STATE OF NORTH CAROLINA

University of North Carolina at Wilmington (UNCW)

Invitation for Bid #: 72-BDKS24039

Marine Research Vessel

Date Issued: February 6,2024

Bid Due Date: March 14,2024

At 2:00 PM ET

Direct all inquiries concerning this IFB to:

Dian Smith, CPPB

Procurement Specialist

Email: smithdk@uncw.edu

Phone: 910-962-3153

STATE OF NORTH CAROLINA

Invitation for Bids

72-BDKS24039

For internal State agency processing, including tabulation of bids, provide your company's eVP (Electronic Vendor Portal) Number. Pursuant to G.S. 132-1.10(b) this identification number shall not be released to the public. **This page will be removed and shredded, or otherwise kept confidential**, before the procurement file is made available for public inspection.

This page shall be filled out and returned with your bid.
Failure to do so shall be sufficient cause to reject your bid.

_____

Vendor Name

_____

Vendor eVP #

Note: For a contract to be awarded to you, your company (you) must be a North Carolina registered vendor in good standing. You must enter the vendor number assigned through eVP (Electronic Vendor Portal). If you do not have a vendor number, register at https://vendor.ncgov.com/vendor/login

Sealed, mailed responses ONLY will be accepted for this solicitation.

STATE OF NORTH CAROLINA
University of North Carolina at Wilmington (UNCW)

Refer *ALL* Inquiries regarding this IFB to: ***Dian Smith, CPPB*** ***smithdk@uncw.edu or 910-962-3153***	**Invitation for Bids # 72-BDKS24039** **Bids will be publicly opened: March 14, 2024, at 2:30 pm ET**
Using Agency: University of North Carolina at Wilmington **Requisition No.: 180507468**	**Commodity No. and Description:** 125110000 Research Vessel

EXECUTION

In compliance with this Invitation for Bids (IFB), and subject to all the conditions herein, the undersigned Vendor offers and agrees to furnish and deliver any or all items upon which prices are bid, at the prices set opposite each item within the time specified herein.

By executing this bid, the undersigned Vendor understands that false certification is a Class I felony and certifies that:

- this bid is submitted competitively and without collusion (G.S. 143-54),
- that none of its officers, directors, or owners of an unincorporated business entity has been convicted of any violations of Chapter 78A of the General Statutes, the Securities Act of 1933, or the Securities Exchange Act of 1934 (G.S. 143-59.2), and
- it is not an ineligible Vendor as set forth in G.S. 143-59.1.

Furthermore, by executing this bid, the undersigned certifies to the best of Vendor's knowledge and belief, that:

- it and its principals are not presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from covered transactions by any Federal or State department or agency.

As required by G.S. 143-48.5, the undersigned Vendor certifies that it, and each of its sub-Contractors for any Contract awarded as a result of this IFB, complies with the requirements of Article 2 of Chapter 64 of the NC General Statutes, including the requirement for each employer with more than 25 employees in North Carolina to verify the work authorization of its employees through the federal E-Verify system.

As required by Executive Order 24 (2017), the undersigned vendor certifies will comply with all Federal and State requirements concerning fair employment and that it does not and will not discriminate, harass, or retaliate against any employee in connection with performance of any Contract arising from this solicitation.

G.S. 133-32 and Executive Order 24 (2009) prohibit the offer to, or acceptance by, any State Employee associated with the preparing plans, specifications, estimates for public Contract; or awarding or administering public Contracts; or inspecting or supervising delivery of the public Contract of any gift from anyone with a Contract with the State, or from any person seeking to do business with the State. By execution of this bid response to the IFB, the undersigned certifies, for Vendor's entire organization and its employees or agents, that Vendor are not aware that any such gift has been offered, accepted, or promised by any employees or agents of Vendor's organization.

By executing this bid, Vendor certifies that it has read and agreed to the **INSTRUCTION TO VENDORS** and the **NORTH CAROLINA GENERAL TERMS AND CONDITIONS incorporated herein**. These documents can be accessed from the ATTACHMENTS page within this document.

Failure to execute/sign bid prior to submittal may render bid invalid and it MAY BE REJECTED. Late bids cannot be accepted.

COMPLETE/FORMAL NAME OF VENDOR:			
STREET ADDRESS:		P.O. BOX:	ZIP:
CITY & STATE & ZIP:		TELEPHONE NUMBER:	TOLL FREE TEL. NO:
PRINCIPAL PLACE OF BUSINESS ADDRESS IF DIFFERENT FROM ABOVE (SEE INSTRUCTIONS TO VENDORS ITEM #21):			
PRINT NAME & TITLE OF PERSON SIGNING ON BEHALF OF VENDOR:		FAX NUMBER:	
VENDOR'S AUTHORIZED SIGNATURE:	**DATE:**	E-MAIL:	

VALIDITY PERIOD

Offer shall be valid for at least ninety (90) days from date of bid opening, or if extended by mutual agreement of the parties. Any withdrawal of this offer shall be made in writing, effective upon receipt by the agency issuing this IFB.

BID ACCEPTANCE

If your bid is accepted, all provisions of this IFB, along with the written results of any negotiations, shall constitute the written agreement between the parties ("Contract"). The NORTH CAROLINA GENERAL TERMS AND CONDITIONS are incorporated herein and shall apply. Depending upon the Goods or Services being offered, other terms and conditions may apply, as mutually agreed.

FOR STATE USE ONLY: Offer accepted and Contract awarded this ____ day of _____, 20____, as indicated on the attached certification, by _____

(Authorized Representative of University of North Carolina at Wilmington)

1.0 PURPOSE AND BACKGROUND

The University of North Carolina at Wilmington (UNCW) is soliciting bid responses from vendors for a new research vessel for its Center for Marine Science (CMS). UNCW is an internationally recognized leader in coastal and marine science and education advancing research and teaching of the highest quality. The new vessel will be utilized for advancing both academic and research purposes.

The University of North Carolina at Wilmington (UNCW) is interested in advancing the manufacturing and build schedule of the vessel and is willing to buy forward longer lead time equipment with a larger initial down payment to ensure more timely completion of the vessel. Multiple payments may be engaged through the manufacturing/build of the vessel based on meeting required milestones. UNCW has engaged the services of JMS Naval Architects to assist with all inspections at the manufacturing site, pre-acceptance sea-trials, final sea-trials, and final acceptance.

The intent of this solicitation is to award an Agency Contract for the purchase of one (1) new fully equipped and fully functional vessel meeting the specifications within for all academic and research requirements with a useful life of at least thirty (30) years.

2.0 GENERAL INFORMATION

Only Sealed, mailed responses will be accepted for this solicitation. It is the responsibility of the bidder to ensure that their bid is delivered on time and at the correct location as directed in the instructions. The failure of the bidder to have their bid delivered on time and to the correct location will result in their bid being disqualified.

Contact with anyone working for or with the State or the University of North Carolina at Wilmington regarding this IFB other than the bid/contract lead identified on the cover of this IFB or in a manner not specified by this IFB shall constitute grounds for rejection of said Vendor's bid, at the State's election.

2.1 INVITATION FOR BID DOCUMENT

The IFB is comprised of the base IFB document, any attachments, and any addenda released before Contract award, which are incorporated herein by reference.

2.2 E-PROCUREMENT

ATTENTION: This is NOT an e-procurement solicitation. Section 16 of Attachment C: North Carolina General Contract Terms and Conditions, paragraphs (b) and (c), do not apply to this solicitation.

2.3 NOTICE TO VENDORS REGARDING IFB TERMS AND CONDITIONS

It shall be the Vendor's responsibility to read the Instructions to Vendors, the North Carolina General Terms and Conditions, all relevant exhibits and attachments, and any other components made a part of this IFB and comply with all requirements and specifications herein. Vendors also are responsible for obtaining and complying with all Addenda and other changes that may be issued in connection with this IFB.

If Vendors have questions or issues, or exceptions regarding any component within this IFB, those must be submitted as questions in accordance with the instructions in the BID QUESTIONS Section. If the State determines that any changes will be made as a result of the questions asked, then such decisions will be communicated in the form of an IFB addendum. The State may also elect to leave open the possibility for later negotiation of specific provisions of the Contract that have been addressed during the question-and-answer period, prior to contact award.

Other than through this process or negotiation under 01 NCAC 05B.0503, the State rejects and will not be required to evaluate or consider any additional or modified terms and conditions submitted with Vendor's bid. This applies

to any language appearing in or attached to the document as part of the Vendor's bid that purports to vary any terms and conditions or Vendors' instructions herein or to render the bid non-binding or subject to further negotiation. Vendor's bid shall constitute a firm offer that shall be held open for the period required herein ("Validity Period" above).

The State may exercise its discretion to consider Vendor proposed modifications. By execution and delivery of this IFB Response, the Vendor agrees that any additional or modified terms and conditions, whether submitted purposely or inadvertently, shall have no force or effect, and will be disregarded unless expressly agreed upon through negotiations and incorporated by way of a Best and Final Offer (BAFO). Noncompliance with, or any attempt to alter or delete, this paragraph shall constitute sufficient grounds to reject Vendor's bid as nonresponsive.

2.4 IFB SCHEDULE

The table below shows the *intended* schedule for this IFB. The State will make every effort to adhere to this schedule.

Event	Responsibility	Date and Time
Issue IFB	State	February 6, 2024
Submit Written Questions	Vendor	February 14, 2024, by 5:00 pm ET
Responses to Written Questions	State	February 19, 2024, by 5:00 pm ET
Submit Bids	Vendor	March 14, 2024, by 2:00 pm ET
Bid Opening	State	March 14, 2024, 2:30 pm ET
Contract Award	State	April 26, 2024
Contract Effective Date	State	April 26, 2024

2.5 SITE VISIT or PRE-BID CONFERENCE

There is no Site Visit or Pre-Bid Conference for this solicitation.

2.6 BID QUESTIONS

Upon review of the IFB documents, Vendors may have questions to clarify or interpret the IFB in order to submit the best bid possible. To accommodate the Bid Questions process, Vendors shall submit any such questions by the "Submit Written Questions" date and time provided in the IFB SCHEDULE Section above, unless modified by Addendum.

Written questions shall be e-mailed to **smithdk@uncw.edu** by the date and time specified above. Vendors will enter "IFB # 72-BDKS24039*:* Questions" as the subject for the email. Question submittals will include a reference to the applicable IFB section and be submitted in a format shown below:

Reference	Vendor Question
IFB Section, Page Number	Vendor question …?

Questions received prior to the submission deadline date, the State's response, and any additional terms deemed necessary by the State will be posted in the form of an addendum to *the electronic Vendor Portal (eVP), https://evp.nc.gov,* and shall become an Addendum to this IFB. No information, instruction or advice provided orally or informally by any State personnel, whether made in response to a question or otherwise in connection with this IFB, shall be considered authoritative or binding. Vendors shall rely *only* on written material contained in an Addendum to this IFB.

2.7 BID SUBMITTAL

IMPORTANT NOTE: <u>This is an absolute requirement.</u> Vendor shall bear the risk of late submission due to unintended or unanticipated delay. <u>It is the Vendor's sole responsibility to ensure its bid has been received as described in this IFB by the specified time and date of opening</u>. The date and time of receipt will be marked on each bid when received. Any bid or portion thereof received after the bid submission deadline will be rejected.

Mailing address for delivery of bid via US Postal Service	**Office Address of delivery by any other method (special delivery, overnight, or any other carrier).**
BID NUMBER: 72-BDKS24039 *Attn: Dian Smith, CPPB* *UNCW Purchasing Services* *601 South College Road* *Wilmington, NC 28403-5615*	*BID NUMBER: 72-BDKS24039* *Attn: Dian Smith, CPPB* *UNCW Central Receiving Warehouse* *5179 Lionfish Drive* *Wilmington, NC 28403*

CAUTION: For bids submitted via U.S. mail, please note that the U.S. Postal Service generally does not deliver mail to a specified street address but to the State's Mail Service Center. Vendors are cautioned that bids sent via U.S. Mail, including Express Mail, may not be delivered by the Mail Service Center to the agency's purchasing office on the due date in time to meet the bid deadline. All Vendors are urged to take the possibility of delay into account when submitting bids by U.S. Postal Service, courier, or other delivery service. **Attempts to submit a bid via facsimile (FAX) machine, telephone or email in response to this IFB shall NOT be accepted.**

a) Submit **a signed, original executed** bid responses, *four (4)* photocopies, *one (1)* un-redacted copy on flash drive and, if required, *one (1)* redacted (Proprietary and Confidential Information Excluded) copies on flash drive of your bid simultaneously to the address identified in the table above.

b) Submit your bid in a sealed package. Clearly mark each package with: (1) Vendor name; (2) the IFB number; and (3) the due date. Address the package(s) for delivery as shown in the table above. If Vendor is submitting more than one (1) bid, each bid shall be submitted in separate sealed envelopes and marked accordingly. For delivery purposes, separate sealed envelopes from a single Vendor may be included in the same outer package. Bids are subject to rejection unless submitted with the information above included on the outside of the sealed bid package.

c) Copies of bid files must be provided on separate read-only flash drives. File contents **shall NOT** be password protected but shall be in .PDF or .XLS format and shall be capable of being copied to other sources.

2.8 BID CONTENTS

Vendors shall populate all attachments of this IFB that require the Vendor to provide information and include an authorized signature where requested. Failure to provide all required items, or Vendor's submission of incomplete items, may result in the State rejecting Vendor's bid, in the State's sole discretion.

Vendor IFB responses shall include the following items and attachments, which shall be arranged in the following order:

a) Cover Letter, which must contain all of the following; (i) a statement that confirms that the Vendor has read the IFB in its entirety, including all links, and all Addenda released in conjunction with the IFB; (ii) a statement that the Vendor agrees to perform in accordance with the scope of work, requirements, and specifications contained herein; and (iii) Vendor's agreement to comply with all instructions, terms and conditions, and attachments.

b) Title Page: Include the company name, address, phone number and authorized representative along with the Bid Number.

c) Completed and signed version of EXECUTION PAGES, along with the body of the IFB (all pages and any addendum).

d) Signed receipt pages of any addenda released in conjunction with this IFB, if required to be returned.

e) Vendor Response – all pages of this Invitation for Bid

f) Completed version of ATTACHMENT A: PRICING

g) Completed version of ATTACHMENT D: HUB SUPPLEMENTAL VENDOR INFORMATION

h) Completed version of ATTACHMENT E: CUSTOMER REFERENCE FORM

i) Completed version of ATTACHMENT F: LOCATION OF WORKERS UTILIZED BY VENDOR

j) Completed and signed version of ATTACHMENT G: CERTIFICATION OF FINANCIAL CONDITION

k) Completed and signed version of ATTACHMENT H: VENDOR REQUEST FOR EO50 PRICE-MATCHING, if applicable

l) Completed and signed version of ATTACHMENT I: ACKNOWLEDGMENT OF COVID-19 VACCINATION AND TESTING POLICY, if applicable

m) Completed and signed version of ATTACHMENTJ: CERTIFICATION FOR CONTRACTS, GRANTS, LOANS, AND COOPERATIVE AGREEMENTS and OMB STANDARD FORM LLL

n) Completed version of ATTACHMENT L: TECHNICAL BID SUBMISSION

2.9 ALTERNATE BIDS

Unless provided otherwise in this IFB, Vendor may submit alternate bids for comparable Goods, various methods or levels of Service(s), or that propose different options. Alternate bids must specifically identify the IFB requirements and advantage(s) addressed by the alternate bid. Any alternate bid, in addition to the marking described above, must be clearly marked with the legend: "Alternate Bid #___ *[for 'name of Vendor']*". Each bid must be for a specific set of Goods and Services and must include specific pricing. If a Vendor chooses to respond with various offerings, each must be offered with a separate price and be contained in a separate bid. Each bid must be complete and independent of other bids offered.

2.10 DEFINITIONS, ACRONYMS, AND ABBREVIATIONS

Relevant definitions for this IFB are provided in 01 NCAC 05A .0112 and in the Instructions to Vendors referenced below which are incorporated herein by this reference.

The following definitions, acronyms, and abbreviations are also relevant to this IFB:

a) **BAFO**: Best and Final Offer, submitted by a Vendor to alter its initial bid, made in response to a request by the issuing agency.

b) **BUYER:** The employee of the State or Other Eligible Entity that places an order with the Vendor.

c) **CONTRACT LEAD / PURCHASING SPECIALIST:** Representative of UNCW identified on the first page of this IFB who will correspond with potential Vendors concerning solicitation issues and will contract with the Vendor providing the best offer to the State and is the individual who will administer The Contract for the State.

d) **FOB-DESTINATION:** Title changes hand from Vendor to purchaser at the destination point of the shipment; Vendor owns commodity in transit and files any claims, and Vendor pays all freight and any related transportation charges. A solicitation may request a Vendor to separately identify freight charges in its bid,

but no amount or charge not included as part of the total bid price will be paid.

e) **IFB:** Invitation for Bids.

f) **INCOTERMS DDP:** International Commercial Terms published by the International Chamber of Commerce relating to international commercial law. Delivered Duty Paid (DDP) is the delivery agreement that the seller assumes all responsibility for transporting the vessel and goods until they reach the agreed upon destination.

g) **IPS:** The NC Interactive Purchasing System, a free, electronic system for Vendors to view and search for bids opportunities.

h) **MUST**: A term indicating a mandatory requirement.

i) **NC BIDS:** The North Carolina Business Invitation Delivery System provides vendors the opportunity to submit bid responses electronically. https://ncadmin.nc.gov/nc-bids-vendors

j) **ON-TIME DELIVERY:** The delivery of all items for each milestone/deliverable and/or within a single order to the receiving point designated by the ordering entity within the delivery time required.

k) **QUALIFIED BID:** A responsive bid submitted by a responsible Vendor.

l) **RESPONSIVE BID:** A bid that meets all criteria of a bid such as, but not limited to, bid execution, and submittal of all required data within the required timeframe.

m) **RESPONSIBLE BIDDER:** Bidder has 1) the skill, judgment, and integrity necessary to faithfully perform the Contract and 2) has sufficient financial resources and 3) has the ability to perform the Contract.

n) **SHALL:** A term indicating a mandatory requirement or action.

o) **STATE:** The State of North Carolina, including any of its sub-units recognized under North Carolina law.

p) **STATE AGENCY:** Any of the more than 400 sub-units within the executive branch of the State, including its departments, boards, commissions, institutions of higher education and other institutions.

q) **UNIVERSITY:** The University of North Carolina at Wilmington, UNCW.

r) **VENDOR:** Contractor, offeror, supplier, bidder, proposer, company, firm, corporation, partnership, individual or other entity submitting a response to an Invitation for Bids.

s) **EST:** Eastern Standard Time

3.0 METHOD OF AWARD AND BID EVALUATION PROCESS

3.1 METHOD OF AWARD

North Carolina G.S. 143-52 provides a general list of criteria the State shall use to award contracts, as supplemented by the additional criteria herein. The Goods being procured shall dictate the application and order of criteria; however, all award decisions shall be in the State's best interest.

All responsive bids will be reviewed, and award will be based on the responsive bid offering the lowest price that meets the specifications to include any required verifications set out herein such as but not limited to past performance, references, and financial documents.

If a Vendor selected for award is determined by the State to be a non-resident of North Carolina, all responsive bids will be reviewed to determine if any of them were submitted by a North Carolina resident Vendor who requested an opportunity to match the price of the winning bid, pursuant to Executive Order #50 and G.S. 143-59 (for more information, please refer to ATTACHMENT H: VENDOR REQUEST FOR EXECUTIVE ORDER #50 PRICE MATCHING. If such bid(s) are identified, the State will then determine whether any such bid falls within the price-match range, and, if so, make a Contract award in accordance with the process that implements G.S. 143-59 and Executive Order #50.

The State reserves the right to waive any minor informality or technicality in bids received.

3.2 CONFIDENTIALITY AND PROHIBITED COMMUNICATIONS DURING EVALUATION

While this IFB is under evaluation, the responding Vendor, including any subcontractors and suppliers, is prohibited from engaging in conversations intended to influence the outcome of the evaluation. See Paragraph 29 of the Instructions To Vendors entitled COMMUNICATIONS BY VENDORS.

Each Vendor submitting a bid to this IFB, including its employees, agents, subcontractors, suppliers, subsidiaries and affiliates, is prohibited from having any communications with any person inside or outside the using agency; issuing agency; other government agency office or body (including the purchaser named above, any department secretary, agency head, members of the General Assembly and Governor's office); or private entity, if the communication refers to the content of Vendor's bid or qualifications, the content of another Vendor's proposal, another Vendor's qualifications or ability to perform a resulting contract, and/or the transmittal of any other communication of information that could be reasonably considered to have the effect of directly or indirectly influencing the evaluation of proposals, the award of a contract, or both.

Any Vendor not in compliance with this provision shall be disqualified from evaluation and award. A Vendor's proposal may be disqualified if its subcontractor and/or supplier engage in any of the foregoing communications during the time that the procurement is active (*i.e.*, the issuance date of the procurement until the date of contract award or cancellation of the procurement). Only those discussions, communications or transmittals of information authorized or initiated by the issuing agency for this IFB, or inquiries directed to the purchaser named in this IFB regarding requirements of the IFB (prior to proposal submission) or the status of the award (after submission) are excepted from this provision.

3.3 BID EVALUATION PROCESS

Only responsive submissions will be evaluated.

The State will conduct an evaluation of responsive Bids, as follows:

Bids will be received according to the method stated in the Bid Submittal section above.

All bids must be received by the issuing agency not later than the date and time specified in the IFB SCHEDULE Section above, unless modified by Addendum. Vendors are cautioned that this is a request for offers, not an offer or request to contract, and the State reserves the unqualified right to reject any and all offers at any time if such rejection is deemed to be in the best interest of the State.

At the date and time provided in the IFB SCHEDULE Section above, unless modified by Addendum, the bids from each responding Vendor will be opened publicly and all offers (except those that have been previously withdrawn, or voided bids) will be tabulated. The tabulation shall be made public at the time it is created. When negotiations after receipt of bids is authorized pursuant to G.S. 143-49 and 01 NCAC 05B.0503, only the names of offerors and the Goods and Services offered shall be tabulated at the time of opening. If negotiation is anticipated, cost and price shall become available for public inspection at the time of the award. Interested parties are cautioned that these costs and their components are subject to further evaluation for completeness and correctness and therefore may not be an exact indicator of a vendor's pricing position.

At their option, the evaluators may request oral presentations or discussions with any or all Vendors for clarification or to amplify the materials presented in any part of the bid. Vendors are cautioned, however, that the evaluators are not required to request presentations or other clarification—and often do not. Therefore, all bids should be complete and reflect the most favorable terms available from the Vendor. Prices bid cannot be altered or modified as part of a clarification.

Bids will generally be evaluated, based on completeness, content, cost, and responsibility of the Vendor to supply the requested Goods and Services. Specific evaluation criteria are listed in Section 3.1 METHOD OF AWARD.

Upon completion of the evaluation process, the State will make Award(s) based on the evaluation and post the award(s) to the State's eVP website under the IFB number for this solicitation. Award of a Contract to one Vendor does not mean that the other bids lacked merit, but that, all factors considered, the selected bid was deemed most advantageous and represented the best value to the State.

The State reserves the right to negotiate with one or more Vendors, or to reject all original offers and negotiate with one or more sources of supply that may be capable of satisfying the requirement, and in either case to require Vendor to submit a Best and Final Offer (BAFO) based on discussions and negotiations with the State.

3.4 PERFORMANCE OUTSIDE THE UNITED STATES

Vendor shall complete ATTACHMENT F: LOCATION OF WORKERS UTILIZED BY VENDOR. In addition to any other evaluation criteria identified in this IFB, the State may also consider, for purposes of evaluating proposed or actual contract performance outside of the United States, how that performance may affect the following factors to ensure that any award will be in the best interest of the State:

a) Total cost to the State
b) Level of quality provided by the Vendor.
c) Process and performance capability across multiple jurisdictions.
d) Protection of the State's information and intellectual property
e) Availability of pertinent skills
f) Ability to understand the State's business requirements and internal operational culture.
g) Particular risk factors such as the security of the State's information technology.
h) Relations with citizens and employees.
i) Contract enforcement jurisdictional issues.

3.5 INTERPRETATION OF TERMS AND PHRASES

This IFB serves two functions: (1) to advise potential Vendors of the parameters of the solution being sought by the State; and (2) to provide (together with other specified documents) the terms of the Contract resulting from this procurement. The use of phrases such as "shall," "must," and "requirements" are intended to create enforceable contract conditions. In determining whether bids should be evaluated or rejected, the State will take into consideration the degree to which Vendors have proposed or failed to propose solutions that will satisfy the State's needs as described in the IFB. Except as specifically stated in the IFB, no one requirement shall automatically disqualify a Vendor from consideration. However, failure to comply with any single requirement may result in the State exercising its discretion to reject a bid in its entirety.

4.0 REQUIREMENTS

This Section lists the requirements related to this IFB. By submitting a bid, the Vendor agrees to meet all stated requirements in this Section, as well as any other specifications, requirements, and terms and conditions stated in this IFB. If a Vendor is unclear about a requirement or specification or believes a change in a requirement would allow for the State to receive a better bid, the Vendor is encouraged to submit these items in the form of a question during the question-and-answer period in accordance with the Bid Questions Section above.

4.1 PRICING

Bid price shall constitute the total cost to the State for delivery fully assembled and ready for use, including all applicable charges for shipping, delivery, handling, administrative and other similar fees. Complete ATTACHMENT A: PRICING FORM and include in Vendor's response.

4.2 VENDOR EXPERIENCE

In its Bid, the Vendor shall demonstrate experience with public and/or private sector clients with similar or greater size and complexity to the State of North Carolina. Vendor shall provide information as to the qualifications and experience of all executives, managerial, legal, and professional personnel to be assigned to this project, including resumes citing experience with similar projects and the responsibilities to be assigned to each person. Vendor shall provide information as to the manufacturing and welding staff and their capabilities that will be responsible for building the vessel.

4.3 PRODUCT IDENTIFICATION AND PROJECT PLAN

SUITABILITY FOR INTENDED USE

Vendors are requested to offer only items directly complying with the specifications herein or comparable items which will provide the equivalent capabilities, features and diversity called for herein. The State reserves the right to evaluate all bids for suitability for the required use and to award the one best meeting requirements and considered to be in the State's best interest.

Vendors shall submit a complete project plan and timeline for the manufacturing/build of the research vessel. The project plan shall include all timelines, milestones, and inspection dates and deliverables.

4.4 TRANSPORTATION AND IDENTIFICATION

The Vendor shall deliver Domestic Free-On-Board (FOB) Destination or International Shipping INCOTERMS Delivered Duty Paid (DDP) to any requested location within the State of North Carolina with all transportation costs and fees included in the total bid price.

A purchase order will be issued to confirm award of the bid/contract and the purchase order number shall be shown on all packages and shipping manifests to ensure proper identification and payment of invoices. A complete packing list or bill of materials shall accompany each shipment. Vendors shall not ship any products until they have received an order.

4.5 DELIVERY

The Vendor shall deliver Domestic Free-On-Board (FOB) Destination or International Shipping INCOTERMS Delivered Duty Paid (DDP) to the following location(s):

University of North Carolina at Wilmington
Center for Marine Science Facility Dock
5600 Marvin K Moss Lane
Wilmington, NC 28409
GPS Coordinates 34 08'24" N 77 51'44"W

For completion by Vendor: Delivery will be made from _____ (city, state) within _____ consecutive calendar days after receipt of purchase order. Promptness of delivery may be used as a factor in the award criteria.

Delivery shall not be considered to have occurred until final acceptance sea trials have been completed.

