protection and powered from a UPS supply of 208VAC or 24VDC at 100W.

#### **438.12 General Requirements**

The systems must be arranged to alarm and annunciate in the Pilothouse and locally for propulsion alarms, battery alarms, and vessel system alarms. The alarms must be self-monitoring, and independent of the functions monitored. Alarms must be audible (with an acknowledge button silencer) and visual.

Alarm and monitoring functionality for all vessel systems must be integrated into the IAS/EPMS to the extent permitted by the regulatory agencies. The intent is to limit the number of system control panels installed on the vessel. The CONTR must include any other alarms that may be recommended by equipment manufacturers. All of the inputs and outputs must be determined and documented in a detailed I/O spreadsheet that will list every item, its point of interface, type of signal and sensor location. The intent of the spreadsheet is to have all of the information organized and documented so that there is no confusion about what sensors are being used and how the systems will be designed.

All audible Pilothouse alarms must be distinguishable as to system by different tones or tone patterns to the extent possible. All visual Pilothouse alarms must be distinguishable as to system by differing light colors or light patterns. All alarms must be on separate circuits to avoid cascading failures.

The system must be fitted with 19" touch screen displays. The display must include a physical dimmer and an alarm test feature. All touch screens must be capacitive only, not resistive, with buttons adequately sized. Draft menus and pages for all systems must be designed and provided to the OWNER for final layouts and approval.

All equipment that can be remotely operated from the Pilothouse or elsewhere, must be fitted with a master cut-off switch at the equipment operating station in order to prevent personnel hazard.

OS in the Pilothouse must give a complete readout of electric propulsion system performance with audible and visual alarms of propulsion faults. The system must be designed and built to classification society requirements even though the vessel is not classed.

<b>Table 438-1 – PILOTHOUSE CONTROL, ALARM, and MONITORING</b>			
	Monitor	Alarm	Control
<b>ALL-ELECTRIC PROPULSION SYSTEMS (IAS/EPMS)</b>			
Propulsion System Charging	x	x	x
Propulsion Power Electrical System	x	x	x
Battery Charge State and Remaining Power	x	x	x
Propulsion Motors	x	x	
Propulsion Alarm Systems	x	x	
<b>VESSEL SYSTEMS (integrated into IAS/EPMS)</b>			
Cathodic Protection System (see Section 633)	x	x	
Pilothouse Battery Systems (24VDC & 12VDC)	x	x	
Shore Power ( volts, amps, kW, frequency, breaker status)	x	x	x
Bus Current Monitor (all DC and AC buses)	x	x	
Bilge Levels (in all voids and machinery spaces)		x	
Potable Water Tank (level monitor and 20% low level alarm)	x	x	
Sewage Tank (level monitor and 85% high level alarm)	x	x	
Fire Dampers for Battery Room	x	x	x
Fire and Bilge Pumps	x		x
HVAC Systems	x	x	x
Freshwater Cooling System Sensors (see Section 255)	x	x	x
Seawater Cooling System Sensors (see Section 256)	x	x	x
Battery Room Fire Extinguishing System (see Section 555.1)	x	x	
Ship Service Switchboard – Power Feed Circuit Breakers	x		x
Battery Room Gas Detection (see Section 436.2)	x	x	x
Thruster Alarms	x	x	

All tank level senders are to be pressure sensor type based on the fluid's density. All low and high alarms are to be derived from the level monitoring sensor and adjustable in the system software by the OWNER. The location, mounting and details of the sender installation must be reviewed and approved for each location dependent on the tank geometry and the fluid in the tank.

#### **439 CCTV SURVEILLANCE SYSTEM**

A complete IP based closed-circuit color television (CCTV) system must be installed with an appropriate number of cameras topside, throughout the passenger spaces, and in the propulsion rooms, and with centralized monitor mounted in the Pilothouse. The system must allow complete monitoring of the propulsion spaces, passenger spaces, stairwells, and boarding areas from the Pilothouse and must also enhance the master's view alongside and astern during docking and maneuvering. Final mounting and locations will be reviewed and approved by the OWNER.

The system must be designed and installed with (17) Uniview IPC3638SB-ADZK-IO, 8MP IP67 PoE Cameras. Final placement to be approved by OWNER. The system must be complete in all respects including cameras, camera mounts and enclosures, power supplies, switches, digital video recorder unit and hard drive, dedicated computer (vibration isolated mounted) with wired keyboard and mouse, 19" LCD color marine monitor dimmable to black (via a front knob or dial versus menu-based dimming), foundations, cabling, fittings, cable penetrations, junction boxes, et cetera.

The CONTR must outfit each Battery Rooms with thermal imaging cameras integrated with the CCTV System

Provide dedicated, independent, rear facing, Port and Starboard Cameras that clearly display the side of the vessel and the aft mooring and charging locations

The CCTV system must provide for continuous recording, with a minimum of twenty-one ( $\geq 21$ ) day capacity before overwriting. These cameras must be vandal resistant, weatherproof, and must have internal heaters as applicable. Cameras in main propulsion equipment and machinery spaces must be provided with motion sensing feature. Cameras must be fitted in the Battery Rooms to provide a view of the entire compartment.

The dedicated computer and digital recorder unit must be connected to a dedicated inverter with a DC power backup source.

#### **441 VHF RADIOS**

Radios and associated antenna are to be provided as outlined in Appendix B1.

Provide a 12VDC battery per Section 313 that meets all of the requirements of 47 CFR Part 80 Subpart S (FCC requirements) applicable to Large Passenger Vessels.

#### **443 DECK LOUDHAILER**

Provide a complete loudhailer with foghorn, with all required speakers, microphones, amplifiers, and other components. The deck loudhailer will be installed in the Pilothouse and must feature hail, listen, talkback, and fog signal. Four (4) exterior waterproof marine intercom speakers, at bow, stern and aft boarding area locations must be installed. The use of impedance matching speakers in series and parallel configurations must be used to allow all 4 speakers to be active at once. During production engineering and design phase the configuration of the loudhailer will be reviewed to ensure it meets these operational requirements.

External speakers must be heavy-duty marine grade, stainless steel or non-metallic components and junction boxes. Mounting and location of all loudhailer components is subject to OWNER review and approval.

**444 WHISTLE**

An electric whistle must be installed and must comply with all USCG requirements. The whistle must have an integrated fog signal feature. Provide one (1) KB-30 Kahlenberg 24VDC horn, a CM-14 control module, a M-512 24VDC Signal controller, and a M-313 6A horn buttons. Kahlenberg drawing No.3-6942A represents the desired configuration.

**448 VISUAL SYSTEM****448.1 VIDEO SYSTEM**

A video system must be supplied for the Vessel comprised of (1) LG 75UA7700PUA, 75: UHD 4K Smart TV mounted on centerline bulkhead of main deck cabin using marine-approved vibration-resistant mount. Provide concealed routing of power and HDMI/network cabling. CONTR will work with OWNER to integrate PA/AV computer as primary display. The system must be capable of displaying video from a video digital messaging system.

The video digital messaging system must be capable of feeding custom video messages as provided by the OWNER as well as digital video files to help the Vessel meet 49 CFR Part 39 American with Disabilities Act requirements for passenger vessels. Provisions must be able to allow for displaying paid advertisements. CONTR will integrate with the current video messaging network utilized by the OWNER.

The video digital messaging system must be controlled from the Pilothouse and used to provide safety messaging and arrival and departure messaging in conjunction with the Public Address system described in Section 433.

**448.1 POINT-OF-SALE (POS) SYSTEM**

Provide (1) Toast POS System (OWNER to approve selected model) with concealed cabling, power and network drops through bar location. CONTR to install and integrate into vessel network.

**451 RADARS**

Provide complete installation of radar outlined in Appendix B1.

The primary radar and its display must be powered from a 24VDC power source. 24VDC power must come from Pilothouse battery banks that are in turn charged by dedicated AC battery chargers. Uninterruptable power sources (UPS) must not be used. See Section 313 for battery requirements.

**455 AUTOMATIC IDENTIFICATION SYSTEM (AIS)**

Provide complete installation for a Class A AIS System. The AIS must be integrated into the ECS personal computer and radars. Mounting and location of all AIS components will be subject to OWNER review and approval. The AIS must include a console mounted pilot plug for deliveries. Location of the pilot plug to be approved by the OWNER.

The VHF AIS antenna must be positioned above radio VHF antennas and in no case on the same plane. AIS antenna must be connected using PL-259 connectors. Antenna must be field replaceable without cable modifications.

**465 DEPTH SOUNDER**

Depth Sounder must use a transducer model designed for speed of the vessel. The transducer must be faired on the outside of the hull to prevent false signals. A coffer dam must be installed in way of the transducer hull penetration with details approved by the OWNER. The transducer must be stainless steel.

## 500 AUXILIARY SYSTEMS

### 505 GENERAL PIPING REQUIREMENTS

All piping must conform to USCG requirements for strength, materials, and testing. Piping and system components must be in accordance with: the requirements of this Section, the specific system details contained in this specification, and Appendix B1.

Piping runs must be straight, neat, and out of the way of walkways and passageways. Pipe hangers welded to ship structure must be suitably located to support pipe against stress and vibration. Wherever piping must be removed for maintenance or replacement of other components, flanges or takedown joints must be fitted. Piping to rotating machinery must have flexible connections of components suitable for the pressure and service.

Piping must not be run on the tight side of equipment or machinery, or in areas where such piping will impact maintenance access.

All piping system fasteners must be SS 316.

To the greatest extent possible, pumps for a given service must be provided by the same manufacturer and must be of the same size and material.

Shore interface fittings must conform to drawings. All valves, fittings, and fasteners must be high quality marine grade materials. Pot metal or nickel-plated components must not be used.

All pipe hangers and clamps must be stainless steel with non-conductive bushings around the pipe such as ZSI Alpha, Beta, or Omega series clamps.

All valves must be high quality, quarter-turn butterfly or ball style unless required otherwise by regulatory agencies. Valves in seawater systems must have highly corrosion resistant discs and stems i.e. Monel, Inconel, Hastelloy, or equal. All seawater valves and piping must be isolated from the hull for galvanic protection. The CONTR must ensure all valve handles rotate in the same direction (e.g. clockwise to close or vice versa).

All valves located below deck plates must be equipped with reach rods to be accessible from the deck plates without removing deck plates. Removable or hinged deck access hatches must not be used to access valves unless approved by the OWNER.

If a valve is installed with a gear operator and a reach rod the CONTR must ensure that visual indication of the valve's orientation is readily identifiable. As an example, a contrasting colored metallic flag can be affixed to the rotating face of the gear operator that shows the orientation of the butterfly valve disc.

All check valves must be entirely constructed from a highly corrosion resistant material appropriate for the service intended. As an example, materials would be SS 316, MIL SPEC Bronze/Monel, Inconel, or Hastelloy. Check valves must not be used in seawater systems unless specifically approved by the OWNER for the material, location, and orientation of the valve.

No plastic or composite piping will be permitted in the Battery Rooms.

### 506 VENTS, FILLS, & SOUNDING SYSTEMS

All spaces and tanks must be vented as required by USCG regulations. All vent openings to weather decks must be fitted with stainless steel insect screens. Screens must be accessible for cleaning and replacement. Vent and fill caps must be color coded to show service. All vents for systems containing hazardous waste must terminate above a spill containment. The containment must have a removable plug for drainage.

Tank vents and load/off-load connections must be configured and located such that they are not subject to mechanical damage.

Alarms must be derived from the tank level senders. Tank level indication must be provided through the alarm system as described in Section 438.

Inspection by deck hatch is acceptable for void spaces if the lowest point is visible from the deck hatch location. Otherwise, a sounding or ullage system must be provided to determine water levels in voids.

Shoreside connections and fittings must be provided as specified in Appendix B1.

#### **506.1 Potable & Freshwater**

Water tank fill must be located on the outboard hull above the rub rail, aligned with the passenger boarding gate on both port and starboard sides of the vessel. A watertight access box must be built into the hull at this location for both the water tank fill and sewage tank suction. A drain plug must be included to release any spillage. The water tank fill portion of the access box must be isolated and sealed from the sewage tank suction portion to avoid contamination. The water tank fill must terminate inside this access box, be valved and capped, and be directly compatible with the shoreside hose fittings as outlined in Appendix B1. Water tank vent to be terminated inside a recessed box incorporated into the starboard aft stairs to be out of the way of passenger movement.

#### **506.2 Sewage**

Sewage tank suction must be located on the outboard hull above the rub rail, aligned with the passenger boarding gate on both port and starboard sides of the vessel. A watertight access box must be built into the hull at this location for both the sewage tank suction and water tank fill. A drain plug must be included to release any spillage. The sewage tank suction portion of the access box must be isolated and sealed from the water tank fill portion to avoid contamination. The sewage tank suction must terminate inside this access box, be valved and capped, and be directly compatible with the shoreside hose fittings as outlined in Appendix B1. The sewage tank vent must be located to keep odors away from passenger and boarding areas.

### **507 PIPING DESIGNATION & MARKINGS**

All piping systems must be color coded and stenciled in large letters at least twice in each compartment to indicate their service. Arrows of contrasting color to the pipe must be applied to the pipes to indicate the direction of fluid flow under normal conditions.

All valve wheels and handles must have engraved stainless steel name tags attached that indicate the system, purpose of the valve, and the normal position if appropriate. For example:

POTABLE WATER FILL NORMALLY CLOSED & LOCKED
--

All nameplates must adhere to the equipment with a permanent marine adhesive, 3M™ 5200 or approved equal.

## 513 MACHINERY SPACE HVAC

Machinery space ventilation must be installed as outlined in Appendix B1.

The Battery Rooms require an HVAC system that works in conjunction with the fire suppression system installed in the space. Section 513.3 describes the HVAC requirements for the Battery Room. Refer to Section 555 for fire suppression system requirements.

All ventilation systems are designed to inhibit water intrusion to the maximum extent possible. All supply and exhaust air terminations in the weather must be fitted with inverted float check valves. Where required, vents must be fitted with manual closing devices to prevent downflooding.

### 513.1 Forepeaks, Ballast Tanks, and Wet Deck Void Spaces

The CONTR must install at least one vent for each of the forepeaks and ballast tanks, and at least two vents for the wet deck void space to provide natural ventilation for these compartments.

### 513.2 Mechanically Ventilated Machinery Spaces

This section applies to the Thruster Room and DC Hub Room. These spaces require forced air ventilation to promote circulation with outdoor air. Each space must have a natural air inlet and an exhaust fan as outlined in Appendix B1.

The air inlet and exhaust ducts in the DC Hub Room must be equipped with fire dampers in accordance with Section 513.7.

### 513.3 Battery Room HVAC

The Battery Room requires forced air ventilation and air conditioning. Battery Room air conditioning is to be accomplished via a mini split with two air handlers installed in each Battery Room and the condenser units installed on the upper deck. Refer to Section 514 for further HVAC details. HVAC in the Battery Room must maintain temperatures and humidities within limits specified by the battery manufacturer.

The CONTR must install a common exhaust duct at the top of the battery packs that connect each individual battery's exhaust duct as detailed in Appendix B1. The common exhaust duct must also be equipped with an exhaust blower that can evacuate harmful gases directly overboard in the event of fire or gas detection in the batteries. The exhaust blower must have automatic and manual control from the pilothouse.

Several fire dampers are required as outlined in Appendix B1 to direct airflow for the various modes of operation. Refer to Appendix B4 for an illustration of the various operating schemes of the Battery Room ventilation system.

The CONTR must integrate the ventilation equipment in the Battery Room (fire dampers, fans, blowers, shell valves, air handlers) and the FiFi4Marine fire suppression system into the vessel's automation system. The ventilation system must respond to the following sources:

- FiFi4Marine fire control system
- Float switch located in the Battery Room to indicate flooding to the level of the batteries
- Manual signal from the automation system in the pilothouse

The supply and exhaust ducting from the Battery Rooms must be insulated to A-60.

#### **513.4 Fans**

Fans must be marine duty and, in general, must be selected with low noise and vibration characteristics. Fan types and sizes must be standardized and provided by the same manufacturer wherever possible. Fans, in general, must be of the vane axial type, directly driven. Motors must be supplied bolted to fan housings and IEEE-45 compliant.

Supply and exhaust fans must be mounted with resilient connections to both the fixed ductwork and to their structural foundations. All fans must be accessible for service and inspection.

When fans or blowers are installed in hazardous environments, they must be certified for use in those specific conditions.

#### **513.5 Ducting**

Ducts may be round or rectangular, provided they do not exceed a four to one (4:1) aspect ratio. All ducts must have a smooth inside, with no protruding edges. Ducts must have riveted, welded, or hooked seams. All ducts must be airtight, with flanged takedown connections. Takedown connections must be provided where required for maintenance of the ventilation systems and for access to other vessel equipment. Ducts and plenums must be suitably stiffened to prevent panting and bulging.

All fabricated non-watertight ducts must be made of aluminum, except where penetrating a fire boundary, in which case they must be stainless steel. Dissimilar metals in ducting sections must be galvanically isolated.

#### **513.6 Louvers and Mist Eliminators**

Ducted air supply weather openings must be fitted with marine-grade mist eliminators. Airflow velocities across intake mist eliminators must generally be limited to 500 FPM based on gross area and/or 1000 FPM based on net area. Mist eliminators must be fitted with drains to the weather.