4.6 QUALITY ACCEPTANCE INSPECTION

Prior to any milestone or final payment, the University and the University Representative shall conduct an inspection of all materials, supplies, workmanship, and equipment to ensure compliance with the contract requirements and specifications. The vendor shall demonstrate that all respective equipment is fully functional and fit for use as specified.

Invoices may not be paid by the University until an inspection has occurred and the work/goods are accepted.

4.7 WARRANTY

Vendor warrants that all equipment furnished under this IFB will be newly manufactured, of good material and workmanship. The warranty will apply from the date equipment is put into operation for a minimum period of twelve (12) months or the length of the manufacturer's warranty, whichever is longer. Such warranty shall cover the cost of all defective parts replacement, labor, freight, and technicians' travel at no additional cost to the State, or as specified by the University. To the extent not superseded by the terms of this paragraph, manufacturer's warranty terms shall apply. Vendor's warranty shall be at least the level of coverage provided for its comparable customers.

The report of a problem does not presuppose that every call must result in an "on-site" visit for service/repair. The Vendor and/or service sub-contractor shall utilize best efforts to resolve problems in a timely fashion by using acceptable servicing methods to include, but not limited to, verbal problem analysis and remote diagnosis. The warranty requirement does not impose any additional duty on the State to make other than normal and good faith problem resolution efforts or expenditures of time. Vendor shall be responsible for compliance with warranty terms by any third-party service provider. Vendor shall provide contact information for warranty service provider, below and/or attached with their bid submission.

Product warranty will be a consideration evaluating award of contract.

Vendor is authorized by manufacturer to repair equipment offered during the warranty period? ☐ YES ☐ NO

Will the Vendor provide warranty service? ☐ YES ☐ NO, a manufacturer-authorized third party will perform warranty service.

Contact information for warranty service provider:

Company Name: _____

Company Address: _____

_____

Contact Person (name): _____

Contact Person (phone number): _____

Contact Person (email): _____

4.8 MAINTENANCE OPTION

Following expiration of the above warranty, Vendor, or its third-party service provider, shall maintain the system specifications and performance level in accordance with the manufacturer's published specifications and those of this IFB. Maintenance shall include all parts, remedial maintenance labor, travel and living expenses incurred. Except as specifically provided for elsewhere herein, coverage shall be at least for 8:00 am ET to 5:00 pm ET, Monday through Friday, except State recognized holidays and shall include a minimum of two (2) preventive and safety maintenance inspections per year. The State shall have the option to accept the maintenance coverage in this paragraph at the price offered in ATTACHMENT A: PRICING of this IFB, if applicable.

4.9 DEMONSTRATION / DESCRIPTIVE LITERATURE

DEMONSTRATION

The State reserves the right to require a demonstration of the exact model of equipment offered to assess suitability of the offered equipment for the intended use. Such demonstration shall be performed at a mutually agreed facility or virtually by Vendor or his authorized representative before award of the contract, upon request by and without

charge to the State. The failure of Vendor or his authorized representative to perform a satisfactory demonstration (if requested) in accordance with these requirements shall be a sufficient basis for rejection of the bid. The results of such a demonstration will be considered in the evaluation and award of a contract.

DESCRIPTIVE LITERATURE/CERTIFICATION

Each bid shall be accompanied by complete descriptive literature, specifications, certifications, and all other pertinent data necessary for thorough evaluation of the item(s) offered and sufficient to determine compliance of the item(s) with the specifications. Failure to include such information shall be a sufficient basis for rejection of the bid.

4.10 HUB PARTICIPATION

Pursuant to North Carolina General Statute G.S. 143-48, it is State policy to encourage and promote the use of small, minority, physically handicapped, and women contractors in purchasing Goods and Services. As such, this IFB will serve to identify those Vendors that are minority owned or have a strategic plan to support the State's Historically Underutilized Business program by meeting or exceeding the goal of 10% utilization of diverse firms as 1st or 2nd tier subcontractors. Vendor shall complete ATTACHMENT D: HUB SUPPLEMENTAL VENDOR INFORMATION.

4.11 REFERENCES

Vendors shall provide at least three (3) references, using ATTACHMENT E: CUSTOMER REFERENCE FORM, for which your company has supplied the exact model of equipment offered. The State may contact these users to determine the quality level of the offered equipment; as well as, but not limited to, user satisfaction with Vendor performance. Information obtained shall be considered in the evaluation of the bid.

4.12 VENDOR'S REPRESENTATIONS

If the bid results in an award, Vendor agrees that it will not enter any agreement with a third party that may abridge any rights of the State under the Contract. If any Services, deliverables, functions, or responsibilities not specifically described in this solicitation are required for Vendor's proper performance, provision and delivery of the Service and deliverables under a resulting Contract, or are an inherent part of or necessary sub-task included within such service, they will be deemed to be implied by and included within the scope of the contract to the same extent and in the same manner as if specifically described in the Contract. Unless otherwise expressly provided herein, Vendor will furnish all its own necessary management, supervision, labor, facilities, furniture, computer and telecommunications equipment, software, supplies and materials necessary for the Vendor to provide and deliver the Services and/or other Deliverables.

4.13 FINANCIAL STABILITY

As a condition of contract award, the Vendor must certify that it has the financial capacity to perform and to continue to perform its obligations under the Contract; that Vendor has no constructive or actual knowledge of an actual or potential legal proceeding being brought against Vendor that could materially adversely affect performance of this Contract; and that entering into this Contract is not prohibited by any contract, or order by any court of competent jurisdiction

Each Vendor shall certify it is financially stable by completing the ATTACHMENT G: CERTIFICATION OF FINANCIAL CONDITION. The State is requiring this certification to minimize potential performance issues from contracting with a Vendor that is financially unstable. This Certification shall be deemed continuing, and from the date of the Certification to the expiration of the Contract, the Vendor shall notify the State within thirty (30) days of any occurrence or condition that materially alters the truth of any statement made in this Certification.

4.14 AGENCY INSURANCE REQUIREMENTS MODIFICATION

A. Default Insurance Coverage from the General Terms and Conditions applicable to this Solicitation:

☐ Small Purchases

☐ Contract value in excess of the Small Purchase threshold, but up to $1,000,000.00.

☒ Contract value in excess of $1,000,000.00.

4.15 TECHNICAL BID SUBMISSION

5.0 PRODUCT SPECIFICATIONS

5.1 TECHNICAL AND PERFORMANCE SPECIFICATIONS

The specific items and any specifications that the University is seeking are listed in ATTACHMENT K. Items offered by the Vendor must meet or exceed the listed Specifications. Certain products or equipment may be identified as Brand Specific and as such shall be provided as identified. Other products or equipment may be identified by brand name to establish the minimum level of quality and specifications required.

5.2 CERTIFICATION AND SAFETY LABELS

All manufactured items and/or fabricated assemblies subject to operation under pressure, operation by connection to an electric source, or operation involving a connection to a manufactured, natural, or LP gas source shall be constructed and approved in a manner acceptable to the appropriate state inspector which customarily requires the label or re-examination listing or identification marking of the appropriate safety standard organization; such as the American Society of Mechanical Engineers for pressure vessels; the Underwriters Laboratories and /or National Electrical Manufacturers' Association for electrically operated assemblies; or the American Gas Association for gas operated assemblies, where such approvals of listings have been established for the type of device offered and furnished. Further, all items furnished shall meet all requirements of the Occupational Safety and Health Act (OSHA), and state and federal requirements relating to clean air and water pollution.

5.3 DEVIATIONS

The nature of all deviations from the Specifications listed herein shall be clearly described by the Vendor. Otherwise, it will be considered that items offered by the Vendor are in strict compliance with the Specifications provided herein, and the successful Vendor shall be required to supply conforming goods. Deviations shall be explained in detail on an attached sheet. However, no implication is made or intended by the State that any deviation will be acceptable. Do not list objections to the North Carolina General Terms and Conditions in this section. There shall be no deviations to any product or equipment designated as Brand Specific.

6.0 CONTRACT ADMINISTRATION

All Contract Administration requirements are conditioned on an award resulting from this solicitation. This information is provided for the Vendor's planning purposes.

6.1 CONTRACT MANAGER AND CUSTOMER SERVICE

The Vendor shall be required to designate and make available to the University a contract manager. The contract manager shall be the University's point of contact for Contract related issues and issues concerning performance, progress review, scheduling, and service.

Contract Manager Point of Contact	
Name:	
Office Phone #:	
Mobile Phone #:	
Email:	

6.2 POST AWARD PROJECT REVIEW MEETINGS

The Vendor, at the request of the State, shall be required to meet at the least monthly with the State for Project Review meetings. The purpose of these meetings will be to review project progress reports, discuss Vendor and State performance, address outstanding issues, review problem resolution, provide direction, evaluate continuous improvement, and cost saving ideas, and discuss any other pertinent topics. Onsite inspections as desired by the State shall take place during the manufacturing process.

6.3 CONTINUOUS IMPROVEMENT

The State encourages the Vendor to identify opportunities to reduce the total cost to the State. A continuous improvement effort consisting of various ideas to enhance business efficiencies as performance progresses.

6.4 PERIODIC BI-WEEKLY STATUS REPORTS

The Vendor shall be required to provide Project Management Reports to the designated Contract Lead and Purchasing Representative every two weeks or on a weekly basis if required by the State. This report shall include, at a minimum, information concerning status of work accomplished during the reporting period, work to be accomplished during the subsequent reporting period; lead-times of products and equipment; problems, real or anticipated, and notification of any significant deviation from previously agreed upon work plans and schedules. These reports shall be well organized and easy to read. The Vendor shall submit these reports electronically using the format required by the University. The Vendor shall submit the reports in a timely manner and on a regular schedule as agreed by the parties.

Within ten (10) business days of the award of the Contract the Vendor shall submit a final work plan and a sample report, both to the designated Contract Lead and Purchasing Representative for approval.

6.5 ACCEPTANCE OF WORK

Performance of the work and delivery of Goods shall be conducted and completed at least in accordance with the Contract requirements and recognized and customarily accepted industry practices. Performance shall be considered complete when the Services or Goods are approved as acceptable by the Contract Administrator and the University Naval Architect Representative.

Acceptance of work products shall be based on the following criteria: Adherence to the technical specifications; welding/fabrication/manufacturing inspection by the University Naval Architect; Submission of all deliverable materials; Demonstration of applicable working equipment and functionality of equipment; Acceptable Sea-Trials and operational function of equipment; and any other industry standard requirements for acceptance.

The State shall have the obligation to notify Vendor, in writing ten (10) calendar days following completion of such work or delivery of a deliverable described in the Contract that it is not acceptable. The notice shall specify in

reasonable detail the reason(s) it is unacceptable. Acceptance by the State shall not be unreasonably withheld; but may be conditioned or delayed as required for reasonable review, evaluation, installation, or testing, as applicable to the work or deliverable. Final acceptance is expressly conditioned upon completion of all applicable assessment procedures. Should the work or deliverables fail to meet any specifications, acceptance criteria or otherwise fail to conform to the Contract, the State may exercise any and all rights hereunder, including, for Goods deliverables, such rights provided by the Uniform Commercial Code, as adopted in North Carolina.

6.6 INVOICES

Vendor shall invoice the University. The standard format for invoicing shall be Single Invoices meaning that the Vendor shall provide the University with an invoice for each deliverable. Invoices shall include detailed line-item information to allow the University to verify pricing at point of receipt matches the correct price from the original date of order. At a minimum, the following fields shall be included on all invoices:

Vendor's Billing Address, Customer Account Number, NC Contract Number, Order Date, University Purchase Order Number, Manufacturer Part Numbers, Vendor Part Numbers, Item Descriptions, Price, Quantity, and Unit of Measure.

INVOICES MAY NOT BE PAID UNTIL AN INSPECTION HAS OCCURRED AND THE WORK/GOODS ACCEPTED.

6.7 DISPUTE RESOLUTION

During the performance of the Contract, the Parties agree that it is in their mutual interest to resolve disputes informally. Any claims by the Vendor shall be submitted in writing to the State's Contract Manager for resolution. Any claims by the State shall be submitted in writing to the Vendor's Project Manager for resolution. The Parties shall agree to negotiate in good faith and use all reasonable efforts to resolve such dispute(s).

During the time the Parties are attempting to resolve any dispute, each shall proceed diligently to perform their respective duties and responsibilities under this Contract. The Parties will agree on a reasonable amount of time to resolve a dispute. If a dispute cannot be resolved between the Parties within the agreed upon period, either Party may elect to exercise any other remedies available under the Contract, or at law. This provision, when agreed in the Contract, shall not constitute an agreement by either party to mediate or arbitrate any dispute.

6.8 PRODUCT RECALL

Vendor expressly assumes full responsibility for prompt notification to the Buyer listed on the face of this IFB of any product recall in accordance with the applicable state or federal regulations. The Vendor shall support the State, as necessary, to promptly replace any such products, at no cost to the State.

6.9.1 PRICE ADJUSTMENTS

Prices proposed by the Vendor shall be firm against any increase for 360 days from the effective date of the Contract.

Price increase requests shall be submitted in writing to the Contract Lead and Purchasing Representative, which shall include the reason(s) for the request and contain supporting documentation for the need. Price increases will be negotiated and agreed to by both the State and Vendor in advance of any price increase going into effect. The State is not obligated to accept pricing adjustments or increases and reserves the right to accept or reject them in part or in whole. Price de-escalation or decreases may be requested by the State at any time.

It is understood and agreed that orders will be shipped at the established Contract prices in effect on the date an order is placed. Invoicing that deviates from this provision may result in Contract to cancellation.

6.10 CONTRACT CHANGES

Contract changes, if any, over the life of the Contract shall be implemented by contract amendments agreed to in writing by the State and Vendor. Amendments to the contract can only be made through the contract administrator.

The remainder of this page is intentionally left blank.

7.0 ATTACHMENTS

IMPORTANT NOTICE

RETURN THE REQUIRED ATTACHMENTS WITH YOUR RESPONSE

FOLLOW THE LINKS TO ACCESS EACH ATTACHMENT

ATTACHMENT A: PRICING

Complete and return the Pricing associated with this IFB, which can be found in the table below:

FURNISH AND DELIVER: RESEARCH VESSEL

Pricing must be all inclusive of all products, delivery per section 4.5, training, punch list items, fuel, sea-trials, final acceptance, travel, and any associated costs to meet and obtain final acceptance.

COST OF RESEARCH VESSEL AS SPECIFIED WITHIN THE BID: $_____

TRANSPORTATION / DELIVERY COST TO UNCW CENTER FOR MARINE SCIENCE $_____

TOTAL EXENDEND PRICE: $_____

OPTIONAL COST: Bidder to designate cost increase of option as a positive amount or cost decrease of option as a negative amount to be applied to the cost above of the research vessel as specified within the bid. Bidder to include additional information about any options being offered.

Transportation/Delivery to East Coast location other than UNCW CMS $_____

TOTAL EXENDEND PRICE: $_____

Location for Delivery _____

4.8 Annual Maintenance Option $_____

ATTACHMENT B: INSTRUCTIONS TO VENDORS

The Instructions to Vendors, which are incorporated herein by this reference, may be found here:

https://ncadmin.nc.gov/formnorth-carolina-instructions-vendors032023/download?attachment

ATTACHMENT C: NORTH CAROLINA GENERAL TERMS & CONDITIONS

The North Carolina General Terms and Conditions, which are incorporated herein by this reference, may be found here:

https://www.doa.nc.gov/form-north-carolina-general-terms-and-conditions-11-2023/open

ATTACHMENT D: HUB SUPPLEMENTAL VENDOR INFORMATION

Complete and return the Historically Underutilized Businesses (HUB) Vendor Information form, which can be found at the following link:

https://files.nc.gov/ncdoa/pandc/OnlineForms/Form_HUB-Supplemental-Vendor-Information_9.2021.pdf

ATTACHMENT E: CUSTOMER REFERENCE FORM

Complete and return the Customer Reference Form, which can be found at the following link:

https://files.nc.gov/ncdoa/pandc/OnlineForms/Form_Customer_Reference_Template_09.2021.pdf

ATTACHMENT F: LOCATION OF WORKERS UTILIZED BY VENDOR

Complete and return the Location of Workers Utilized by Vendor, which can be found at the following link:

https://files.nc.gov/ncdoa/pandc/OnlineForms/Form_Location-of-Workers_09.2021.pdf

ATTACHMENT G: CERTIFICATION OF FINANCIAL CONDITION

Complete, sign, and return the Certification of Financial Condition, which can be found at the following link:

https://files.nc.gov/ncdoa/pandc/OnlineForms/Form_Certification-of-Financial-Condition_09.2021.pdf

ATTACHMENT H: VENDOR REQUEST FOR EO50 PRICE-MATCHING

Complete, sign, and return the Vendor Request for EO50 Price-Matching, which can be found at the following link:

https://files.nc.gov/ncdoa/pandc/OnlineForms/Form_Vendor-Price-Matching-Opportunity_09.2021.pdf

ATTACHMENT I: ACKNOWLEDGMENT OF COVID-19 VACCINATION AND TESTING POLICY

Complete, sign, and return the ACKNOWLEDGMENT OF COVID-19 VACCINATION AND TESTING POLICY associated with this IFB is a separate document that can be found at the following link:

https://files.nc.gov/ncdoa/pandc/OnlineForms/COVID_Policy_Acknowledgement_-_Fillable.pdf

ATTACHMENT J: LOBBYING ACTIVITY CERTIFICATION FOR FEDERAL GRANTS

The Certification for Contracts, Grants, Loans, and Cooperative Agreements and the OMB Standard Form LLL are separate documents that can be found at the following link:
https://ncadmin.nc.gov/documents/vendor-forms

ATTACHMENT K: TECHNICAL SPECIFICATION OF A SUBCHAPTER T RESEARCH VESSEL

See Pages 24-88

ATTACHMENT L: TECHNICAL BID SUBMISSION

Bid submissions shall include all pages of this IFB, and all additional information required and, in the layout, as noted in ATTACHMENT L: TECHNICAL BID SUBMISSION.

See Pages 89-92

***** Failure to Return the Required Attachments May Eliminate Your Response from Further Consideration *****

ATTACHMENT: K

TECHNICAL SPECIFICATION
FOR THE PROCUREMENT OF
A SUBCHAPTER T RESEARCH VESSEL

prepared for:

University of North Carolina Wilmington

Center for Marine Science

prepared by:

Naval Architecture
Marine Engineering
Marine Surveying
Salvage Engineering

70 Essex Street • Mystic, CT 06355

[860] 536-0009 • http://www.jmsnet.com • jms@jmsnet.com

Project Number: 23-140

000 GENERAL REQUIREMENTS FOR DESIGN AND CONSTRUCTION

000 VESSEL DESCRIPTION

The primary mission of the Institute's new vessel is to provide a nearshore and offshore work platform for the support of oceanographic research projects in the mid-Atlantic near coastal waters.

The vessel is to be built and operated as a USCG Inspected Passenger Vessel under 100GRT, which operates beyond the boundary line but will not have a Load Line issued. The Builder will be responsible for obtaining a U.S. Coast Guard Certificate of Inspection as a Passenger Vessel. The Owner will additionally obtain a U.S. Coast Guard Letter of Designation as an Oceanographic Research Vessel.

The vessel as delivered shall comply with all applicable regulatory body requirements in effect at the time of the Contract Award, including regulatory body requirements formally approved and scheduled for implementation prior to the scheduled delivery of the vessel. In case of conflict between regulatory body requirements and this specification, regulatory body requirements take precedence, unless the specifications exceed the regulatory body requirements, in which case the specifications take precedence.

The primary area of operation for the vessel will be the mid-Atlantic regions near coastal waters. The vessel will typically operate year-round and should be capable of operating in the extremes of both summer operations and winter operations up to 100 miles offshore in the mid-Atlantic region. The vessel and its subsystems shall have full capability within a range of air temperatures from 0° to 110° F and a range of water temperatures from 28° to 90° F.

The primary science missions are:

1. Conduct oceanographic surveys.
2. Deploy oceanographic instrumentation, moorings.
3. Conduct education and public outreach programs.
4. Conduct biological surveys.
5. Conduct water quality sampling and sediment sampling.
6. Deploy, recover of ROV's and AUV's
7. Act as a dive support vessel.

PRINCIPAL CHARACTERISTICS	Length Overall	TBD	
	Length Waterline	TBD	
	Breadth	TBD	
	Hull Depth	TBD	
	Full Load Navigational Draft	< 6.5	feet
	Cruising Speed at 85% MCR	21.0	knots
	Tonnage	< 100	GRT
	Accommodations	10	
	Class	no	
	USCG Inspected	yes	Subchapter T, passenger vessel
	USCG Documented	yes	
	USCG, other		Letter of Designation as an Oceanographic Research Vessel

The projected cruising speed is based on 85% of rated power, full fuel, full fresh water, complement of 10 people onboard, provisions for 5-day cruise and a 1,000 lbs. of scientific equipment, operating in calm seas with a clean bottom.

001 GENERAL ADMINISTRATIVE REQUIREMENTS

001.1 General

This Specification provides the overall requirements for the design and construction of the Research Vessel.

The Contractor shall complete the detail design, construct, and test the vessel in accordance with this specification.

The Contractor shall be responsible for providing documentation, including inventory, installed weights and drawings of all provided and/or installed articles, fittings, equipment, materials, and supplies. The Contactor shall obtain and provide documentation of all necessary inspections and surveys during construction. The Contractor shall provide the appropriate operational and maintenance manuals for equipment and machinery. The Contractor shall provide MSC reviewed and approved "As-Built" Drawings in accordance with section 001e and provide them to the Vessel Owner.

001.2 Reference Documents

The following Standards and Documents are referenced within this Specification. While every effort has been made to ensure the completeness of this list, the Contractor is required to meet all specified requirements documents cited in this Specification, whether or not they are listed in this section.

In any documents where a piece of equipment is called out with a specific manufacturer, the Contractor shall be able to propose an equivalent alternative, as long as a formal change request is filed and approved by the vessel owner and owner's representative in accordance with section 001d.

001.2.1 Order of Precedence

In the event of a conflict between the text of this document and the references (other than regulatory body requirements) cited in this document, the text of this document takes precedence. Nothing in this document shall supersede applicable laws and regulations unless a specific exemption has been obtained.

Silence of one document with respect to details or requirements in another document shall not be considered an inconsistency.

001.2.2 Effective issue

Where first tier references, such as industry standards or Government specifications and standards are referred to, the issue or revision in effect at the Design & Construction Contract Award Date shall apply.

001.3 Deviations

Should the Contractor desire to deviate from this Specification during the execution of the Contract, he shall submit his request in writing to the Vessel Owner and Owner's Representative. Deviations shall not be considered during the proposal. Each proposed deviation request shall be accompanied by a detailed analysis and comparison of the equipment, material or arrangement specified, and the equipment, material or arrangement proposed, including features, dimensions, performance characteristics, benefit to the Vessel Owner, and compelling reason why the deviation should be made. The request shall include, but is not limited to:

- Desired deviation
- Reason for the deviation
- Detailed analysis (as stated above)
- Detailed analysis and identification of impact on speed, maneuvering, mission supportability, draft, and regulatory compliance
- Impact on schedule
- Impact of regulatory review and classification
- Supporting documentation (i.e. cut sheets, engineering drawings, photos, etc.)
- Cost Impact

- Cumulative impact with any and all other requested deviations, and/or requested and approved deviations.

In the absence of compelling reasons for approving the deviation, the Contractor's proposal may be denied.

If approved, the Contractor shall be responsible for any cascading effects on the design, drawings or scientific reports as determined by the Vessel Owner and Owner's Representative. The Contractor shall be responsible for integrating the deviation into the design at no increase in contract cost or no extension of contract completion.

The Contractor bears ultimate responsibility for satisfactory performance of all systems/arrangements impacted or affected by an approved deviation as well as the operation of the completed vessel, as affected by the deviation.

No work shall commence without a written approval from the Vessel Owner and Owner's Representative.

If a deviation is approved by the Vessel Owner and Owner's Representative, it is the sole responsibility of the Contractor to coordinate with all applicable regulatory bodies and provide any additional engineering effort to meet the conditions of those bodies and this specification. In addition, Vessel Owner and Owner's Representative approval of a deviation does not constitute approval for any degradation in vessel speed, maneuvering, mission supportability, draft, and regulatory compliance. The Contractor bears responsibility for ensuring that the Vessel Owner and Owner's Representative approved Contractor requested deviation does not result in adverse impact on the vessel or vessel performance.

The Contractor shall bear all costs associated with any requested and/or approved deviations, including engineering, estimating, administrative and overhead, regulatory review and approval, construction and test and trials.

020 VESSEL DOCUMENTATION AND DRAWINGS

020.1 General

The Contractor is responsible for providing all relevant plans, calculations, and documentation necessary to obtain USCG Subchapter T approval and reflecting the final "as-built" condition of the vessel. Vessel documentation is to be provided prior to Vessel Owner Acceptance of the vessel. All documentation will be the property of the Vessel Owner to be used solely for the operation and maintenance of the vessel and not for the construction of additional vessels. Unless otherwise specified in this specification, the format and quantities of documents shall be in accordance with Table 1.

Table 1: VESSEL DOCUMENTATION

Documents	No. of Copies		
	Hard Copy	.dwg /.xls / .doc	.pdf
Contract Deviation Log	0	1	1
Contract Questions/Clarifications Log	0	1	1
Booklet of General Plans	2	1	1
Vessel Outfitting Documentation	1	1, as available	
Stability Documentation	1	1	1
Booklet of Tests and Trials	1	-	1

020.2 Contract Deviation Log

The Contract Deviation Log shall document all contract deviations either proposed by the Contractor to UNCW or issued to the Contractor by UNCW. This documentation shall include:

- Cover Page

- Table of Contents indicating each deviation, with supporting attachments and documentation

020.3 Contract Questions/Clarifications Log

The Contract Questions/Clarifications Log shall document all correspondence between the Contractor and UNCW/UNCW Owner Representative that addresses questions or comments related to the interpretation of the Contract documents and Specification. This documentation shall include:

- Cover Page
- Table of Contents
- Questions
- Responses
- Time Stamp for questions and responses

020.4 Booklet of General Plans

The Contractor will be responsible for developing a Booklet of General Plans. The Booklet of General Plans will contain "as-built" versions of all MSC reviewed and approved drawings plus any drawings relevant to the life-cycle operation and maintenance of the vessel. This will also specifically include:

- The specific launch plan as developed by the shipyard for the shipyard launch of the vessel. A dry-docking plan for the vessel illustrating all major hull structure on the bottom, all hull penetrations, all transverse and longitudinal bulkheads connecting with the bottom shell, and other features relevant to setting and shifting of the blocks.
- A transverse section and a shell expansion plan showing all plate details, weld details and location of butts and seams.
- Tank tables in 1 inch increments accounting for the location of sounding tubes and/or sight glass.
- Electrical system load analysis calculations
- HVAC system load analysis calculations.
- Any and all detail fabrication or "shop" drawings that may be useful in the life-cycle operation and maintenance of the vessel.
- Fire and Safety Plan for posting on the vessel, approved by the USCG.

020.5 Vessel Outfitting Documentation

The Contractor shall provide a final master equipment list of all significant machinery and equipment. In addition, vendor catalog "cut" sheets, regulatory body approval certificates, applicable calculation summaries, material certificates, manuals, operating instructions, maintenance routines and vendor contact information shall be provided. This documentation shall be provided in the form of:

020.5.1 Booklet of calculations

Specific calculations to be included, but the booklet shall not be limited to these calculations alone:

- HVAC
- R&P
- Electrical

020.5.2 Operation/Maintenance Manuals

020.5.3 Certificates Log

020.6 Stability Documentation

The Contractor will be responsible for providing a USCG approved Stability letter and supporting calculations.