All louvers and mist eliminators must be made of marine-grade aluminum.

The CONTR must provide all supply and exhaust louvers with stainless steel insect screens.

The CONTR must design the machinery space ventilation inlet and exhausts to minimize water or mist ingress. Ventilation inlets and exhaust must not terminate above, or discharge air directly at electrical equipment.

#### **513.7 Fire Dampers**

The CONTR must provide and install fire dampers where required by regulation. Fire dampers must be installed in accordance with applicable USCG requirements, including the provisions of NVIC 9-97 Change 1, using stainless steel fasteners.

Fire dampers must be automatic with electric actuators.

All fire dampers must be capable of manual operation. CONTR must provide remote closure controls for all fire dampers in the Pilothouse. Locate fire damper controls adjacent to the fire detection panel and the firefighting system controls.

Fire damper actuators must be provided with power from the power distribution system. Except for the Battery Room, the actuators must be configured so that interruption of power will initiate closing of dampers and shutdown of ventilation fans located within the protected space. In the Battery Room, the interruption of power must be configured so that interruption of power will initiate the opening of dampers and the activation of ventilation fans located within the protected space. Dampers and fan shutdowns for each system must be independent.

All fire dampers must have DC electrical actuators that can be reset by one crew member when they reset the fire system pressure switch. Indication of the fire damper orientation (open/closed) must be indicated on the vessel alarm system.

## **514 CABIN HVAC**

The vessel shall have the passenger, crew, and battery spaces conditioned with reverse cycle heat pump mini split systems.

### **514.1 Cabin HVAC Equipment**

The vessel shall be equipped with mini split systems from Mitsubishi/Mitsubishi Electric Trane HVAC US (METUS), or approved equal. All components shall be ordered for a marine environment with condenser corrosion coatings and electronics potting as per manufacturer's marine installation standards (Mitsubishi Bluefin or equivalent).

### **514.2 Cabin HVAC System Configuration**

Indoor units shall be as outlined in Appendix B1.

The HVAC compressors shall be base mounted to the deck. The CONTR shall work with the OWNER to review the production details of the mounting of these units and develop the production details for the installation on the vessel. The units shall all be vibration isolated from the hull structure. Enclosures with ventilation will be incorporated into the design to camouflage units.

Condensate drains must be routed from each indoor unit to the outlets as specified in Appendix B1. Install condensate pump on indoor units serving the battery rooms. Neither the indoor air-handling unit, nor the condensate drain piping may be led over or near electrical equipment. Except for a short piece of hose between the indoor unit and the drain piping, condensate drains must be constructed using USCG approved CPVC pipe and fittings. Under no conditions shall the condensate lines route condensate to flow over windows, into passenger walkways or other areas where the condensate could collect.

The refrigerant lines shall be soft copper insulated lines. The OFFEROR shall work with the OWNER to approve changes and preferences for these installations by their HVAC subcontractor. The final insulation chosen shall thermally and galvanically isolate the copper lines from the aluminum structure of the vessel. 100% of the copper lines shall be covered inside the vessel to ensure there is no sweating or copper contamination of the aluminum structure. If there are any locations in any part of the system that are left exposed the copper portions shall be coated with hard wax, densyl tape or other approved means to seal the copper from interacting with the aluminum structure of the vessel. Where copper lines are clamped, the insulation shall not be compromised. The insulation IWO of the piping supports shall be stiff enough to provide suitable clamping load Rubatex, ArmaFlex Ultima or equal. The penetration details for the refrigerant lines as they pass through bulkheads shall be determined by the OFFEROR and OWNER to provide a system that is watertight, suitable for the temperature variations, meeting USCG requirements and suitable for the OFFEROR's preferences Nofirno or equal. CONTR changes and preferences that affect routing of these lines will have to be checked and approved to ensure maximum line lengths are not violated.

Tamperproof thermostats for all Passenger Cabin and Pilothouse ventilation systems must be located in the Pilothouse and be password protected. Remote shutdown must be provided in accordance with USCG requirements.

### 514.3 Pilothouse Defogging

A central, two-fan window defrost blowing system must be installed in the Pilothouse. The fans must blow air across interior window surfaces to prevent moisture from condensing on the windows. The fans must be positioned to serve each window across the front and sides of the Pilothouse, delivering air upwards across the glass.

### 521 FIREMAIN

A firemain system must be provided to provide firefighting capability. The system must include two fire pumps, one in each demi-hull Propulsion Room. Each fire pump must take suction from the seachest crossover header and discharge to the firemain system.

The firemain system must be installed as specified in Appendix B1. Both fire pumps must be sized to supply sufficient water flow to the entire firemain system. The fire pumps must have identical functions, and the system must be entirely cross-connected such that either fire pump can supply water to the firemain.

Fire pumps must not double as bilge pumps. Fire pumps must be self-priming.

Each fire pump must be operable from the Pilothouse as well as locally at the pump.

Fire stations must be located as specified on drawings and equipped to meet USCG regulations. The firemain hose stations must have recessed fiberglass enclosures. The CONTR must provide complete systems to include pumps, piping, valves, gauges, hoses, nozzles, and hull fittings.

All valves and materials in the firemain system must be in accordance with the drawings. All valves must be easily accessible and operable, with visual feedback of the valve orientation. All piping must be in accordance with the general piping requirements outlined in the drawings. System pipe flow must be analyzed to ensure that the maximum flow velocities are within industry accepted standards for the piping material.

### 526 DRAINS

Drains must be installed as outlined in Appendix B1. Drained water must be collected and led overboard through downspouts. Drains must be arranged such that puddles of standing water do not collect. Horizontal piping must utilize CPVC piping whenever possible as 6061 piping in deck drains suffers from corrosion problems in the long horizontals.

Trapped deck drains must be provided in the rest room and bar area. These drains must be directed to the sewage tank. Whenever possible CPVC must be utilized for piping. Use of CPVC for P-traps under deck drains is required. No deck drains with integral P-traps may be used. All CPVC must be ASTM D1785 type.

### 528 SEWAGE SYSTEM

A sewage system must be installed, collecting sewage from the installed toilet, as outlined in Appendix B1. The system must meet all USPHS regulations. The sewage tank must be fitted with a high-level alarm set to 90% and tank level indication in the Pilothouse per Section 438.

The CONTR must take particular care to properly slope the drains to the sewage tank and to provide convenient clean out ports for snaking lines.

The toilet flushing system must be a Sanmarin 4, electric macerating toilet. The toilets must use fresh water and the supply must be fitted with a proper USPHS inspected and approved back flow preventer. Toilets must be fitted with a remote pushbutton mounted in the bulkhead as directed by the OWNER. Toilet has a 1 hp motor that will be accounted for in the switchboard update during the production design & engineering phase.

All gray water drains must be connected to the sewage tank and must include accessible traps fabricated from CPVC.

The sewage discharge pump must be installed to draw from the tank and discharge to the offload shoreside connections located as described in Section 506.

Weatherproof, lockable sewage pump controls must be located adjacent to the shore connection fittings with a hold to pump pushbutton to prevent running the pump dry for extended periods.

Sewage pump suction and discharge piping must be installed using long radius fittings or equivalent pipe bends.

### **529 BILGE SYSTEM**

Bilge piping and pumping systems must be provided and installed as outlined in Appendix B1 so that bilges can be pumped overboard for purposes of emergency dewatering.

Bilge pumps must be standalone and self-priming, with individual pumps located in each compartment and installed in accordance with the bilge drawing. The bilge system must be in accordance with the applicable rules of a Class Society that provides provisions for single-compartment bilge systems, such as Lloyd's Register. The CONTR must obtain a waiver from USCG for the alternate bilge system. The OWNER's Representative will provide a letter supporting the waiver request along with calculations and precedents.

The overboard check valves and pipe must be sloped towards the overboard to ensure water and salt cannot accumulate in the pipe and on the face of the check valves.

Bilge suctions must be placed so that each compartment bilge can be pumped completely dry with the installed bilge pumps.

A visual and audible alarm must be provided in the Pilothouse to indicate a high-water level in any of the watertight compartments. Pumps must be non-automatic, manual operation, and switched from the Pilothouse as well as locally at the entrance to the space being pumped. A visual indicator must be provided to indicate when any of the bilge pumps is in operation.

### **533 POTABLE & FRESH WATER SYSTEM**

The freshwater system must be installed as outlined in Appendix B1 to include the freshwater storage tank, a filter system, a hot water heater, and distribution piping to fixtures. Hot potable water must be provided using a tank style water heater that meets USCG requirements. The freshwater system must satisfy all health regulations of the USPHS.

All fresh water, besides hose bibs and water closet, must be filtered ahead of the pump with a cartridge type mechanical paper filter.

The CONTR must supply fresh water to:

- Hose bibs on the aft pilothouse, foredeck, and aft deck. Foredeck water supply must have sufficient pressure to spray the pilothouse windows
- The pilothouse window washers
- The head flushing system
- The head sink (hot and cold water)
- Snack bar sinks (hot and cold water)
- Equipment in the snack bar: ice machine, soda gun, and coffee maker

**555 FIRE SUPPRESSION SYSTEMS**

Fire detection, alarm, and suppression systems must be installed to protect the Battery Room in accordance with USCG requirements, as outlined in Appendix B1.

The CONTR must install a single FiFi4Marine battery fire suppression system which will serve the Battery Racks in both Battery Rooms. The system must communicate with the Battery Management System and provide signal to the IAS system to alarm in the Pilothouse and coordinate fire damper closure with the IAS system. The system must be provided with its own battery monitoring system with heat sensors and gas detection sensors in each battery rack. The release of the water-based foam shall be divided into ten zones, five in each battery system. The system will automatically inject foam to all the battery strings in the affected zone.

The CONTR must also install a complete firemain system throughout the rest of the vessel in accordance with USCG requirements, see Section 521. Additionally, the CONTR must provide portable fire extinguishers throughout the vessel in accordance with USCG requirements. Portable fire extinguishers shall be located in flush mounted cabinets painted red and labeled. Provide a CO<sub>2</sub> based portable fire extinguisher mounted in the pilothouse for response to an electrical fire in the pilothouse console or void space.

**581 GROUND TACKLE**

Ground tackle must be provided by the CONTR and approved by the OWNER. A lightweight DANFORTH (Fortress manufacturer) type anchor of appropriate holding power must be provided. The anchor must be attached to high strength galvanized stud link chain and 300' of nylon line with an orange marker buoy attached. The chain, line, and buoy must be fitted and stowed forward, with provisions for quick release without requiring the crewmember to lift outside the railing.

The bitter end of the anchor line must be securely attached to hull structure. The line must be complete with closed eye socket, and must have all necessary detachable links, swivel and fittings required for a complete anchoring assembly.

Any sliding surface for anchor movement must be faced with UHMW plastic.

**582 MOORING**

CONTR to provide deck cleats as necessary for mooring operations. Final number and location of cleats to be approved by OWNER. Deck cleats must be the aluminum Fraser Bronze DC-18 (18") model or approved equal.

The vessel must be fitted with rub rails that are to be approved by the OWNER. At a minimum, the rub rails must wrap around the transom and extend forward to frame 20. The top surface of the rub rail is to be painted with non-skid and the vertical surface is to be left unpainted.

**583 LIFESAVING EQUIPMENT**

The CONTR must provide lifesaving equipment that complies with USCG requirements. CONTR to also provide a Jason's Cradle for overboard recovery.

Life jackets must be stored in dedicated bins or cabinetry which are integrated into the vessel's interior outfit. Life jackets must be stowed in ratios proportionate to the seating in each space. The CONTR to provide extended size life preservers, Taylortec LP-11, for 50% of total PFD count.

The CONTR must prepare a list of all proposed lifesaving equipment and the proposed stowage location for OWNER's approval.

## 600 OUTFITTING

### 601 GENERAL ARRANGEMENT

The OWNER desires a modern, easily maintainable interior with a light, open aesthetic and good exterior visibility through large windows. The intention is for the vessel to comfortably accommodate the variable rates of riders. Keeping a modern lounge aesthetic while supporting high volume ridership is the intention of this layout.

The CONTR must follow a vessel arrangement that includes, but is not limited to, the following general features on each deck:

#### 601.1 Pilothouse

Pilothouse requirements are further specified in Section 401.

#### 601.2 Interior Decks

- A mixture of interior seating, per Section 645
- Unisex and ADA passenger head per Section 644.1
- Accessibility provisions per Section 092
- Bar/Snack Bar per Section 644.2

#### 601.3 Exterior Decks

- Bicycle stowage per Section 672
- A mixture of covered and uncovered exterior seating per Section 645
- All boarding facilities per Section 064
- Crew locker space per Section 671

### 602 HULL DESIGNATING & MARKING

The CONTR must furnish all nameplates, notices, notice frames, markings, and labels required to complete the vessel to the satisfaction of the USCG and all other regulatory agencies. This includes the ship name on each side of the bow, the ship name and hailing port across the stern, deck plans, safety plan, lifesaving equipment plan, a CONTR's nameplate, and all licenses and certificates required for posting.

The CONTR must provide vessel name lettering and hailing port lettering made from 1/8" thick aluminum plate. The lettering must be permanently welded to the vessel at locations approved by the OWNER. Size and style of the lettering will also be subject to OWNER approval thirty (30) days prior to beginning this work. The lettering must be preserved and painted following installation.

The CONTR must install the vessel's CARB Unique Vessel Identifier (UVI) number per CARB Commercial Harbor Craft regulations.

All nameplates, labels, and identification tags must be permanently adhered to the equipment or adjacent surface with a marine adhesive, 3M™ 5200 or approved equal.

The CONTR must provide interior signage as required to encompass:

- No Smoking signs
- Fire door markings
- Video surveillance
- Seats reserved for disabled and elderly
- No Admittance - Crew Only
- Lighted exit signs
- Lifesaving equipment locations
- Life preserver markings
- Life buoy markings
- Boarding direction signs
- Instructions for use of lifesaving equipment
- Any and all markings and notices required by USCG
- Signs denoting mobility impaired and accessibility facilities
- 

Final style and placement to be agreed upon by OWNER and CONTR at time of build.

All vents, fills, and shore side connections must be clearly marked to show their purpose and restrictions on their use.

Pipe marking details are provided in Section 507.

Fire hydrants, shore fire suppression connections, and firefighting equipment must each be clearly marked to indicate the station number and handheld fire extinguishers must be marked with the location of their station, all per USCG requirements.

Service and other spaces not otherwise required to have markings must have identification plates of 1/8" thick engraved aluminum material. Markings must be compatible with the interior design scheme.

If the vessel is provided with certified spaces (certified for deduction from gross tonnage as determined by the Tonnage Admeasurer), those spaces must be permanently marked by center punching as required by admeasurement regulations.

Emergency lights must be marked with a 1" high letter "E", with white lettering on a red background.

To facilitate future blasting and painting of the hulls, provide permanent skip weld marks to indicate the boot stripe location along each hull, at full load static displacement plus 6".

### **603 DRAFT MARKS**

The CONTR must provide vessel draft markers made from 1/8" thick aluminum plate at high and low draft marks. The draft markers must be permanently welded to the vessel at locations approved by the OWNER. Subsequent draft marks may be vinyl decals. Size and style of the lettering and draft markers will also be subject to OWNER approval thirty (30) days prior to beginning this work. The lettering and draft markers must be preserved and painted following installation. The draft marks must indicate true navigational draft.

**604 LOCKS, KEYS, & TAGS**

Weather-tight doors and all joinery doors, except where otherwise specified, must be fitted with cylindrical type locksets with a latch bolt operated by a knob from inside, a cylinder outside, and no means of locking on the inside. Pilothouse doors must have cylindrical locksets with latch bolts operated by knob on the inside, cylinder on the outside, and thumb turn on the inside. Interior passageway doors must have cylindrical type latch sets with knobs free on both sides. Doors held open by magnetic holdbacks must have flush ring type handles.

All door locks on the vessel must be set up for single OWNER grand master key operation. The OWNER will provide the CONTR with a master key.

The overall number of keys on the vessel must be minimized and consolidated to the maximum extent possible; all keys must be tagged and indexed.

External hatches leading to propulsion equipment rooms, void spaces, and other machinery spaces must be furnished with hasps and padlocks, or equal locking provisions for securing with a padlock. Manhole keys and/or wrenches must be provided and stowed as directed by the OWNER.

**612 RAILS, STANCHIONS, & LIFELINES**

Handrails, grabs, and/or bulwarks must be fitted on all decks where necessary for the safety of passengers, and for crew access. Handrail stanchions must be of non-corrosive material. Where breaks are required for line handling, portable handrail sections and suitable grabs must be provided for the safety of line handlers.

Provide personnel safety equipment, harnesses, tracks, rigging, fittings, railings, et cetera to enable crews to externally deploy lifesaving gear, service cabin top equipment, and wash and maintain all windows.

Exterior passenger observation decks must be fitted with handrails and bulwarks to a USCG approved height of at least thirty-nine and one-half inches (39.5") to protect against persons or objects falling overboard. Exterior crew observation decks must be fitted with handrails and bulwarks to a USCG approved height of at least thirty-six inches (36") to protect against persons or objects falling overboard. Handrails must be supported such that they are free from vibrations at all vessel speeds and that reasonable loads developed by passengers do not deflect the rail course by an unacceptable amount.

Handrails and bulwarks in passenger areas must pass the four-inch (4") sphere test along their entire length and height. Other locations of handrails and bulwarks must have rail courses to ensure that no open space exists more than 12 inches high.