020.7 Booklet of Tests and Trials

The Contractor shall provide a complete Booklet of Test and Trial Documentation containing all test agendas, memorandums and results performed per Section 074 of this specification.

- Document cover page
- Table of contents
- Test agendas
- Memorandums
- Reports for levels 1, 2, 3 & 4 tests and trials.
- Noise survey report.
- Potable water lab report.

025 CARE DURING CONSTRUCTION

025.1 General

The ship and construction modules must be maintained in a safe, clean, and workmanlike condition during the entire period that the ship is in the Contractor's possession. All parts of the ship including tanks and voids must be kept free of chips, shavings, refuse, dirt, water, and other extraneous matter at all times. Places that are to be permanently closed or that may become inaccessible must be inspected by the Owner's Representative and approved with all rubbish removed prior to closure. Appropriate measures must be taken to minimize wear and damage from construction and to prevent corrosion or other deterioration.

Unpainted machine parts, both interior and exterior, must be protected against corrosion and deterioration during the interval between manufacture and placing in service aboard the ship. If removal of the preservative is required for testing the machinery or equipment prior to installation, the Contractor must re-preserve and protect the machinery or equipment prior to installation and after installation in accordance with manufacturers' instructions. Preservative on working parts must be removed prior to the operation of the machinery or equipment.

Equipment, prefabricated parts, furniture, piping, machinery, equipment, and outfit must be protected from damage at all times, be kept free of vermin and contamination, and be kept clean and protected during manufacture, storage, assembly, and installation.

Prior to delivery, the interior and exterior of the ship must be swept, washed down, or otherwise cleaned and the ship put in a habitable condition for the crew.

025.2 Owner Furnished Equipment

The following items are to be Owner Furnished Equipment (OFE) that will not be made available to the Contractor. These items will be purchased and installed by the owner at the owner's expense upon delivery of the vessel.

- 1,000 meters of 0.322" 3 conductor cable for the CTD winch. The Owner intends to purchase the cable and deliver to the winch manufacturer for spooling onto the winch prior to delivery to the shipyard.
- Safety Equipment, Soft Goods (shipyard supplied safety equipment is listed in section 700).
    - Work vests and Immersion Suits
- Galley Goods:
    - Pots, Pans, Dishes, Cutlery

030 DESIGN

030.1 General

The Contractor and its Naval Architect shall develop the detailed design, obtain plan approval from the United States Coast Guard Marine Safety Center for a Subchapter T vessel, and develop all working drawings necessary for construction.

The final design and construction shall ensure the vessel can be operated and maintained safely and efficiently while conducting the following science missions over a projected 30-year service life:

1. Conduct oceanographic surveys.

- Surveys will be conducted with either multibeam, side scan, magnetometer or sub bottom profiler instruments towed from the A-frame, or from a multibeam deployed from a Contractor fabricated and installed bow mounted retractable pole.

2. Deploy oceanographic instrumentation, moorings.
    - Deploy and retrieve up to two mooring systems at a time. With buoys of up to 1,000 lbs, mooring weights of 2,000 lbs and 500 lbs of chain. Dive operations must be simultaneously supported. The deck crane will be used to relocate, position moorings and buoys on deck while underway. The A-frame will be used to retrieve and deploy packages over the stern.
3. Conduct education and public outreach programs
    - Education outreach programs will entail supporting up to 20 person groups for day trips in the near coastal waters engaged in deploying small trawls, towed nets and CTD casts. The deckhouse should be sufficiently large to permit all 20 persons plus crew to seek shelter inside in inclement weather. Food for large education groups will be brought onboard in portable coolers (2 x 200 quart). Provision will need to be made to secure the coolers on deck outboard by the bulwarks.
4. Conduct biological surveys.
    - Surveys will include deploying a 12 bottle CTD, deploying trawl nets/doors, marine mammal monitoring with bridge wing observation decks and the ability to stow, deploy and retrieve a RIB, the RIB is OFE that will be installed after vessel delivery.
5. Conduct water quality sampling and sediment sampling
    - Water quality is achieved through a seawater flow through system, sediment sampling is achieved with a Dynamic Positioning System that will maintain the vessels position while grabs, box cores, box dredge or vibracore are deployed from the stern A-frame.
6. Deploy, recover of ROV's and AUV's
    - Deploy/retrieve ROV packages of up to 500 lbs. Dynamic positioning capability will be used to support ROV and AUV operations.
    - ROV operations will require 220 Vac 3 Phase, 70 Amp power to be available on the back deck of the vessel.
7. Act as a Dive support vessel
    - Provide storage for diving gear on deck, freshwater shower on deck to wash down equipment, provide easy entry/exit to the water and the ability to stow, deploy and retrieve the RIB to support diving operations. Four dive boxes (20 cubic feet each) will need to be secured on deck, outboard adjacent to the bulwarks. The dive boxes will be OFE to be installed as needed after vessel delivery.

The vessel shall be designed and outfitted to support the above scientific missions. Educational outreach missions will be day trips with a crew of two and up to 20 passengers onboard. The remaining science missions will be either day trips or multi day trips with a total complement of not more than 10 total, 3 crew and 7 scientists underway, an endurance of up to 5 days with a cruising speed of 21 knots fully laden, with range of operation in a 5-day cruise of up to 500 nm.

The Contractor shall provide a Concept General Arrangement with their proposal for evaluation. This Conceptual General Arrangement shall be developed with the objective of meeting the performance requirements of this specification and the science mission requirements identified herein. Emphasis should be placed on providing a large open working deck area, functional deckhouse, and lab spaces, in addition to sufficient berthing below deck. Additionally, the operator's station shall provide excellent visibility throughout a 360 deg arc, the aft operators station shall be easily accessed from the primary operators' station.

The following operating profile table will provide some further information on the vessel capabilities for each science mission.

Type of Mission	Frequency	Range (NM)	Duration of Cruise	% Time Cruise Speed	% Time on Station	Science Payload (lbs)	Personnel		Water Depth (M)	Notes
							Crew	Science		
Oceanographic Survey	45 days/year	500	5 Days	50	50	500	3	7	2,000	Surveys will be conducted with either multibeam, side scan, magnetometer or sub bottom profiler instruments towed from the A-frame, or from a multibeam deployed from a Contractor fabricated and installed bow mounted retractable pole.
Oceanographic Instrumentation and Moorings	15 days/year	250	2 Days	75	25	7000	3	7	50	Deploy and retrieve up to two mooring systems at a time. With buoys of up to 1,000 lbs, mooring weights of 2,000 lbs and 500 lbs of chain. Dive operations must be simultaneously supported. The deck crane will be used to relocate, position moorings and buoys on deck while underway. The A-frame will be used to retrieve and deploy packages over the stern.
Education and Outreach	30 days/year	20	12 Hrs	50	50	250	2	20	Near Coastal	Educational outreach programs will operate under a USCG COI and support up to 20 person groups for day trips in the near coastal waters engaged

Type of Mission	Frequency	Range (NM)	Duration of Cruise	% Time Cruise Speed	% Time on Station	Science Payload (lbs)	Personnel		Water Depth (M)	Notes
							Crew	Science		
										in deploying small trawls, towed nets and CTD casts. The deckhouse should be sufficiently large to permit all 20 persons plus crew to seek shelter inside in inclement weather. Food for large education groups will be brought onboard in portable coolers (2 x 200 quart). Provision will need to be made to secure the coolers on deck outboard by the bulwarks.
Biological Surveys	10 days/year	250	2 Days	50	50	250	2	7	1,000	Surveys will include deploying a 12 bottle CTD, deploying trawl nets/doors, marine mammal monitoring with bridge wing observation decks and the ability to stow, deploy and retrieve a RIB.
Sediment / Water Sample Collection	15 days/year	250	1 Day	75	25	500	2	7	50	Water quality is achieved through a seawater flow through system, sediment sampling is achieved with a Dynamic Positioning System that will maintain the vessels position while grabs, box cores, box dredge or

Type of Mission	Frequency	Range (NM)	Duration of Cruise	% Time Cruise Speed	% Time on Station	Science Payload (lbs)	Personnel		Water Depth (M)	Notes
							Crew	Science		
										vibracore are deployed from the stern A-frame.
ROV Ops	15 days/ year	500	5 Days	50	50	1000	3	7	1,000	Deploy/retrieve ROV packages of up to 500 lbs. Dynamic positioning capability will be used to support ROV and AUV operations. ROV operations will require 220 Vac 3 Phase, 70 Amp power to be available on the back deck of the vessel.
Diving Operations	15 days/year	250	1 Day	50	50	1350	3	7	50	Provide storage for diving gear on deck, freshwater shower on deck to wash down equipment, provide easy entry/exit to the water and the ability to stow, deploy and retrieve the RIB to support diving operations. Four dive boxes (20 cubic feet each) will need to be secured on deck, outboard adjacent to the bulwarks. The dive boxes will be OFE to be installed as needed after vessel delivery.

030.2 Standards and Requirements

The vessel shall be designed and constructed to a recognized IACS classification society design standard for Aluminum High-Speed Craft. The vessel shall be inspected by the USCG under construction for the purpose of receiving a certificate of inspection as a passenger carrying vessel prior to delivery and a completed COI upon delivery to the operational district. The vessel shall be less than 100 GRT and designated as an Inspected Subchapter T Passenger Vessel. The Owner will additionally obtain a U.S. Coast Guard Letter of Designation as an Oceanographic Research Vessel.

The Contractor shall provide the marine grade materials, equipment and outfit items required for the ship to operate in compliance with USCG Requirements.

The ship's air emissions shall meet the most stringent combined requirements of federal, state (Atlantic coast and Gulf coast), local (all) regulations and Annex VI of MARPOL 73/78 for engines. The use of volatile organic compounds shall be minimized. The impact of exhaust gases on topside arrangements shall be minimized.

The Contractor shall obtain and provide a United States Certificate of Admeasurement and an International Engine Air Pollution Prevention (EIAPP) certificate. The Contractor shall obtain a Certificate of Inspection (COI) and stability letter, issued by the USCG. The Contractor shall obtain an FCC Vessel Station License for marine VHF installation.

In case of conflict between regulatory body requirements, and other specific requirements of this Specification, regulatory body requirements take precedence, unless the Specification exceeds regulatory body requirements, in which case the specific Specification take precedence.

The Contractor shall be responsible for the construction of a complete and functioning vessel. The Contractor shall utilize the specified components to meet specification requirements utilizing construction and testing methods to ensure that the complete vessel shall conform to the intended design. Inspection by the Vessel Owner and Owner's Representative is for the purpose of verifying the proper function of the Contractor's quality control measures and is not to be used as a substitute for control of quality by the Contractor.

The Contractor shall submit a Quality Assurance (QA) program plan to UNCW as part of the solicitation. The QA program plan shall describe how the Contractor intends to meet or exceed the QA requirements in this section.

The Contractor shall utilize a QA program that assures that all aspects of engineering, construction, and completion of the work comply with the requirements of the contract. The program shall 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 shall also include sequential and well-documented inspections and tests of completed elements of work by the Contractor. The intent of these inspections and tests shall be to identify and resolve all deficiencies prior to presentation of the work to UNCW for acceptance. The QA program and its implementation shall be coordinated with the inspection and test requirements and request for deviation process of the contract.

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

The Contractor shall be responsible for tracking all issues raised by USCG, UNCW or shipyard QA. A status report shall be provided to UNCW no less than monthly by the Contractor, listing all documented discrepancies. Outstanding issues shall be highlighted.

All materials and workmanship will be subject to the inspection and acceptance of UNCW and approval by the regulatory body or bodies. Approval by the USCG is mandatory but does not constitute final approval. Acceptance by VIMS of work, materials and equipment is also required.

The primary responsibility for workmanship and quality assurance rests with the Contractor. Inspections, tests, measurements, or other functions performed by UNCW are for the sole purpose of determining with reasonable assurance that the work, materials, equipment, rate of progress and quantities comply with the contract. This shall in no manner be construed to relieve the Contractor from determining to his own satisfaction that he is in full compliance with the contract requirements at all times. The implementation of QA

procedures by a subcontractor or vendor does not relieve the Contractor of the responsibility to assure that the supplied items fully comply with the requirements of the contract. Failure of UNCW to discover work or materials not in accordance with the contract.

shall not be deemed as acceptance of such work or materials.

A final Acceptance Survey of all accessible spaces will be made by UNCW and their representative immediately preceding acceptance of the vessel by UNCW. Work, materials, and equipment not meeting the contract requirements shall be corrected, and unsuitable work and materials are to be replaced at the Contractor's expense notwithstanding that such work or materials may have been previously inspected or that payment therefore may have been included in a progress payment.

Nothing contained in this subsection will in any way restrict UNCW's rights under any warranty or guarantee.

Construction Standards - All material, machinery and equipment shall be new, of current manufacture and suitable for the marine service intended. Spare parts and service shall be readily obtainable. All material, unless otherwise specified in these specifications or in the Contract drawings, shall be of commercial quality to ASTM, ANSI, or SAE specifications. During construction and before delivery, the Contractor shall be responsible for protection of all material, equipment, etc., intended for the vessels.

The overweight tolerance of members shall be within the limits defined by the specifications of the American Society for Testing and Materials. All materials shall be free of imperfections due to manufacturing processes and from defects which adversely affect appearance or serviceability.

All sharp edges or projections which constitute a personnel hazard shall be removed or ground smooth. All notches shall have a radius to prevent stress concentrations. Except where indicated otherwise, stainless steel fasteners having insulation to prevent metal-to-metal contact shall be used to join aluminum to dissimilar metals or dissimilar alloys of aluminum. All galvanizing shall be done after fabrication by the hot dip process, and the zinc shall be not less than 98% pure. In instances where some types of metals cannot be hot dip galvanized, zinc silicate coating may then be substituted.

032 CALCULATIONS

032.1 Weights

A service life allowance of 5 percent of the full load displacement shall be included at the lightship LCG and TCG and at the VCG, to allow for future growth of the vessel.

A design and building margin shall be selected by the Contractor and shall be included in the weight estimates. A breakdown of the design and building margin shall be provided to the Vessel Owner and/or Owner's Representative for review and approval during the early stages of detail design, prior to construction.

041 HUMAN ENGINEERING AND SAFETY

The vessel design shall reflect system and personnel safety considerations, including the elimination or minimization of the potential for human error during operation and maintenance, under routine, non-routine, and emergency conditions. The Human Engineering principles of ASTM F1166, Standard Practice for Human Engineering Design for Marine Systems, Equipment and Facilities, shall be followed for design of controls and indicators and for interfaces with machinery and gear handling systems to the maximum extent practicable.

System safety shall be integrated into the design to avoid hazardous manual handling operations as far as reasonably practicable and shall limit activities to the required range of physical capabilities. Human-machine interfaces shall minimize potential for and the consequences of human error.

Safety guards shall be installed over unprotected moving parts of rotating or oscillating equipment and machinery that could pose a hazard to personnel. Guards shall also be installed over moving wire ropes that could be contacted by personnel. Guards for scientific winches shall not enclose the drums or cable lead.

Pinch points shall be identified and minimized where possible through design, construction, and component selection. Where pinch points cannot be eliminated through the preceding measures, pinch points shall be identified and painted with yellow and black stripes on all pinch point surfaces.

Emphasis should be placed upon avoiding obstructions within passageways and corridors.

045 STABILITY

The vessel is to comply with the stability requirements for an Inspected Passenger Vessel, under 100 GRT, which operates on the open ocean. The Builder is to demonstrate that the vessel meets the stability requirements of 46 CFR Subchapter T for service with educational outreach programs onboard with no stability related restrictions. In addition, the vessel stability and stability letter shall consider the science missions described in Section 030. The analysis and review shall consider numbers of persons and variable deck loads in addition to normal consumables under each science mission scenario to ensure no restrictions are placed on the operation of the vessel. This should include conducting mooring deployment/retrieval operations with two moorings/buoys on deck with 10 crew and no stability restrictions.

Mooring operations will be conducted with up to two full mooring systems on deck with a maximum crew complement of 10. Mooring operations will not be conducted with educational groups of 20 passengers onboard. Other scientific operations, such as CTD casts, towed instruments, trawls may be conducted when 20 passenger groups are onboard.

The Contractor shall deliver the vessel with a stability letter issued by the USCG and supporting calculations clearly defining the lightship characteristics and summarizing the allowable conditions of operation.

062 LAUNCHING

The Contractor is responsible for the safe launching of the vessel at a time and manner as agreed upon by the Contractor and the Vessel Owner and Owner's Representative. A launch plan including launch calculations must be prepared and presented to the Vessel Owner and Owner's Representative for review and approval at least 14 days in advance of the vessel launching. The launching plan and supporting calculations shall be provided as a deliverable document in accordance with 020 of this specification.

074 TESTING AND TRIALS

074.1 General

The Contractor shall perform tests on all equipment, machinery, and systems; individually, and integrated as a whole. The tests shall be performed as necessary to demonstrate satisfactory compliance with the requirements of this specification. All demonstrations, tests, and trials shall be performed as specified herein. The Contractor shall furnish all labor, materials, tools, and test equipment as necessary and perform the testing, trials, and demonstrations specified.

The Contractor shall perform four levels of testing:

- 074.2 Pre-Test Trials (Level 1)
- 074.3 Contractor's Dock Trials (Level 2)
- 074.4 Dock Trials (Level 3)
- 074.5 Sea Trials (Level 4)

074.1.1 Consumables and Operating Fluids

The Contractor shall furnish all engine anti-freeze, treatment chemicals, degreasing agents, gases, potable water, and any other consumables required to perform the tests and demonstrations.

074.1.2 Test Agenda and Test Memoranda

The Contractor shall prepare an Agenda and Test Memoranda of the required tests and trials in accordance with the requirements set forth herein. Two copies of the Agenda and Test Memoranda shall be submitted to the vessel owner and owner's representative not less than 10 days prior to the scheduled test, for review and approval.

The Contractor shall prepare a Test Agenda for Level 3 Tests and Trials. The agenda shall be a complete, detailed schedule of all tests, trials and demonstrations specified in this clause. The Test Agenda shall be arranged by day, not date, and shall list the specific tests, trials, and demonstrations, and the sequence in which these will be performed.

The Contractor shall prepare Test Memoranda for all systems and equipment tested under the Levels 1, 2, 3 and 4 test and trial requirements of this clause. The test memoranda shall describe the actual test procedures, vendors attending and data to be taken. The procedures shall be in accordance with the "start-up" procedures for the equipment, as delineated in the operating manuals furnished for the equipment by the manufacturer. The Contractor shall incorporate demonstrations of all applicable controls, instruments, and alarms, into each system's Contractor's Dock Trials, Dock Trials, and Sea Trials sections of the Test Memoranda. Data recorded in time intervals shall be tabular so that data trends can be easily recognized.

Each test memorandum shall:

- Include a safety and risk assessment plan. The safety plan and risk assessment should identify potential hazards as a result of the activities to be performed and include emergency procedures.
- Reference to the operator's manual used to format the test procedure.
- Describe instrumentation for each test.
- Include a blank space for relevant nameplate data, ambient conditions, and tested parameter values for each time interval, designated values for pass/fail.
- Include signature blocks for Contractor's representatives, Vessel Owner and/or Owner's Representatives and applicable vendor signatures, along with times and dates.
- Include a space for writing comments.

074.1.3 Test Report

The Contractor shall compile the results of all tests and trials in a Test Report in accordance with the requirements set forth herein. Four levels of test reporting are required in accordance with the following schedule:

- Within 2 days of the completion of any Pre-Trial test, a copy of the documentation of that test shall be available to the Vessel Owner and Owner's Representative for review.
- A preliminary Contractor's Dock Trial Test Report shall be available to the Owner and Owner's Representative for examination following the successful completion of Pre-Trial Tests (Level 1) and the Contractor's Dock Trials (Level 2).

- Following the successful completion of Dock Trials (Level 3), the Contractor shall make the Dock Trials Test Report available to the Owner and Owner's Representative for review.

The Contractor shall make available a Test Report comprised of the results of all required Level 1, Level 2 and Level 3 tests and trials, and the results of all vendors' tests. The Test Report shall be the filled-in version of the Test Memoranda and supporting Contractor and subcontractor documentation. The test report shall be maintained current as tests and test levels progress. The test report shall be furnished in three ring binders, with dividers for each test. The Test Report, including the results of all Level 1 and Level 2 trials, shall be available to the Vessel Owner and Owner's Representative prior to, and during, the Level 3 tests. The Test Report, including the results of all Level 1, Level 2 and Level 3 tests and trials, shall be available for review by the Vessel Owner and Owner's Representative prior to and during the Level 4 trials.

074.1.4 Test Report Review and Approval

The Test Report shall be reviewed and accepted by both the Contractor and the Vessel Owner and Owner's Representative at the conclusion of each level of testing. Review and approval of the Test Report by the Contractor and the Vessel Owner and Owner's Representative is a precondition of moving to the next level of testing. Within 10 calendar days following the successful completion of Sea Trials (Level 4), the Contractor shall submit the Sea Trials Test Report to the Vessel Owner and Owner's Representative for review. The final version of the Test Report, including results of all four levels of the tests and trials, shall be bound in three ring binders, and submitted in triplicate, within 10 calendar days following successful completion of the Level 4 demonstrations, and prior to Final Payment.

074.1.5 Deficiencies

The Vessel Owner and Owner's Representative will compile a list of deficiencies, which will be given to the Contractor. All deficiencies shall be corrected. Final Acceptance of the vessel will be made following remedy of all deficiencies. The successful completion of all tests, trials, demonstrations, and remedied deficiencies shall be determined by the Vessel Owner and Owner's Representative.

074.2 Pre-Test Trials (Level 1)

The Pre-Trial tests are designed to insure proper construction, and installation of all equipment, piping, and electrical systems, tanks, and exterior and interior bulkheads. Pre-trial tests shall be performed during the course of construction and prior to the beginning of Contractor's Dock Trials (Level 2). The Vessel Owner and/or Owner's Representative shall be notified at least 2 weeks in advance of any such testing and may, at their discretion, send a representative to witness any or all tests. Documentation of all pre-test inspection shall be in accordance with the requirements of this specification. All deficiencies, including cracks, leaks, ground detected in new circuits, or poor workmanship shall be corrected prior to commencement of Contractor's Trials (Level 2). Pre-trial tests shall include the following:

074.2.1 Hull

All tanks, hull seams and watertight bulkheads shall be tested in accordance with 46 CFR Subchapter T and in the presence of the Vessel Owner and/or Owner's Representative.

074.2.2 Superstructure

All watertight exterior bulkheads, doors, windows, manholes and hatches that have been installed as part of the contract hot work shall be hose tested for tightness prior to coating. All weathertight doors, windows, and hatches shall be hose tested for tightness upon installation, in accordance with 46 CFR Subchapter T and in the presence of the Vessel Owner and/or Owner's Representative.

074.2.3 Penetrations

All penetrations through the vessel's watertight boundary, including shell plate, weather decks, exterior of super structure, pilot house overhead, or watertight bulkheads shall be hose tested upon completion of hot work and prior to the application of coatings, in accordance with 46 CFR Subchapter T and in the presence of and the Vessel Owner and/or Owner's Representative.

074.2.4 Piping System Tests

- General – The testing requirements set forth herein include system flushing procedures to demonstrate system cleanliness and integrity on any piping installed as part of the contract. Hydrostatic testing shall be performed at 1-1/2 times working pressure unless indicated otherwise by the applicable code.
- Compressed Air – Upon completion of installation, the piping of the compressed air system shall be air-pressure tested to 1-1/2 times working pressure, Soap bubbles shall be used to detect leaks at the welds, fittings, etc.
- Hydraulics – Installation shall be in accordance with EN-IM Installation of Hydraulic System. Upon completion of the installation, the system's piping and fittings shall be flushed with hydraulic fluid in accordance with the requirements of manufacturers and ASTM standards. Jumpers shall be provided as necessary. Flushing shall be accomplished using a Contractor furnished pump to circulate the hydraulic fluid, and the Contractor furnished filters to collect all contaminants. The system shall be hydrostatically tested to 1-1/2 times the working pressure in accordance with the manufacturer's recommendations and in accordance with ASTM standards. Servo valves shall be bypassed in flushing the hydraulic system and consumers. Servo valves shall be flushed in accordance with manufacturer recommendations. The hydraulic system and components shall be flushed in accordance with the requirements of ASTM D4174.
- Piping – After thorough flushing, hydrostatically test all piping systems for leaks at 1-1/2 time working pressure for no less than 10 minutes per test. Each system shall be inspected for leaks at the welds, fittings, hoses, etc.
- HVAC – Blow out, with compressed air, all installed ductwork. Operationally test each supply and exhaust fan, along with its ducting, to ensure absence of leaks, adequate support and acceptable vibration levels. All chill water lines shall be flushed, and pressure tested to 1-1/2 times the working pressure unless indicated otherwise.
- Potable Water – The Contractor shall clean, chlorinate, and flush all system tanks and piping.
- Fixed Fire Extinguishing System Installation test requirements:

○ Upon completion of the piping installation, and before the cylinders are connected, a pressure test of the fixed system shall be performed IAW 46 CFR 193.15.

○ Demonstrate the proper operation of the fire suppression system. Demonstrate the operation of the audible alarms and the automatic shutdown of the ventilation system fans. A Vessel Owner's Representative must be present to witness these tests.

074.2.5 Electrical Cabling

The contractor shall measure the voltage drop of all main feeders, and the longest circuit for each type of circuit feed from each panel. A complete record of all readings shall be kept assuring that circuits and equipment have been checked and for possible assistance in troubleshooting any discrepancies detected during subsequent testing.

074.2.6 Exhaust Systems

Blank off and test the flanges, welds, and gaskets of each exhaust system using compressed air and soap bubbles. All engine exhaust shall all be checked in this manner prior to installation and the application of any coatings or lagging blankets.

074.3 Contractor's Dock Trials (Level 2)

Contractor's Dock Trials are a preliminary "run-through" of all required Dock Tests (Level 3) by the Contractor. The intent of this testing is to provide the Contractor and the Vessel Owner and Owner's Representative reasonable assurance that all equipment and systems have been thoroughly prepared and are ready for formal testing and that the Contractor has made adequate provisions for Dock Trials (Level 3).

Contractor's Dock Trials shall be conducted at the Contractor's facility. The Vessel Owner and/or Owner's Representative shall be notified, in writing, at least 2 weeks prior to the scheduled commencement date of Contractor's Dock Trials. The Test Report must be current prior to commencing Contractor's Dock Trials. The trials shall be of sufficient scope and duration to assure that all equipment and systems are complete and capable of performing as required during Dock Trials.

074.4 Dock Trials (Level 3)

Dock Trials are the operability tests the Contractor must perform in the presence of the Vessel Owner and/or Owner's Representative to demonstrate the proper installation, operation, control, and performance of all equipment, machinery, and systems installed as part of this specification. Specific dock trials and demonstrations are defined in section 074e. In addition, each test or demonstration shall include control, instrumentation, and alarm operation as applicable. Prior to the start of Dock Trials, all construction and installations must be complete (except for final cleaning and touch-up painting), and all Level 1 and Level 2 testing must be successfully completed and documented. This requirement shall apply on a system-by-system basis and is not meant to require that all Level 1 and Level 2 testing for the entire vessel be complete prior to commencing any Level 3 testing. The Test Report must be current through the two levels of testing and accepted by the Vessel Owner and/or Owner's Representative before Level 3 testing can proceed. Commencement of Dock Trials shall not be sooner than one full working day after completion of Contractor's Dock Trials. The Vessel Owner and/or Owner's Representative shall be notified immediately of any condition which would delay the conduct of Dock Trials. The Vessel Owner and/or Owner's Representative shall be notified in writing 10 working days in advance of the date set for testing. Results of the Level 2 Testing must be faxed to the Vessel Owner and/or Owner's Representative at least one working day prior to the start of the Dock Trials if Level 2 Testing was not attended by a Vessel Owner Representative. All testing and trials shall be conducted in accordance with the agenda and in the presence of the Vessel Owner and/or Owner's Representative and vendor representatives for the following equipment:

- Main Engines, reduction gear and propeller
- Diesel generator Sets
- Bow thruster (if fitted)
- Main switchgear
- Control and monitoring systems
- Windlass, crane, A-frame
- Hydraulic System
- Pumps, compressors, and associated piping systems
- HVAC Systems
- Engine Room Ventilation Systems
- Fire detection and alarms systems
- AC and DC electrical systems
- Steering system

- Dynamic Positioning System

The Contractor shall indicate in the test memoranda which tests will be performed using the diesel generators and which tests will be performed using the shore power.

Within 24-hours of final inspection, and before any representative of the Vessel Owner boards the vessel for such duties, each compartment or space to be inspected shall be certified "SAFE FOR WORKERS" by a contractor's in-house qualified competent person. This means that in the compartment or space so designated:

- The oxygen content in the atmosphere is at least 19.5 percent by volume.
- Toxic materials in the atmosphere are within permissible concentrations.
- The residues are not capable of producing toxic materials under existing atmospheric conditions while maintained as directed on the Contractor Confined Space Entry procedure and certificate. The Contractor shall notify the Vessel Owner and Owner's Representative when this certificate has been issued. The vessel will not be inspected and accepted by the Vessel Owner and Owner's Representative without a valid confined space safe-entry certificate for each hull compartment designated "SAFE FOR WORKERS." The success of all tests and the existence of any deficiencies shall be determined by the Vessel Owner and Owner's Representative. Deficiencies shall be remedied prior to the start of the Sea Trials (Level 4).

The Contractor shall test in the presence of the Vessel Owner and/or Owner's Representative and to the satisfaction of the attending USCG Inspector as applicable, all onboard equipment and systems. Among the tests performed shall be the following:

074.4.1 WINDOW TIGHTNESS

Using the fire hose, demonstrate weather tightness of all watertight and weathertight windows, doors, ports, and hatches. Record any spots where leakage occurs. All windows, doors, ports, and hatches that did not pass hose testing shall be removed, have all mating surfaces cleaned, shall be re-bedded, reinstalled, and retested until satisfactory results are achieved.

The addition of sealing compounds or caulks to the windows exterior or interior seating surfaces after installation will not be an acceptable means of addressing any leaks found during testing.

074.4.2 DIESEL GENERATOR SETS

For the generator sets demonstrate the following in the presence of an authorized manufacturer's representative:

- Cold starting. The cold starting testing shall demonstrate the minimum number of starts required for each engine.
- Starting and stopping of each engine from all control panels.
- Operation of all emergency stops.
- Operation of all engine alarms from all control panels. Ensure the proper operation of all alarm test circuits for each main engine.
- Operate each generator set at 1/4, 1/2, 3/4 and full loads in 15-minute intervals, and then at 110% rated load (with the use of a load bank) for a minimum of 2 hours until the jacket water and exhaust temperatures stabilize.
- On board loads may be used to supplement, or in lieu of, the load bank provided that the Contractor can demonstrate a stable load for the duration of the test including power factor. The load levels required above and below shall be based on the engine rating.
- All engine and generator parameters shall be recorded at 5-minute intervals for the partial and full load periods and at 15-minute intervals for the 110% load period. If the test is interrupted for any reason, the entire test must be repeated.
- Demonstrate reverse power relay protection.
- Demonstrate paralleling capability and operate the generators in parallel for two hours, at no less than 60% of the combined rated load. Record all engine and generator parameters at 30-minute intervals.
- Demonstrate load sharing and load shedding/shunting capability of the switchgear and generators under test conditions using either ships loads or a load bank.

074.4.3 MAIN ENGINES

For each main engine, demonstrate the following in the presence of an authorized manufacturer's representative:

- Cold starting. The cold starting testing shall demonstrate the minimum number of starts required for each engine.
- Starting and stopping of each engine from its local panel and its Pilot House panel.
- Emergency stop from the Pilot House console. Resetting at the local engine panel.
- Automatic shutdown for engine over speed.
- Engine alarms at its local panel and at the Pilot House console. Ensure the proper operation of all alarm test circuits for each main engine.
- Operation of the main engines in all paired modes required for operation, speed matching and synchronization from idle throughout the rpm range in 100 rpm increments.

074.4.4 ENGINE COOLING SYSTEMS

- Demonstrate that proper cooling water flow takes place during the operation of the main engines and diesel generators.
- Inspect the system for leaks.

074.4.5 ENGINE EXHAUST SYSTEMS

- Demonstrate the operation of each engine and diesel generator exhaust system under load.
- Inspect each system for leaks and verify the backpressure on each system.
- Testing exhaust system under full engine load shall be reserved for sea trials where appropriate.

074.4.6 ENGINE ROOM VENTILATION

- Demonstrate the operation of all engine room supply and exhaust fans and measure the flow rate of each fan.
- Demonstrate the operation of all remote shutoffs to supply and exhaust fans and dampers.

074.4.7 FUEL OIL SYSTEM

- Ensure proper fuel flow to the engines during operation.
- Demonstrate operation of all remote operated shut-off valves.
- Check for evidence of leaks at connections.
- Demonstrate the fuel oil transfer and filtration system.

074.4.8 BILGE SYSTEM

Demonstrate the operation of the bilge pumps by taking suction from each compartment serviced and discharging the flow overboard. This test shall be conducted for each pump fitted in the bilge system. All bilge alarms shall be tested.

074.4.9 POTABLE WATER

- Demonstrate capability of the potable water pressure set to cycle on and off at the set pressures and deliver water to all toilets, sinks, and showers.
- Extract sufficient water effluent samples and have them tested by a qualified facility to demonstrate that the water meets the EPA regulations of Title 40, Chapter 1, Part 141 – "National Interim Primary Drinking Water Regulations."
- Measure the chlorine level in the potable water tank using a standard test kit.

074.4.10 SANITARY & SEWAGE SYSTEM

The Media tank shall be hydrostatically tested per 33 CFR Part 159. With the Blower operating, the proper operation of Airlifts and Air Scours shall be confirmed and as applicable, water shall be introduced into the Wet Well to check operation of the Float Switch and Discharge Pump(s).

A demonstration of the proper operation of the system shall take place, this may occur simultaneously with the above testing.

074.4.11 FIXED FIRE EXTINGUISHING (CO_2) SYSTEM

Demonstrate the proper operation of the installed CO2 system. Tests shall be performed in accordance with NFPA12, with the exception of the full discharge requirement, to demonstrate proper operation of the trip devices, nozzles, audible alarms and the automatic shutdown of the ventilation system fans. The Vessel Owner and/or Owner's Representative must be present to witness the tests.

074.4.12 FIRE DETECTION & ALARM SYSTEM

Demonstrate the operation of the fire detection system. The testing and trials shall demonstrate activation of the alarms from each smoke detector and heat sensor. A representative of the alarm system shall be present during the tests and trials of the detection and alarm system.

074.4.13 HVAC

Demonstrate operation of the air conditioning and heating equipment as follows, using the available thermostatic or manual controls provided:

- Measure and record the local environmental conditions at the start and end of demonstration, indicating wet and dry bulb temperatures, wind speed, time of day.
- Measure and record the heating and cooling air supply temperatures (wet and dry bulb) and measure and record the sound levels at each outlet under full load.
- Demonstrate the operation and measure the cfm of all ventilation supply and exhaust fans while operating at full and half speeds.
- Demonstrate the operation of each electric resistance heater located in a mechanical space.

074.4.14 COMPRESSED AIR SYSTEMS

- Fill the air receiver from empty to automatic shut off using the compressor. Record the time to fill tank and the cut-out pressures of the compressor.
- Bleed air from the system until the respective compressor cuts in. Record the cut-in pressures.
- Demonstrate air availability at each service air connection.
- Demonstrate the operation of the ship's air horn.

074.4.15 LOAD HANDLING EQUIPMENT

All load handling equipment shall be tested for proper operation to the satisfaction of the equipment vendor. Safe working load tests of the A-Frame shall be conducted in accordance with 46 CFR Subchapter U Section 189.35.

- Demonstrate operation of the anchor windlass by lowering and raising as much anchor and chain as the dock side depth allows.
- Demonstrate operation of the stern mounted A-Frame and test it in accordance with 46 CFR Subchapter U Section 189.35.
- Demonstrate operation of the A-Frame mounted winch and test it in accordance with 46 CFR Subchapter U Section 189.35.
- Load test the deck crane in accordance with 46 CFR Subchapter U Section 189.35. Demonstrate operation of the crane hoist and slewing mechanisms using a weight equal to 1.25 times the safe working load of the crane.
- Demonstrate the operation of the Hydro winch mounted on the 01 deck and test it in accordance with 46 CFR Subchapter U Section 189.35.
- Demonstrate operation of the CTD winch mounted on the 01 deck and test it in accordance with 46 CFR Subchapter U Section 189.35.

074.4.17 HYDRAULIC SYSTEMS

- Demonstrate operation of the Hydraulic system and all the machinery powered by the system to the satisfaction of the manufactures' representatives and the Vessel Owner's Representative.

074.4.18 FIRE PUMP & FIRE MAIN SYSTEM

- Demonstrate the starting capability of each fire pump from the local and remote stations. Using the fire hoses, demonstrate operation of flow from each fire station separately and then from any two fire stations simultaneously. Demonstrate that all locations on the vessel can be reached with fire hoses from at least a single fire station.
- Demonstrate the operation of each local hose reel station.

074.4.19 CONTROLS, INSTRUMENTATION AND ALARMS

- All control, instrument, and alarm functions shall be demonstrated with the system or equipment for which they function. All remote control, indication, and alarm functions shall be divided up and included on the Test Data Sheet with the test or demonstration with which they are most logically associated. Similarly, all local control, instrumentation, and alarm functions shall be included on the Test Data Sheet with the test or demonstration with which they are associated.
- Instruments - Demonstration of instruments and other non-alarm indicators shall consist of recording the readings once during the appropriate time of operation or as specified. The appropriate time of operation is the time at which the instrument is displaying a useful output. If an operation for which an instrument reading can be recorded is not specified, the Contractor shall develop one.
- Alarms - Similar to control demonstrations, alarms shall be demonstrated by exceeding the parameter limit(s) during the specified operations if possible; otherwise, the Contractor shall develop a specific test to extend an operating parameter beyond its limit(s). Also, a sensor limit may be manually activated. If these "natural" methods of testing are impractical due to excessive time or disassembly, then the alarm contacts may be bridged or opened to simulate an alarm condition.

074.4.20 AC ELECTRICAL SYSTEM

- Switchgear – Demonstrate the operation of all circuit breakers and all equipment in the main switchboard. Safely demonstrate all mechanical and electrical interlocks on the generator breakers, bus ties breakers, and shore power breakers.
- Variable Speed Drives – Demonstrate operation of all variable speed drives, including monitoring, controls, and shutdowns.
- Switchboard – Demonstrate all features of the switchboard such as the voltmeters and selector switches, ammeters and selector switches, frequency meters and selector switches, power available indicator lights, space heaters, ground detection lights and test switches, and ground ammeter and test switch.
- Generators - Demonstrate all features of the generator controller such as the voltmeters, ammeters, frequency meters, automation, load shedding and paralleling capability.
- Distribution Panels – Demonstrate the operation of all circuit breakers in the distribution panel boards.
- Convenience Receptacles – Demonstrate the operability of all receptacles. Check the receptacles for polarity and voltage drop. For GFCI types, demonstrate their ability to reset.
- Lighting – Demonstrate the operation of all interior, exterior and floodlights. Demonstrate the operation of all lighting switches.

074.4.21 DC ELECTRICAL SYSTEM

- Demonstrate the general operation of the DC electrical system.
- Distribution Panels - Demonstrate the operation of all circuit breakers in the DC panels.
- Demonstrate the operation of all battery chargers.

074.4.23 Stability Test

After all items on the schedule of Dock Tests (Level 3) have been satisfactorily completed and any deficiencies corrected to the satisfaction of the Vessel Owner and Owner's Representative, the Contractor shall prepare the vessel for a stability test as required by the USCG for development of the required stability information.

The Contractor shall provide the Owner with copies of all stability test documentation that is submitted to or received by the USCG.

074.5 Sea Trials (Level 4)

074.5.1 GENERAL

After all items on the schedule of Dock Tests (Level 3) have been satisfactorily completed and any deficiencies corrected to the satisfaction of the Vessel Owner and Owner's Representative, the Contractor shall commence a program of open water trials. The Contractor shall furnish manpower to operate the vessel, troubleshoot problems and make necessary adjustments and repairs. As a minimum, the Contractor shall arrange to have 2 of his own experienced shop personnel on board to handle routine mechanical and electrical problems, and representatives from the manufacturers of the main engines, reduction gears, generators, and hydraulic system. The Contractor's personnel shall operate the vessel and shall make all observations and record all

data. The Contractor shall provide appropriately licensed personnel as may be required by the USCG for conduct of trials.

Commencement of Sea Trials shall not be sooner than one full working day after completion of Dock Tests. The Vessel Owner and/or Owner's Representative shall be notified immediately of any condition which would delay the conduct of the Sea Trials. The Vessel Owner and/or Owner's Representative shall be notified in writing 10 working days in advance of the date set for the trials. All testing and trials shall be conducted in the presence of a Vessel Owner Representative and any vendor representatives required by the contract, or the attending USCG Inspector as required. The trials shall follow the agenda outlines below:

074.5.2 TRIAL LOCATION

The site of the trials shall be such that accurately placed targets can be readily observed for the purpose of computing speeds. The site of the trials should be free from fog and traffic, with a depth of water of 40 feet. The Contractor shall take the vessel to the nearest mile range that will provide the required minimum depth and permit operation of the vessel at full speed.

074.5.3 TRIAL CONDITIONS

The vessel shall be complete and ready for trials, with a six to eight-person trial crew aboard, with tools and miscellaneous equipment.

The trial conditions are:

- Full (80%) Fuel oil
- Hydraulic oil filled to operational level.
- Full (100%) potable water tanks
- Empty sewage holding tank.

Before trials, record all fuel tank soundings, record level of the potable water tank, and record tank levels for all tanks. Ensure that the sanitary holding tank is empty. Record drafts at the draft marks and read the hull freeboards at the four corners. These draft readings shall be used to calculate the displacements and LCG. Compare these values to the updated final weight estimate. After trials are completed, again read the drafts, and take the freeboards as a double check on the trial displacement and trim. Record fuel tank soundings, record level of potable water tanks, and record tank levels for the lube oil tank, transmission oil tank, and hydraulic oil tank. Calculate the fuel (volume) consumed during the trial period.

074.5.4 GENERAL TRIAL DATA

The following general data shall be furnished by the Contractor. This data shall be recorded at the location of the runs:

- Location of trial course and direction of runs
- Depth of water
- State of tide, direction of prevailing current
- Density of the water
- Wind velocity, temperature, and direction relative to the course
- Displacement of vessel at beginning of trials
- Draft readings of the vessel forward and aft
- Freeboard forward and aft
- Fuel consumption for each pair of runs (Volume of fuel)
- Total number/weight of people on board
- Ballast carried (if any)
- Propeller diameter, pitch, and style

074.5.6 SEAKEEPING TRIALS

The Seakeeping performance shall be tested in accordance with the requirements of the manufacturers' recommendations. The system shall be operated and demonstrated in all modes of operation. Displacement and environmental conditions shall be monitored and recorded.

074.5.7 SPEED TRIALS

Speed trials are to be run over a measured distance in both directions to determine the speed of the vessel. The vessel shall be run at minimum rpm through max rpm in increments as required to achieve ½ knot

increases in vessel speed, and maximum engine rpm as permitted by the bow wash. Speeds shall be recorded in ½ knot increments.

The trial course selected shall be laid out over a depth in excess of 40 feet of water. Two runs over the course shall be made at each of the engine speeds, reversing the direction after each trial run.

The following performance data shall be recorded for each propulsion engine at the start and finish of each run:

- Engine jacket water temperature
- Lube oil pressure
- Lube oil temperature
- Transmission oil pressure
- Transmission oil temperature
- Engine exhaust temperature
- Engine exhaust back pressure
- Shaft tachometer
- Engine tachometer
- Engine compartment temperature
- Time over the course for each run

The engine and transmission gauges and instrumentation shall be read at the local panels in the engine room and at the Pilot House panel.

074.5.8 ENGINE PERFORMANCE TEST

An Engine Manufacturer Performance Analysis Report Test shall be performed on the main engines by a representative of the engine manufacturer. The fuel rate of the main engines shall be compared to the original factory performance specifications during the vessel's test and trials. This comparison shall be made for the entire operating range of the engines by the engine manufacturer's representatives using instrumentation to acquire real-time fuel rate and engine output.

074.5.9 SWING COMPASS

During Sea Trials the Contractor shall swing the compass, correct it, and develop a deviation table for the compass.

074.6 Final Inspection

When all work and testing has been satisfactorily completed at the Contractor's yard, the Contractor and the Vessel Owner and Owner's Representative shall make a complete physical inspection and inventory of the vessel. A "punch list" of deficiencies shall be developed and presented to the Contractor for corrective action. All corrective action necessary to eliminate the "punch list" deficiencies shall be completed at the Contractor's facility. The Contractor shall give the Vessel Owner and Owner's Representative 7 working days' notice prior to the desired date of re-inspection. Prior to any inspection or re-inspection, the vessel and all its equipment shall be thoroughly cleaned, and all painting and finishes required to be performed by the Contractor put in first class condition. At the time of Final Inspection, the Contractor shall take water samples of the potable water on board the vessel for a water analysis. The Contractor shall have the water analyzed by a subcontractor especially qualified for this work. The Contractor shall identify the proposed subcontractor and include the subcontractor's qualifications. A lab report shall be prepared showing that the potable water provided on the vessel meets the standards prescribed in the CDC Safe Drinking Water Act.

074.8 Final Inspection and Acceptance

Delivery of the vessel may not be started until Final Acceptance of the vessel has been made. The vessel will be accepted at the Contractor's yard upon satisfactory completion of the following:

- Tests and Trials Levels 1, 2, 3 and 4
- Correction of all "punch list" deficiencies
- Receipt of a "passing" potable water lab report
- Receipt of required contract deliverables

The Contractor shall then deliver the vessel afloat and "Ready for Service", which is defined as clean inside and out; all trash, dunnage, lashing, and delivery related material disposed of; loose items of outfit in place; all electrical and mechanical systems operational; equipment properly adjusted; instruments and electronics calibrated or aligned, and damaged paint touched up. The Contractor shall provide necessary personnel, equipment, and materials to make the vessel "Ready for Service." Every space, compartment, and deck of the vessel shall be cleaned to the satisfaction of the Vessel Owner and Owner's Representative.

The Vessel shall be delivered with the tanks in the following condition:

- Fuel oil – 90% full, at Contractor's expense
- Hydraulic oil – 75% full, at Contractor's expense

The vessel shall be delivered with all waste tanks, and bilge empty and clean.

074.9 Commercial Warranty of Supplies

The Contractor shall assign, in writing, all commercial warranties for equipment provided under this contract to the Vessel Owner. The effective date of all commercial warranties shall be the date of Final Acceptance.

100 HULL

100 GENERAL REQUIREMENTS FOR HULL STRUCTURE

100.1 General

The OFFEROR shall supply all necessary labor, material, skill, and equipment required to complete and test the construction of the vessel. No OFE will be provided for the vessel. Regardless of what's included in this specification, anything deemed necessary and usual to a complete vessel, shall be supplied as part of this Contract. The work, in every respect, shall be in accordance with the marine standards and USCG requirements. Defects appearing at any stage of the work may be cause for rejection even though the piece in question may have previously been passed as satisfactory.

The vessel shall be designed in conformance with the requirements of the USCG, recognized IACS society standard, AWS D1.2, and the special requirements of this specification. Every effort shall be made to implement best practices in accordance with SNAME Ship Structure Committee Aluminum Structure Design and Fabrication Guide.

Non-structural items of trim and outfit such as window and doorframes, castings and hardware items may be of alloy 6063, or 6061 of ASTM B221, or alloy356.1, 356.2 or A356.2 of ASTM B179. Alloy 6061-T6 of ASTM B241 may be used for pipes as structural components. Unwelded fasteners, pipe, tube, sheet metal, or plates and shapes of stainless steel will be grade 316. Where stainless steel is welded, grade 316L will be used unless otherwise specified.

Plating shall be fair, closely fitted, and free from buckles or uneven sight edges. Formed plates and shapes shall be well formed, true to required alignment, shape, or curvature. Where flanges are used for attachments, the faying edges shall be free from hollows, and shall be beveled. Shims shall not be used to correct improper fit.

Care shall be taken to ensure fair lines, and smooth surfaces. Use of fairing cement is prohibited. Sharp edges exposed to personnel shall be dressed or ground smooth. Partitions and coamings shall be provided with rounded corners.

Care shall be taken to prevent the building in of water traps or pockets which may collect dirt, debris, or moisture. Every effort shall be made to prevent the fabrication of weldments that are partially welded which may promote corrosion at the interface of joined members.

Dissimilar metals that are not electrolytically compatible shall not be joined directly. Electrolytic corrosion shall be prevented by insulating dissimilar metals from each other with gaskets, washers, and sleeves, or bushings of insulating and non-conductive materials. Faying surfaces between wood, metals and laminates, or any combination of these materials, except machinery foundation shims, shall be protected by use of bedding compound plus one coat of primer applied to the metal. Faying surfaces between wood and other materials shall be protected by use of wood preservative fortified bedding compound. Asbestos, ceramic fiber,

radioactive or radium bearing material, magnesium, cadmium plated parts, chromate or lead containing materials, and mercury shall not be used in construction applications where a functionally equivalent environmentally safe substitute is available.

Standard Parts and Materials - All articles, fittings, equipment, machinery, supplies, and materials used in the construction and outfitting of the vessel shall be the highest grade, free from defects and imperfections, unused and, be the standard product of reputable manufacturers, to the maximum extent practicable. Any material not specified shall be the best of their kind for the purpose intended. Materials specified herein to meet the requirements of standard specifications published by national authorities shall conform to the respective editions, including amendments, specified. No salvage materials shall be used in the work. All parts and materials shall be of marine grade suitable for maritime environment.

Workmanship - All labor shall be especially skilled for each kind of work and under competent direction. In engaging one kind of work with another, marring or damage of previously acceptable construction shall be cause for rejection. All parts of the vessel intended to join or bear upon other parts shall have complete and solid contact and shall fit together without excessive cold work during erection. Shims or liners shall not be used for the purpose of overcoming a bad fit. Lightening holes may be punched or flame-cut and all edges shall have burrs removed. Holes in members having sharp curvature shall be avoided.

Welders - All welding under this contract shall be done only by welders who have successfully passed qualification tests accepted by a classification society per IACS and/or USCG qualified in the welding of aluminum. The Contractor shall bear the expense of conducting these tests and shall certify, by name to the Vessel Owner and Owner's Representative, welders who have successfully passed the prescribed tests and hold current, valid certifications. The Contractor shall require any welder to repeat these tests when, in the opinion of the Vessel Owner and Owner's Representative, the work of the welder indicates a reasonable doubt of his proficiency. In such cases the welder shall be re-certified as above if he successfully passed the retest; otherwise, he shall be disqualified until he has successfully passed the retest. The Contractor shall maintain records of each welder's certification during the contract. The records are to be available for examination upon request of the Vessel Owner and Owner's Representative.

Welding - All welding and welding procedures shall be in accordance with the current rules of the American Bureau of Shipping. All welding equipment used on the work shall be of a modern type subject to close control. The electrodes used throughout the work shall be suitable for use with the parent metal at each weld and be approved by the USCG. Welding procedures, as to direction, length, numbers, and sequence of beads, shall be carefully planned to minimize lock-up stresses. Care shall be exercised to produce smooth even beads, especially on all exposed plating and fittings. Beads shall be ground where directed by the Vessel Owner's Representative. The Contractor shall employ appropriate welding procedures and grounding connections to preclude the possibility of anodic erosion of the hull after launching.

Installation - Materials and equipment shall be installed in accordance with the approved recommendations of the manufacturer. The installation shall be accomplished by workmen skilled in this type of work.

Plate Fairness - Aluminum plating shall be installed using proper welding procedures and sequences to insure fair, undistorted plating panels. The use of filler materials to surface unfair areas is not acceptable.

100.2 Foundations

All kevels, bitts, and hull outfitting intended for similar use shall be mounted on heavy insert plates continuously welded to the deck. Insert plates shall have 3-inch radius corners, with the plate extending beyond the item in all directions. Where applicable, insert plate edges shall have transition bevels of no less than a 3:1 ratio.

Insert plates shall also be provided in way of all permanently installed winches and deck machinery foundations.

Foundations shall be arranged to provide clearance for disassembling parts without dismantling other machinery, structure, or piping.

Suitable foundations shall be provided under all units of equipment, machinery, tanks, deck fittings, winches, and other heavy concentrations of weight to properly mount the item, to distribute the loads into the hull structure, and to avoid undue stresses and vibrations in the hull.

Removable and permanently installed deck machinery requiring either/or both under deck and above deck foundations and supporting structure, shall have this structure provided. The deck crane, Hydro winch and CTD winch shall be provided with dedicated mounting locations and foundations suitable for their installation. The CTD may not be installed at the time of delivery, however its foundation will be part of the scope of supply of the Contractor.

Foundations shall be fabricated from structural shapes and plates. Foundation members shall be lightened, and openings provided to permit access to all parts of the foundation for inspection, drainage, and maintenance. Web plates of foundations shall be stiffened at holding-down bolts and other points of load concentration.

Bolting surfaces on foundations shall be made coplanar using machined shims or poured-in type chocking material. Bolt holes in foundations shall be templated from the unit. All equipment bolted to foundations shall have mounting bolt holes accurately bored (not burned) and reamed to provide a no-slop fit.

Unless otherwise specified by the manufacturer, Grade #8 fasteners shall be used for all bolted connections and equipment and machinery hold downs. The threaded portion of the bolts shall be clear of the foundation or equipment pads, and heavy flat and lock washers shall be used under all nuts. Elastic stop nuts may be substituted for lock washers.

Where dripping water or oil can be expected, the top plates of foundations shall be tight and project slightly beyond the edges of bedplates or bases of units to be supported. Flat bars shall be seal-welded around the edges of the top plates to retain any leakage of oil or water, and threaded plugs shall be provided for drainage.

100.4 Bulwarks

Bulwarks shall be provided on the main deck extending from the brow, all the way aft and surround the main deck. The bulwarks shall be fitted with scupper openings to allow draining of heavy seas. Bulwarks shall comply with the requirements of 46 CFR Subchapter T. Scupper openings in the main deck bulwarks shall be provided to allow rapid draining of boarding seas. The location and frequency of openings shall be as required to comply with applicable regulatory requirements. Bulwarks shall be omitted in way of the of the sweep of the stern between the outboard faces of the A-frames, to ensure the A-Frame is not prohibited from deployment. In way of the A-Frame removable stanchions and chains will be incorporated into the deck and bulwark design in accordance with specification section 620.3.