Handrails must be installed as required around machinery and equipment, and elsewhere for safety of operation. Where required for repair or maintenance of equipment, handrails must be made removable or portable as appropriate.

**621 INTERIOR JOINERY**

The interior joinery of the vessel must be constructed of honeycomb aluminum panels with HPL laminate, decorative metal finishes or microperforated aluminum sheet as required by the location of installation. The honeycomb joinery system must be Ayres Aylrite panels or OWNER approved equal. The system must be constructed using the approved Ayres aluminum extrusions, panels, assembly accessories, and techniques best suited for each application. Where multiple options exist on how to connect, support, retain, or finish panels, the most robust method and materials must be chosen to complete the detail.

Standard details for construction must be developed by the CONTR for review and approved by the OWNER prior to construction. All panel finishes (both sides) must be approved by the OWNER prior to ordering any interior materials. All laminates must be high quality and readily available. All adhesives used in honeycomb panel fabrication must be approved by Ayres and the OWNER. The interior design must strike a balance between lightweight and a durable system suitable for years of heavy passenger service. The OWNER must approve all panel scantlings to ensure that a suitable balance has been met. The OWNER reserves the right to consult with the manufacturer, require calculations and/or a full-size mockup if required to prove the suitability of scantlings, assembly techniques, and accessories used.

All joinery systems must conform to the fire load, structural fire protection, and other interior design standards as dictated by the USCG for a vessel of this type and passenger capacity. Where possible, lightweight materials must be used to lower the overall weight of the vessel.

The CONTR must provide and install lightweight, clip-in tile ceiling panels from DAMPA Tile or approved equal.

## **622 FLOOR PLATES & GRATINGS**

In machinery and equipment spaces, suitable gratings and flats must be installed to allow safe access to all machinery and equipment. Deck plates and gratings must be aluminum anti-slip plate, flanged, and fastened to framing with standard slot type SS 316 countersunk deck screws of proper length.

Access hatches shall be installed where needed to get to equipment or for visual access as required. Locations for access hatches shall be determined in Production Engineering.

Lifting padeyes must be installed above all equipment and machinery room ladders to allow for easy lifting of parts, motors, and other heavy equipment. Lifting padeyes must also be welded to overhead framing to facilitate equipment change out where the weight of said equipment exceeds sixty-five (> 65) pounds. All padeyes must be weight tested and marked accordingly and rated at 1,000 pounds minimum.

Any rotating and/or exposed machinery must be fitted with removable guards to prevent personnel injury.

## **623 LADDERS & STAIRS**

Ladders must be provided for access to all spaces. Ladders to machinery and equipment spaces must be inclined versus vertical wherever practicable.

Vertical ladders in general, as well as inclined ladders to machinery and equipment spaces, must be of aluminum construction where allowed and fitted with handrails and overhead grabs as required for safe use. All the surfaces of the ladders must be free of sharp corners.

Interior stairs between passenger spaces, arranged and dimensioned to support the passenger offloading requirements of Section 063, must be designed for loads of at least 200 pounds per square foot. Stairs must be fitted with handrails and non-slip deck treads. Wherever installed, non-slip treads must not present a tripping hazard. Handrails supported by bulkheads must have a clear hand space per ADA guidelines. Handrails in way of tonnage openings must be made removable or portable as required to conform to tonnage regulations.

## **624 NON-STRUCTURAL CLOSURES**

Hardware including doors, door hardware, trim, fasteners, and attachments must be corrosion resistant satin finished stainless steel unless otherwise approved. All hardware must be of the best marine quality, TrioVing or equal.

Exterior Doors must be Fabtek or approved equal. Exterior doors must have windows approved by OWNER.

Provide rubber button stops and catch hooks for all doors at the appropriate working level subject to OWNER approval. Doubler plates must secure stops and hooks to the respective bulkhead or structure.

All exterior weathertight doors must be fitted with closers, single lever dogs, and latches for holding the door securely open at the appropriate working level subject to OWNER approval.

Interior honeycomb doors are acceptable. All doors are to be verified flat, planar to door frame within 1 mm. In general, interior doors must be fitted with closers and not swing into an aisle or passageway. Door thresholds and sills must meet the ADA requirements of Section 092 and incorporate fairings to eliminate all tripping hazards. All interior doors must be fitted with closers requiring less than five (5) pounds of pressure for operation.

Any fire doors that require an A-class rating shall be 316 stainless steel construction from Fabtek. The exterior doors shall remain unpainted with a brushed finish and passivated so they do not rust in service.

All doors, interior and exterior, must be fitted with hold opens (except fire doors). All hold opens must be located at the same height where they are accessible to all crew members without bending over. All hold opens must be of the same type as reviewed and approved by the OWNER.

## **625 WINDOWS**

CONTR to provide and install windows as specified by Appendix B1. Windows in the passenger spaces must be of the bonded frameless type and installed using an approved marine grade adhesive system such as Sika, 3M, or equal. The glass must be high quality laminated safety glass or monolithic tempered or toughened safety glass. Glass panes must be of a thickness required by the USCG and classification society rules. All passenger space windows must be fixed.

Windows that require fire clips shall employ 316 stainless steel fire clips that are embedded in the window caulking or other method to limit corrosion. The final production fire clip details shall be determined in Production Engineering. CONTR should estimate fire clips on all windows until approvals are received otherwise.

Forward pilothouse windows must be fitted with adjustable, robust, marine grade Mylar shades in guided tracks. Aft pilothouse windows must be provided with window treatments (blinds) wherever passengers could potentially see into the pilothouse. Window treatments must be fully integrated with the vessel's interior decor.

All windows must be tinted to the satisfaction of the OWNER. Pilothouse windows must not be tinted.

### **625.1 (OPTION) Bow Curtain Windows**

CONTR to provide and install exterior windows in the Bow Curtain, identified as windows W5, W6, and W7 in Appendix B1.

## **626 WINDOW WIPERS**

CONTR to provide and install a window wiper for only the center forward window of the pilothouse. The wiper blade must cover the entire rain swept area of visibility clearing at least eighty percent (80%) of the visible/useable window area. The wipers must be Wynn Type D, Mk-V or approved equal, linear style, with variable solid-state speed control. The wipers must have an auto-parking feature that does not obscure the window in the parked position. Quiet wiper operation is essential, the CONTR must be responsible for ensuring that noise from operating wipers is minimized. See Section 088 for noise limits.

**631 PAINT & COATINGS**

The vessel is to be painted with International marine coatings as outlined in Appendix B1. Vinyl film is not allowed other than for graphics. All coatings must be applied as per the manufacturer's written requirements under climate-controlled conditions.

All surfaces to be painted must be grit blasted to SSPC-SP 10 (NACE No. 2) requirements prior to applying coatings. In all areas there must be contrasting colors between coats of paint so that holidays can be easily identified.

Careful attention must be paid to overlapping coating system seams to avoid edge conditions that promote premature coating failure. The edge termination details must be approved by the OWNER prior to the application of any coatings.

The final color scheme is to be determined during Production Engineering and approved by the OWNER.

Paint performance, including but not limited to anti-fouling performance, must be fully warranted by the CONTR.

**631.1 Hull Below Waterline**

The underwater hull coatings must encompass each demihull from the keel to six (6) inches above the full load waterline. Refer to Appendix B1 for the coating schedule.

The Hydromaster thruster units must be coated as per Hydromaster's requirements with an approved anti-fouling.

**631.2 (OPTION) Hull Above Waterline**

This area includes the wet deck, the integrated bulwarks on the aft deck and foredeck, and the ship service diesel generator enclosure. Refer to Appendix B1 for the coating schedule.

**631.3 (OPTION) Superstructure Sides and Top**

This area includes all surfaces above main deck less the upper deck. Refer to Appendix B1 for the coating schedule.

**631.4 Deck Non-Skid**

The exterior decks on the vessel must be coated with a non-skid system as described below and in accordance with Appendix B1. These areas are critical as they must provide a safe walking surface for passengers and crew. Prior experience has shown that non-skid coatings on lightweight aluminum vessels are difficult and prone to failure. Non-skid deck coatings must be kept thin so the coating system can flex and move with the aluminum as it thermally expands and contracts with solar loading. Applying non-skid coatings with any substantial thickness leads to failure of the coating system whereby it separates in large sheets and leaves behind dangerous bare spots that become slippery in wet conditions. Therefore, the non-skid deck coatings as outlined in Appendix B1 do not follow International's guidance.

**631.5 Interior Wet Spaces**

Interior wet spaces require a coating system that provides a watertight envelope while remaining somewhat flexible. Interior wet spaces are defined as the head, snack bar, and the two storage areas attached to the snack bar. In all cases the wet space coating must be applied to the deck with a three (3) inch minimum coving up surrounding walls or bulkheads or to the next logical break in the interior joinery.

### **631.6 Interior Exposed Mullions and Structure**

All exposed metal surfaces in the pilothouse interior must be painted flat black. Interior joinery in the pilothouse must also be finished with matte or flat black laminate. If the console is built off-site, it must be meticulously covered to prevent damage prior to delivery.

All exposed metal surfaces in the passenger cabin must be painted with colors chosen to complement the interior décor of the vessel pending OWNER review and approval.

### **631.7 Pipe Through-Hull Penetrations**

All through hull piping (including sea chests) must be coated with Belzona 5831 or approved equivalent prior to being coated according to their applicable zone coating schedule. Refer to Appendix B1 for the coating schedule.

## **633 CATHODIC PROTECTION**

The vessel must be fitted with passive zinc MilSpec anode-type protection system. Bolt-on passive anodes must be provided on the hull bottoms, and at each seachest in sufficient numbers, locations, and weight/size to protect the hull for 2½ years. The CONTR must provide the services of an ABYC certified specialist qualified to design the system and then to measure and provide a report of adequacy when the vessel is afloat.

All hull anodes must be mounted with round Fraser Bronze cast aluminum/stainless steel hull mounts per Fraser Drawing No. FR 072.0.

Hull anodes shall be installed flush with the molded hull unless specifically approved by the OWNER.

Cathodic protection meters must be installed on the pilothouse to allow for assessment of each of the hulls' potential by the operators. The meters must be Electro-Guard Model 125A meters, one for each hull with a reference cell located aft near the cathodic load in a location that will always be well submerged. The reference cells must be mounted inside of cofferdams fabricated from pipe and standard flanges. The cofferdam must preclude the possibility of reference failure from flooding the compartment it is located in. The closure flange of the cofferdam must be tapped and a ¼" NPT SS 316 ball valve installed where it is protected so that the cofferdam can be checked for flooding prior to opening. The protection must make it such that crew cannot accidentally step on the valve and break it off.

Unless otherwise noted, all hardware and fasteners used in the construction of the vessel must be SS316.

### **633.1 Isolation of Dissimilar Metals**

The assembly of dissimilar metals throughout the vessel must be in accordance with best shipbuilding practices and all regulatory requirements. The provisions of Corrosion and Coatings Prevention in the ABS Rules for Building and Classing Aluminum Vessels must be followed without exception.

Copper tubing is not permitted in sea water systems, and copper nickel piping must be isolated from hull fittings. Water systems must be constructed using the same material for piping and fittings throughout the system. Steel and other non-aluminum metal fittings must be isolated from the aluminum structure at their mounting surfaces by means of 10 mil PVC tape or other approved methods. Isolate stainless steel from aluminum using isolation kits and products such as TEF-GEL in areas where direct contact cannot be avoided.

Pumps in sea water systems must be corrosion resistant and approved by OWNER.

**634 DECK COVERINGS**

Deck coverings must not be applied until production work, especially welding, has been substantially completed. The decks must be smooth and fair when deck coverings are applied. All decks must be covered as specified in Table 634-1. Deck areas not covered by Section 631 or Table 634-1 are to be bare unpainted aluminum.

<b>Table 634-1 – Deck Covering</b>	
<b>Location</b>	<b>Type</b>
Weather decks	See Section 631 for coatings
Pilothouse	Forbo Flotex Carpet per OWNER approval
Passenger spaces	Forbo Flotex Carpet per OWNER approval. Carpet must have cove base that meets ADA requirements of Section 092.
Stairways	Full tread width and depth WOOSTER PRODUCTS STAIRMASTER treads, safety yellow at the top and bottom stair.
Head, snack bar, storage connected to snack bar	See Section 631 for coatings

Stair treads must not present tripping hazards wherever installed.

Rubber matting must be provided for the Pilothouse and installed in way of switchboards and other electrical equipment. Matting installed in way of electrical equipment must conform to MIL SPEC #M-15562F Type III for dielectric properties.

After installation of finished deck coverings, they must be immediately and completely covered with plywood runners and cardboard protection through completion of the delivery voyage in order to protect the finishes.

**635 INSULATION**

CONTR to install insulation in accordance with Appendix B1.

All insulation details must provide for a clean, well-trimmed and terminated installation that will not inhibit maintenance and repair activities. All products and debris from the installation of the insulations systems must be cleaned and removed from the vessel. Where bimetallic pins are used to retain the insulation products the CONTR must ensure that the pins are cut as short as possible with a dull rounded termination that cannot pierce the button cap and injure crew members. Where insulation systems are prone to high wear or mechanical damage they must be covered with a protective layer. Where insulation systems are likely to encounter fluids, they must be sealed to ensure they do not absorb the fluids causing corrosion or fire hazards.

**635.1 Thermal Insulation**

The superstructure of the vessel must be thermally insulated with a lightweight non-combustible ceramic/acrylic spray on thermal insulation product from Mascoat or Advanced Coating Solutions. Product must be water based ceramic microballoon suspended in an acrylic substrate.

The system must be applied in two (2) 20-25mil coats for a final DFT of 40-50mils of thermal insulation. All surfaces must get coated to ensure a complete thermal barrier. Where the thermal insulation is in an exposed area of the superstructure, such as the window mullions, the coating must be sanded smooth prior to painting.

### **635.2 Structural Fire Protection**

Structural fire protection is required in several locations in the vessel. CONTR to use appropriate thickness and density insulation from Thermal Ceramics FireMaster – Marine Plus Banket or approved equal.

Mild steel or galvanized pins are not permitted insulation installation. CONTR must use either stick-on or welded bi-metallic stainless-steel pins and stainless-steel clips. All bimetallic pins shall be installed per the spacing required by the certifications. All points of insulation pins must be cut down - hammer flat, rolled, welded, or covered such that the remaining profile is not dangerous. Ends must be dulled to ensure the crew and maintenance staff are not injured by pins. Sharp points left on insulation pins will pierce the protective caps and injure crew and maintenance staff. Particular attention to insulation pin details must be paid in the way of the tight sides of machinery/equipment as the operator's staff will routinely be pressed up against these areas.

### **635.3 Acoustic Insulation**

Acoustic insulation must be installed in machinery/equipment spaces as necessary to limit sound levels per Section 088. The manufacturer's recommended methods must be used for installation of the insulation. Sound leaks at doors and other openings must be sealed to provide an acoustic sound barrier.

## **644 OUTFITTING**

### **644.1 General Outfitting Details**

Special attention will be given to the interior outfit on this vessel with the goal of creating a modern, crisply detailed, minimal, open space that enhances the passenger experience. The interior outfit shall emphasize the large picture windows with minimal visible framing. Particular attention will be paid to lighting layout and the use of indirect lighting where possible.

### **644.1 Restroom**

One (1) unisex restroom must be installed on the vessel. The restroom must be outfitted to meet all requirements for the accommodation of the mobility impaired (ADA). The restroom will be accessible only from the vessel exterior. Restrooms must be outfitted as follows:

- Fresh water flush head, with remote mounted flushing button
- One single stainless steel sink and no-touch faucet
- Mirror
- Liquid soap dispenser, no touch
- Toilet paper dispenser
- Toilet seat protector dispenser
- Electric hand dryer, no touch
- Floor drain
- Overhead light
- Power exhaust ventilation
- Waste receptacle with lid
- Coat hook
- Baby changing station

### **645.2 Snack Bar**

The snack bar arrangement is captured in Appendices B2 and B3. Final fit and finishings will be determined during Production Engineering.

Equipment will need to be secured so that vessel movements do not cause dangerous movement of the equipment.

Special attention needs to be paid to ensure that proper sanitary detailing has occurred on the construction and installation of the snack bar. The deck inside the bar must be sealed as per Section 631 to create a watertight envelope. A similar level of detail is required for the bar counter surfaces – gaps and crevices need to be minimized to the greatest extent possible to prevent debris from falling into.

### **645.2 Furniture & Furnishings**

Materials for furniture and furnishings are to be determined during Production Engineering and must be approved by the OWNER. In general, materials are to be selected based on their ability to hide heavy use, while presenting a pleasing appearance to maximize passenger comfort and contribute to the overall décor.

Exterior lounge and settee seating must be fabricated from welded aluminum bases with outdoor marine-grade upholstery. Settee bases must include locker access for PFD storage. Upholstery fabric should be highest UV resistance and waterproof. Final fabric selection must be approved by owner. Foam should be 4" high density, fast dry high traffic foam. Cushion Wrap Silk Film should be used to double wrap foam to prevent any water intrusion. Cushion attachment to base must be approved by OWNER.

The aft deck is to be outfitted with a fixed bar-top with seating, as depicted in Appendix B1. The space under the bar-top is also reserved for a ship service diesel generator. If the generator is installed, CONTR must include appropriate ventilation and access for the genset. If the generator is not installed, the bar-top can be narrowed and the allocated space under the bar-top can be converted into a storage locker.

### **645.3 Seats**

Seating must be installed as illustrated in Appendices B1, B2, and B3.

Interior seats must be of aluminum construction – UES Sea Force or approved equivalent.

Exterior seats must be of aluminum construction with a corrosion resistant anodized or powder coated finish – UES Newport model or approved equivalent.

Seats must be installed using welded seat tracks.

### **645.4 Tables**

Tables must be aluminum honeycomb panel construction with plastic laminate finish and sea rails with cutouts for cleaning.

### **645.5 Metal Case Furniture**

Case goods (desks, cabinets, et cetera) must be of aluminum honeycomb construction. The gauges of aluminum must be heavy enough to provide the necessary degree of strength and stability for marine use.

Drawers and drawer guides must be constructed to operate freely and without noise. All drawers and doors must have catches with rated strength such that they will remain closed when tilted thirty degrees (30°) from horizontal, but drawers must be removable at will. Drawers must have side glides and positive stops to prevent accidental opening.

Doors and drawer heads in metal furniture must be of vermin proof sealed box construction, braced with proper reinforcements to prevent undue racking or twisting. Doors must be equipped with rubber bumpers to prevent rattling.

Final cabinet and furniture layout to be decided during Production Engineering.

#### **645.6 General Wall Decor**

Bulkheads in all enclosed passenger areas must be finished. Fit and finish to be determined during Production Engineering.

Flooring must be extended upwards a minimum of four inches (4") from decking on all bulkheads.

#### **645.6 Hardware**

Additional items, including but not limited to coat and bag hooks, will be determined during Production Engineering.

### **656 TRASH RECEPTACLES**

The CONTR must provide aluminum trash receptacles to service interior and exterior spaces as depicted in Appendix B1. Receptacles must be color-labeled and provided in pairs with separate receptacles for:

- General waste
- Recycling newspapers, aluminum cans, plastics

Trash receptacle details are to be determined during Production Engineering.

### **671 LOCKERS & SPECIAL STOWAGE**

A deck locker must be incorporated on the foredeck for stowage of mooring lines, bunting, and other deck equipment.

A deck locker must be incorporated under the starboard stairs for stowage of a Jason's Cradle.

Two storage areas are to be incorporated under the stairs and be accessible from the snack bar as depicted in Appendix B1. These storage areas are to have open-framed access. Storage layout and shelving to be determined during Production Engineering.

### **672 BICYCLE ACCESS & STOWAGE**

The CONTR must provide permanent bicycle access and stowage racks on the aft deck to accept the quantity of bicycles specified in Table 081-1.

Bicycle storage facilities must be arranged to promote efficient traffic flow and minimize congestion during loading and offloading. Racks must be designed to accommodate commuter, road, and mountain style bicycles.

Bicycle storage must generally be horizontal racks that secure the bicycle's wheel(s) requiring a minimal vertical lifting effort by the passenger. Alternate arrangements such as hanging storage may be considered and are subject to the OWNER's approval.

## 800 MANAGEMENT & ENGINEERING

The CONTR must supply project management and manufacturing engineering labor, materials, services, and other resources necessary to accomplish the work described in these Technical Specifications (the Specification), and otherwise required by this Request for Proposal.

All aspects of the vessel engineering effort that will take place in the vessel design and engineering phases of the Contract will be completed by the DESIGNER or using in house engineering as proposed by the CONTR and approved by the OWNER.

The Vessel is intended to operate with an unmanned machinery space and have computer-based control systems. Per 46 CFR Subchapter K §121.620(d), the controls must be in accordance with 46 CFR Subchapter F, Part 62, as interpreted by USCG CVC Policy Letter 17-07.

Per 46 CFR Subchapter K §119.200(a), the installation of the battery propulsion system must be in accordance with 46 CFR Subchapters F and J. Per USCG CVC Policy Letter 17-07, a qualitative failure analysis (QFA), design verification test procedures (DVTP), and periodic safety test procedures (PSTP) are required for the propulsion system. These tests must be successfully completed and witnessed during Dock Trials.

The QFA, DVTP, and PSTP shall be developed in accordance with Marine Safety Center Marine Technical Note, MTN 02-11, CH 1: Review of Vital System Automation and Dynamic Positioning System Plans, as applicable, for steering systems, propulsion systems, control and monitoring systems, and power generation and distribution systems. Additionally, the following analyses must be completed and submitted to the OWNER for review and to USCG MSC for review and approval:

- Overcurrent protective device coordination study - a comparison of the time and current relationships of each series set of protective devices, to verify selective tripping of circuit breakers and fuses
- Short circuit and device evaluation study
- Voltage drop - to determine required conductor sizes and voltage drops of AC and DC circuits, using final load values and cable lengths

Approved documents must be provided to the OWNER with approval letters.

## 810 DESIGN & ENGINEERING

The Design and Engineering of the vessel will be broken into three distinct activities:

- Contract Design
- Production Design & Engineering
- Manufacturing Design & Engineering

The OWNER must approve each phase prior to moving to the next phase.

### 810.1 Contract Design Phase (OWNER provided with the RFP)

This phase is complete and has been provided in the Part B appendices. This package defines the OWNER's desired vessel, the required configuration, and major material selections to enable the CONTR to bid the vessel accurately enough to enter into a construction contract with the OWNER. This package has not been submitted to US Coast Guard for review but shall be assumed to be compliant with current USCG regulations.

The Contract Design package consists of three forms of information, listed here in order of precedence:

- Contract Drawings - PDF drawings organized by Ships Work Breakdown Structure (SWBS) drawing numbers. These drawings contain relevant bill of materials, general notes, system schematics, and construction & installation details. (Included in Appendix B1 of the RFP)
- The Technical Specifications. (Part B of the RFP)
- 3D CAD model (Included in Appendix B1 of the RFP)

Where specific details within contract drawings do not exist or are noted to be resolved during the Production Design & Engineering Phase, the written specifications and 3D model give additional insight and context to the OWNER's requirements for a satisfactory vessel. Where specific details within contract drawings do not exist or are noted to be resolved during the Production Engineering Phase, the written specifications and 3D model give additional insight and context to the requirements of the PEP and the needs of the OWNER for a satisfactory vessel.

### **810.2 Production Design & Engineering (DESIGNER to provide post award)**

During this phase, the DESIGNER will work with the CONTR to develop the Production Design & Engineering package that incorporates the CONTR's standard processes, constraints, and build plan, while ensuring the OWNER's critical requirements from Contract Design are preserved. The primary goals of Production design are:

- To define the final configuration of the vessels to be produced
- Adapt and mature the Contract Design to incorporate the approved CONTR's standard processes, installation details, vendor preferences, Manufacturing Plan, processes and assembly plan.
- Provide CNC cut files for aluminum
- Align with the CONTR's Manufacturing Plans
- Achieve regulatory Approvals
- Set final contractual thresholds for weight, centers of gravity and speed.

The CONTR must participate in Production Design and Engineering phase as necessary for the DESIGNER to complete their work.

The DESIGNER will establish a comprehensive deliverables list to track the status of each drawing or report and the regulatory and approval status. After Production Design, the CONTR will eventually maintain this list as the central database of drawings and data through delivery of the vessel.

Schematics shall be used to convey a system theory of operation and design. However, the CONTR shall not build from drawings that are schematic in nature except for electrical and electronics drawings. The CONTR shall build from production drawings that show production level details including but not limited to foundations, hangers, brackets, supports, removal clearances, routing and other details required to ensure the elements of the drawing get installed as per the approved drawing.

The DESIGNER will be responsible for submitting and approval of USCG required drawings and engineering

The CONTR shall furnish a copy of all written or email correspondence sent to or received from regulatory agencies to the DESIGNER and OWNER.

By including the CONTR as a contributor to Production Engineering, the OWNER aims to improve the quality and build efficiencies of the vessels. Upon successful completion and approval of the Production Design and Engineering by the OWNER and USCG, the DESIGNER's engineering work will be complete and the complete package will be officially transmitted to the CONTR as "Approved for Construction".

### **810.3 Manufacturing Design & Engineering (CONTR to provide)**

The CONTR will use the final approved Production Design developed in 810.2 as the basis for their Manufacturing Design and Engineering. The intent of this phase is for the CONTR to:

- Translate the Production Design and Engineering package into shop level manufacturing information that may include, but not be limited to, surveys, material selection, preparation of diagrams, sketches, schedules, data, and preparation of shop level production drawings as required to construct the vessel
  - Produce drawings and other information to support shipyard processes such as:
    - Tooling & Jigs
    - Cut lists, Extrusion and Plate Orders
    - Assembly, Workstation and Workpack plans
    - Pipe Spool and subassembly drawings
    - Module/Vessel Lift, Movement & Launch Plans

Any Manufacturing Plans and drawings developed by the CONTR shall not change any configurations, materials or equipment that are defined in the Production Design

The CONTR shall propose to the OWNER a plan for determining the stability of the vessel. This plan will build upon the preliminary stability assessment developed by the DESIGNER as part to the vessel concept design submittal package. This plan shall detail the process that the CONTR will follow in obtaining USCG approval of the final approval of vessel stability calculations and issuance of a USCG Stability Letter. The CONTR shall submit final stability calculations for OWNER review ten (10) days after vessel launch.

Stability Letters shall be framed and posted in the pilothouse as required by USCG.

### **810.4 As-Built Drawings**

The CONTR will be responsible for auditing the vessels post construction and updating drawings to reflect the As-Built condition. All working drawings are to conform to an “as-built” condition and stamped “AS-BUILT FINAL” in the title block. The final drawings shall reflect systems and arrangements of the Vessel as finally completed and approved. The drawings shall not be stamped “AS-BUILT FINAL” until after the CONTR has verified that the physical configuration of the Vessel matches the drawing being submitted as an as-built. Drawings that are modified after USCG approval must be resubmitted for approval prior to being accepted as as-built drawings by the OWNER. Close attention shall be paid to electrical and piping termination details. The CONTR shall verify that equipment data matches the drawing BOMs.

### **810.5 Display Drawings**

The CONTR shall develop and provide 24” x 36” D sheet size, non-fading positive prints of drawings to be mounted in the locations as required by the USCG on board the Vessel. Any plans required by the USCG for issuance of the COI shall also be provided by the CONTR. These drawings shall be mounted in anodized aluminum frames with clear plastic covers (“Plexiglass”) prior to delivery of the Vessel.

### **810.6 Weight Control Program**

Minimizing weight growth during the contract work is critically important. Scantling sizes shall be kept to a reasonable size.

The CONTR must assume responsibility of maintaining the Weight Estimate after Production Design and engineering is complete. Each revision of the weight estimate shall be submitted to the OWNER. Throughout the design and construction period, the CONTR shall monitor the actual weight of equipment and materials against the weight estimate. Weight growth or migration shall be brought to the attention of the OWNER in writing.

The CONTR is responsible for constructing the vessel in compliance with the agreed weight and centers of gravity finalized in the Production Design phase

## **820 TECHNICAL DOCUMENTS**

As part of the complete Vessel, the CONTR must provide to the OWNER, upon delivery:

- A complete set of the USCG approved drawings for the Vessel, including revisions required to reflect As-Built status
- A complete set of all As-Built drawings for the Vessel, three (3) full-sized black and white reproducible copies, and an identical AutoCAD (Latest Release) copy on a USB thumb drive
- Smaller drawings, such as 8½" × 11", and 11" × 17", shall be on bond paper
- Manufacturer's drawings and schematics – minimum three (≥3) copies of each document
- Vendor and subcontractor drawings – minimum three (≥3) copies of each document
- Machinery, equipment, and parts: manuals and technical documentation – minimum three (≥3) copies of each document and one copy on a USB thumb drive
- Vessel operations manual, specifically manuals for EPMS, and procedures to operate shipyard custom built and interfaced systems including machinery, controls, auxiliary, electrical, plumbing and safety – minimum three (≥3) copies
- All manuals and system and equipment documentation must be in new, unused condition
- One copy of all purchase orders, the purchase orders shall be grouped by SWBS section, the intention is that the OWNER shall have all the information required to contact vendors, order spares, operate, and repair the Vessel

## **830 MATERIALS**

### **830.1 Control of Materials**

The materials used on the work must meet all requirements of these technical specifications.

Materials to be supplied must be identified in the CONTR-developed documents such as: specifications, purchase technical specifications, drawing BOMs, drawing equipment lists, or detail drawings. Materials must be described to the extent required for ordering or reordering from suppliers. Descriptions must include brand name, model, type, size and other information as applicable to the item.

Where necessary to provide flexibility and competition in the purchasing process, alternative manufacturers may be suggested by CONTR and are subject to approval by the OWNER.

No materials must be ordered until after Notice to Proceed has been authorized by the OWNER. Any materials ordered prior to such notice to proceed are at the CONTR's sole risk.

All materials incorporated in the Work covered by this Contract are to be new, of current production, of the specified or most suitable grade of their respective kinds for the purpose and, except where otherwise specifically provided for in the Contract for particular items, currently supported by spare parts in the United States of America and as required by the Contract. All material items used must be suitable for use in a marine environment and for their intended use.

All materials must be free from imperfections of manufacture and from defects that adversely affect appearance or serviceability.

Materials banned by the State of California must not be used under this Contract.

Structural plates, shapes, bars, castings, forgings and all other material used throughout the Vessel which are subject to Regulatory Body approval must meet the requirements of the Regulatory Bodies.

### **830.2 Samples**

Samples of materials must be submitted for approval when so directed by the OWNER or indicated in the Contract Documents. The OWNER may order such sampling at their sole discretion. Any work in which untested materials are used after such direction from the OWNER, and which the OWNER has not approved in writing, is subject to removal at the OWNER's direction and at the CONTR's expense.

Material samples may, at the option of the OWNER or Regulatory Bodies, be subjected to laboratory testing beyond that normally performed by the manufacturer, to verify compliance with quality requirements. The results of the tests may be the basis for acceptance of quality of manufactured lots. Except where such testing is expressly required by the Contract, the costs of laboratory testing that is requested by the OWNER and beyond that normally performed by the manufacturer must be paid for by the OWNER as Extra Work at the laboratory facility's invoiced price and without CONTR mark-up.

### **830.3 Tests & Inspections at Place of Manufacture, Production, or Shipment**

In addition to material tests and inspections that occur at the CONTR's facilities, certain items of equipment and other materials must be inspected and/or tested at the source (place of manufacture, production or shipment) as required by the Regulatory Bodies and the Contract. During the monthly Progress Meetings CONTR must apprise the OWNER of anticipated tests that may occur in the following month that the OWNER may desire to witness including similar propulsion component testing.

Where inspections and tests at the place of manufacture, production or shipment are made, the following conditions must be met. The conditions in subparagraphs 'A' and 'B' below must be requirements of any Contract or agreement between the CONTR and the producer, manufacturer, fabricator or supplier:

- A. The OWNER and Regulatory Body representatives must have the cooperation of the CONTR and the producer, manufacturer, fabricator or supplier with whom the CONTR has contracted for the materials.
- B. The OWNER and Regulatory Body representatives must have full entry at all times to such parts of the plant as may concern the production, manufacture, assembly, cleaning, painting and packaging of similar materials being furnished.
- C. In the case of plant facilities located within the continental United States, the OWNER must be advised of the production and/or fabrication schedule a minimum of 4 calendar days prior to beginning work on any similar item requiring test or inspection. In the case of plant facilities located outside the continental United States, the OWNER must be advised of the production and/or fabrication schedule a minimum of 10 calendar days prior to beginning work on any similar item requiring test or inspection. Such notifications must include the recommended dates that the OWNER be on site to witness or perform tests and inspections.
- D. Planning and coordinating the conducting and witnessing of tests and inspections at sources of supply by Regulatory Body representatives must be the responsibility of the CONTR.

All materials that are fabricated or installed without having received the required inspections and tests witness thereof by Regulatory Body representatives, must be considered unacceptable and may, at the OWNER's discretion, be subject to removal and correction at the CONTR's expense.

The OWNER reserves the right to retest materials that have been tested at the source of supply, after they have been delivered and prior to incorporation into the work where, damage warrants such retest. The OWNER reserves the right to reject all materials which, when retested, do not meet the requirements of the Contract.

#### **830.4 Material Certification**

Where materials are required by these specifications to conform to certain standards and requirements, such as those of the USCG, ASTM, AISI, ANSI, FCC, USPHS, IEEE, or UL, the following provisions must apply:

- A. All items requiring U.S. Coast Guard approval must be listed in COMDTINST M16714.3 (old CG-190), "Equipment Lists," or a USCG approval letter or certificate must be furnished to the OWNER upon request.
- B. Copies of materials certifications, test reports, metal analyses, welding inspections, non-destructive test data, welding procedures and test schedules must be provided to the OWNER as requested.
- C. The OWNER may permit the use, prior to or without sampling and testing, of certain materials or assemblies when accompanied by the manufacturer's certificate of compliance stating that such materials or assemblies fully comply with the requirements of these specifications. The certificate must be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.
- D. Provision of invoices, certificates of compliance or other documentation contending that furnished materials comply with standards and other requirements applicable to the materials must not relieve the CONTR of his responsibility to perform inspections, tests, research or other validation work necessary to ensure that the materials do in fact comply with the requirements.
- E. All items requiring classification society approval must have an approval affidavit furnished to the OWNER prior to installation of the item.