100.6 Openings

Where it is necessary to provide holes for passage of wiring, piping or ductwork through structural members, compensation shall be provided where appropriate. In general, if such holes remove more than 30 percent of the depth of the web of a member or if they are unfavorably located, reinforcement will be required. Where reinforcement is required in way of penetrations of decks, shell bulkheads or framing members, the use of doublers shall be avoided in favor of insert plates or reinforcing rings. Wherever insert plates are used, rounded corners with a radius of not less than three inches shall be provided, and the insert thickness shall be sufficient to maintain total web cross sectional area. Cuts in strength decks or the shell shall have radii at the corners with a radius of 1/8 the transverse dimensions of the opening. Trunks and coamings in general should be worked with corners rounded to a 3-inch radius. In longitudinal structural bulkheads and in deckhouse sides the radii shall be 1/8 the vertical dimensions but need not exceed 6 inches. In main transverse structural bulkheads, the radii shall be equal to 1/20 of the vertical dimensions of the cut but radii need not exceed 6 inches and shall not be less than 1 inch.

Access openings and manholes shall not be restricted by interferences including but not limited to cable runs, pipes, valves, heating coils, girders, longitudinal, web frames, or major bulkhead stiffeners. When access openings or manholes require ladders, rungs, and/or grab rails for accessibility, they shall be installed in line with the openings. All trunks and casings shall be large enough to facilitate unobstructed servicing of piping, manifolds, and other items.

Where access to components such as piping cleanout connections, wiring, ducts, vents, piping, air conditioning controls, filters, heaters, valves, and ducting access plates are needed due to maintenance/inspection requirements, the access shall be hinged and fitted with quick acting catches and be clearly labeled to identify the concealed equipment.

All spaces shall be provided with practical and convenient access. Passageways shall have a clear width (distance between protuberances) of at least 30 inches. Door openings shall provide a clear width of 24 inches minimum. Clear openings of doorways with swinging doors shall be measured between the face of the door and the stop, with the door open 90 degrees.

For all overboard, above-waterline discharge openings not specifically addressed in the contract documentation, the through-shell openings shall be located at, or close to, the full-load waterline.

The sea chests shall be arranged as indicated in specification section 530 and described elsewhere herein. All other openings below the waterline shall be fitted with schedule 80 spool pieces and skin valves located no less than 6 inches from the hull opening, to reduce the chance of freezing in cold weather. The inboard end of the spool piece shall have a 150-lb pipe flange to bolt to the valve.

All openings shall be located clear of the draft marks and other hull markings. All discharge penetrations shall not extend beyond the hull plating and shall be of extra strong pipe welded to a circular insert shell plate. Each insert plate shall have a radius of 3 inches or greater than the discharge spool piece outside diameter.

Insert plates shall be of equal or greater thickness than the wall of the attached spool piece. No insert plate shall be less than the hull plate in that area, plus 1/8th inch.

110 HULL PLATING

All hull plating shall meet USCG requirements.

111 FENDERING

A rub rail shall be installed on each side of the vessel, at the main deck edge and below the main deck edge. The rub rails shall be of a design to permit the vessel to lay alongside pilings and prevent shell plating from contacting the pilings.

140 BULKHEADS

The vessel shall be fitted with transverse watertight bulkheads, in accordance with the requirements of the USCG.

When penetrations are made in watertight, fume tight or oil tight bulkheads, the plating shall be restored to the same condition, in accordance with USCG requirements.

150 TANKS & VOIDS

150.1 General

All tanks shall meet USCG requirements. Potable water, sewage tanks and associated systems shall comply with United States Public Health Service (USPHS) requirements.

All tanks shall be independent of the hull shell and shall have sufficient space between the tank and shell structure for inspection and maintenance of the shell and the tanks. Non-integral tanks shall be suitably supported by foundations to the ship’s structure.

All fuel tanks shall be welded aluminum construction with remote level gauges that can be read from the pilothouse and locally shall be fitted with sight glasses. All potable water and waste tanks shall be of polyethylene rotomolded construction.

All tanks shall have fills, vents and sounding provisions in accordance with section 155.

Each tank & void space shall be fitted with a watertight or oil-tight, bolted plate manhole with not less than an 18-inch diameter clear opening. All hatches shall be supplied with gaskets suitable for the liquid contained in their respective tanks.

Capacity tables shall be created for the tanks in accordance with this specification. Tanks shall be complete with manholes, access ladders, filling connections, drains, vents, and all necessary connecting piping, gauges, and level indicators, as described in the individual system descriptions herein.

The vessel shall not be fitted with any ballast water tanks.

155 VENTS, SOUNDING, FILLS, AND OVERFLOW ARRANGEMENTS

155.1 General

All tanks and voids shall be vented, venting shall be in accordance with the requirements of the USCG. All tank vents shall have appropriate vent check valves for commercial marine use in accordance with 46 CFR Subchapter T. All flammable liquid tank vents shall be provided with flame arresting screens.

Vents, and overflow pipes shall be kept clear of the Working Deck and shall be located within the protection of nearby bulwark stiffeners or similar structure, or along the aft bulkhead on the main deckhouse.

Void compartments below the main deck shall each have two vents, located port and starboard. Vents shall be kept clear of the working deck, side decks and shall be located within the protection of nearby bulwark stiffeners. Each void compartment shall be provided with forced ventilation with a blower fitted to one of the vents to forcibly vent the below deck void space.

A tank filling station(s) shall be installed on the main deck. The filling station(s) shall include a fill for the fuel as well as discharges for the waste holding tank. Each fill/discharge connection shall be provided with a quick disconnect coupling with cap. A spill containment bin shall be fabricated around the fill station. The containment shall be furnished with a hinged lid that may be secured open during fill/discharge operations and permits ventilation of the containment space when closed. The fill station containment device and the tank vent/overflow containment shall be combined in a single containment where possible. For those vents not accommodated in the fill station containment device, individual containment may be provided at their respective locations within the confines of existing permanent bulwark forming containment bins or through the placement of a suitable portable containment device.

The potable water tank fill shall be located on the main deck level; the fill shall be in the form of a standpipe above deck, within the protection of the bulwark, clearly marked and separate to the fuel oil tank fill and waste holding tank discharge.

155.2 Tank Level Indicators

A tank level indicating system shall be installed with a display in the wheelhouse. The system shall provide tank level indication for all the fuel oil, potable water and wastewater holding tanks.

A plastic or aluminum engraved table indicating total tank capacity, as well as tank capacity in gallons vs. height of liquid in the tank, shall be installed in the vicinity of local level indicators. The fuel oil tanks shall additionally be fitted locally with sight glass, shut off valves and protection in accordance with the requirements of 46 CFR Subchapter T.

160 DECK PLATING

Aluminum diamond deck plating of 3/16” thickness shall be provided in the engineering spaces and void compartments anywhere personnel have a need to access for maintenance or operation. Nonskid strips or similar may be used where it is not possible to install deck plates as long as safe and secure footing can be provided. Deck plating shall be accurately fitted and free from paint, warp, twist, sharp edges, burrs or other defects affecting their appearance or serviceability. Deck plating shall be cut and fitted around piping, etc., in such a manner that no sacrifice of strength results.

Aluminum diamond deck plating shall be fitted above the installed supporting transverses and shall be designed for a uniform deck loading of 120 psf. Deck plating shall be locally reinforced, as necessary, where greater loadings are contemplated in the removal or disassembly of machinery for overhaul.

Aluminum diamond deck plating shall be secured with countersunk stainless steel cap screws to the support angles. Neoprene strips shall be provided along the tops of all supports to separate the deck plate from the supporting structure, to prevent rattling of deck plates when walked upon.

170 SUPERSTRUCTURE

The enclosed deckhouse structure above the main deck shall be well insulated from exterior weather, noise, and odors of the machinery plant. This deckhouse structure shall be tested for tightness prior to commencing outfitting to verify that all seams, joints, or penetrations are in fact tight.

200 PROPULSION

200 GENERAL REQUIREMENTS FOR PROPULSION

200.1 General

The vessel will be propelled by a twin-screw configuration. Main propulsion power for the vessel shall be provided by propellers, each driven by a diesel engine through forward/reversing marine reduction gearboxes. The main propulsion system shall have sufficient power and thrust to achieve the specified Guaranteed Service Speeds.

All propulsion machinery and components shall be of high quality and made by recognized manufacturers of marine equipment having facilities to supply service and parts within the mid-Atlantic region of the United States of America.

All machinery using oil for lubrication (or fuel oil for fuel) shall be fitted with drip pans as appropriate to prevent lubricating and fuel oil contamination of the bilges.

210 DIESEL ENGINES

210.1 General

The propulsion engines shall be new (with the manufacturer's warranty), non-refurbished, non-rebuilt, heavy duty marine diesel engines in regular production. The Builder shall perform a duty cycle analysis to determine the engine rating appropriate for the operational profile defined in Section 030 and operating less than 5,000 hours per year.

The propulsion engines require the following characteristics: Engine horsepower to be sized to meet vessel speed requirements, Four Stroke, EPA Tier 3 or 4 compliant, raw water heat exchange cooled, wet exhaust system, 24 volt starting system, isolation mounted for vibration and noise abatement. Each main engine shall be provided with its own 24 volt starting battery bank, capable of providing sufficient cold cranking amps to permit cold starting of each engine 6 times in less than 30 minutes with no further outside assistance or power.

The engine manufacturer and model shall have convenient technical service and parts support in the Mid-Atlantic region to the satisfaction of the vessel owner.

The engine and all associated equipment shall be installed in strict compliance with the engine manufacturer's recommendations. The installation shall be approved by the engine manufacturer's field representative.

The main engines shall be mounted on resilient mounts to minimize the transmittance of engine vibration to the ship's structure.

210.2 Instruments, Controls, and Accessories

Diesel engines shall be provided with all accessories recommended by the manufacturer for continuous service at sea. The propulsion control systems shall meet all USCG requirements. The specifications, location and layout of all speed control and direction controls are subject to Owner review and approval.

Electronic propulsion controls shall be provided at each control station and each engine must also be capable of start/stop and independent engine operation at each engine location with a local control panel. The pilothouse control station shall be outfitted with the equipment and functionality listed herein at minimum:

- Factory Instrument panel for each engine with start/stop, RPM, water temperature, Oil pressure, DC voltage, Hour meter, engine alarms.
- Engine throttles and forward/reverse shift control levers.
- Rudder Angle indicators for rudder(s).
- Shaft tachometer(s)

Electronic propulsion controls shall also be provided at each bridge wing and/or fly bridge location and at the aft control station overlooking the aft working deck.

220 REDUCTION GEAR

The reduction gears shall be continuous duty rated at the engine's maximum continuous duty rating. The gear

manufacturer and model shall have convenient technical service and parts support in the Mid-Atlantic region to the satisfaction of the vessel owner.

The reduction gears shall be located such that there is good access on all sides of the unit for maintenance and repair and that the replacement of the clutch packs, input/output couplings and lubrication oil pumps shall not require removal of the unit or removal of soft patches. Further the location and configuration of the reduction gear shall not inhibit access to and maintenance to the propulsion shaft gland or seal.

The reduction gear shall be provided with the correct shaft rotational direction to match the input rotation of the engines and the desired output rotation of the propeller.

Control levers shall be provided for the propulsion gear in both the engine room and bridge. A propeller shaft tachometer shall be provided at both locations (pilothouse and engine room) indicating propulsion shafting rpm as measured.

The Contractor shall work with the reduction gear supplier to verify the reduction ratio during final engineering and detail design phase. The reduction ratio shall be chosen to best minimize cavitation, while working within the allowable propeller diameter, required operating speed and supplier requirements.

225 SHAFTING

225.1 General

The main propulsion shafting system shall include all necessary shafting, bearings, seals, couplings, and components to connect the propeller to the propulsion shaft and gear.

The drive line consisting of propulsion shaft, flanges, bearings, and seals shall be machined, fabricated, and assembled in accordance with standard marine practice and in accordance with the requirement of the USCG. Critical system component tolerances and alignment shall be in accordance with USCG requirements or the propulsion manufacturer, whichever is deemed to be the most stringent.

All components of the driveline from reduction gear to and including shaft, propeller, stern tube, and companion coupling are to be pre-fit by the manufacturer.

225.4 Stern Tube Seals

The forward shaft seal shall be of a close fit, “dripless type” provided with water injection if so required by the specific seal manufacturer for the intended vessel speeds and operational conditions.

230 PROPELLERS

The propeller design shall be optimized to minimize cavitation at all speeds up to sustained speed at full load displacement. The propeller shall be free of cavitation erosion tendencies under all operating conditions, including all forward speeds up to 100 percent of maximum continuous power. The propulsive efficiency shall be as high as practical. The Contractor shall verify the propeller characteristics during final engineering and detail design phase.

A close-fitting sleeve type propeller rope cutter shall be fitted on the aft end of the stern tube to prevent lines from wrapping on the shaft between the propeller hub and aft end of the stern tube.

The propeller and running gear shall be provided protection, either behind a skeg, rudder heel strut or by recessing into the hull sufficiently to lie above the line of the keel.

235 RIDE CONTROL

235.1 RIDE CONTROL SYSTEM

The vessel shall be outfitted with an active ride control system such a Humphree Interceptor system, or equivalent, for automatic trim, list, and stabilization.

237 RUDDER

Each propeller is to be fitted with a rudder, fabricated of approved materials and of sufficient height, chord length, thickness, and area to provide the required performance characteristics and handling capability. The rudder stock and blade shall be capable of operating through 40 degrees of rotation both port and starboard.

The rudder stock will be of a single piece with key, nut and locknut designed to match the steering tiller configuration.

The rudder and steering system shall be designed, fabricated, installed, and tested in accordance with USCG requirements. The system will not be provided with class certificates.

260 MACHINERY COOLING WATER SYSTEMS

260.1 Diesel Engine and Gearbox Cooling Water System

Each diesel propulsion engine, gearbox and each generator set engine shall be provided with a dedicated, independent cooling system. The system shall be a sweater loop through component mounted heat exchangers, in accordance with manufacturer and USCG requirements.

The engine cooling systems shall be capable of cooling the engines under all operating conditions outlined in section 000. The cooling system shall meet the cooling requirements of each engine and the gearbox when the seawater temperature is 85°F and the current or vessel speed is 0 knots, be provided with all hull piping penetrations in accordance with USCG requirements. Alarms shall be provided to indicate high system cooling water temperatures and low water levels in the engine expansion tanks.

270 DIESEL ENGINE VENTILATION AND EXHAUST GAS SYSTEMS

270.1 Diesel Engine Ventilation System

The engine room shall be provided with adequate ventilation to support both combustion air intake of the diesel engines and heat rejection to ambient heated air in order to maintain a habitable working environment in the engine room space. The diesel engine combustion air and engine room ventilation shall be provided in accordance with the diesel engine manufacturer’s specification for heat rejection and in accordance with the Code of Federal Regulations, Title 46, Subchapter T, Section 182.465.

Engine room ventilation systems shall minimize turbulence, noise and moisture to maintain a reasonably quiet and dry engine room atmosphere. It is desirable to maintain a slightly negative pressure in the engine room under all operating conditions in order to minimize diesel odors permeating habitability spaces. The engine room ventilation and exhaust louvers shall not drive the down-flooding angle of the vessel under normal operating conditions. The shipyard shall provide adequate bolted access plates for regular maintenance and/or replacement of the ventilation components.

270.1 Diesel Engine Exhaust Gas System

Propulsion Engine combustion air and exhaust systems shall minimize pressure drop and back pressure, turbulence, noise and shipping of water or spray at weather openings.

Over the full operating range of the vessel outline in section 000, the diesel engine combustion exhaust systems shall not have a pressure drop or back pressure which exceeds the acceptable values of the engine manufacturer's recommendations. The diesel exhaust system shall minimize turbulence, noise, and moisture throughout the system.

The impact of exhaust gases on topside arrangements shall be minimized. Re-ingestion of any exhaust gases from the ship into any air intakes shall be prevented under all normal operating conditions.

280 FUEL SYSTEMS

280.1 General

The Contractor shall provide a fuel oil fill, transfer and service system which can transfer fuel oil to and from the fuel oil storage tanks, the fuel oil day tank and the diesel engines in accordance with the Code of Federal Regulations, Title 46, Subchapter T, Section 182.465 and Subchapter F, Section 56.

Fuel supply lines to each diesel engine shall be equipped with a marine-grade, 10-micron duplex fuel filter/water separator, Parker/Racor or engine manufacturer equivalent. Each duplex unit shall contain shut-off valves to allow continuous operation while being serviced. A drip pan with 6" deep sides shall be provided under each filter/water separator.

The primary fuel oil manifold shall be serviced by a motor driven fuel oil transfer pump capable of transferring fuel oil throughout the system. The pump shall be a self-priming, positive displacement gear pump consisting of a cast iron body, steel/cast iron gears and mechanical self-adjusting shaft seals. The pump shall have either an internal or pump manufacturer supplied external pressure relief valve with return to the suction side of the pump. The pump shall be provided with local manual control for starting and stopping. The fuel oil manifold shall be capable of routing fuel from the day tank through a duplex filter/water separator back into the day tank for fuel polishing purposes. The filter/water separator shall be a Parker/Racor 5-micron filter with a water detection and alert system.

280.2 Fuel Tanks

The fuel oil storage tanks shall have baffles, remote level indication as defined at section 155.2 and be equipped with isolation valves and adequate atmospheric venting to avoid excessive pressure build up within the tanks. The atmospheric vents shall be surrounded by a stainless-steel flame screen. A plastic or aluminum engraved table indicating total tank capacity, as well as tank capacity in gallons vs. height of fuel in the tank, shall be installed in the vicinity of local level indicators.

Each fuel oil storage tank suction line shall be provided with a remotely activated shut-off valve, in accordance with 46 CFR 182.455.

Fuel tank filling connections shall be located on the port side of the main deck as described in Section 155.1. Filling connections shall terminate in valves with caps and retaining chains and be located within a containment bin of sufficient capacity to comply with USCG requirements and be provided with a lid.

300 ELECTRICAL

300 GENERAL REQUIREMENTS FOR ELECTRIC PLANT AND CABLING

300.1 General

The electric plant shall be configured in accordance with USCG and IEEE 45 requirements. All electrical system detailed drawings with bill of material and references, shall be submitted to the owner for final review and approval prior to submission to MSC.

The electrical system design shall include at least 10 percent in generating capacity reserve and a growth reserve in the electrical switchboard distribution system of at least 10 percent evenly distributed among the most frequently used breaker sizes and types.

All cables exposed to the weather shall be unarmored.

Where cables penetrate decks, a 9-inch kick pipe with watertight gland and sealing compound molded to shed water or equivalent protection shall be provided to protect the cable.

Signal cables shall be separated from power cables and shall be protected from electromagnetic interference by installation in separate cableways or in conduit. Cable separation practices shall be in accordance with IEEE Std. 518, Section 6.4.3, except that paragraph 6.4.3.7.6 does not apply. Wireway crossings shall be as nearly perpendicular as practical with maximum practical separation.

Where transformers are provided, they must be electrostatically shielded, except when such transformers are provided as an integral part of a commercially available item.

300.2 Electrical Load Analysis

An electrical load analysis shall be prepared and maintained throughout the vessels' construction. This analysis shall be updated whenever actual purchased equipment data becomes available or when major service load changes occur. Each revision of the load analysis shall be submitted to the owner for review.

300.3 Nameplates and Labels

Nameplates/Labels shall be fitted on all circuit breakers, distribution panels, shore power receptacles, and connection/junction boxes. Nameplates shall show "fed from" and location on all breaker panels. Amperage of breakers shall also be marked.

Circuit directory cards and one-line diagrams shall be provided inside panel boxes and switchboards to identify the equipment and service supplied from each circuit including breaker amperage.

All nameplates shall be adhered to the equipment with a permanent marine adhesive.

310 GENERATOR SETS

310.1 General

The electrical power generating plant shall include two commercial marine self-regulating, 120-240 VAC 60 Hz, 3 Phase diesel generator sets installed in the machinery space(s). Power output shall be sized to handle the maximum electrical loads plus 20%. The maximum electrical loads shall consider operation of the scientific equipment, including but not limited to coring, ROVs and portable electric winches. The generators shall be marine, EPA tier 3 certification, raw water cooled, maintenance free direct coupled brushless AC generator, automatic voltage regulation, Class “H” epoxy insulation, disposable dry air cleaner, full flow spin-on oil filter, closed crankcase vent system, self-venting fuel system, low pressure and high coolant temperature shutdowns, isolation mounts to minimize vibration and noise, compliance with all USCG and EPA requirements.

The generator set manufacturer and model shall have convenient technical service and parts support in the Mid-Atlantic region to the satisfaction of the vessel owner.

Remote panels for location on the bridge shall also be provided by the manufacturer. Each generator shall be equipped with droop transformers enabling paralleling. Each generator shall be capable of supplying the vessel’s full (worst case) AC electrical load at 80% of its continuous rated capacity and shall be capable of starting the largest motor without requiring load shedding.

Each generator shall be arranged for local starting and stopping, as well as remote starting and stopping from the pilot house. An engine room located lockout switch shall be provided in the engine room to prevent starting from the bridge. The local and remote OEM instrument panels shall include DC voltage, water temperature, oil pressure, start/stop and elapsed run time meters.

The generator sets shall be factory-assembled units, skids mounted and essentially complete and ready for connection to the shipboard system. The generator sets shall be of a type and configuration as required by 46 CFR 183.320. A full-length drip pan shall be provided under each engine.

Each engine shall be provided with a 24-volt DC starting motor, and a jacket water heater. Each generator shall be provided with its own 24 volt starting battery bank, capable of providing sufficient cold cranking amps to permit cold starting of the generator engine 6 times in less than 30 minutes with no further outside assistance or power.

The diesel generator starting batteries shall be marine, heavy duty, rated in accordance with the engine manufacturer's recommendations. The Contractor shall provide and install a battery box with cover for the starting batteries. The battery box shall be located as close as possible to the generator set within the main machinery space.

320 SWITCHBOARDS

320.1 Main Switchboard

Parallel operation of the generators shall be capable through manual as well as automatic means, from the Generator Paralleling Controller. Generator breakers will be electrically interlocked to prevent paralleling with shore power.

The switchboard shall be built in accordance with 46 CFR Subchapter T. The switchboard shall be front accessible only and shall be equipped with hardwood or other non-conducting grab rails.

The main bus shall be constructed of silver-plated copper, rated to withstand the available fault current.

The switchboard shall be designed to operate in ambient air temperatures up to 45°C.

The switchboard shall be provided with local instrumentation for monitoring voltage, current and frequency of the ship service and shore power. Metering, controls, and components shall be provided in accordance with IEEE 45 requirements.

All instruments, indicator lamp and control circuits shall be protected by suitably rated fuses and shall be clearly labeled.

All bus bar joints and wiring connections shall have locking devices to prevent loosening from vibration and shall be fully accessible.

Switch and annunciator colors should generally be in accordance with ISO 2412:1982, Shipbuilding - Colors of indicator lights and MIL-STD-1472F, Human Engineering.

Ground Fault Detection or Bus Insulation Monitoring shall be provided for each separate bus or system as required by the regulatory standards.

The switchboard shall have sufficient reserved electrical capacity and physical space to support 20% future growth.

320.2 Shore Power

The UNCW vessel base is limited to 240-volt single phase, 100-amp shore power. The vessel shall be configured to operate on such a supply and the vessel shall be supplied with a receptacle and compatible 75-foot cable, for use when moored alongside. The location of the receptacle, balance of AC loads on the system, and final required length of the cable shall be confirmed with the CO.

A Safety interlock shall be installed to prevent putting both shore power and generator on-line at the same time.

325 POWER DISTRIBUTION SYSTEM

325.1 General

The primary generating voltage is 120-240 vac. AC distribution panels shall be provided as required. Panel locations and segregation of loads shall be subject to vessel owner review and approval.

DC powered systems such as alarms, communications and navigation systems shall be supplied power from the house batteries with an AC-powered charging system. Emergency lighting shall be supplied as required by USCG regulations.

Circuit protection for DC circuits, other than for engine starters, shall be provided by distribution panels. DC distribution panels shall be installed int the Pilothouse and as required elsewhere.

Compression-type, multi-cable transits shall be provided at each watertight and weathertight bulkhead or deck penetration. Bulkhead penetrations for ship service electric power cabling and scientific electric cable must include 30 percent spare cable penetrations.

All penetrations shall be located below the above deckhead and shall be routed at high points through watertight and weathertight bulkheads.

Power cables shall be marked at each end, at intervals along each cable, and at both sides of bulkheads.

Cableways shall provide a 30% growth margin.

All electrical outlets in the wet lab, galley, heads, showers, vessel exterior, and any outlet near a sink shall be GFCI protected and labeled as such. All electrical outlets in the interior of the vessel shall be recessed into the joinery system, providing a flush mount with cover plate.

325.2 Laboratory Power System

Electrical service for each lab (wet and dry) shall include four 120 VAC outlets each along the workbenches/countertops, fed from two Smart Online 208/240 & 120 6kVA 5.4Kw Double conversion UPS Modules for dedicated clean power.

Power panels shall have approximately 50 percent spare capacity. (Spare provided shall be for circuit capacity, panel feeder size, and isolation transformer rating only).

325.3 Working Deck Power

Electrical service shall be provided on the working deck of the vessel. This shall include two 120 VAC outlets port and starboard on deck. There shall also be at least one 220 VAC 1Ph and 3PH outlet each located inside the working deck locker. The 220 VAC 3PH outlet shall be provided with at least 70 Amp service to support ROV operations. The deck locker shall be provided with a pass through to the working deck and a pass through to the Dry Lab to provide a means of powering equipment on either the working deck or Dry Lab.

325.4 Uninterruptible Power

The electronic navigation system components, communication system components and Station Keeping power supplies shall be provided with uninterruptible power in accordance with the manufacturer's recommendations.

340 BATTERIES

Batteries and battery banks shall be fully accessible for maintenance and located well clear of the bilge. All batteries shall be contained within USCG approved battery boxes with secured covers. All batteries shall be installed with SUCG approved disconnect switches. All battery banks shall be charged via appropriately sized automatic charging systems and engine alternators, as applicable.

The battery charging system requires the following characteristics similar to LaMarche MSCR Series, or approved equal: solid state with SCR technology, programmable output 12/24 VDC, available output range 10-20 amps, LCD Display with DC output voltmeter and ammeter, adjustable float and equalize voltages, automatic AC input voltage compensation, AC to DC isolation, battery fault detection, drip shield, water tight connectors, three isolated charge dividers (negative common), soft start, remote battery condition indication in the Pilothouse and shall meet all USCG requirements. The condition of all starting and house batteries shall be able to be monitored remotely from the Pilot House (voltage and current load).

Lead acid batteries shall be absorbed glass mat (AGM), maintenance free type and installations shall reflect the requirements of 46 CFR Subchapter J, Section 111.15

350 LIGHTING

350.1 General

The ship shall be lighted throughout with LED fixtures where practical and permitted by USCG regulations.

Watertight LED floodlights shall be provided on the weather deck for the deck machinery, operation of the crane, for loading and unloading, over side and over stern scientific equipment handling, line handling, and anchor handling areas. Floodlights shall be provided on or near overboard handling equipment to illuminate the water surface. Final location and arrangement of floodlights shall be approved by the Vessel Owner.

All exterior lights shall be controlled by switches located in the Pilot House.

Lighting in machinery spaces and voids shall be controlled at local panel boards. Lighting in passageways, stairways, galley, labs, and berthing spaces shall be controlled locally with switches.

Lighting fixtures shall be provided in numbers, sizes, and arrangements in order to maintain in service the foot-candle values specified in the ABS Guide for Crew Habitability on Workboats.

Red lights are required on the aft deck (a total of 4) and in the pilothouse, deckhouse, and berthing spaces for nighttime operations. The final arrangement of these lights must be approved by the Vessel Owner.