#### **830.5 Protection & Storage of Material**

The CONTR must be responsible for the protection from the elements, weather, and abuse, of all material intended for use and installed on board the Vessel until the Vessel is delivered to the OWNER in accordance with these specifications.

Due consideration must be given to the nature of the item during handling and storage. Materials must be stored out of the weather in a manner that assures the preservation of material quality and fitness for the work.

All finished surfaces must be protected by appropriate means. Surfaces damaged or marred must be replaced or repaired by the CONTR to the satisfaction of the OWNER at the CONTR's expense.

The OWNER may reject any material improperly stored or handled.

The OWNER may require that stored materials, even though inspected before storage, be inspected again prior to their use. Stored materials must be located so as to facilitate their prompt inspection.

#### **830.6 OWNER Furnished Equipment & Material**

The CONTR must furnish all parts, materials, equipment, tools, or any other items as necessary to complete the contract, except where indicated otherwise. There will be no OWNER furnished equipment or materials.

**830.7 “Or Equal” Material**

Where a specific vendor, brand name and/or model is required by the Contract design package the indicated brand name must be provided unless OWNER approval of an “or equal” is obtained. To request OWNER approval of an “or equal”, the CONTR must submit a written request to the OWNER and must be obligated to include the following in the request:

- A. All relevant data establishing equality or superiority of the product as it relates to:
- B. performance, reliability, maintainability, durability, size, and weight characteristics
- C. requisite regulatory body approvals
- D. availability of parts and service
- E. service history/records of the proposed item
- F. Identification of any material variations of the proposed “or equal” from the materials provided and these specifications otherwise addressed by item ‘A’ above.
- G. The warranty of the proposed item.
- H. Drawings and sketches of the proposed item, if available.
- I. Names, addresses and telephone numbers of firms that have the item in similar service.
- J. An analysis of the effect on Vessel’s weight, center-of-gravity and stability.
- K. A statement that no increase in the Contract Price or time to complete the Work must result from use of the “or equal”. Written quotes from the “specified” and proposed “or equal” vendors must be provided.
- L. Other salient technical data necessary for a comparative analysis.

The CONTR must make arrangements for the OWNER to view the proposed “or equal” item in use at the CONTR’s site or deliver a sample to the OWNER if requested.

The OWNER must provide a written determination regarding the request for use of the “or equal”. The OWNER’s determination must be considered final. For use of an “or equal” to be considered approved, it must have the unambiguous written approval of the OWNER. The OWNER’s approval of an “or equal” allows the CONTR the option of procuring that item or services. In each case where the request is disapproved by the OWNER, the CONTR must provide the specified vendor or material at no extra cost to the OWNER.

Use of “or equal” items and material substitution must not be considered without a written request for same, nor must it be allowed without the OWNER’s written approval.

It must be the CONTR’s responsibility to design, integrate, test and incorporate the “or equal” item in the work. All costs to the CONTR as a result of the use of the “or equal”, over and above the cost of the originally specified, must be at the CONTR’s expense. The CONTR must be entitled to no extension of time associated with the use of an “or equal”. The OWNER must not be responsible for any delay resulting from a substitution request.

**835 DRYDOCKING**

Following delivery of the Vessel to the OWNER’s facilities in San Diego Bay, the CONTR must arrange at its expense for the vessel to be drydocked in the San Diego area. The drydocking operation must include having the underwater appendages examined, bottom cleaned, and any damages from delivery repaired. Bottom paint anti-fouling must be touched up as necessary, and anodes inspected. Seachests must be opened for examination and

cleaning. The OWNER must be notified of the time and place of this drydocking and must inspect the vessel prior to undocking.

The drydocking must be witnessed by the USCG for the purposes of fulfilling periodic underwater inspection requirements.

Docking plans must be provided with the Vessel. The docking plan must identify three (3) unique block set arrangements.

All costs associated with this drydocking must be borne by the CONTR.

At the OWNER's sole discretion these drydocking requirements may be waived if a complete bottom inspection of the Vessel is completed by the OWNER prior to launching off of the Delivery transport vessel, and if the launching of the Vessel completes without incident.

### **836 PRELIMINARY ACCEPTANCE, SURVEY, & TRIALS**

Prior to Final Acceptance Trials at the OWNER's location, the CONTR must conduct a Preliminary Acceptance Survey and Preliminary Acceptance Trials at or near the CONTR's facilities. The OWNER will issue Preliminary Acceptance when all the following requirements are fulfilled to the OWNER's satisfaction:

- A. Allowing for a small quantity of minor deficiencies (see below), all physical work is completed, with all requisite regulatory approvals, certifications and letters of compliance obtained, and with the Vessel ready for service in full compliance with the Contract to the satisfaction of the OWNER.
- B. Vessel displacement, trim and speed in accordance with the limits established in Production Design
- C. Battery performance as specified in the CONTR's proposal and capacities as listed in Table 081-1.
- D. The Vessel must be thoroughly cleaned in accordance with Section 951 of these provisions to the satisfaction of the OWNER.
- E. All shop and installation tests and inspections must be completed, with results demonstrating compliance with the Contract to the satisfaction of the OWNER.
- F. The Preliminary Acceptance Survey described herein is complete, with the results supporting a conclusion by the OWNER that the Vessel is complete, clean, free of deficiencies, and ready for delivery to the OWNER in compliance with the Contract to the satisfaction of the OWNER.
- G. All Trials and prerequisite tests must have been completed, with results demonstrating compliance with the Contract, and approved by the OWNER.
- H. Any prerequisite tests to Preliminary Acceptance Trials and/or Preliminary Acceptance is complete, with results demonstrating compliance with the Contract, and approved by the OWNER.
- I. Correction of all known deficiencies including deficiencies that develop or are identified after Preliminary Acceptance Trials.

The survey, tests, inspections, requirements, and trials referred to in subparagraphs "C" through "I" above will serve to assist the OWNER in making the determination as to whether the requirements of subparagraphs "A" and "B" above are fulfilled.

The conduct of the Preliminary Acceptance Survey must be contingent upon receipt by the OWNER of written notice from the CONTR of presumptive completion of all physical work, testing, and clean-up provided for under the Contract. The Preliminary Acceptance Survey must precede the Preliminary Acceptance Trial for the Vessel.

The Preliminary Acceptance Survey must be solely for the purpose of relating the OWNER's determination that, if the CONTR delivers the Vessel in like condition in material, operation and performance, and corrects deficiencies

which must be authorized in writing by the OWNER to be corrected following Preliminary Acceptance but before the Vessel Delivery (see below), the Vessel as constructed and presented is acceptable to the OWNER.

A Preliminary Acceptance Survey for the Vessel must be a prerequisite to the Delivery of the Vessel to the OWNER's location.

A Preliminary Acceptance Survey must be conducted after all physical work, testing, and clean-up provided for under the Contract is completed. The intent of the Preliminary Acceptance Survey must be to affirm that the Vessel is complete; the form, fit and function of installed materials are satisfactory, and the Vessel is clean and clear of rubbish, excess material, et cetera, in accordance with Section 951. In conjunction with the survey, the status of the compartment close-outs required by the Contract must be presented for review, with any remaining close-outs performed prior to completion of the Preliminary Acceptance Survey.

The existence of any uncorrected deficiency affecting the safety, operation, performance or immediate efficient use of the Vessel for its intended service must be sufficient cause to reject Preliminary Acceptance of the Vessel pending correction of the deficiency by the CONTR. The existence of uncorrected deficiencies must likewise be a cause for rejection of the Vessel until their number has been reduced to a level acceptable to the OWNER.

Upon completion of the Preliminary Acceptance Survey and Trials for the Vessel, a letter relating the OWNER's determination regarding Preliminary Acceptance of the Vessel may be issued by the OWNER. The letter may provide notice as to the extent of unsatisfactory or incomplete Work which must be corrected or completed prior to the Final Acceptance Trials of the Vessel, and which discrepancies, if any, may be deferred for accomplishment after Final Acceptance Trials, but before Final Acceptance Survey of the Vessel. In connection with this notice, it must be recognized that under the terms of the Contract, the CONTR is required to deliver a complete Vessel that is free of all deficiencies, and that deferral of corrective Work is not a waiver by the OWNER of its entitlement to a complete Vessel that is free of deficiencies.

The CONTR must immediately take appropriate action to correct and complete any work that is determined to be unsatisfactory or incomplete, and must be responsible for any delay in the Project associated with correcting deficiencies. The cost of such delay must be at the CONTR's expense.

Any work or operation of the Vessel called for by the OWNER in the course of inspection of previously unsatisfactory or incomplete Work must be performed at the CONTR's expense in advance of Preliminary Acceptance.

Preliminary Acceptance by the OWNER will not constitute acceptance by the OWNER of any latent defects or other deficiencies which may develop or be identified subsequent to Preliminary Acceptance, but prior to completion of the warranty period. Such defects and deficiencies must be the responsibility of the CONTR to correct. In addition, Preliminary Acceptance must not stop the count of construction time, nor must such acceptance be the basis for starting the count of time for the warranty/guarantee period.

**837 FINAL ACCEPTANCE, SURVEY, & TRIALS**

Following successful completion of Preliminary Acceptance Survey and Trials, issuance of Preliminary Acceptance, and Delivery, the CONTR must conduct Final Acceptance Trials. The OWNER will issue Final Acceptance when the following requirements are fulfilled to the OWNER's satisfaction:

- A. Completion of shipboard CONTR responsible training, see Section 842.
- B. USCG Sector approval and receipt of a final Certificate of Inspection (COI).
- C. Round-trip transit times achieved as described in Section 061.
- D. Compatibility with passenger-loading facilities and demonstration of passenger loading/unloading rates as described in Section 063.
- E. The Final Acceptance Survey described herein is completed, with the results supporting a conclusion by the OWNER that the Vessel is complete, clean, free of deficiencies, and in compliance with the Contract to the satisfaction of the OWNER.
- F. Satisfactory provision of documentation evidencing transfer of title to the vessel to the OWNER.
- G. Final Acceptance Trials are completed. To fulfill this requirement the Vessel must be operated by the CONTR on the San Diego Bay route for a period of two (2) consecutive days, duplicating the daily sailing schedule of that route, to fully demonstrate that the operation of the Vessel meets all of the performance requirements of the Agreement.

The CONTR must immediately take appropriate action to correct and complete any work that is determined to be unsatisfactory or incomplete and must be responsible for any delay in the Project associated with correcting deficiencies. The cost of such delay must be at the CONTR's expense.

Any work or operation of the Vessel called for by the OWNER in the course of inspection of previously unsatisfactory or incomplete Work must be performed at the CONTR's expense in advance of Final Acceptance.

If the Final Acceptance Trials and Final Acceptance Survey reveal only minor defects or deficiencies that The OWNER determines do not prohibit it from placing the Vessel in revenue service, then The OWNER may at its sole discretion Finally Accept the Vessel. OWNER will provide CONTR with written notice of unsatisfactory or incomplete Work which must be corrected or completed prior to Completion of the Warranty Period, Section 952. Correction of discrepancies, if any, may be deferred until after Final Acceptance Trials, but before Completion of the Warranty Period. In connection with this notice, it must be recognized that under the terms of the Contract, the CONTR is required to deliver a complete Vessel that is free of all deficiencies, and that deferral of corrective Work is not a waiver by the OWNER of its entitlement to a complete Vessel that is free of deficiencies.

The OWNER will certify Final Acceptance by issuing CONTR a Certificate of Final Acceptance.

Following Final Acceptance, the completed Vessel must be turned over to the OWNER in San Diego, California. The CONTR must present a vessel ready and fit for service .

Final Acceptance Payment against the Contract will be made by the OWNER within 30 calendar days of the OWNER's issuance of a Certificate of Final Acceptance.

**840 QUALITY ASSURANCE & INSPECTION OF WORK AT CONTRACTOR'S SITE**

Nothing contained in this subsection must in any way restrict or impair the OWNER's rights under any warranty or guarantee.

The CONTR must utilize a Quality Assurance (QA) program that assures that all aspects of design, construction, and completion of the Work comply with the requirements of the Contract. The program must ensure that the latest applicable drawings, requirements, specifications and instructions defined in the Contract, as well as authorized changes, are communicated to workers and used in the Work. The program must also include sequential and well-documented inspections and tests of completed elements of Work by the CONTR. The intent of these inspections and tests must be to identify and resolve all deficiencies prior to presentation of the Work to the OWNER for acceptance. The QA program and its implementation plan (described below) must be coordinated with the inspection and test requirements of the Contract; as well as the weight control program, noise and vibration control program, and other programs required by the Contract or otherwise developed by the CONTR to control the Work.

The personnel assigned to the development and administration of the QA program must have independent authority and organizational freedom to identify and evaluate quality problems and initiate and recommend timely and positive solutions.

The implementation of QA procedures by a Subcontractor or Vendor does not relieve the CONTR of their responsibility to assure that the supplied items fully comply with the requirements of the Contract.

At a minimum, the Quality Assurance program must make provision for the following or similar:

- A. Status reports must be provided monthly, on a mutually pre-established date, by the CONTR, listing any and all discrepancies in a Discrepancy Report (hereinafter "DR") and their disposition(s). Outstanding issues must be highlighted.
- B. A process utilizing a CONTR-developed standard DR form, through which the OWNER can communicate potential issues and problems to the CONTR. The form must include, at a minimum:
  - i. Independent tracking number suitable to the OWNER
  - ii. Date of issue initiated or identified by the OWNER
  - iii. Reference drawings/materials and revisions
  - iv. Subject
  - v. Requirement references
  - vi. Issue or problem description
  - vii. Signature column by OWNER and date, if corrected
  - viii. Response area for CONTR, sign off and date

The CONTR must be responsible for tracking and providing a disposition for all issues raised by the OWNER.

The CONTR must maintain and comply with its internal QA program as reviewed by the OWNER.

### **840.1 Factory Acceptance Testing**

CONTR must conduct factory testing of specified equipment. CONTR must identify all factory-tested equipment for prior approval by OWNER and must submit documentation of test results to the OWNER for OWNER's approval. Examples of some equipment subject to Factory Acceptance Testing include:

- Pressure test of non-integral tanks or pressure vessels.
- Operational and load tests for electric propulsion motors and propulsors.
- Functional tests for other machinery, electrical and electronic equipment at vendor's facilities.
- Rapid Charging System ability to pass the required power for the required duration to charge the propulsion batteries, see Section 226.
- Other components as requested by the CONTR and specifically approved by the OWNER.

### **841 TESTING & TRIALS REQUIREMENTS**

The CONTR must develop, in cooperation with the OWNER, a comprehensive testing and trials plan. The plan must identify all testing milestones, communicate and continually update a testing schedule, define testing procedures and track deficiencies, corrections and acceptance.

The CONTR must provide a Master Test Plan and Index for OWNER's approval before agreement signing. No less than ten (10) days prior to beginning any test, the CONTR must provide test procedures to the OWNER for approval.

Tests must be conducted to the requirements and satisfaction of the OWNER, classification society inspector, and USCG Officer in Charge Marine Inspections (OCMI) and must consist of the following phases:

- Factory Acceptance Testing, see Section 840
- Quality Assurance & Component Testing
- Dock Trials (System Testing), see Section 982.1
- Sea Trials (Vessel Testing), see Section 982.2

Following completion of Sea Trials, any item of CONTR-furnished equipment that shows questionable operating characteristics must be thoroughly examined and repaired by the CONTR, if necessary. The tightness of all electrical connections, switches, circuit breakers, and buss bars must be verified to the OWNER's satisfaction. If repairs are necessary or if the performance of any CONTR-furnished equipment does not meet specification requirements, tests of the individual units are to be repeated by the CONTR and corrections made until the equipment meets the specifications.

The CONTR must provide all instruments for operational tests. The type and quantity must be such that they must provide sufficient data to analyze the performance of systems, machinery, and equipment. Electric motor test instruments must include a voltmeter, ammeter, and watt meter, either as separate meters or combined in a single analyzer.

Ship's gauges and instruments may be used for tests of the systems they serve provided they have been calibrated. Shipyard test instruments and means of connection must be provided as necessary for additional readings required to test equipment, machinery, and systems.

The CONTR must check test instruments against standards at the beginning and end of the test program. If readings taken during a test appear unreasonable, the OWNER's Representative can require the CONTR to check all the instruments, gauges, and thermometers, whether ship or test instruments, used on the test in question.

The CONTR is responsible for all costs associated with all testing and trials. If for any reason, additional sea trials are required due to CONTR or vendor issues, the CONTR must be responsible and bill vendor directly.

**841.1 Trials Condition**

- Fully loaded with passengers (simulated weight)
- 90% tankage of potable water and 5% sewage.

A full passenger load may be simulated with the use of temporary weights (water or other) positioned throughout the Vessel so as to mimic a standard distribution of passengers. CONTR must submit a simulation plan to the OWNER for approval at least thirty (30) days prior to trials.

Sea state requirements for speed trials and motions will be determined by the CONTR and mutually agreed to by the OWNER. Conditions on trials must be documented and signed off by the OWNER and the CONTR prior to final speed documentation.

**842 TRAINING****842.1 General Vessel Training**

The CONTR must provide technical instruction and training for the proper startup, operation, and shutdown procedures, preventative maintenance, and basic troubleshooting of the major machinery, equipment, and control systems. Training is to be coordinated between the OWNER and the manufacturer's Technical Representative and conducted by the manufacturer's Technical Representative or OWNER approved CONTR Technical Representative for up to eight (8) OWNER personnel. Training must include an overview of the vessel, and while there is no intent that this training be duplicative of training to be provided by the Propulsion System Vendors, an overview of the electrical propulsion system, including control and monitoring. Equipment for which training must be provided includes:

- Vessel start up, shut down, rapid charging and shore power
- Main electrical propulsion and charging systems
- Battery electric storage systems and energy management systems
- Integrated monitoring and alarm systems
- Main switchboard and electrical distribution
- Propulsors and propulsor removal
- Plumbing, fire fighting and fire suppression systems
- Heating ventilation and air conditioning systems
- Safety systems
- Pilothouse controls

The training must be provided at the OWNER's facilities and be conducted onboard, prior to Final Acceptance of the vessel. The Contractor must assume up to thirty-six (36) hours of instruction time. Within four (4) weeks prior to the training, the CONTR must provide a training outline, syllabus, and schedule, including time to be spent on each topic, to the OWNER for approval. Training dates and session attendees shall be coordinated with the OWNER. OWNER will make every possible effort to minimize duplication of training but due to operating schedules it may not be possible to schedule all personnel simultaneously for training. Multiple sessions may be required in some or all areas listed above. OWNER will pay all wages and expenses of OWNER's personnel during training sessions.

**842.2 Electric Propulsion Systems In-Depth Training**

The CONTR shall provide in-depth training related to the propulsion system and its components, including propulsion motors, drive cabinets, switchboards, batteries, generators, shore connections for rapid and trickle battery charging, and IMACS systems. Training must include vessel charging procedures, startup procedures, operating procedures, and shutdown procedures. The training must also include personnel safety procedures, and basic maintenance and trouble-shooting procedures.

The training must be provided at the OWNER's facilities and be conducted onboard, prior to acceptance of the vessel. The CONTR is to plan for one training session of approximately sixteen (16) hours over two to three (2-3) days with accommodation for nine (9) OWNER personnel. Within four (4) weeks prior to the training, the Propulsion System Vendors must provide a training outline, syllabus, and schedule, including time to be spent on each topic, to the OWNER for approval. Training dates and session attendees shall be coordinated with the OWNER. OWNER will make every possible effort to minimize duplication of training but due to operating schedules it may not be possible to schedule all personnel simultaneously for training. Multiple sessions may be required in some or all areas listed above. OWNER will pay all wages and expenses of OWNER's personnel during training sessions.

## **860 WARRANTY**

The CONTR must propose a written warranty procedure acceptable to the OWNER that describes the process to accomplish warranty repairs after the Vessel is delivered.

Neither Final Acceptance or payment, nor any provision in the Contract Documents, nor partial or entire use of the Vessels by the OWNER will constitute an acceptance of Work not done in accordance with the Contract Documents or relieve the CONTR of liability for faulty materials or Workmanship.

The CONTR must furnish the OWNER with all warranties, including manufacturer's warranties, specified in the OWNER's Technical Specifications and Agreement, and submit them to the OWNER prior to Final Acceptance of the Vessel. All warranties must be provided by and processed through the CONTR. All warranties must commence after Final Acceptance of the Vessel by the OWNER.

It is understood and agreed that the OWNER does not waive any warranty, either express or implied, in Sections 2312 through 2317, inclusive, of the California Commercial Code, or any liability of the manufacturer or CONTR as may be determined by a decision of the court of the State of California or of the United States.

The OWNER must give notice to CONTR of deficiencies on each of the Vessels. CONTR guarantees and warrants that all equipment and components in each of the Vessels must conform to the requirements of the Contract.

The CONTR must also guarantee all material and workmanship entering into the Vessels and furnished by CONTR, or any Subcontractors, suppliers or vendors on its account, against defects in material or workmanship, or latent defects which may develop within three hundred sixty-five (365) calendar days following the date of Final Acceptance of the Vessel by the OWNER. Any items of material or workmanship found defective, or found not to operate in accordance with the requirements of the Contract, must be repaired or replaced at CONTR's option by the CONTR at the CONTR's expense. The CONTR must pass through any optional extended warranties exercised by the OWNER on the entire electrical propulsion power train to the OWNER. The CONTR does not have any additional warranty responsibility after the warranty period expires, except to assist the OWNER with extended warranty issues.

If, in the opinion of the OWNER, immediate repairs or replacements are essential to keep a Vessel on its scheduled operations, these repairs may be made by the OWNER and back charged to the CONTR. The OWNER must give prompt notice to the CONTR that the immediate corrective action is being taken and provide clear documentation of the deficiency, the action taken and the cost attributable to the deficiency.

Where the OWNER's action results in the betterment of material, the CONTR will not be responsible for the reimbursement for the betterment. If immediate repairs are not necessary, the CONTR must be notified and given fourteen (14) calendar days to examine and provide a written plan of rectification complete with a detailed time schedule, subject to the approval of the OWNER. If the defects are not addressed sufficiently or a detailed rectification plan is not provided by the CONTR and approved by the OWNER within this period, the OWNER may correct the defects and back charge the correction costs, including labor, to the CONTR.

Immediately prior to expiration of the Guarantee/Warranty Period set forth in this subsection and prior to the Completion of Warranty Period milestone payment in the Contract, a Guarantee Survey must be conducted for the purpose of determining remaining deficiencies to be corrected in compliance with the requirements of the guarantee. The Survey must be made by the OWNER, CONTR's representative(s), and applicable regulatory body representatives. The time and place for the Guarantee Survey must be at the convenience of the OWNER, having due consideration for the Vessels schedule and commitments. All fees/expenses required by regulatory bodies for their participation must be borne by the CONTR.

Upon expiration of the three hundred sixty-five (365) calendar day Guarantee/Warranty Period, all remaining product guarantees as originally obtained by the CONTR for materials and equipment from vendors and suppliers must be assigned or reassigned to the OWNER.

If any materials or equipment from vendors or suppliers fails after the three hundred sixty-five (365) calendar day Guarantee/Warranty Period, but before the expiration of remaining vendor, supplier, or manufacturer product guarantees, CONTR must cooperate with the OWNER to assist in enforcing the remaining product guarantees from vendors, suppliers, and manufacturers.

The CONTR must provide a transferrable equipment and services warranties for the IAS/EPMS to The OWNER upon acceptance of the Vessel. This warranty must cover a minimum period of three hundred sixty-five (365) calendar days, starting from the date of Final Acceptance of the Vessel. This warranty must cover parts, equipment, machinery, and labor required to correct failures, whether the failures arise from a defect, incorrect installation, or installation. The CONTR must promptly respond within one (1) calendar day to failures and affect repairs at the OWNER's facility located in San Diego, CA. The repairs and service will be performed at no cost to the OWNER.

For determination of underwater deficiencies, the OWNER, at its expense, may drydock the Vessels or carry out an underwater survey, during the Guarantee/Warranty Period. The OWNER must pay for the haul day, launch day, and any days required to accomplish the Vessels' normal drydocking maintenance; provided, however, that if a warranty deficiency is discovered which requires additional drydocking time, the CONTR, in addition to the cost of the correction of the warranty deficiency, must pay for each additional drydocking lay day due to correcting the warranty deficiency. If it becomes necessary to drydock the Vessels solely for the correction of a warranty deficiency, the CONTR must be liable for the entire drydocking charge required for correction of the warranty deficiency as well as the cost of remedying the warranty deficiency.

Should any disagreement arise in connection with warranty deficiencies, the CONTR may dispute any action taken by the OWNER in the manner set forth in, and subject to the terms of the contract.

In addition, CONTR warrants that, for a period of three hundred sixty-five (365) calendar days after the Final Acceptance of the Vessel, the Vessel must be free from Defects. As used herein "Defect" means: (a) a material variance between the Vessel as delivered and the Vessel as required in this Agreement, the Plans and Specifications, modified by mutually approved change orders, (b) an instance in which the CONTR's design or workmanship in the Vessel is not equal to or better than the general standard of design or workmanship that prevails in the commercial passenger only Vessel industry, or (c) a defect in workmanship or materials under normal use and service provided, however the following are not defects, and the CONTR's warranty does not apply to or include defects, damages or claims to the extent caused by:

- failure of OWNER to perform required maintenance and servicing
- normal expected wear and tear during warranty period, also abuse, misuse, accident, vandalism, neglect, and improper operation by OWNER
- repairs or replacements not authorized by CONTR in violation of warranty terms

- any OWNER Furnished Equipment, except that the CONTR warrants its Workmanlike installation of OWNER Furnished Equipment in accordance with the manufacturer's specifications, good shipbuilding practices and approved marine construction practices

The CONTR must also guarantee all material and Workmanship entering into the Vessels and furnished by him during the warranty period. If a Vessel is not operational due to warranty repairs, replacements or other Work required, by a fault of the CONTR's Workmanship, the warranty period for the CONTRs workmanship must automatically be extended for a period of time equal to the number of calendar days that the Vessel is non-operational as a result of warranty Work.

If during the warranty period the OWNER determines that equipment or component parts fail to satisfy the terms of the warranty, the CONTR must promptly repair or replace the failed equipment or component part to the satisfaction of the OWNER.

The OWNER, by determining that Final Acceptance has been achieved, does not waive any warranty, express or implied, under Sections 2312 to 2317 of the California Code with respect to any materials, equipment or supplies manufactured, supplied Commercial or assembled by the CONTR pursuant to this Contract.

CONTR must be responsible for consequential damages due to a warranty Defect as described herein, to the extent not disclaimed in the contract agreement.

## 900 SHIPYARD CONTRACT SERVICES

### 901 SCOPE & INTENT OF CONTRACT

The CONTR is required to notify the OWNER of any deviations in the Contract Design Package from the Technical Specification. The scope of the Work associated with the term “design,” as used throughout the Contract documents, must be broadly interpreted to be inclusive of the associated engineering, calculations, studies, and other related work necessary to affect a thorough design. The term “material” must be broadly interpreted to include vessel “equipment,” except where a clear distinction is being made otherwise.

### 902 PROSECUTION & PROGRESS

Following Contract Award the CONTR must submit the following to the OWNER:

- A. Project Schedule (see Sections 921 - 924)
- B. The following lists derived from the Project Schedule:
  - i. A list showing anticipated dates for procurement of materials and equipment, or the ordering of articles of special manufacture.
  - ii. A list showing proposed begin and end fabrication and installation dates for Vessel systems, tests and trials, maintenance items, and other items of scheduled Work.
  - iii. Installation dates for vessel systems, tests and trials, maintenance items, and other items of scheduled work.
  - iv. A list of proposed shipment dates for material other than stocked items.
- C. Deliverable Schedule (see Section 925)
- D. A letter designating the Equal Employment Opportunity Officer and that person's responsibilities and authority.
- E. A list showing all proposed Subcontractors, Vendors, and Suppliers to be used, their addresses and applicable purchase order numbers.
- F. A letter designating the CONTR's Project Manager, defining that person's responsibility and authority, and providing a specimen of his signature.

During the PEP, the CONTR shall develop and submit to the OWNER for review the following:

- A. Quality Control and Assurance Plan with Processes that are specific to this Contract execution (Section 840)
- B. Aluminum Plate Testing Plan (Section 101)
- C. Fitup and Welding Procedures (Section 102)

The CONTR must provide adequate materials, labor and equipment to ensure the completion of the Project in accordance with all Contract requirements. The Work must be performed as vigorously and as continuously as conditions may permit. The CONTR must take into consideration and make due allowances for foreseeable delays and interruptions to the Work such as weather, equipment breakdowns, shipping, Regulatory agency inspections and approvals. Receipt and acceptance of a schedule submitted by the CONTR must not be construed to assign responsibility for performance or contingencies to the OWNER or relieve the CONTR of their responsibility to adjust work forces, equipment, and work schedules as necessary to insure completion of the work within the prescribed time (See Sections 941 through 946).

The OWNER may require up to three OWNER's Designated Representatives onboard for all legs of deliveries at OWNER's expense.

**910 MANAGEMENT REVIEW & PROGRESS MEETINGS**

The CONTR must present Management Reviews to the OWNER. The reviews must be scheduled monthly at a location in or near the construction shipyard and must be coordinated so that they are held concurrently with the progress meetings. The first review is to be held within thirty (30) calendar days following Notice to Proceed. These reviews must, at a minimum, address the following topics:

- A. Status of the design and outstanding design issues. Actions taken to resolve issues and schedules for same must be included. OWNER-responsible actions that affect the CONTR must also be included.
- B. Material status, certification, delivery schedule and other outstanding issues. Actions taken to resolve issues and schedules for same must be included. OWNER-responsible actions that affect the CONTR must also be included.
- C. Construction schedule, issues and status. Actions taken to resolve any issues must be addressed. OWNER-responsible actions that affect the CONTR must be included.
- D. Status of the Work to date, current and potential problem areas that could affect the Project Schedule and cost, and activities including inspections scheduled for the following two weeks.
- E. Regulatory Body approval and certification; status and outstanding issues; actions underway to resolve any outstanding issues.
- F. Quality Assurance
- G. Schedule of Values and Payments
- H. Change Order Status
- I. Any Contractual Issues

The CONTR must identify any OWNER actions that are requested or required to resolve issues and/or support the CONTR's efforts.

The CONTR must prepare an agenda and submit to the OWNER for review prior to the meeting. The OWNER may request additional topics for the Management Review and the CONTR must address those topics during the meeting. A copy of the final agenda and any supporting documentation must be provided to the OWNER not less than twenty-four (24) hours prior to each scheduled meeting date.

The CONTR must provide a written record of the minutes of the progress meetings and maintain a file of minutes. The OWNER must acknowledge receipt of the minutes and may provide comments or additional information to the CONTR to be appended to the minutes. The acknowledgement of the minutes by the OWNER must not constitute acceptance of any item of equipment or component parts.

**921 PROJECT SCHEDULE**

Within seven (7) calendar days after Notice to Proceed the CONTR must prepare and submit to the OWNER for review and comment a workforce resource loaded schedule as described below. The OWNER to review and comment within seven (7) calendar days. CONTR then has seven (7) calendar days to modify or comment on the OWNER's review and resubmit the schedule. After the OWNER's comments are addressed to the satisfaction of the OWNER, the schedule at that time must become the Project Schedule. The Project Schedule is to be developed to the CONTR's normal detail and as agreed in this document to produce OWNER-specific information, and must be prepared by the CONTR's "in-house" supervisory personnel. The Project Schedule should not deviate significantly from the preliminary schedule submitted with the CONTR's Proposal. The completed Project Schedule must define the operations required to bring the entire work to Final Acceptance by the scheduled Final Acceptance date and within the allotted time. The Project Schedule may be modified to incorporate the most efficient use of CONTR resources provided no additional costs or time delays are incurred on the Project.

The CONTR warrants that the Project Schedule is the CONTR's committed plan to complete all Work within the allotted Contract Time and assumes responsibility for prosecution of the work as shown. The CONTR must utilize the Project Schedule in planning, scheduling, coordinating, and performing the Work under this Contract (including major activities of subcontractors, equipment vendors, and suppliers).

The purpose of the Project Schedule must be to:

- A. Assure adequate planning, scheduling and reporting during execution of the work by the CONTR;
- B. Assure coordination of the work and material procurement of the CONTR and all subcontractors; and
- C. Assist the CONTR and OWNER in monitoring the progress of the work and evaluating proposed changes to the Contract and the Project Schedule.

NOTE: The Project Schedule must be developed to connect and drive the work from Contract Award. The Project Schedule must be developed to the contactors normal detail of major tasks by trade and job cost numbers.

The CONTR must provide the Project Schedule to the OWNER in both electronic (on Microsoft Project compatible software) and hard copy format.

## **922 SCHEDULE REQUIREMENTS**

The Project Schedule must incorporate labor and major equipment resource data as described below. The schedule must show the order in which the CONTR proposes to carry out the Work. The Project Schedule must cover the time from Notice to Proceed to Final Acceptance, which period of time constitutes the Contract Time. The Project Schedule must be itemized in sufficient detail to cover at a minimum the following tasks:

- A. Milestones set forth in Section 6 of the Agreement.
- B. Anticipated dates for procurement of materials and equipment, or the ordering of articles of special manufacture.
- C. Construction broken down into modules for each major structure unit, Vessel system, or task, including proposed begin and end construction dates and installation dates.
- D. All subcontract/vendor/supplier activities, including begin and end dates.
- E. Any anticipated periods of shutdown and multiple-shift Work.
- F. Major inspection and testing. Final testing as defined for regulatory body approval, OWNER's approval or for Acceptance Trial approval. Intermediate testing must be updated as construction progresses and added to the schedule as known.
- G. Trials and Acceptance tests.

Failure by the CONTR to include any element of Work required for performance of the Contract must not excuse the CONTR from completing all Work by the scheduled Final Acceptance date.

## **923 SCHEDULE UPDATES**

The Project Schedule must be updated whenever a Milestone Payment request is submitted for payment. The updated Project Schedule must include the dates activities were actually started and when they were completed, the physical percentage of work complete, and the estimated remaining duration for each activity in progress.

The CONTR must also prepare a description of the amount of progress during the last reporting period in terms of completed activities, a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates and an explanation of corrective action taken or proposed. The report must include a forecast of key activities to be completed, started and worked during the next fifteen (15) calendar days.