Light fixtures in the wet and dry labs shall be fitted with dimming control devices. LED light fixtures in these locations shall be provided with dimmers from the manufacturer of the light fixtures and shall be installed in accordance with the manufacturer's requirements.

A remotely controlled marine searchlight shall be provided on the top of the Pilothouse.

350.2 Special Illumination

- **Laboratory Lighting** - Laboratories shall have 55 foot-candles of light on work surfaces.
- **Locker Lighting** - Storerooms shall have 20 foot-candles of general lighting.
- **Working Deck Lighting** – The Working Deck shall have 15 foot-candles of light.

- **Weather Deck (other than Working Deck) Lighting** – The Weather Deck shall have 10 foot-candles of light.
- **Navigation Spaces** – Navigation spaces shall have 30 foot-candles of light. Red illumination shall be switched outside each interior entrance. Chart table lamps shall be equipped with adjustable red lens.

350.3 Emergency Lighting

Emergency lighting shall be installed in accordance with 46 CFR Part 183.432 Emergency lighting system shall be LED and DC based, the emergency lighting system shall turn on in all manned locations and in all passageways and egress routes immediately upon loss of power.

395 EMERGENCY POWER

Emergency power is required in accordance with USCG requirements and this specification, in order to supply:

- Emergency lighting per section 350.3.
- Navigation Lights, Panel.
- GPS, VHF, Radar (1), Propulsion controls and the DP system.
- Shipboard communication systems.

400 ELECTRONICS AND NAVIGATION

400 GENERAL REQUIREMENTS FOR ELECTRONICS AND NAVIGATION

400.1 General

Pilothouse control and display systems must be ergonomically consistent, and controls and displays which are used to accomplish the same task must be operated consistently and displayed identically. All illuminated devices on the Pilothouse, including video displays, must have dimming controls or night vision colors to prevent loss of night vision.

Controls and displays must be arranged by function so that the ship controls and navigational equipment are organizationally separated on the console from mission controls, displays and instruments. Selection of location for the various units and arrangement of controls and displays on the consoles must be based on visibility, frequency of use, ease of operation and other aspects of human engineering. Control equipment and displays must have the same look and feel at each control station. The use of overhead mounting above the consoles is desirable for equipment such as radios, and for equipment with displays that are required to be visible throughout the Pilothouse. Recessing equipment overhead is permissible for local displays.

The vessel will be equipped with a minimum of three control stations. The final arrangement of the control stations shall be approved by the Owner:

- Primary bridge control and helm steering station location on the centerline of the pilothouse.
- The aft control station, (shift, throttle, rudder, and rudder angle indicator) The aft station shall be covered and provide protection from the sun and weather.
- Bridge wing (shift, throttle, rudder, and rudder angle indicator).

The pilothouse shall at a minimum be outfitted with the following equipment and features:

- A locking file cabinet
- Power receptacles
- HVAC
- Sun Glare covers
- Windows and shades
- Table with bench seating
- Two (2) helm chairs
- Horizontal chart surface, approximately 36” x 30” minimum
- Storage for charts, publications, flares, defibrillator, binoculars, manuals and first aid kit
- Bulletin board for ship’s documentation
- Operators control station and console.

415 ALARM SYSTEMS

415.2 Fire Detection System

The fire detection system shall be USCG approved and meet the requirements of 46 CFR Subchapter T.

420 NAVIGATION

420.1 General

420.2 Electronic Navigation

The Navigation suite shall be an integrated, commercial marine, single source vendor as much as practicable such as Furuno, Garmin or similar. Proposed make and model of the units shall be subject to Owner review and approval. At a minimum, the following equipment shall be provided:

- Autopilot
- Rudder Angle Indicator
- Satellite compass for position and heading
- Magnetic Compass with light
- Echosounder with Fish finder function for depth and bottom target detection

- Doppler Speed log
- +/-48 mile short-range radar
- Short range radar
- AIS Class A transponder with display
- DGPS (2 minimum)
- Navigation Computer, running NobelTec Time Zero software or similar.
- BNWAS System with motion sensor and push button in helm and remote alarm in galley area
- Automatic Signal Controller and Ship's Horn (Kahlenberg M512 or similar)

The console arrangement shall be of an ergonomic configuration. Multi-function and computer displays are to be installed in sufficient quantity and sizes to provide flexibility and redundancy.

One Weather Station multisensor shall be provided on the starboard yardarm, integrated into the NMEA2000 network to be displayed on the RD-33 display in the Pilothouse. The sensor shall be an Airmar 220WX weather station. The NMEA2000 network will also be fed to the Dry Lab through the Contractor routed Conduits in 945.

A 6-inch diameter magnetic compass shall be installed on the bridge on centerline at the helm station with red light illumination and shall be in accordance with 46 CFR 184.402. A deviation table shall be developed for the compass following construction of the vessel. The Contractor shall swing and adjust the compass once the installation of all equipment that may affect the magnetic signature has been completed. A magnetic compass deviation table shall be posted in clear view of the helm station.

A recording barometer shall be provided in the Pilot House.

Trim and heel clinometers shall be provided in the Pilot House.

An analog ships clock shall be provided in the Pilot House.

The contractor shall provide a scaled drawing of the proposed console and pilothouse arrangements, denoting the location of electronics, displays, switches and engine panels, etc. for both the top of the console and vertical surface which may be used for panel mounting. These arrangement drawings will require Owner approval prior to construction.

All instrument lighting (LCD, displays and status/alarm indicator lights, etc.) shall be equipped with physical dimmer controls for night operation and to prevent back lighting on windows. Dimmer range shall be infinitely variable from lights off through to full illumination. The number of separate dimmer switches shall be kept to a minimum.

420.3 Station Keeping System

The Vessel shall be outfitted with a robust, commercially supported station keeping system. Sea trials will verify performance.

420.4 Scientific Electronic Systems

The Vessel will be designed and constructed to readily accept future installation of the Scientific Electronic Systems, SES in the Dry and Wet lab spaces. Power supply in the labs for 110 vac, 220 1ph and 220 3ph.

430 INTERNAL COMMUNICATIONS

Internal communications devices shall be as listed below:

- Loud Hailer
- Public Address and General Alarm System
- CCTV

Two-way communications shall be provided between the pilot house, engine room, galley, wet lab, dry lab, aft deck, and accommodations via a PA / phone system in accordance with 46 CFR 184.602 and 184.610(a)(b)(c). The PA system shall have speakers in every habitable space on board, and a visual beacon shall be included in the communications system in the engine room.

A loud hailer shall also be installed to allow communications between the pilot house and the foredeck and between the pilot house and the aft deck.

A closed-circuit color TV system shall be installed with a networked monitor in the pilot house for viewing areas that cannot be directly seen from the bridge. This system shall include, at a minimum, cameras on the aft deck and one camera in each engine room and one each in the steering gear rooms. Exterior cameras shall be wide angle. Interior cameras shall have low light capability. The final arrangement, configuration and orientation of the CCTV cameras will be subject to the approval of the Owner's Representative and Vessel Owner. The contractor shall plan for not less than 8 cameras.

The make, model, and final configuration of, number of stations, and location of closed-circuit cameras shall be subject to Owner review and approval.

440 EXTERNAL COMMUNICATIONS

The vessel shall be equipped with the external communication devices listed below. The Ships horn shall be in accordance with 33 CFR 86. Proposed make and model of the units shall be subject to Owner review and approval.

- Two (2) Marine VHF Radios with DSC in Pilot House
- One (1) remote VHF radio microphone & loudspeaker for use at aft helm station
- Starlink
- Cellular Modem
- WiFi

445 ANTENNAS

Access for maintenance and service shall be provided for antennas. All antennas, mounts, wire ways and penetrations shall be installed in accordance with manufacturer's specifications.

Antenna disable switches shall be provided for mechanical rotating antennas.

Remotely controlled units used in antenna circuits, such as tuners, shall be located to provide the shortest practical length of transmission line between the antenna and the remote unit.

Coating material shall not be applied to any portion of insulation material forming a part of the antenna installation.

VHF antennas shall be omni-directional antennas located to have the maximum possible vertical separation and there shall be two such antennas.

GPS antennas shall be located for unobstructed 360 degree of overhead coverage to 15 degrees above the horizon and to minimize antenna cable lengths to rack locations.

All antennas shall be installed in accordance with manufacturer recommendations for location, height and separation. Cable runs for antennas shall be separated from data and power cables for scientific purposes to prevent interference and data corruption.

450 RADAR

Two radars shall be provided. Radars shall be installed to provide long range detection, short range performance, and freedom from blind arcs and false returns, in accordance with 46 CFR 184.404. Radars shall have X-Band and S-Band capability.

Display and control shall be located in the Pilot House, with two separate display consoles, having the capability of inter-switching. Each radar shall be provided with CAS (collision avoidance system) and AIS display.

480 NAVIGATION LIGHTS, SIGNAL LIGHTS AND SEARCHLIGHTS

Navigation lights, including, task (restricted maneuverability, trawling, not under command, fishing), and clearance/obstruction lights, shall be provided to comply with USCG COMDTINST M16672.2D, 46 CFR 183.420, 46 CFR 111.75-17, 33 CFR Part 84, IEEE-45. Fixtures shall be certified in accordance with UL 1104.

The vessel shall be equipped with all required lights in accordance with COLREGS and USCG Navigational Rules, including running lights, anchor light, and a masthead light. The masthead lights and task lights shall be fitted with screens attached to the base of the fixtures to ensure that direct or reflected light will not fall into the

eyes of the Pilot House personnel. Running lights shall have side shields on their inboard side painted flat black.

All Navigation lights shall be LED lights with redundant elements. Navigation and signal lights shall be monitored from a flush mounted 24VDC J Box navigation light indicator panel located in the pilot house. The navigation light indicator panel must comply with 46 CFR 111.75-17, IEEE-45.

One remote searchlight with remote controls shall be provided on top of the Pilot House forward. Searchlight control shall be from electronic joystick inside the Pilot House.

Access for maintenance of the lights shall be provided and include climber safety features.

500 SHIP SERVICES

501 GENERAL

All piping shall conform to USCG requirements, and the specific material and system details contained in this specification. Piping runs shall be straight, neat, and out of the way of walkways and passageways. Pipe hangers welded to the ship structure shall be suitably located and spaced to support pipe against stress and vibration. Wherever piping must be removed for maintenance or replacement of other components, flanges or take-down joints shall be fitted. Piping to rotating machinery shall have flexible connections of components suitable for the pressure and service.

All piping system fasteners shall be 316 stainless steel.

All pipe hangers and clamps shall be stainless steel with non-conductive rubber type bushings around the pipe.

All seawater valves and piping shall be 100% isolated from the hull for galvanic protection. The contractor shall ensure all valves handles rotated in the same direction (clockwise to close the valve).

All valves are to be labeled with durable tags indicating the type of system and valve function, for example (RAW WATER-COOLING SUCTION).

Access to valves below deck plates shall be via removable or hinged deck access hatches and/or reach rods.

505 COMPRESSED AIR

A compressor and receiver shall be provided for ship service air. The air compressor shall be equipped for automatic load-less starting. In addition, the compressor shall be equipped with automatic pressure operated control switches, check valves, pressure relief valves, and stop valves. The compressor shall be designed to operate continuously at rated flow.

Quick connect compressed airports shall be provided on the aft working deck, the 01 deck, in the engine room and the wet and dry labs. The Contractor shall propose specific locations to be Owner and the Owner's Representative approved prior to fabrication.

507 INSULATION FOR PIPING AND MACHINERY

The Contractor shall provide insulation and lagging in accordance with the requirements specified in ASTM F683. Surface maximum temperatures shall not exceed 125 degrees F.

510 AIR-CONDITIONING AND VENTILATION

510.1 General

The contractor shall provide a heating, ventilation, and air conditioning system for the vessel. Due to the mid-Atlantic climate and associated heat and humidity, particular attention must be given to providing robust air conditioning, knowing deckhouse doors will be open frequently due to the nature of the work to be conducted. Final equipment sizing, air handlers, locations and sizes of ductwork, fans, room diffusers, fire, and balance dampers, return and exhaust grills shall be determined by the contractor to meet the requirements of this section. The final installation shall conform to the applicable regulatory requirements and be in compliance with USCG regulations.

The following spaces shall be air conditioned:

- Berthing

- Pilot House
- Galley/mess
- Dry Lab & Wet Lab
- Passageways within air-conditioned zones
- Heads (ventilation)

510.2 Air Conditioning System

The HVAC system shall provide automatic control of heating and cooling temperature and humidity to satisfy the vessel's heating and cooling loads. Thermal insulation heat transfer values shall be in accordance with SNAME T&R Bulletin 4-7. The system shall be designed for external environmental conditions outlined in section 000. The maximum temperature for air-conditioned spaces shall be 75°F with a maximum of 50% relative humidity measured at the compartment's center. The minimum temperature for conditioned and heated spaces shall be 70°F, and 50°F in the engine room and other non-conditioned mechanical spaces.

The contractor shall provide and submit all necessary calculations including heating and cooling load calculations, equipment sizing and ductwork calculations, for the HVAC system proposed. The contractor shall propose a commercial grade system utilizing heat pumps, air conditioners, heating coils, air handlers, etc. The HVAC system shall be robust, cost effective, low maintenance, and relatively easy to repair and source replacement components in the event of a breakdown.

Where externally mounted condensing units are proposed, they shall be located to make them less visible from common viewing angles. Special attention should be paid to selecting units which offer quiet operation and best-in-class reliability.

510.3 Ventilation System

The engine room ventilation system includes the combustion air. All spaces below decks that contain machinery shall be mechanically ventilated, to maintain space temperatures and air quality suitable for human occupancy. All below deck void spaces shall be mechanically ventilated to maintain space temperature and air quality suitable for human access, inspection and to minimize condensation.

The engine room intake vent shall be equipped with an acoustic louver to reduce the noise of the engine room intake system as experienced on the working deck. A forced exhaust ventilation system shall be provided for the engine room. Both the supply and exhaust systems for the engine room shall be provided with controls to shut down the supply and exhaust fans, and ventilation duct damper closures in the event of fire. The supply and exhaust fans for the main machinery spaces shall also be provided variable speed control.

The below deck machinery and void spaces, excluding the engine room, shall be vented via ball check vents, and fitted with an inline exhaust blower. Inline blower motors shall be in IP44 enclosures below deck.

510.4 Heating System

Heating shall be via the HVAC system as defined in section 510.2. All conditioned spaces shall be heated via the HVAC system.

Space heaters shall be provided in the engine room(s), steering gear room(s) and voids containing independent free-standing tanks and/or systems.

515 WATER HEATER

The vessel shall have an electric water heater, with sufficient capacity for the maximum liveaboard complement of 10.

520 CHILLERS & REFRIGERATION

A scientific blast freezer, under counter model Stirling, SU105UE, 3.7 cubic foot shall be fitted in the wet lab under the counter. There shall also be a scientific refrigerator, under counter model adjacent to the blast freezer in the wet lab.

The galley shall be equipped with a refrigerator/freezer with icemaker for provisions.

The contractor shall secure these units to the deck and bulkhead as part of the installation in order to prevent shifting while underway.

530 SEAWATER SYSTEM

The vessel shall have a sea chest located in the Engine Room(s).

The sea chest shall provide seawater to a common manifold which serves the vessels systems.

Wet lab scientific sea water will flow from a dedicated pump (March TE5.5C-MD-AC), drawing off the sea chest, via CPVC piping up to the wet lab wall, where the piping will be finished in a CPVC valve and capped. The Owner will further plumb the system in the wet lab upon delivery and will install an SBE 21 SeaCAT Thermosalinograph. To further support this system installation, the Contractor shall include the SBE 21 remote temperature sensor mounting kit incorporated into the scientific sea chest in the engine room. The science seawater pump shall be switched on from the wet lab, and there shall be an “on” indicating light when the pump is in operational condition. There shall be a hard piped drain extension from the wet lab sink drain line, to above the countertop for the Owner furnished plumbing to discharge into.

Seawater service shall additionally be plumbed from this system to a pair of outlets port and starboard on the aft deck. All piping for the science seawater system shall be either PVC or FGP material, satisfying the requirements of NVIC 11-86.

Facilities shall be provided for raw water wash-down of the ship's handling equipment in the weather and the scientific equipment on the Working Deck area. The deck wash system shall be provided and powered by the bilge/fire pumps. The bilge/fire pumps shall be provided with start/stop capability in the engine room, on the aft working deck station and the operator’s station.

540 PLUMBING DRAINS

540.1 General

Drains shall be designed for proper function at all normal conditions of heel and trim and ship motion. All drains shall be sloped to a minimum of 1/4" per foot.

540.2 Interior Deck Drains

Deck drains shall be provided to prevent accumulation of water on deck in the galley, wet lab, heads, and showers in accordance with this specification.

Deck drains shall be fitted with removable strainer plates, and traps.

540.3 Weather Deck Drains

Exterior decks shall be cambered or sloped for drainage of water. Drained water shall be collected and led overboard through downspouts.

Deck drains shall be fitted at all low points on the 01 deck and/or pilot house roof in accordance with this specification, in order to remove standing water from these decks.

Deck drains shall be fitted with removable strainer plates.

541 PLUMBING TRAPS, CLEANOUTS AND VENTS

541.1 General

A water seal deep trap shall be installed for each plumbing fixture. Traps shall be oriented fore and aft.

Cleanouts shall be installed in sufficient number to enable any section of piping to be easily reached with a plumbing snake.

Connections shall be provided in accessible locations for drains to permit cleaning. When cleanouts in the overhead of living spaces, passageways, and office spaces cannot be avoided, the cleanouts shall include a full-sized ball or plug cutout valve or be extended to the deck above.

Cleanouts and traps shall be positioned to allow for at least 12 inches of open access to the opening to the trap or cleanout with sufficient space for the easy entry and removal of a cleanout rod or plumbing snake.

541.2 Vents

Drains from lavatories, sinks, and other plumbing fixtures shall be vented. Trap seals of fixtures and deck drains shall be protected from siphonage or backpressure. Plumbing systems may be vented by means of anti-siphon valves. Vents terminating in the weather shall be installed to ensure that no trap seal is subject to overpressure. Vents terminating in the weather shall be fitted with insect screens. Sewage gas odors in any compartment, Working Deck area, or Weather Deck area are prohibited.

546 WASTEWATER SYSTEM

A sewage collection system shall be installed, collecting sewage from all installed toilets. The system shall be designed and installed to meet all USPHS regulations.

At least two complete heads, comprising a toilet, sink and shower shall be provided for in the arrangement of the vessel. One head shall be at least accessible from the weather deck and access to this head shall be in accordance with the requirements of ADA.

All sinks and showers shall be configured to drain directly to the combined waste holding tank. All toilets shall be configured to drain directly to the type II MSD system. The MSD system shall be configured such that it can be pumped out from a deck station and under normal circumstances its waste stream will flow by gravity to the combined waste holding tank. When in a zero-discharge zone, this combined waste holding tank will be secured and can also be pumped out from a deck station. When operating offshore, this tank will also be able to drain overboard. All through hull valves shall require the purposeful alignment of valves, in order to prevent the accidental discharge of treated waste into the marine environment.

Toilets shall be of a low flow type.

The combined waste holding tank shall be at least 200-gallon capacity.

The MSD system shall be sized with consideration given to the normal 5-day cruise with a 10-person complement, and the education cruise requirement to carry up to 20 passengers for a day.

547 WASTE OIL

The main engines, gears and generators shall be plumbed with valves flexible hose and stainless-steel tubing to a manifold with flocs camlock on the main deck near the entry to the machinery space. It is intended that this system be used in conjunction with a portable transfer pump for pulling lube oil from any individual engine or gear and then used to pump new, clean oil to a specific engine or gear. This is intended to permit easy oil changes to be performed without having to transport buckets of oil into the engine room. The portable pump and hose shall be part of the scope of supply.

550 POTABLE WATER

The system shall be arranged to provide a continuous supply from the stowage tanks to the hot potable water outlets and to cold potable water outlets throughout the vessel and in the wet lab, to all sinks and shower. Potable water shall also be plumbed to the aft working deck with a ¾" quarter turn hose bibb, with a hose of sufficient length to reach the entirety of the working deck and rack for coiling and stowage of the hose. Additionally, a fresh water, hot & cold shower shall be provided for on the aft deck of the vessel, under the aft deckhouse overhang for Divers to rinse off after exiting the water.

All potable water fixtures shall have an isolation valve installed in the potable water supply piping to the end faucet. The isolation valve shall be located as close to the fixture as practicable and shall be readily accessible for operation. PEX Pipe and fittings shall be considered for the potable water distribution, where in compliance with USCG requirements. USCG approved system for Deck and Bulkhead penetration shall be used, where applicable.

The potable water system shall be arranged with the capability to either receive potable water from shore, port and starboard side or generate desalinated, filtered fresh water through an RO unit. The RO unit shall be a spectra model, capable of producing up to 700 GPD and designed to be energy efficient, automated, and coupled to the spectra connect controller easily operated from the wheelhouse while underway. The water maker shall be capable of filling the potable water tank automatically from the controller. The RO unit shall be sized appropriately to ensure adequate water is made onboard when underway on multi day excursions.

This system shall be FDA approved in accordance with USFDA 21 CFR 1240.90.

After the potable water system is installed, the system shall be cleaned, flushed, and sanitized.

555 FIRE MAIN SYSTEM

A fire main system shall be installed, serviced by a fair pump with fire stations located and equipped to meet requirements for a Subchapter T vessel. Fire pumps may not double as bilge pumps. Fire pumps shall be stand alone and self-priming. The fire pumps, and related systems, shall be operable from the Pilothouse as well as locally at the pump.

The fire pump and manifold shall be provided with a knuckle valve and overboard discharge to prevent deadheading of the fire pump and damage.

The fire main hose stations shall be recessed enclosures. The contractor shall provide a complete system, including pumps, piping, valves, gauges, hull fittings, hoses, and nozzles, etc.

565 BILGE SYSTEM

565.1 Bilge System

A central bilge piping manifold and pumping system shall be provided and installed so that all bilges can be pumped either overboard for purposes of emergency dewatering, or to the fire main in case of emergency.

A secondary bilge pumping system, consisting of Seaflo dry bilge, bilge pumps shall be included in each compartment in order to ensure all compartments are maintained in a dry condition at all times.

A high-bilge-level alarm shall be provided in the Pilot House.

567 PIPING

567.1 General

All machinery and piping systems shall be rated for marine applications and shall be in accordance with the regulatory bodies in this specification.

Manufacturers' recommendations concerning fabrication and installation shall be followed in addition to these specifications.

567.2 Pressure and Temperature Gauges

All pressure gauges shall give readings in psig; all temperature gauges shall give readings in degrees Fahrenheit. The gauges shall be selected so the operating point is in the middle of the gauge range. All gauges shall be fitted with gauge isolation valves.

Pressure gauges shall be provided on the discharge of all pumps, and pressure/vacuum gauges shall be provided on the suction side of positive displacement pumps and specifically the bilge, and fire pumps. Temperature gauges shall be provided on all piping that transfers a medium in excess of ambient temperature. Additional pressure and temperature gauges shown on the Contract drawings or specified elsewhere in the contract documents shall be also provided.

567.3 Piping Requirements

The use of the designation "line" in this specification is defined as all pipe, fittings, and valves in a piping run between the points indicated.

Piping shall be arranged to obtain optimum operating and maintenance conditions for the equipment and intended service. Items of piping not covered in these specifications but required for proper installation and operation shall be furnished and installed the same as if specified. System design shall route all piping as directly as practicable, shall not interfere with structure, machinery access or accommodations and shall be sufficiently flexible and supported to account for thermal expansion, shock, vibration, and the working of the vessel. Wherever practicable, piping shall be run below the grating or deck plate level. No piping runs shall be made through access openings.

A sufficient number of unions and/or flanges shall be installed in all pipelines to permit dismantling of the lines, equipment and their removal. Valves shall be installed in sufficient quantity to isolate any piece of equipment in the systems.

Sufficient drains shall be provided to permit draining of all lines within the vessel in an even trim condition. The drains shall be provided at low spots in the piping and shall be located so that they will be readily accessible. Screwed plugs shall be brass in all piping systems.

Pipes passing through decks or watertight or oil tight bulkheads shall be made of extra heavy pipe in that section, in way of the penetration and the bulkhead or deck shall maintain its integrity. Where pipes pass through watertight bulkheads or decks, the penetrations shall be watertight.

Heat sensitive materials shall not be used in piping systems that penetrate watertight subdivisions where deterioration of such systems would, in the event of a fire, impair the watertight integrity of such bulkheads. Copper tubing that penetrates watertight bulkheads and decks shall use a suitable stuffing tube. Spool pieces with flanges shall be provided for all galvanized pipe penetrations to prevent the destruction of galvanizing due to welding.

All piping carrying fluids that can freeze shall be electrically heat traced where located in unheated spaces or to the weather. One exception is the fire main piping, which shall be dry when not pressurized. Freeze protection shall be provided by installing drain plugs at all low points in all piping systems carrying fluids that can freeze, including the fire main system.

All hot and cold potable water piping shall be insulated with preformed high-density fiberglass with aluminum foil lagging of appropriate size.

All piping between the side shell and the first inboard valve shall be a minimum of Schedule 80. Fasteners for valves at the hull connections and sea chests shall be stainless steel. All tank penetrations shall be through schedule 80 welded couplings.

When three or more valves are located together for the same service, they shall be combined in a manifold.

Manually operated valves shall be operable by one person, directly or through mechanical advantage type operators.

Hydraulic piping, tubing and fittings exposed to the weather shall be CRES. All hydraulic hose connections exposed to the weather shall be wrapped with grease tape to prevent corrosion of the coupling fittings. Grease tape shall not be applied to any fitting until the entire system has been fabricated, installed, pressure tested, functionally tested, and level 3 testing has been completed satisfactorily.

All hoses shall comply with SAE J 1942, Hose and Hose Assemblies for Marine Applications.

567.4 Pipe Routing Restrictions

Piping shall not be run over or in the vicinity of switchboards, distribution panels or other electrical equipment unless unavoidable, in which case joints, valves, etc. shall not be installed in the vicinity.

Piping conveying flammable materials shall not be routed adjacent to or over hot surfaces unless unavoidable; in such cases adequate shields shall be provided.

567.5 Pipe Hangers

Rigid hangers shall be designed and located in accordance with ASTM practices for the Design and Installation of Rigid Pipe Hangers, F708-92 (1997). The hangers shall safely support the weight of the piping, its operating or test fluid (whichever is heavier) and its insulation and lagging (where installed).

The number of supports installed, the type selected, and their location shall prevent excessive vibration of piping under all system operating conditions, but they shall not constrain the piping to such an extent as to cause excessive transfer of load from support to piping or from support to support.

The locations and types of supports shall be selected to prevent excessive stress from being transmitted by the piping to machinery, equipment or ship structure.

Hangers for copper pipe or tubing shall be lined with plastic. Non-ferrous metal pipes shall be insulated from direct contact with any structure.

567.6 Pipe Cleaning

All piping, pipe appurtenances and applicable equipment shall be thoroughly cleaned after fabrication and prior to installation in the vessel. After complete installation, each system shall be thoroughly cleaned and flushed of all foreign matter with the applicable system's medium or an approved substitute.

System flushing shall be conducted at the applicable system's maximum operating pressure and temperature and above the normal line velocity. However, prior to flushing operations, such units as heat exchangers and control valves, having in-line mechanisms capable of trapping or being affected by the carryover of foreign matter, shall be either removed or blanked-off and bypassed.

567.7 Pipe and Equipment Marking

Label plates shall be attached to all mechanical equipment to indicate the system and function of the equipment.

All controls, gauges, switches, etc. shall be labeled with phenolic label plates to permit operation of the vessel.

The Contractor shall color code all piping on the vessel to indicate the medium contained and stenciled to indicate normal direction of flow. Standard color schemes such as Sherwin-Williams Recommended Standards for Color Coding shall be used. The color scheme legend shall be prominently posted in the engine room. The pipes shall be marked at a minimum at each termination and at each watertight bulkhead penetration to indicate service and flow direction. Piping shall also be marked at the midpoint of long compartment runs, at least once between take down joints and at 10-foot intervals maximum.

Label plates shall be attached to all valves, manifolds, and pumps to indicate the system and function of the equipment.

For valves, the label plates shall be installed over the stem of the hand wheel, where possible, and shall indicate the direction of opening (or closing). The nameplate shall be 14-gauge (or heavier) brass with ¼-inch high, engraved letters filled with black paint.

All hydraulic hoses installed on the winches, cranes and frames are to be tagged. Markings on the tag shall be clearly visible and weatherproof. The tag should be affixed permanently in a manner that will not cause damage to the hose. It should designate a serial number for cross reference in a Hydraulic Hose Log. In addition to the serial number, the tag should indicate the hydrostatic test pressure and test date as well as the date of installation.

570 STEERING

The steering system shall consist of a robust, reliable, and proven hydraulic steering system engineered/manufactured by Jastram or an approved equal. The steering system shall be capable of turning the rudder from hard over to hard over at full speed in less than 10 seconds. Installation and testing and certification during sea trials shall be in accordance with all USCG requirements, including all testing required to obtain USCG COI. The system shall be complete and inclusive of all required system components, controls, heads, actuators, hydraulics, reservoir tanks, valves, rudder angle indicators (at all helm stations) and alarm panels.

The steering quadrant shall have the range of rotation angles mechanically marked on them in 5° increments.

An emergency steering hand pump shall be installed in the steering system to provide the capability to manually power the steering system in the event of an emergency. The vessel will be required to comply with 46 CFR 182.620 and be fitted with an auxiliary means of steering. In addition, emergency lighting, posted instructions for operation of the emergency steering pump, and communication to the bridge shall be provided in the steering gear compartment. Instructions for changing over to emergency and secondary steering gear arrangements shall be posted in the steering gear room and at each secondary steering station in ½" letters and numerals of contrasting color to the background.

575 HYDRAULICS

575.1 Hydraulic Power Equipment

The hydraulic system onboard the vessel, shall consist of at least two, PTO driven hydraulic pumps, providing hydraulic fluid power to the consumers, which shall be not less than the contractor fabricated A-frame and a contractor furnished and installed Deck Crane, Hydro Winch and CTD Winch. Additionally, the anchor windlass may be hydraulically powered.

The winches will be mounted on the deckhouse top (01 level) side by side to maintain the working deck as open and clear for operations as possible. All hydraulic controls will be installed and commissioned by the Contractor.

Each PTO will have the capability to be declutched when not in use, independently. The operation of the PTO pumps shall not in any way impar the operation of the propulsion machinery through limiting RPM range or shifting the engines in or out of gear.

The hydraulic system shall be a load sensing system to reduce unnecessary noise; vibrations, wear, and power draw from the propulsion engine(s). The system shall be compatible with biodegradable hydraulic fluids meeting EPA Vessel General Permit requirements for Environmentally Acceptable lubricants (EAL) unless technically infeasible. The hydraulic oil shall be cooled by heat exchanger(s). The heat exchanger(s) shall be sufficient to allow for continuous summer operations of deck machinery at maximum flow rate for periods up to 1 hour, and sufficient to support DP operations.

590 POLLUTION CONTROL

590.1 General

The Contractor shall provide all the necessary features and equipment to ensure the ship:

- Complies with all applicable Federal, state, international and regulatory body environmental regulations while retaining its full scientific capabilities.
- Prevents contamination of science experiments.
- Protects the health and safety of embarked personnel.
- Sustains minimal logistic and life cycle management costs for waste management.

Discharges of engine exhaust, sewage system vents, galley range hood, and ventilation exhaust systems shall be designed so they do not re-enter the ship's interior or ventilation systems and so they can all be directed away from the Working Deck and other areas of the ship. Exhaust and air system discharges shall be separated from sensor locations.

All lubricants shall meet EPA Vessel General Permit requirements for Environmentally Acceptable Lubricants (EAL) unless technically infeasible.

Perimeter containment shall be provided around the fueling station.

The oil transfer system line diagram shall be posted in the vicinity of the fuel manifold. 33 CFR 155.720

MARPOL placards prohibiting discharge of oil shall be posted. 33 CFR 155.450, 33 CFR 151.59.

600 SHIP SYSTEMS

600 GENERAL REQUIREMENTS FOR SHIP SYSTEMS

600.1 General

600.2 Locks, Keys, and Tags

Locks and keys shall be provided for closures (except for escape scuttles) providing access to the interior of the ship from the weather and for interior closures where required for security, such as storerooms, lockers, staterooms, laboratories, workshops, and operating spaces.

Each door requiring a lock shall be provided with three keys. The keys for each lock shall be different from the keys to other locks, except where there is more than one door to a single compartment, in which case all doors to that compartment shall be keyed alike. Three master keys shall be furnished. Keys shall be numbered

and have a tag of heavy fiber or plastic with the name of the space and ship inscribed thereon. A key tag index book, in loose-leaf form, shall be prepared identifying the key tag number, the key serial number, and the compartment or item secured by the key. A lock, key and tag index for spaces and equipment shall be prepared.

Weather deck watertight doors to the vessel interior shall be fitted with hasps and staples for padlocks. Hasps and staples shall be welded and fitted so that when the closure is opened or closed, padlocks cannot be caught between the closure and the frame.

The doors for all the heads and showers shall be provided with barrel bolt locks on the inside of the door.

Hardware including handles, hinges, and locks for exterior and interior doors shall be 316 CRES.

A master key control system shall be complied with if required per 46 U.S.C. § 3106. Any requirements of 46 U.S.C. § 3106 shall supersede any other requirements of this section.

610 ANCHOR HANDLING AND MOORING

610.1 General

The contractor shall provide ground tackle in accordance with the following requirements. The vessel is required to be fitted with a primary anchor, rode and anchor winch or capstan. The anchor system shall include an appropriately sized and positioned hawse pipe or pulpit to ensure that the anchor stows securely without shifting in a seaway. The anchor must be able to be launched and retrieved without interfering with the vessels bow, transducers, docking and mooring facilities. Pockets or bolsters shall be provided as needed to ensure good contact between the anchor and the hull. The anchor shall be a modern, high holding power type of ROCNA or equivalent design. The primary anchor shall be attached to a high strength galvanized stud link chain and 300 feet of nylon line. The windlass shall provide for powered raising and lowering of the entire anchor rode system.

The dead end of the anchor rode is to be fixed to the inside the chain locker with an appropriately sized shackle.

The chain locker shall be fitted with an overboard drain, and above deck access to inspect and service the rode.

610.2 Mooring and Towing Fittings

All line handling fittings shall be designed for proper use with nominal 1” diameter mooring lines. A total of 6 nylon double braid mooring lines, 100 feet long each with a 3-foot eye spliced in an end, shall be provided.

Cleats, bitts, and chocks shall be provided and arranged to simplify handling arrangements and to clear interferences. All cleats, bitts and chocks shall be appropriately sized for securing and handling 1” nylon line.

All Chocks shall be closed and shall be designed to ensure lines do not interfere with railings, stanchions, or other deck fittings. Chocks shall be designed to permit an eye splice or bight with two parts of the largest size line used to pass through the opening.

Bitts and chocks shall be fitted directly to the deck, and deck plates shall be inserted in way of all cleats, bitts and chocks as required meeting the requirements of the Owner.

620 HULL FITTINGS, RAILS, AND STANCHIONS

620.1 Padeyes

Padeyes shall be provided in number, location, and capacity as necessary for convenient and rapid handling of stores to and from storerooms. Padeyes and lifting fittings shall be provided over machinery as may be necessary for lifting parts of the machines, and transfers to the open deck or over-the-side. Padeyes shall be located and installed in order that the load will be applied in the plane of the eye or shall be designed for side loading when required by the handling arrangement.

620.2 Eyebolts

Eyebolts, ringbolts, deck screw removable eyebolts, cleats, and other fittings necessary for the attachment, working, belaying, and securing of all parts and appliances shall be fitted. Deck screw reversible eyebolts of

equal size shall be interchangeable. Deck screw reversible eyebolts and other portable fittings on deck shall be arranged to leave the deck flush when the portable parts are removed and stowed.

Deck sockets shall be designed to safely withstand a load rating of not less than 750 lbsf. Deck socket supporting structure shall be designed to safely withstand the largest load that can be applied to the socket. All sockets on the weather deck or interior decks shall be Aluminum, with countersunk 1”-8 NC Helicoil inserts and provided with synthetic plugs to seal sockets when not in use.

Deck socket locations shall include the main working deck area from the aft end of the deckhouse, aft to the stern of the vessel and the open deck top area of the deckhouse or 01 deck level. The sockets shall be in a standard UNOLS 24” x 24” cc pattern. The final location and arrangement of the deck sockets is to be approved by the vessel Owner and Owner’s Representative.

620.3 Life Rails and Lifelines

Life rails and lifelines where fitted shall comply with the requirements of 46 CFR subchapter T. All hardware and fittings shall be of CRES.

Deck edges on top of the deckhouse and pilothouse, shall be provided with life rails, deck edges on the main working deck shall have bulwarks rather than life rails port and starboard, around the transom corners but shall be omitted in way of the A-frame. Life rails shall be installed except along the aft deck edge of the 01 Deck and in way of the outboard side of the life rafts. In these locations and specifically in way of winches, wire fairleads, Hydro Winch, CTD winch, deck cranes and life rafts removable lifelines and stanchions are required. In addition, removable lifeline stanchions and lifelines shall be installed on the aft deck spanning the gap in the transom bulwark where the A-frame is installed. Removable lifeline stanchions shall use specifically located and installed recessed deck sockets, to present a clean deck profile when the stanchions are removed. Each stanchion shall have a male thread fitting to permit the stanchion to be tied into the specific deck sockets when needed. The Contractor will be responsible for determining the number and location of these sockets and stanchions as part of the detail design.

625 MARKINGS

625.1 General

The ship shall be provided with label plates. Each control and control setting should be labeled. The label should describe the control function and the result of the control movement in words and/or symbols. All deck equipment controls should be labeled consistently and be clearly visible by the operator with adequate lighting and a conspicuous format. Label plates for any specific purpose shall be uniform in size, of the same material with the same style lettering. A symmetrical and well-balanced arrangement of letters and lines is required. Label plates shall be located to ensure visibility and shall not be located where they can be obscured by furniture, pipes, or other fittings. Label plates installed in the weather or areas exposed to seawater shall be sealed to prevent seepage behind the plates.

Electrical cable and components shall be labeled in accordance with IEEE 45.

All equipment and components shall be labeled as to service and function. All remote operating gear shall be labeled. All bulkhead and ceiling access plates shall be labeled as to the service concealed.

Exterior vents, outlets, and piping shall be labeled, and color coded with an appropriate color scheme.

625.2 Warning, Caution, Operating, and Instruction Plates

Warning, caution, operating, and instruction plates shall be installed in accordance with USCG regulations.

All steps, lips, or other potential tripping hazards are to be clearly marked with reflective tape or other acceptable means, in accordance with USCG regulations.

Non-corroding commercial label plates, provided by the equipment manufacturer, which contain the required information, are acceptable. However, the label plate and underlying surface shall be coated and protected against corrosion in accordance with this specification.

625.3 Historical Data Plate

The builder's standard historical data plate shall be provided with the vessel name, name of the builder, name of designers, year of the keel laying and year of commissioning. Final data plate to be approved by Vessel Owner and/or Owner's Representative.

625.4 Ship's Name

The vessel's name shall be placed on both sides of the bow in block letters 12 inches high. The vessel's name and hailing port shall be placed on the transom; the name in 12-inch-high letters and the hailing port in 6-inch-high letters. All letters shall be vinyl and in a contrasting color to the hull.

625.5 Owner Logos

The logo for the University of North Carolina Wilmington shall be provided on both the port and starboard sides of the stack or deckhouse/superstructure. The logo shall be a vinyl print adhered to the structure.

625.6 Draft Marks

Draft marks shall be fabricated and installed in accordance with 46 CFR 196.40-10.

Draft marks shall cover the draft of the vessel under all probable conditions of loading and corresponding trims. The centerline of each set of draft marks shall be in a plane perpendicular to the ship's centerline plane and to the molded base plane. The draft marks shall be in block Arabic numbers, 6 inches in vertical projected height. Draft marks shall be neatly cut from plate, welded to the shell, and painted in a contrasting color to the hull.

Draft marks shall be located port and starboard, forward, and aft, and on the transom on centerline.

625.8 Thruster Marks

Thruster marks shall be provided above the bow thruster location, if fitted, on the port and starboard sides of the hull.

630 COATING SYSTEM

630.2 Surface Preparation

Surface preparation shall be in accordance with the manufacturer recommendations and requirements.

630.3 Coating Requirements

Coating products shall be delivered in sealed containers with labels to indicate manufacturer, contents, manufacturing date, and any special instructions. Coating products and materials shall be stored under cover and protected from extreme temperatures.

Coating products shall not be used if they have exceeded the closed shelf life or pot life recommended by the manufacturer. Additionally, coatings shall not be applied in weather or humidity conditions not recommended by the manufacturer.

630.4 Application of Coatings

Surface preparation and coatings application shall be in strict compliance with the coating manufacturer's recommendations. The contractor shall verify and record for all applications that surface preparation and environmental conditions are within manufacturer requirements. Verification and approval to proceed with coatings shall be conducted with the Coatings Representative present at a minimum. The Coatings Representative shall verify environmental conditions as well as all preparation prior to the application taking place. The Owner's Representative and Owner shall retain the right to inspect, approve or disapprove environmental conditions or coatings preparatory work at any time, and shall be provided notice regarding the performance of coatings activities. The Contractor shall take particular care to insure that all coating system requirements are met in all areas, especially those difficult to coat, such as flange undersides. All coatings on both the interior and exterior surfaces of the vessel shall be accomplished and completed prior to launching of the vessel.

Where transducers are fitted, they are to be protected from preparation and will only be coated per the manufacturer's specifications.

630.5 Coating System

630.5.1 Number of Coats

The Contractor is required to provide the number of coats necessary to attain the Dry Film Thickness (DFT) recommended by the manufacturer. Thickness applied per coat may not exceed the manufacturer's recommended maximum thickness. Each coat shall be listed in the Coatings Application Schedule.

The "under coats" of all multiple coat applications (except the hull exterior) shall be "contrast tinted" to ensure complete coverage of successive coats.

630.8 Coating "Type" and Schedule

All areas of the vessel that are to be coated are to be in accordance with the following schedule and the DFT requirements recommended by the manufacturer.

630.8.1 Underwater Hull Surface

This area includes all sea water exposed surfaces of the hull including the side shell, transom, bow, sea chest surfaces exposed to sea water, skegs and all other sea water exposed aluminum below the maximum draft waterline.

This coating system shall be applied prior to the installation of anodes. All underwater hull surfaces are to be coated with three (3) Coats of epoxy primer and three (3) coats of Trilux 33 antifouling coating.

For coating purposes, the waterline is defined as a line 6 inches above the full load displacement waterline of the ship over the entire waterline length.

A vinyl boot strip shall be applied.

630.8.2 Hull Surface, Above Waterline

All hull surfaces above the waterline are to be coated with shark hide metal protectant in accordance with the manufacturer recommendations.

Lettering and numerals on the hull exterior shall be vinyl.

630.8.3 Exterior Weather Decks

The Contractor shall propose a coating system with adequate traction for consideration of the vessel Owner. A system providing sufficient traction to prevent slips, trips and falls is required. The system shall be both durable and easily repaired.

630.8.5 Compartments, Voids, and Inner Bottoms

All bilge areas where dirt, debris and water can be reasonably expected to accumulate shall be coated with a minimum of two (2) Base Coats of epoxy primer.

630.10 Final Inspection of Coatings

The Contractor is responsible for delivering the vessel with all coated surfaces in sound condition, and in accordance with this specification. Prior to launching the vessel, all interior and exterior surface coatings shall be thoroughly inspected. If there are any defects or damage in the coating of the vessel, the Contractor shall repair the coating to restore the integrity of the system, and to meet the requirements of this specification. The vessel shall not be launched until:

- The coating warranty and documentation as required in section 630j below has been provided to the Vessel Owner and Owner's Representative. The warranty and documentation must show compliance with this specification in all areas, and all readings taken.

- The coating has been inspected to the satisfaction of the Vessel Owner, Owner's Representative and Coatings Representative. The Contractor must provide a Coatings warranty and documentation prior to inspection.

If outfitting is required after launching, all interior and exterior coatings shall be re-inspected prior to acceptance, and any damaged areas of the coating shall be repaired by the contractor as necessary to restore the integrity of the coatings system.

Any additional coating required as a result of the Final Inspection shall be done as required to meet this specification at no additional cost to the Vessel Owner.

630.11 Documentation and Warranty

630.11.1 Documentation

For the subject vessel, the Contractor shall provide a written signed statement from the coatings manufacturer representative certifying that all coatings application and surface preparation are in accordance with the coating system manufacturer's requirements, and that the coating application meets all requirements in this specification.

The Contractor shall provide documentation logs for each coating application. The logs shall include the following parameters:

- Coating (per specification) type.
- Coating manufacturer's requirements for preparation, environmental conditions and application.
- MSDS sheets for the coating, and any thinning agents or cleaners used.
- Date and time of preparation and application.
- Extent and location of area coated.
- Surface: preparation, condition at time of coating, temperature at time of coating, dew point at time of coating.
- DFT measurements for each applied coating type. Measurements shall be taken as follows:
  - All flat surfaces, one reading per every 200 square feet, uniformly distributed.
  - Undersides of all flanges, one reading per every 50 linear feet of flange, uniformly distributed.
  - All free-standing structural members, i.e. stanchions, trusses, etc., one reading per 50
  - Linear feet of length each surface, but a minimum of two readings per surface.
  - Wet film measurements may be taken and converted to DFT as an alternative to direct DFT. In areas where multiple coating types are required, the DFT requirements are applied to each coating type and application.
- Services provided by coating manufacturer's representative (i.e. DFT readings, dew point, etc.), if present during application.
- Signature of coating manufacturer's representative on site if present.

630.11.2 Warranty

For the subject vessel, the Contractor shall warranty the coating system for one calendar year, commencing at Final Acceptance. The Contractor shall repair any coating failures during this time period at his cost.

630.12 Safety & Health Standards

The U.S. Occupational Safety and Health Administration Regulations (OSHA) require the Contractor to designate a "competent person" to test compartment atmosphere quality (29 CFR 1915.7). On 24-hours' notice of any inspection, and before any representative of the Vessel Owner boards the vessel for inspection, each enclosed or confined space to be inspected shall be labeled "Safe for Workers" in accordance with the OSHA regulations stated in 29 CFR 1915.31-36. This means that in all spaces so designated:

- The oxygen content of the atmosphere is at least 19.5 percent and below 22 percent by volume.
- The concentration of flammable vapors is below 10 percent of the lower explosive limit (LEL);
- Any toxic materials in the atmosphere are within permissible concentrations.
- Any residues or materials associated with any work in the space will not produce uncontrolled release of toxic materials under existing atmospheric conditions while maintained as directed.

Entry shall not be permitted to any enclosed or confined space, which does not have a current "Safe for Workers" designation.

Each compartment inspection and test shall be logged on OSHA Form 74, with instructions on how to maintain a safe atmosphere in these spaces until the completion of the contract.

632 CORROSION PROTECTION / ANODES

632.1 General

632.2 Cathodic Protection

An Aluminum anode cathodic protection system appropriate for saltwater use shall be installed to protect the underwater hull, appendages, sea chests, and other external seawater exposed components. Selection and location of anodes shall be in accordance with the manufacturer's recommendations and by NAVSEA 0901-LP-190-0002, NAVAL SHIPS TECHNICAL MANUAL CHAPTER 9190 Preservation of Ship's In Service (Paints and Cathodic Protection) for a minimum service life of five years between dry dockings. Anodes shall be bolted to studs in recessed anode pockets welded to the hull. No anodes shall be positioned in any location that could possibly cause bubbles to sweep down into the path of the scientific or navigational transducers.

634 DECK COVERINGS

634.1 General

Decks shall be dry, free of dirt and primed or otherwise protected in accordance with manufacturer's recommendations prior to application of underlayment and deck coverings. Welds shall be ground to a maximum of 1/8 inch to avoid excessive underlayment thickness. The underlayment shall be clean and fully cured before installation of deck covering.

Lonseal londeck No. 776 vinyl flooring or equivalent shall be installed, in accordance with the manufacturer's recommendations, throughout the Wet, Dry labs, mess and galley and berthing spaces. The heads shall have a Polyspec flex flexible vinyl chip seamless floor. Shower stalls shall be mounted over a prefabricated base.

In the pilothouse flooring shall consist of laid Tuflex floor matting or an equivalent resilient material.

Operating areas around electrical or electronic equipment shall be provided with electrical grade mats.

Adjustment of deck covering thickness or underlay shall be used to slope the deck for drainage in built-in shower stalls, and in the immediate vicinity of drains. The underlay may be used for drainage in other areas where location of drains makes this necessary, and to smooth over deck welds and irregularities to prevent wear spots.

Slip resistant deck covering shall be applied on all Working Deck areas on main deck, the 01 deck, the pilothouse top, and in the Wet Lab.

636 JOINERY AND INSULATION

636.1 Joinery and Linings

The Contractor shall provide and install joinery and linings in accordance with this specification.

Joinery shall follow the natural contours of the hull, maximizing internal volume and habitable space. Joiner bulkheads and partitions abutting the hull shall not box in the space in a rectangular fashion forming a rectangular space where an alternate orientation would improve the usable habitable volume.

Joiner bulkheads shall be of lightweight, corrosion resistant materials, primed and painted and/or faced to match the joiner panels.

There shall be no wood behind joinery. If furring strips are used, they shall be metal or another noncombustible material.

Low flame spread material/finishing and non-combustible materials shall be used wherever possible. No more than 4% of all of the internal joinery and linings shall be of combustible materials.

All items mounted against the bulkhead panels shall be fastened through the joiner system directly to vessel structure.

Doors, windows, lighting fixtures, and ventilation penetrations shall be integrated into the joinery system using moldings and trim pieces provided by the sheathing or joinery manufacturer for that purpose.

All cabinetry shall be provided and installed complete with appropriate drawer slides, hinges and handles.

The color scheme of joiner work shall be selected by the Vessel Owner from available color options.

The Pilot house, Dry Lab, Wet lab, Galley/Mess, Passageways, and accommodation spaces shall be fitted with an acoustic ceiling tile system, such as the Dampa Tiles, 600x600, beveled edge fitted to an overhead structure. The tiles shall be removable. The color scheme of the ceiling and track system shall be selected by the Vessel Owner from available color options. The Pilothouse ceiling shall be finished in flat black.

Finished ceilings shall be provided and be integrated with recessed lights, speakers, and air terminals.

636.2 Insulation and Sheathing

The Contractor shall provide and install insulation and vapor barrier to the inside of the habitable and conditioned spaces in accordance with the final interior arrangement drawings approved by the Owner.

The machinery space shall be insulated for thermal and acoustic purposes and have protective sheathing to prevent damage from personnel or material handling. Joinery shall cover insulation in the Pilot house, Dry Lab, Wet Lab, Galley/Mess, Passageways, Staterooms, and accommodation spaces.

Insulation mount pins shall be either spot welded prior to the application of the coating system or use epoxy to secure the insulation mount pins to the structure after the application of the coating system. Use of asbestos material is not permitted.

Insulation shall be in accordance with 46 CFR, Subchapter T, Subpart D: Structural Fire Protection.

Acoustic insulation shall be installed in the engine room(s) and shall be effective so as to limit sound levels to not higher than an average level of 71 dB (measured in each of the habitable spaces) with the vessel operating at normal cruising speed. The manufacturer's recommended methods shall be used for installation of the insulation. Sound leaks at doors and other openings shall be sealed to provide an acoustic sound barrier. Noise levels in habitable spaces shall be kept as low as possible. Noise levels shall meet or exceed OSHA permissible noise regulations per 29 CFR 1910.95.

The contractor shall specify in their proposal the type of insulation proposed for each application.

The insulation shall be professionally installed. Professionally installed is taken to mean, there shall be no construction debris, dirt or other materials left on framing/stiffening members and buried behind insulation. The insulation shall be securely attached and lay tight to the vessels structure. The insulation shall not be torn, crushed or damaged in any fashion. The vapor barrier shall similarly be smooth, intact, not torn and seams shall be taped.

Access panels shall be provided as required for access to wiring or piping behind sheathing. Access panels shall be labeled to indicate the distributive or maintenance related item to access.

Sheathing shall be complete with finished profile edges as provided by the sheathing manufacturer for that purpose. Sheathing seams shall be covered with joining channels as provided by the sheathing manufacturer for that purpose. Any fastener heads protruding beyond the sheathing surface shall be capped with suitable decorative coverings to present a safe finished appearance.

The color scheme of the sheathing shall be approved by the Vessel Owner from available color options.

The exhaust pipe from the diesel engines and any pipe that may present a temperature hazard (in excess of 125 degrees F) shall be insulated with an approved blanket system.

All piping in the habitable spaces shall be insulated and suitably wrapped to prevent condensation. No piping shall be routed in the overhead of the Pilothouse in the vicinity of the Bridge Console.

Where access is required for maintenance, inspection, or repair, hinged and latched panels shall be provided and labeled to indicate the item concealed.

Sanitary bulkhead sheathing shall be installed in the Galley behind the stove and as a backsplash for countertop surfaces. Sanitary sheathing shall be CRES 304, satin finish, USSG 16 for the bulkheads, and USSG 20 for the overhead.

Protective sheathing shall be installed in spaces without linings or sanitary sheathing, stair towers, and where insulation is subject to damage by personnel, material handling, or storage.

636.3 Antisweat Protection

Antisweat treatment shall be applied on the warm side of uninsulated boundaries, including webs and flanges of beams and stiffeners; in areas where sweating can occur because of temperature differences on the deck underside; on all vertical boundaries of air-conditioned spaces common to non-air-conditioned spaces; on the exterior surface of tanks; and on any area where condensation can affect electrical installation.

636.4 Vapor Barriers

Vapor barriers shall be applied to all insulation located within the habitable spaces of the vessel. Vapor barriers shall be integral to the supplied insulation system, in the form of a thin Mylar or fiberglass faced film and all seams shall be taped. This shall include all insulated bulkheads and decks within the Pilothouse, Dry Lab, Wet Lab, Galley/Mess, Passageways and State rooms and to the insulation on the warm side of the engine room and bow thruster room.

637 DOORS, HATCHES AND WINDOWS

637.1 Doors

Interior doors shall be steel, hollow joiner-type in accordance with ASTM F821, except where other types are required for tightness, security, and damage resistance, or as otherwise required by the compartment function. The clear height above the finished deck for all doors shall not be less than 72”. The clear width of interior doors in living and working spaces shall not be less than: 30 inches for offices, control spaces, and public spaces; 30 inches for other staterooms; and 30 inches for sanitary spaces and miscellaneous lockers. In general, doors shall open into rooms from passageways except for small lockers where outward opening doors conserve interior space.

All doors shall be fitted with bumper stops and holdbacks.