The CONTR must submit a corresponding schedule update when a milestone payment is requested and will only be entitled to payments upon OWNER approval of the milestone request. The electronic and hard files provided must be a complete copy of all information contained in the schedule.

Updating the Project Schedule to reflect actual progress made must not be considered a revision to the Project Schedule.

#### **924 SCHEDULE REVISIONS**

If, as a result of the schedule updates, the schedule no longer represents the planned prosecution or progress of the remaining work, the OWNER may request, and the CONTR must submit, a revision to the Project Schedule.

The CONTR may also request revisions to the Project Schedule in the event the CONTR's planning for the remaining work is revised.

Such revised schedules or lists must conform to the Contract Time allocated by the Contract and take into account delays that may have been encountered in the performance of the Work. In submitting a revised schedule, the CONTR must state specifically the reason for the revision and the adjustments made in his schedule or methods of operation to ensure completion of all Work within the prescribed time.

Should the prosecution of the Work during normal Work days be discontinued for any reason, for more than two (2) calendar days, the CONTR must notify the OWNER at least twenty-four (24) hours in advance of resuming operations.

#### **925 DELIVERABLE SCHEDULE**

The CONTR must submit a schedule of dates for deliverables. This Deliverable Schedule is the CONTR's committed plan to complete the PEP, production, procurement, and regulatory support within a reasonable time to allow the OWNER to complete the Production Package and support the Production Schedule. The Deliverable Schedule shall list all plans, drawings, analyses, reports, Technical Specifications, purchase technical specifications, and other deliverables that must be developed pursuant to the requirements for production planning, PEP support, production procurement, testing, trials regulatory and Final Acceptance support.

The Deliverable Schedule must provide for various interim submittals, revisions, and a final submittal of each deliverable, and must include columns giving the intended dates of all submittals. The quantity and timing of submittals for each deliverable must be proposed by the CONTR in the Deliverable Schedule, and should appropriately consider the need for OWNER approval of CONTR proposed changes, preferences, details production and procurement documentation.

The Deliverable Schedule must include columns for the following entries for each listed deliverable: scheduled dates of submittals, actual dates of submittals, latest revision (by letter), drawing size, outstanding reservations, and expected release date. The Deliverable Schedule must also identify deliverables that are required to be submitted to each Regulatory Body for approval, review and/or information, and the expected and actual dates of such approvals.

CONTR must provide electronic copies of all drawings and data to OWNER for at least a seven (7) calendar day review and comment period. All drawings and documents prepared for submittal to the U.S. Coast Guard must be reviewed by OWNER prior to submittal to U.S. Coast Guard. OWNER must receive all drawings approved by the U.S. Coast Guard. It is the intention that the OWNER submit a vast majority of the documentation to the U.S. Coast Guard, but the CONTR may need to submit.

The Deliverable Schedule must be revised to show all changes, progress and delays, and must be submitted monthly to the OWNER at least three (3) days prior to the monthly Management Review meeting.

**930 OWNER APPROVAL OF WORK**

Where the words "approved" or "for approval" are used without reference to the approving authority, they shall mean "approved by the OWNER" and "for the OWNER's approval."

"Approved" status cannot be conferred by anyone but an authorized employee or other representative of the OWNER. OWNER approval does not relieve the CONTR of securing Regulatory Body approvals as required herein.

In no event shall approval by the OWNER of any aspect of the CONTR's Work be a warranty that the Work is complete, accurate or of sound design, or that the Work complies with Regulatory Body requirements.

The CONTR shall work with the DESIGNER in the Production Engineering Phase to review all submissions to and responses from USCG to ensure the final production package is meeting regulatory requirements.

Specific changes and preferences requested by the CONTR are the CONTR's responsibility in addition to the construction of the vessels and all physical and documentational representations of the CONTR's efforts referred hereto as Work, to the approved plans.

Should any subsequent discovery of omissions or deficiencies with regard to the completeness, accuracy or soundness of the Work, and/or conformance with the Contract and approved plans, and/or compliance with Regulatory Body requirements, shall be remedied by the CONTR to the OWNER's satisfaction through correction of the omissions or deficiencies at the CONTR's expense, irrespective of prior approval of the Work by the OWNER.

Production shall not progress on any portion of the vessel's construction until the Team is assured that US Coast Guard Approval of the Production Package relevant to that scope of work has been received.

Any submittal that is found to be substantially deficient upon review shall be rejected and returned to the CONTR for resolution of deficiencies and resubmitted. A "rejected" determination shall void any credit which may otherwise be due the CONTR with respect to meeting a deadline for submission of the material in question.

**931 REGULATORY BODY REVIEW, APPROVAL, & CERTIFICATION OF WORK**

The CONTR shall work with the OWNER to review the regulatory approvals. It is assumed that there will be some changes in submittals during changes through the Preliminary Engineering phase. At the time of the bid due date the CONTR shall account for, in their bid, any minor issues in the USCG review process. Should a major item remain open, substantive change in work scope or material supply, that change shall be addressed in the change order process.

The CONTR must plan, coordinate and obtain in a timely manner all Regulatory Body inspections of the Work, and reviews and approvals of the related drawings, specifications and other documentation, as required to obtain the required regulatory classifications and certifications of the Vessel. A schedule of inspections, tests and trials requiring Regulatory Body observance must be maintained in accordance with the provisions of the Technical Specifications.

All fees associated with inspections, witness of material and equipment tests and certifications, reviews and approval of Work, and classification and certification of the Vessel by Regulatory Bodies shall be included within the Contract Price. Costs of travel and per diem for visits to CONTR's and manufacturers' facilities by Regulatory Body agents shall be borne by the CONTR and included in the Contract Price.

A copy of all written communications, which includes electronic transmissions of information or letters, between the CONTR or its agents and the Regulatory Bodies, and any attached drawings or other technical documentation included with each written communication, shall be provided to the OWNER. A copy of each item of written communication, plus any attached technical documentation, from the CONTR or its agents to a Regulatory Body

shall be forwarded to the OWNER, on the day the communication is mailed or otherwise transmitted to the Regulatory Body. A copy of each item of written communication, plus any attached technical

documentation, from a Regulatory Body to the CONTR or its agents shall be provided to the OWNER within two days of receipt by the CONTR or its agents.

It is the intention of these specifications that Design drawings and calculations shall primarily be submitted by the OWNER.

The Production Design Package must be submitted to the USCG for compliance review with respect to USCG and applicable regulations, specifically addressing requirements for 46 CFR Subchapter K passenger vessels.

All deliverables must be revised to address comments provided by the Regulatory Bodies in conjunction with their reviews. This work must be accomplished to the satisfaction of the OWNER.

### **932 CONFORMITY WITH CONTRACT**

All Work performed and all materials furnished must be in conformity with the Contract. In certain respects, the requirements of the approved design for the Vessel may exceed the requirements of pertinent Regulatory Bodies. Such approved design requirements must not be changed except on written approval of the OWNER.

### **933 COOPERATION BY CONTRACTOR**

The CONTR must maintain a minimum of two full size sets of approved plans and Contract Documents, one set of which the CONTR must keep available on the Work site at all times.

The CONTR must give the Work the constant attention necessary to facilitate the progress thereof in accordance with the Project Schedule, and must cooperate with the OWNER, their Inspectors and other CONTRs in every way possible.

The CONTR must have on the Work site at all times, as their agent, a competent Superintendent or Project Manager, thoroughly experienced in the type of Work being performed and capable of reading and thoroughly understanding the plans and specifications, who must receive instructions from the OWNER or their authorized representatives to the extent provided elsewhere in the Contract Documents. The Superintendent or Project Manager must have full authority to supply such materials, equipment, tools, labor and incidentals as may be required. Such Superintendent or Project Manager must be furnished irrespective of the amount of Work subcontracted.

The CONTR must bear the sole risk and the obligation to rebuild, repair, restore, replace and to otherwise make good all damage, loss or injury to all or any portion of the Vessel, and to any Work or material for the Contract, including Change Order Work, on or incorporated into the Vessel until the entire Work for both Vessel has been finally accepted by the OWNER.

### **934 DUTIES OF THE OWNER'S INSPECTORS**

Inspectors employed by the OWNER are authorized to inspect all Work done and materials furnished. The Inspector is not authorized to issue instructions contrary to the terms of the Contract documents, or to act as foreman for the CONTR; however, the Inspector must have the authority to reject Work and materials, which rejection the CONTR may request to be decided by the OWNER. The OWNER's personnel are not to be considered part of CONTR's Quality Assurance program.

**936 REMOVAL OF UNACCEPTABLE & UNAUTHORIZED WORK**

All Work that does not conform to the Contract must be considered as unacceptable Work, unless determined acceptable under in the OWNER's sole discretion the provisions of Section 932.

Unacceptable Work, whether the result of poor workmanship, use of defective, unsuitable, or unauthorized materials or equipment, or damage through carelessness or any other cause, found to exist prior to the Completion of the Warranty Period, must be remedied or removed immediately and replaced in an acceptable manner at the CONTR's expense.

No Work must be done on the Vessel except as required by the Contract or directed by the OWNER. Work done contrary to directives, except as herein provided, or any Work done without authority, must be considered as unauthorized and must not be paid for under the provisions of the Contract. Work so done may be ordered removed or replaced at the CONTR's expense.

Upon failure on the part of the CONTR to comply forthwith with any order of the OWNER made under the provisions of this section, the OWNER must have authority to cause unacceptable Work to be remedied, or removed and replaced, unless determined acceptable under Section 932. No change in the Contract Price will be allowed in respect to any costs incurred by CONTR for such remedial work.

**941 CONTRACT TIME DEFINITION**

Contract Time must be the period of time, measured in calendar days, that is allocated to the CONTR to complete the design and construction Work required by the Contract and to redeliver the Vessel to the OWNER in full compliance with the Contract requirements and Preliminary Acceptance by the OWNER. Contract Time equals the number of days of time stipulated in the Contract at the time of Contract Award as proposed by the CONTR and agreed to by the OWNER, plus any additional days of time allocated during the course of the Contract by approved extensions of time, minus any days of time reclaimed by the OWNER based upon reductions in the scope or character of the Work during the course of the Contract.

The count of Contract Time expended must begin on the date of the Notice to Proceed. The count of Contract Time, in conjunction with approved modifications or suspensions of the count of Contract Time, must be the basis for establishing the approved scheduled date of Acceptance and for assessing liquidated damages associated with untimely Vessel Delivery as described in Section 945. Failure to complete the Work, submit all deliverables, and deliver the Vessel to the OWNER within the Contract Time may also be an event of default authorizing the OWNER to take any steps permitted by the Contract Agreement.

**942 EXTENSION OF CONTRACT TIME**

The OWNER may consider requests for extension of Contract Time and, if deemed warranted, approve extensions of Contract Time equal to the number of additional days considered by the OWNER to be necessary to accomplish approved change Work or Work associated with OWNER issued directives other than Work orders. Work associated with changes and directives, or any portion of such Work, which could reasonably be accomplished within the Contract Time, as determined by the approved CONTR's schedule, must be completed within the established Contract Time.

The CONTR must be responsible for promptly requesting extensions of Contract Time and for furnishing any and all information necessary to justify each proposed extension to the satisfaction of the OWNER. For changes to the Work, a request for extension of Contract Time must be considered timely only if the request is included with the CONTR's originally submitted Change Order.

Under no circumstances must Contract Time be extended due to inclement weather or the results of inclement weather. However, extraordinary weather conditions for the pertinent geographical area may, but not necessarily must, provide a basis for an extension of Contract Time. Severe weather, including hurricanes, with historical precedent in the pertinent geographical area is not extraordinary weather.

Approved change documents and OWNER issued directives which reduce the scope of the Contract or change the character of the Work so as to justify a reduction in the amount of Contract Time allotted, may result in an agreement between the parties to the Contract, to reduce the number of days of design time or construction time, as applicable.

Extensions to Contract Time must be approved in writing by the OWNER.

A claim that insufficient Contract Time was originally specified or otherwise required by the Contract must not constitute a valid reason for extension of Contract Time.

### **943 SUSPENSION OF CONTRACT TIME**

The OWNER may, by written order, suspend Work on the Project, in whole or in part, for such periods as he determines to be necessary. The OWNER must discuss impact of suspension with CONTR to determine impact on schedule. Unless an item of Work is suspended which is agreed by the OWNER to be on the Critical Path of the Project Schedule, no consideration must be given to extending the Contract Time or stopping the count of Contract Time during the period of suspension of the Work until an item lands on the Critical Path.

In those instances where the OWNER orders suspension of the Work for failure by the CONTR to carry out contractual provisions, the count of Contract Time must continue throughout the suspension period.

Suspension of the count of Contract Time may be allowed by the OWNER because of delays in the completion of the Work due to unforeseeable causes beyond the control of and without the fault or negligence of the CONTR, including but not restricted to force majeure or the public enemy, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and extraordinary weather or delays of Subcontractors due to such causes provided that the CONTR must, within ten (10) calendar days of the beginning of any such delay, notify the OWNER in writing of the cause of delay and request suspension of the count of Contract Time. The OWNER must ascertain the facts and the extent of the delay and the parties must agree upon the number of days that justify such suspension.

Suspension of Work by the OWNER or delays in the completion of the Work must not constitute grounds for any claims by the CONTR for damages or extra compensation unless otherwise provided for in the Contract.

For any suspension in the count of Contract Time to be allowable, such suspension must be approved in writing by the OWNER.

### **944 SUSPENSIONS OF WORK ORDERED BY THE OWNER**

If the performance of all or any portion of the Work is suspended or delayed by the OWNER in writing for an unreasonable period of time (not originally anticipated, customary, or inherent to the shipbuilding industry) and the CONTR believes that additional compensation and/or Contract Time is due as a result of such suspension or delay, the CONTR must submit to the OWNER in writing a request for adjustment within seven (7) calendar days of receipt of the notice to resume Work. The request must set forth the reasons and support for such adjustment.

Upon receipt, the OWNER must evaluate the CONTR's request. If the OWNER agrees that the cost and/or time required for the performance of the Contract has increased as a result of such suspension and the suspension was

caused by conditions beyond the control of and not the fault of the CONTR, its suppliers, or Subcontractors at any approved tier, and not caused by weather, the OWNER must make an adjustment including reasonable profit and modify the Contract in writing accordingly. The OWNER must notify the CONTR of his determination whether or not an adjustment of the Contract is warranted.

No Contract Time adjustment are allowed unless the CONTR has submitted the request for adjustment within the time prescribed.

No Contract Time adjustment are allowed under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided for or excluded under any other term or condition of this Contract.

#### **945 FAILURE TO DELIVER ON TIME**

Liquidated damages associated with untimely delivery of the Vessel must be charged against the CONTR's account by the OWNER beginning the day after the scheduled Final Acceptance date of the Vessel and ending on the actual Final Acceptance date of the Vessel. The day of Final Acceptance of a Vessel must stop the accrual of liquidated damages associated with untimely delivery and must not be included in the count of days chargeable to liquidated damages. Liquidated damages must not apply if both parties agree that delivery is not viable due to weather or other circumstances.

Notwithstanding any other provision of this Contract to the contrary, the liquidated damages provided for in this subsection must be the OWNER's sole and exclusive remedy for all damages incurred by reason of the CONTR's failure to complete the Vessel on time.

The scheduled Final Acceptance date of the Vessel must be the date by which all contracted Work is scheduled to be completed, excluding any Work that may be necessary to correct deficiencies arising during the Warranty/Guarantee Period subsequent to Completion of Warranty Period (see below). The scheduled Final Acceptance date of the Vessel must determine the number of days of construction time allocated and calculated in accordance with Sections 941 through 946, subject to any days of approved suspension of construction time, after Notice to Proceed.

The Final Acceptance date must be the date on which the OWNER signs the Certificate of Final Acceptance of the Vessel and takes custody of the Vessel from the CONTR. The Final Acceptance date for the Vessel must be the start date for the count of time for the warranty/guarantee period for the Vessel.

For each calendar day that the Vessel remains undelivered after the scheduled Final Acceptance date of the Vessel, the sum set forth in the agreement must be deducted from any moneys due the CONTR. If no money is due the CONTR, the OWNER must have the right to recover said sum from the CONTR, the surety or both. The Amounts of these deductions are to cover estimated expenses to the OWNER as a result of the CONTR's failure to complete the Work within the time specified. Such deductions are liquidated damages and are not to be considered as penalties.

Permitting the CONTR to continue and finish the Work, or any part of it, after the scheduled Final Acceptance date of a Vessel, as approved by the OWNER, must in no way operate as a waiver on the part of the OWNER of any of its rights under this Contract.

**946 TIME IMPACT ANALYSIS**

When Contract modifications are initiated by either the CONTR or the OWNER these changes must be dealt with using a standard Change Order document.

**951 FINAL CLEANUP**

Before the Preliminary Acceptance Survey, all rubbish, excess materials, temporary structures, and CONTR's equipment must be removed from the Vessel and, as applicable to the item, disposed of. All interior and exterior surfaces of the Vessel must be washed, dusted, polished, vacuumed, and/or disinfected, as applicable to the surface, so as to be thoroughly clean, new, undamaged, and fit for OWNER service.

Immediately prior to the Final Acceptance of the Vessel, all surfaces that require re-cleaning as a result of use during the Preliminary Acceptance Trials or other cause must be washed, dusted, polished, vacuumed, and/or disinfected, as applicable to the surface, so as to be thoroughly clean, new, undamaged, and fit for OWNER service, throughout the Vessel.

**952 COMPLETION OF WARRANTY PERIOD**

Following completion of the Guarantee/Warranty Period required by Section 860 and all provisions stated therein and upon receipt of the executed final estimate, CONTR's Release, settlement of all claims and proof of payment of any applicable sales, payroll and revenue taxes, the OWNER must issue the letter of Completion of Warranty releasing the CONTR from further performance under the Contract subject to rights and remedies reserved in the Contract Agreement. Completion of Warranty Period must be withheld until the CONTR furnishes all certificates, guarantees, releases, affidavits, and other documentation required by the Contract.

**953 SEQUENCE OF EVENTS LEADING TO FINAL ACCEPTANCE OF VESSEL**

The CONTR must develop, in cooperation with the OWNER, a comprehensive testing and trials plan. The following table outlines the minimum required tests and trials:

Required Test or Trial	Location	Purpose	Reference Section
Shipyard Internal QA and Testing Plan	CONTR Facility	Routine and ongoing QA and inspection using the shipyard's standard processes and documentation.	840
Factory Acceptance Tests	CONTR or OEM Facility	Test and verification of certain components and equipment with prior approval from the OWNER.	840.1
Dock Trials	CONTR's Facility	Verification that equipment and systems perform satisfactorily and establish readiness for Sea Trials,	982.1
Sea Trials	CONTR's Facility	Confirm the Vessel meets all requirements and functions properly prior to Delivery.	982.2
Preliminary Acceptance	CONTR's Facility	CONTR states readiness for Acceptance Survey and Delivery	836
Delivery	San Diego Bay	CONTR must deliver Vessel to the specified OWNER facility in San Diego Bay	983
Drydocking	San Diego Bay	CONTR must drydock vessel in San Diego for inspection of underwater portions of the hull.	835
Final Acceptance	San Diego Bay	Vessel to be tested for interface with existing mooring arrangements, passenger load/offload function, and other preparations to go into service. Acceptance whereby the OWNER accepts the Vessel as satisfying all the requirements of the Contract, except the warranty, and signals start of warranty period.	837

**980 PROTECTION & RESTORATION OF PROPERTY**

The CONTR must be responsible for all damage or injury to property of any character, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the Work, or at any time due to defective Work or materials, during the prosecution of the Work, and said responsibility must not be released until the Project must have been completed and accepted.

The CONTR must safeguard the Vessel's machinery and electrical equipment, the use of which must be made only upon the express written approval of the OWNER, and under supervision of competent, trained personnel.

The CONTR must at all times, insofar as conditions of the Work permit, keep the openings of the Vessel closed against the weather. Deck openings, permanent and/or temporary must be protected by a watertight coaming with a securely fastened cover.

During the course of the Work, the CONTR must maintain adequate heating and ventilation throughout the Vessel to preclude the formation of molds and/or other deleterious substances.

**981 CHARACTER OF WORKERS, METHODS, & EQUIPMENT**

The CONTR must at all time employ sufficient labor and equipment for prosecuting the several classes of Work to full completion in the manner and time required by this Contract.

All workers and management personnel must have sufficient skill and experience to perform the Work assigned to them properly. Workers engaged in special Work or skilled Work must have sufficient experience in such Work and in the operation of the equipment required to perform all Work properly and satisfactorily.

Any person, whether worker or superintendent, employed by the CONTR or by any Subcontractor whom the OWNER deems incompetent, careless, insubordinate, or otherwise objectionable, or whose continued employment on the Work is deemed to be contrary to the public interest must, at the written request of the OWNER, be removed forthwith by the CONTR or Subcontractor employing such person, and must not be employed again in any portion of the Work without the approval of the OWNER. The OWNER must notify the CONTR in writing at least five (5) days before submitting a written request to remove any worker and must cite the reason for the impending removal in the notice.

Should the CONTR fail to remove such person or persons as required above or fail to furnish suitable and sufficient personnel for the proper prosecution of the Work, the OWNER may suspend the Work by written notice until such orders are complied with.

No convict labor must be employed and no materials manufactured or produced by convict labor must be used in connection with the Work. This provision must not be construed as applying to convicts on parole or probation.

The CONTR must not discriminate against any person because of sex, race, creed, color, sexual orientation, or national origin.

All equipment which is proposed to be used must be of appropriate size and in such mechanical condition as to meet the requirements of the Work and to produce a satisfactory quality of Work.

When the methods and equipment to be used by the CONTR in accomplishing the construction are not prescribed in the Contract, the CONTR is free to use any methods or equipment that he demonstrates to the satisfaction of the OWNER must accomplish the Work in conformance with the requirements of the Contract, except as provided above.

When the Contract or manufacturer's instruction specifies that the construction be performed by the use of certain methods and equipment, such methods and equipment are used unless others are authorized.

## 982 TRIALS

The CONTR must plan, prepare for, and conduct all required Dock and Sea Trials. The CONTR is responsible for all costs associated with performance of these trials. The purpose of system testing is to ensure that all workmanship is satisfactory, all equipment has been properly installed, all systems are functioning properly, all subcontract work is satisfactory, and that all required regulatory inspections have been completed. This program will cover all aspects of construction, including metal work, machinery systems, piping systems, electrical systems, interior joinery, outfitting, and paint.

### 982.1 Dock Trials

Dock Trials shall be conducted to demonstrate proper functioning of propulsion systems and controls, auxiliary systems, electronics, and safety equipment prior to Sea Trials. At least two ( $\geq 2$ ) weeks prior to Dock Trials, the CONTR will present an agenda to the OWNER for review and comment.

Initial charging, startup, and application of load to the electrical propulsion systems will be performed by the CONTR in conjunction with the manufacturer's representatives. The CONTR, McKay and OEMs shall review and approve the installation of the main electrical propulsion systems, including alignments prior to engagement of electric drive motors to shafting and/or propulsors.

Following initial charging and startup of the electrical propulsion plant and auxiliary electrical distribution systems, the thrusters will be run at the dock for a minimum of four hours (not continuous) to demonstrate readiness for Sea Trials. The OWNER will furnish a portable propulsion system charging unit for use during trials. The CONTR will furnish an AC power supply (either main grid or generator). Vessel charging from this portable charging unit will be demonstrated.

As part of Dock Trials, as preparation for Builder's Trials and Sea Trials, the CONTR must in the presence of the local USCG inspector and the OWNER's Representative, perform the USCG-approved DVTP and PSTP.

Controls, alarms, communication, and monitoring shall be verified from each Control station.

All auxiliary systems will be run at the dock to verify proper operation. Bilge and fire systems will be demonstrated to be fully operable in case of an emergency during Sea Trials. The proper operation of the steering system will be verified from each Control station, including the emergency steering station.

All navigation and communication electronics will be verified to be functioning properly in conjunction with the electronics vendor.

The proper deployment of the anchor and ground tackle will be demonstrated by lowering and retrieving the anchor in a controlled manner.

The CONTR shall ensure that vendors and subcontractors have all necessary spare parts for their systems on hand so that failures of filters, fuses, gaskets, relays, valves, et cetera do not delay Dock or Sea Trails.

Dock Trials will consist of the following (not necessarily all-inclusive) list:

- Weather/water tightness of hatches, windows, port lights, doors, shell doors, et cetera
- Safety equipment – life rafts to be put aboard just before Sea Trials with maximum future service time possible
- Fire extinguishers to be put aboard also with inspection dates as far as possible in the future
- Lifting appliances, cranes, boarding/accommodation ladders, et cetera
- Steering gear
- Ventilation and heating system
- Air conditioning
- Electrical systems load tests

- Successful completion of the DVTP and PSTP as required by Section 800
- Anchor and mooring equipment
- Deck equipment, bitts, cleats, et cetera
- Bilge and firefighting systems
- Sanitary systems
- Bridge and navigation equipment
- Hydraulic equipment
- Alarm tests for safety systems
- Test of lifesaving equipment
- Fire shutdown systems for ventilation, valves, and required pumps, et cetera
- Working tests of all machinery
- Tests of domestic hot and cold-water service
- Blackout test
- Complete electrical lighting systems
- Communication equipment
- Public Announcement and CCTV camera/monitoring equipment, et cetera
- Navigation equipment that can be pre-tested in port
- USCG witnessed deadweight survey
- Harbor condition noise and vibration level measurements
- Ship service power will be demonstrated with one and two battery banks offline and full ship service electrical load
- Ship service shore power
- Electric propulsion charge

The shore sewage and water connections will be separately verified and tested. Only upon satisfactory completion of the system testing, and after correction of all defects by the CONTR to the satisfaction of the OWNER, the Vessel may begin the next stage of testing and trials.

The battery room HVAC, emergency ventilation system, and the battery room fire suppression systems must be tested prior to loading cells into the battery racks.

### **982.2 Sea Trials**

Following completion of Dock Trials, Sea Trials will be conducted to demonstrate the performance of the Vessel and proper function of systems underway. Every effort will be made to replicate a “working” scenario at sea.

The CONTR will conduct at least two ( $\geq 2$ ) sets of Sea Trials. The first set will be Builder’s Trials for yard personnel and regulatory inspectors to confirm proper functioning of all systems. During Builder’s Trials the propulsion system vendor will verify the performance and proper installation of the entire electric drive propulsion system including developed power, cooling temperatures, et cetera.

The second set of Sea Trials will be Performance Trials to demonstrate contractual performance and proper functioning of all systems to the OWNER. The Performance Trials will be conducted at the full Trial Condition specified in Section 841.

Sea Trials will be conducted in a location mutually agreed to by the OWNER and the CONTR. Due to the very limited range of the vessel the CONTR will plan Sea Trials so that the vessel can recharge close to the trial area.

The procedures shall follow SNAME T&R Bulletin C-2, 1973 “Code for Sea Trials.” Sea Trials will include measurement of speed, battery consumption, noise, vibration, and wake wash in accordance with the Agreement. Care will be taken to specify, in the test documents, the acceptable level for all figures to be recorded during Sea Trials.

After a successful Dock Trial the OWNER will negotiate with the CONTR agreed upon dates for Sea Trials. The CONTR will present a Sea Trials agenda to the OWNER for approval and to McKay & the equipment manufacturers for review and comment. Following completion of Sea Trials, the CONTR will prepare the final Sea Trials report in a timely fashion and present the results for the OWNER's approval.

At a minimum, Sea Trials shall consist of the following:

- Propulsion Performance Trials (Builder's Trial only)
- Speed Trials
- Trim Trials, to determine optimum setting of adjustable interceptors
- Endurance Test, this trial will consist of five (5) simulated round trips with charging time between each trip
- Night Trials
- Emergency Crash Stop, thrusters normal (90°) to course
- Emergency Crash Stop, thrusters reversed 180°
- Turning diameter with thrusters athwartships
- Ahead Steering, at full speed ahead
- Astern Operation and Steering, up to maximum safe speed, not to exceed twelve (12) knots
- Zigzag Maneuver, at full speed ahead, with a minimum of twelve (12) course changes
- Auxiliary Systems Testing, underway testing of systems, as required
- Ship Service Electrical System Blackout Test
- Noise and Vibration Survey, underway portion; see Section 088
- Thermographic Survey of all electrical installations
- Compass Adjustment, Builder's Trial only
- Navigation and Communications Systems Testing, underway testing, as required; e.g., GPS, depth sounder, radar, electronic charting, VHF radios, overall integration, et cetera
- Unmanned Engine Room Testing, command, control and monitoring systems - trials to follow Endurance Test format
- Check of tank capacities and drafts for speed runs
- Controls and helm operation
- Test from ahead to astern and astern to ahead
- Slow Ahead trial with all propulsion motors
- Slow Ahead trial with only port or starboard propulsion motors
- Full ahead trial with the full electrical propulsion plant, and port the electrical propulsion plant
- Demonstrate ability to steer with only port or starboard thrusters in operation
- Dead ship inspection and startup
- Emergency steering and maneuvering
- Full load test of emergency fire pumps with the vessel at full ahead speed

All domestic items that would normally be in use during at sea conditions to be run and tested while on the trials, including heads and miscellaneous equipment throughout the Vessel to be sure that they function normally under sea conditions.

Speed Trials will be conducted at 75 RPM shaft speed intervals throughout shaft speed range. For each setting, two (2) runs will be made in opposite directions over a reciprocal course to account for any wind, waves, or current. Speed will be determined by measuring the time to cover a set distance as determined by the vessel's GPS.

A minimum of three quarters ( $\frac{3}{4}$ ) of an hour of trials shall be conducted at night, commencing no earlier than one (1) hour after sunset, at maximum possible operating speed, to determine if visibility, reflections, night backlighting, or fogging issues are present on the bridge and to correct them.

Additional trials may be required if the conditions are not favorable due to excessive wind or waves.

Any lubricating oils from the thrusters shall be sampled for analysis after trials.

The CONTR shall be responsible for all costs associated with Sea Trials including provision of crew, electrical charging, lube oil, water provisions, and any instrumentation or other test equipment required. Drinks and meals shall be provided for all riders during Sea Trials by the CONTR.

Any defects found during the Sea Trials shall be corrected by the CONTR at their own expense and demonstrated to the OWNER prior to OWNER's authorization for Delivery. At its sole discretion, OWNER may authorize Delivery prior to correction of defects found during the Sea Trials. CONTR must correct any such defects as a condition of Final Acceptance.

### **983 VESSEL DELIVERY**

CONTR may not commence Delivery of the Vessel from its location until OWNER has approved all Dock Trials and Sea Trials required to take place at CONTR's location. CONTR may not commence Delivery until OWNER has issued Preliminary Acceptance and an Authorization for Delivery to the CONTR. Delivery will be considered complete after OWNER conducts a post-delivery inspection and will be acknowledged by OWNER's issuance of a Post-Delivery Receipt.

Delivery does not constitute Final Acceptance, nor does Delivery include a transfer of any risk of loss or transfer of title.

If the Vessel is constructed outside of the San Diego Area, it may be delivered (dry) to The OWNER using either heavy-lift ship or tug and barge transport for all exposed water segments of the delivery voyage. The CONTR will be responsible for loading and discharge of the vessel and ensuring that the vessel is adequately secured for the delivery voyage. Both loading, securing, and discharging the vessel will be witnessed by a recognized cargo surveyor and their reports shall be provided to the OWNER. The vessel will be moved from the CONTR's facility to the heavy lift vessel or barge using appropriately sized towing vessel(s) and again from the discharge location to the charging location upon arrival in San Diego. If the vessel is loaded by float-on/float-off, the CONTR must furnish blocking and securing plans to the OWNER for approval at least two ( $\geq 2$ ) weeks prior to loading.

If the CONTR elects lift-on/lift-off, a full lifting plan including all rigging will be furnished to the OWNER for review a minimum of one ( $\geq 1$ ) month before the scheduled lift.

At the CONTR's sole risk for damage and loss, the vessel may be delivered dead ship on its own bottom (wet) via a tugboat tow from the CONTR's facility to the San Diego Area. If this method of delivery is undertaken, the CONTR must prepare a complete Towing Plan and submit it to the OWNER at least two (2) weeks prior to Vessel Delivery.

#### **983.1 Insurance during Delivery**

The CONTR retains full responsibility, including risk of loss or damage to the Vessel, until Final Acceptance. CONTR is responsible for providing all necessary insurance, security, safety maintenance, and operation of the Vessel at all times, including during Delivery. The CONTR must procure and maintain and provide proof of cargo insurance against any loss of or damage to the vessel or personal injury or death or damage to or loss of property caused during the delivery voyage, both wet and dry, in an amount equal to the Total Contract Price, and full form protection and indemnity insurance. Such insurance and proof must be at the CONTR's sole expense, including all deductibles. OWNER must be named as an additional insured under any such insurance.

**983.2 Protection of Vessel During Delivery**

The CONTR is fully responsible for adequately preparing the Vessel for open ocean and local transport. The CONTR will be responsible for loading, securing, and discharge operations from the transport vessel (barge or heavy-lift ship).

**983.3 Damage to Vessel During Delivery**

CONTR must report to the OWNER any allision, collision, grounding, heavy weather damage, or other incident that may have caused damage to the Vessel during the Delivery voyage. OWNER may require that its Representative be onboard at all times while the Vessel is underway. OWNER may require that it's Representative be on site for towing, loading, securing, and discharge operations.

**983.4 Battery Care During Delivery**

CONTR must comply with all OEM instructions for handling batteries during shipping and Delivery.

**993 MATERIAL HANDLING & REMOVAL**

The CONTR must be responsible for all material handling, wrapping, packing, crating, trucking, freight, shipping, and transportation charges in connection with this Work. This includes shipment of spare components back to the OWNER'S facility in California. The CONTR must also pay for all shipping costs associated with the new subcomponents, equipment or machinery.

CONTR must be responsible for the proper disposal of all wastes generated within its facility during the course of the Work.

<b>APPENDIX B1</b>	<b>Contract Design Package</b>
<b>APPENDIX B2</b>	<b>Vessel Renderings - Exterior</b>
<b>APPENDIX B3</b>	<b>Vessel Renderings – Interior</b>
<b>APPENDIX B4</b>	<b>Battery Room Ventilation Operating Scheme</b>

END OF PART B – TECHNICAL SPECIFICATIONS