Door thresholds shall be CRES. Doors, hatches, and scuttles shall have the same degree of tightness as the surrounding bulkheads. Doors shall be provided with lever action handles.

Exterior deckhouse doors shall be lever-actuated, quick acting, weathertight with a minimum of four dogs. Doors without overhead deck protection shall be provided with eye-brows above the doors.

All doors to accommodation spaces shall be equipped with kick out panel. All doors to heads and showers shall have louvered vents in the doors to allow for the flow of fresh air into the space.

All watertight doors and hatches shall meet USCG requirements.

All watertight doors shall be chalk tested prior to hose testing. The vessel owner representative shall be present for all chalk and hose testing. Hose testing with the vessel owner representative present shall be conducted prior to hose testing of weather deck doors in the presence of the cognizant OCMI.

637.2 Hatches and Scuttles

Watertight hatches and scuttles in walking and working areas shall be flush. Scuttles shall be quick-acting. Hatches for personnel access shall be quick-acting. Each hatch shall be provided with a wrench or other tool for undogging the closure. The wrench shall be stowed in a suitable bracket adjacent to the hatch.

Hatches and scuttles shall be provided with a means of securing the closure in the fully open position. The securing device shall be located and designed to be accessible and operable in a seaway. Hand grabs shall be installed on hatches and scuttles to assist personnel in opening and closing the closure. Hand grabs installed on flush hatches and scuttles shall be hinged and provided with a recess within the closure for stowage.

Hatches and scuttles on weather decks shall be provided with drains overboard.

Emergency escape scuttles shall be marked on the interior to indicate exit route.

All hatches and scuttles shall be chalk tested prior to hose testing. The vessel owner representative shall be present for all chalk and hose testing. Hose testing with the vessel owner representative present shall be conducted prior to hose testing in the presence of the cognizant OCMI.

637.3 Manhole Covers

Manholes shall be provided for access to tanks and have a clear opening of 18 x 24 inches. Oil tight and watertight manhole covers shall be fitted with gaskets and secured with CRES Series 300 fasteners and nuts with ant seize compound. Manhole covers shall be labeled with the tank number.

637.4 Windows, Fixed Portlights, and Airports

Airports, portholes, fixed portlights and windows shall be watertight, and shall have CRES frames. On the main deck, the Dry Lab, Wet Lab, Head, Galley/Mess shall have fixed windows.

Windows shall be provided in the Pilot House exterior bulkheads in order to provide a 360 deg field of view in order to maximize viewing area. All pilot house windows shall be fitted with adjustable shades.

Windows on the forward face of the Pilot House shall each have an electric variable speed window wiper and be fitted with window washers. The final wiper specification and arrangement is to be approved by the Vessel Owner prior to installation.

640 ACCOMMODATIONS

640.1 General

The vessel general arrangement shall be a modern, easily maintainable interior with a light, open aesthetic appearance, and good exterior visibility through large windows.

The contractor shall propose a vessel arrangement that includes, but is not limited to the following general accommodation features:

- Permanent berthing accommodations for a total complement of 10, 3 crew and 7 scientists.
- A wet lab.
- A dry lab.
- Mess/Galley.
- A head/shower.
- Pilothouse with Helm, Navigation console.

Where joiner panels follow the contour of the hull, furniture shall also be fitted to match the contour of the panel or sheathing to which it abuts.

All furniture shall be marine style furniture of noncombustible construction and furnished complete in every respect (i.e., finish, hardware, molding, securing hardware, and sub bases). Fixed furniture and furnishings shall be installed level to the baseline. Inaccessible spaces in the way of furniture and furnishings shall be flashed. Fixed furniture shall be secured as necessary and portable furniture shall be fitted with securing devices and flush deck sockets.

Windows in accommodation and living spaces shall be outfitted with curtains or shades.

Color schemes shall be approved by the vessel owner.

640.2 Berthing

Staterooms shall be designed to optimize the available space while maximizing habitability.

Berths shall be provided w/light, lifesaving jacket and immersion suit stowage. Each bunk space shall be provided with lockers underneath bottom bunks and in sufficient quantity to permit each berth to be provided with storage for personal affects, with a volume of at least 9 cubic feet per person.

Berths shall generally be oriented longitudinally and shall be approximately 39 inches wide, 76 inches long, and provided with standard commercial mattresses and fitted sheets. Where tiered double berths exist, there shall be a minimum of 26 inches clearance above the mattresses. The berths shall not be obstructed by pipes, ventilating ducts or other installations. Privacy curtains shall be provided for each berth. Overhead lights and vent terminals shall not be in the area enclosed by privacy curtains. The quantity of berths shall be sufficient to support 10 crew.

650 BATHROOMS

Each bathroom shall include a toilet, sinks, mirror, and paper towel dispenser. Showerheads shall be fitted with restricting devices that limit the flow of water to 2 gpm at 40 psi and quick shut-off devices. Showers shall be provided with shower curtain, curtain rod, curtain hooks, and a four-inch watertight coaming around the base. One hand grab shall be provided for each shower and one for each toilet.

Toilets shall be compatible with the selected Type II MSD.

650.1 Toilet and Shower Enclosures

Toilet and shower enclosure(s) shall be provided with plumbing fixtures and fittings of equal quality.

650.2 Showers

The showers shall be at a minimum size of 32 in x 32 in. All showers shall have anti-scald mixing valves.

650.3 Sinks

Head Lavatory sinks shall be made of 14-gauge CRES, type 304, No. 4 finish with cabinet below, mirror and light above, and GFCI receptacle adjacent to the vanity.

655 GALLEY AND MESS

A Galley and mess/eating area shall be provided to service the crew and scientist complement. The Galley shall be provided with equipment sized for the total personnel complement of ten (10), including one (1) refrigerator with bottom freezer and icemaker, one (1) glass top electric range, a convection microwave over the range with exhaust, and a coffee maker.

The tops of dining surfaces shall be 28 inches minimum and 34 inches maximum above the finish deck surface. The top of seat surfaces shall be 17 inches minimum and 19 inches maximum above the finish deck surface. Cabinets shall be provided with hinged doors.

The range shall be fitted with adjustable metal fiddles to prevent pots and pans from shifting when the range is being used while the vessel is in a seaway. The range shall also be fitted with an exhaust hood equipped with a variable speed exhaust fan, vented to the exterior of the vessel.

Sufficient cabinetry below and above countertop surfaces shall be provided to store pots, pans, dishes, cutlery and dry goods in order to support the science mission requirements.

660 NAVIGATION AREAS

Pilot house front windows are to be inclined from the vertical plane, top out, at an angle of not less than 20 deg and not more than 25 deg and shall be fitted with wipers, freshwater rinse, and shades.

The bridge console shall be ergonomically arranged, to facilitate proper use and operation of all navigation and control equipment. The final arrangement of the bridge console and all navigation equipment is to be approved by the vessel owner prior to fabrication and installation. The bridge console arrangement shall be developed in CAD and drawings submitted for review and approval.

Bridge console layout shall adhere to ASTM F1166 as much as practicable.

In addition to the racks, shelves and cabinets required to house electronics, navigation and control equipment, the Pilot House shall be provided with the following furnishings:

- Book rack
- Binocular holder
- Ship status board
- 2 Helmsman chairs
- Desk lamp with red filer/on chart table
- Chart table with drawers for charts
- Table with bench seating
- Bulletin board(s) for posting vessel documents.
- Bridge forward full width console

661 LADDERS, HANDRAILS, AND HANDGRABS

661.1 Ladders

Inclined ladder(s) on the exterior of the vessel shall provide access between decks. Inclined ladders shall be removable and provided with slip resistant cap treads.

A vertical ladder shall provide access to the pilot house top. Vertical ladders width, rung spacing, and toe clearance shall conform to ANSI A14.3. Where conditions do not permit installation of a vertical ladder, ladder rungs may be welded to the structure.

661.2 Handrails

All interior passageways shall be provided with handrails (i.e. storm rails). Railings shall be installed on all stairways and ladders. All deck openings and other areas where falling and personal injury is a danger shall be fitted with guard rails. Pipe handrails shall be secured to stanchions or bulkheads on each side of inclined ladders. Grab rails shall be provided along the bulkheads at the top and bottom of stairways and inclined ladders.

The perimeter of the bridge console shall be provided with handrails.

Handrails shall be installed on the exterior of the pilot house and deckhouse.

Handrails shall be of NPS 1” to 1 ¼”.

661.3 Hand grabs

Hand grabs shall be secured to the ship's structure and shall be installed where they will assist personnel who are ascending, descending, stepping down from ladders to ingress or egress through a scuttle or hatch, and wherever required for the safety of personnel.

Overhead hand grabs shall be provided in the Pilot House.

665 STOWAGE

665.1 General

Stowage aids shall be provided for portable articles, repair parts, food service equipment and similar items and in storerooms. Stowage aids shall be designed and installed to retain the stowed material without damage under the maximum dynamic conditions of roll, pitch, list, and trim. Bin, rack, and shelving compartments, with vertical compartment clear openings of 10 inches or more, shall be provided with removable horizontal battens. Front flanges of lower shelves of bins, racks and shelving shall be stiffened, as necessary, to prevent damage from persons climbing to upper bins or shelves. Stops shall be provided on the backs of shelving and bins.

665.2 Special Stowage

The following dedicated special stowage spaces shall be provided:

665.2.1 Immersion Suit and Personal Flotation Device Stowage

Stowage for immersion suits and personal flotation devices (PFD) shall be located in the berthing spaces, same number as berths. Two additional immersions suits, and PFDs shall be stowed in the Pilot House.

665.2.2 Medical Stowage Cabinets

A lockable stowage cabinet shall be provided in the Pilot House to store medical items, the size and type of cabinet proposed by the Contractor shall be sufficient to store a coastal pack and will be approved by the Owner prior to installation.

665.3 Storeroom

The following dedicated storeroom shall be provided:

665.3.1 Deck Locker

Deck lockers shall be provided for storing the vessel's tools and Bosun's deck gear. At least one locker shall be of full height and located on the main deck. Unistrut or similar arrangement shall be provided for hanging gear or shelving. Benches may be utilized for additional storage elsewhere on the vessel.

700 SAFETY

700 GENERAL REQUIREMENTS FOR SAFETY

All emergency and lifesaving equipment shall be mounted with appropriate brackets and equipment shall be painted and marked in accordance with USCG requirements.

Emergency instruction placards shall be posted in accordance with 46 CFR 185.510.

Vessel must have all lifesaving equipment manufacturers' instructions on board in accordance with 46 CFR 185.702.

The final arrangement and location of all safety equipment is to be approved by the Vessel Owner and OCMI. All Safety equipment must be located where it is easily accessible and free of obstructions.

The Contractor shall be responsible for developing the final Fire and Safety Plan depicting all Contractor supplied and vessel owner supplied equipment utilizing standard IMO symbols, colors, and format. One copy of the final Fire and Safety Plan shall be posted on the main deck in a format, size and location where it is clearly visible and legible. Two (2) additional hard copies of the final Fire and Safety Plan shall be provided to the Vessel Owner.

The Contractor shall make every effort to reduce the intrusion of equipment and items of outfit within passageways, corridors, and any route of egress. Items or impediments to safe egress from a manned space or unmanned space will not be deemed acceptable.

720 FIRE FIGHTING

720.1 General

A fixed fire extinguishing system shall be installed in the engine room(s). The installations, components and signage shall meet USCG standards for passenger vessels in 46 CFR, Part 76. The suppression agent shall meet EPA standards.

The engine room fixed fire suppression system shall be a pre-engineered arranged for a single pull providing fixed fire suppression for the engine room(s). Provisions shall be made for the easy servicing, removal, and re-installation of the cylinders. The remote pull station shall be installed on the main deck directly outside the access to the engine room in close proximity to the controls for the engine room ventilation fan shutdowns, engine room ventilation damper closures and remote fuel shut offs for all diesel engines. Clear instructions relating to the operation of the system shall be posted at the pull station. The fixed engine room fire suppression system shall also be fitted with automatic discharge based on high temperature sensors installed in the space to be protected.

Audible and visual alarms shall be provided in the engine room that shall automatically sound prior to the discharge of the agent. A discharge delay of 30 seconds shall be provided. The discharge delay shall not depend on any source of power other than the agent. The system shall simultaneously and automatically shut down the engine room supply and exhaust ventilation fans.

720.2 Fire Alarm System

A USCG approved marine fire detection and fire alarm system shall be provided throughout the working, machinery, and living spaces in the ship. The fire alarm system and system installation shall meet the requirements of 46 CFR Part 76.

720.3 Portable Fire Extinguishers

Each portable fire extinguisher must be Marine Type, USCG approved, and have a bracket or support that is permanently welded to the structure of the vessel. The type and quantity shall be in accordance with the requirements of 46 CFR Subchapter T. In addition, both a portable dry chemical extinguisher and a portable CO2 extinguisher shall be provided in the Lab space.

720.4 Fire Hose Stations

Fire stations shall be installed in quantity and location as required by 46 CFR subchapter T.

Fire stations shall be fitted with fire hydrants, hoses, nozzles, and accessory equipment in accordance with 46 CFR 193.10. Hose valves shall be 1-1/2" angle valves.

Fire hose shall be 50-foot lengths of 1-1/2" hose meeting USCG and NFPA requirements for shipboard use.

A spanner wrench shall be provided at each fire station and mounted to the bulkhead such that no tools are required for their removal.

Cutout valves and drain cocks shall be provided upstream of the weather deck angled valve and shall be located within the vessel as close as possible to the bulkhead penetration to prevent freeze damage to the external piping and angle valve.

730 LIFESAVING EQUIPMENT

Lifesaving equipment shall be provided by the Contractor and as required by 46 CFR Subchapter T.

USCG approved 10-person inflatable life rafts shall be provided and installed on each side of the vessel. Life rafts shall be outfitted with SOLAS A packs and USCG approved hydrostatic release units. Copies of the life raft certifications shall be provided to the Vessel Owner. The life rafts shall be purchased as late in the construction schedule as possible to give Vessel Owner the maximum amount of time prior to having to recertify the rafts.

Emergency lighting shall be provided at each life raft station in accordance with USCG requirements. Placards shall be posted at both life raft stations with life raft launching instructions. The life raft mounted on the starboard side shall be labeled # 1 and the life raft mounted on the port side shall be labeled # 2. Both life rafts shall be clearly marked with the life raft capacity.

The Contractor shall provide PFD's, ring buoys, EPIRB and distress signals of sufficient type and size to comply with 46 CFR Subchapter T.

The Contractor shall provide one (1) USCG approved fire axe. The fire axe shall be bulkhead mounted in the pilothouse of the vessel.

Work vests and immersion suits shall be provided by the Vessel Owner.

All remaining lifesaving equipment required by the USCG shall be Contractor furnished. In addition, the Contractor shall also furnish two large fiberglass, sealed storage deck boxes to be permanently located on the deckhouse top (01 level). These deck boxes will be used to store the OFE PFD's and other lifesaving appliances required for the COI. These items will be on board the vessel at all times and shall be accounted for in the vessel design as part of the outfit. Placards identifying storage locations and quantities of PDF's and immersion suits shall be provided and installed by the Contractor.

760 MEDICAL EQUIPMENT

Medical equipment and first aid kits shall be provided by the Vessel Owner.

770 EGRESS

Egress route markings consisting of retro-reflective tape escape route marking strips, escape route symbols, and firefighting equipment markings, shall be provided and installed throughout the vessel. Such markings and symbols shall be provided throughout the vessel to facilitate emergency egress of all persons on board and to ensure ready identification of firefighting equipment throughout the vessel.

Retro-reflective tape markings shall be provided and installed in all accommodation and work areas, and all stairwells and passageways leading from these spaces to the muster station.

Markings and symbols shall be IMO standard symbols and shall be mounted on flat vertical surfaces (e.g., bulkheads and doors), except for specific locations where other mounting schemes are proposed by the material supplier and approved by Vessel Owner prior to installation.

Emergency lighting shall be installed in accordance with 46 CFR 183.432.

800 MAST & RIGGING

800 GENERAL REQUIREMENTS FOR MASTS & RIGGING
810 MASTS

The Contractor shall fabricate and install a mast with signal yardarms and mounting brackets for: navigation lights, electronic equipment, day markers, warning lights, flags, radar antennas and scientific packages. Additional unused spaces shall be provided for the fitting of temporary scientific equipment. The mast and yardarms shall be designed to permit servicing of navigation lighting and electronic equipment. The mast shall include closed loop ladder rungs on either side and harness clip in points to allow for safe climbing and access to the entire mast.

The mast and supporting structure shall be designed to minimize blind arcs and false targets on the radars. The mast shall be self-supporting without the use of stays. Fittings for a minimum of two (2) halyards per yardarm shall be provided, including block, halyard, and cleat. Connections and wiring shall be installed to allow easy connection between sensors and instruments located on the masts and the ship's bridge control station.

The mast shall be fabricated and installed to provide adequate arrangement of all navigational lights and signals including those for restricted in ability to maneuver, not under command, at anchor, trawling/fishing, fishing other than trawling, towing, at anchor and clearance/obstruction lights in accordance with COLREGS, USCG Navigational Rules.

900 MISSION SUPPORT

900 GENERAL REQUIREMENTS FOR MISSION SUPPORT

The vessel's primary mission is to provide a work platform for the support of near coastal fisheries related research projects and oceanographic research projects. The operational profile and science mission requirements are described in Section 030.

The primary area of operation for the vessel will be the near coastal Mid-Atlantic regions of the United States. The vessel will operate year-round throughout its range of operation and thus should be capable of year-round operations throughout the Mid-Atlantic region. The ship and its subsystems shall have full capability within a range of air temperatures from 0° to 110° F and a range of water temperatures from 28° to 90° F.

910 MISSION SUPPORT LOAD HANDLING

910.1 General

Load handling equipment shall be suitable for the marine environment.

All weight handling appliances shall be provided with markings and means to protect personnel from injury at pinch points.

The Contractor shall demonstrate that the handling system design is functional and meets all requirements including lines of sight, proper wire runs, arrangement of gear, and safe operability.

Overboard weight handling gear shall meet the structural requirements of 46 CFR 189.35 and UNOLS Research Vessel Safety Standards Appendix A & B.

910.2 Deck Crane

A foldable knuckle boom or foldable telescoping marine crane shall be furnished and installed by the Contractor. It will be used to load and unload equipment, nets, buoys, moorings and to move equipment about the aft Main Deck and aft 01 Deck of the vessel. The crane is for lifting and is not expected to be used for towing alongside or astern. The crane shall have a two-block alarm and or a two-block limit stop. A load chart for the crane shall be posted in plain view of the crane operator.

The crane shall be provided with a radio remote control system. An emergency stop switch for the hydraulic system shall be provided on the radio remote control consol. The crane shall be provided with all of the appropriate electronics and hydraulic valves to interface with the radio remote control system as recommended by the manufacturer.

The remote control will be provided with a fixed station on the '01 deck level where it can be positioned and operated as if it were a fixed station or removed from and worn about the deck area. A clear line of sight from this station will be provided. The crane will also be provided with fixed controls at its base, for use in the event the belly pack is rendered inoperative.

The crane will be located on the Main Deck or aft 01 Deck and subject to the approval of the vessel owner. It will be positioned to provide reach over the entire area of the main working deck and reach the 01 Deck. It shall be able to reach a minimum of 15 ft outboard over one side of the vessel. The crane will be used to load equipment from the shore to the working deck area and will be required to move moorings and buoys about the main deck for deployment/retrieval while underway per the operational profiles in section 030. The crane shall have a capacity of not less than one ton at 20 feet.

910.3 Oceanographic Load Handling

910.3.1 A-Frame

An A-Frame will be mounted on the main deck level on centerline at the stern of the vessel. It will be used to deploy and retrieve overboard scientific equipment such as towed instrumentation like magnetometers, sub bottom profiler, towed nets and deployment and retrieval of buoys, moorings, ROV's and AUV's. The A-frame will also be used for conducting coring over the stern of the vessel in support of geophysical sciences. The A-Frame is both for lifting and for towing astern. Lifting operations will either make use of the A-Frame mounted winch, or a deck mounted Hydro winch via cross member mounted sheave. Towing operations may be performed from the cross-member sheave. A load rating shall be posted in plain view of the operator station on the deckhouse.

The A-Frame shall have a cross member mounted winch for lifting. The winch will be 3,000 lb. load rated for the 1st layer. The winch will be loaded with synthetic line, with a soft eye in the tail end.

The A-frame and A-Frame winch shall be controlled at the '01 deck level, aft facing control station or "BBQ Pit". An emergency stop button for the hydraulic system shall be provided in the control station. Every effort shall be made to limit the impact of the A-Frame footprint and hydraulic cylinders mounting locations on the function of the working deck area.

A set of stops will be installed on the inboard side to support the A-Frame when stowed in the forward position. A set of stops will be installed on the outboard side to support the A-Frame when in the deployed position. The final location and arrangement of the stops shall be approved by the Vessel Owner and/or Owner's Representative.

The A-frame shall be designed and constructed in accordance with the requirements of 46 CFR 189.35 and UNOLS Research Vessel Safety Standards. It shall be capable of lifting and supporting the SWL while luffing from the stowed position to the deployed position and vice-versa. The A-frame shall be operable with a CTD wire of 0.322" 3 conducting cable and a 1/4" Amsteel blue synthetic cable. It shall have a clear width between supporting legs of not less than 9'-0". Weak links must be provided where required to meet the SWL of the A-frame. The A-frame design shall comply with the requirements of the following table.

Table 2: A-FRAME

Description	*Make/Model or equivalent*	*Clear Height*	*Reach Astern*	*Reach Fwd*	*Safe Working Load*
A-Frame	*Manufactured by Contractor*	*13 ft*	*10 ft*	*6-8 ft*	*Min 5,000 lb.*
A-Frame Winch	*TBD*	*NA*	*NA*	*NA*	*Min 5,000 lb.*

The A-Frame will be provided with a sheave of sufficient diameter for use 1/4" synthetic cable for use with the Hydro Winch and designed in accordance with the requirements of UNOLS recommendations for sheave size and load rating.

The A-Frame will be provided with a sheave of sufficient diameter for use with the CTD winch 3 conductor 0.322" cable. The sheave shall be suitable for use with the conducting wire and designed in accordance with the requirements of UNOLS recommendations for sheave size and load rating.

The cross member shall have two (2) attachment points with the same working load limit, one port and one starboard of centerline and in line with the Hydro and CTD winches on the 01 level. Flood lights shall be mounted on the A-frame to illuminate the water's surface below the frame when deployed.

910.3.2 Davit

A yard fabricated portable Davit shall be installed in a removable holder built into the starboard bulwark of the vessel. This davit shall be located just forward of the starboard bulwark door. The davit shall be capable of supporting up to 250 lbs and shall be fitted with a block and manual winch that permits an operator to hoist or deploy a load of less than 250 lbs. The davit shall be able to slew and be capable of being locked in position. The davit shall be provided with a stowage position on deck, clear of the working deck.

910.4 Winches

910.4.1 Hydro Winch

The vessel shall be delivered with a Hydro winch of the same make/model as the CTD Winch on the 01 level. Only one winch will be active at any given time.

- The winch will be hydraulic.
- The winch shall hold a minimum of 1,000 meters of 1/4" AmsteelBlue synthetic cable (provided with weak link).
- The winch shall provide a bare drum line pull of at least 5,000 lbs.
- The winch shall be provided with level wind and have proportional speed control and provide the operator with real-time data on, line paid out, line remaining on the drum and speed of haul back.
- The winch shall be supplied with 2 sets of sprockets, one set for standard spooling and one set for open lay spool pattern.
- The winch shall also be provided with UDP output to network with an onboard OFE installed SES.
- A marine grade all weather custom fit cover shall be provided.
- Winch monitoring and display shall include tension, max tension, payout, max payout, speed at a minimum. It shall have graphing and data logging capability.
- Provisions for operator calibration of line tension, speed, and payout.
- Line speed accuracy of ±1 m/min or better.
- Line payout accuracy of ±1 m or better.
- Meet the standards of UNOLS Research Vessel Safety Standards Appendix A and B

The vessel will be provided with a foundation oriented on bed plates for installation on the '01 deck level, with a fair lead to the cross-member sheave. The winch and winch foundations shall meet all structural requirements of 46 CFR 189.35. The Hydro Winch shall be a mirror of the CTD winch to provide for motors/connections and service points to be on the outboard side of both winches.

Sheave sizes, number, and locations shall be designed to minimize cable and wire bends, be compatible with the cable/wire type, and simplify the run. Some operations, such as re-reeving wires through fairlead blocks or switching out the wire in use through a frame or with a traction winch, shall be factored into designs.

The winch shall be configured to tie into quick connects provided at the '01 level for this purpose. The '01 deck hydraulic tie in points shall be sized and positioned to support these winch installations and to be as clear of the deck as possible.

910.4.2 CTD Winch

The vessel shall be delivered with a CTD winch of the same make/model as the Hydro Winch on the 01 level. Only one winch will be active at any given time.

- The winch will be hydraulic.
- The winch will be fitted with a Focal 180 series slip ring or equivalent.
- The winch shall hold a total of 1,000 meters of 0.322" 3 conductor cable, instrumentation, and control cable. The 0.322" cable will be purchased by UNCW and shipped directly to the winch manufacturer for spooling onto the winch.
- The winch shall be provided with mechanical level wind and have proportional speed control and provide the operator with real-time data on, line paid out, tension, line remaining on the drum and speed of haul back or cast as well as depth over the side. Operator control provided by manual hydraulic valve for each winch and

a shared belly pack remote containing HMI touch screen display, winch joystick, A-frame control, and E-stop.

- The winch shall provide a bare drum line pull of at least 5,000 lbs.
- The winch shall be provided with level wind and have fine speed control and provide the operator with real-time data on, line paid out, line remaining on the drum and speed of haul back.
- The winch shall be supplied with 2 sets of sprockets, one set for standard spooling and one set for open lay spool pattern.
- The winch shall also be provided with UDP output to network with an onboard OFE installed SES.
- A marine grade all weather custom fit cover shall be provided.
- Winch monitoring and display shall include tension, max tension, payout, max payout, speed at a minimum. It shall have graphing and data logging capability.
- Provisions for operator calibration of line tension, speed, and payout.
- Line speed accuracy of ±1 m/min or better.
- Line payout accuracy of ±1 m or better.
- Meet the standards of UNOLS Research Vessel Safety Standards Appendix A and B

The vessel will be provided with a foundation oriented on bed plates for installation on the ’01 deck level, with a fair lead to the cross-member sheave. The winch and winch foundations shall meet all structural requirements of 46 CFR 189.35. The CTD Winch shall be a mirror of the Hydro Winch to provide for motors/connections and service points to be on the outboard side of both winches.

The combined CTD and Hydro winch control station shall be located on the ‘01 deck for optimum operator visibility. The control station shall provide protection from sun and weather. Local controls shall also be provided on each of the winches, the contractor shall provide for the hydraulic connections. An emergency stop for the hydraulic system shall be installed in the immediate vicinity of the winch control station. Winch monitoring and display shall be provided at the control station and shall include tension, max tension, payout, max payout, speed at a minimum. It shall have graphing and data logging capability.

Sheave sizes, number, and locations shall be designed to minimize cable and wire bends, be compatible with the cable/wire type, and simplify the run. Some operations, such as re-reeving wires through fairlead blocks or switching out the wire in use through a frame or with a traction winch, shall be factored into designs.

The winch shall be configured to tie into quick connects provided at the ’01 level for this purpose. The ’01 deck hydraulic tie in points shall be sized and positioned to support these winch installations and to be as clear of the deck as possible.

915 NETS AND TOWS

Trawl doors and nets shall be provided by the vessel owner and shall be stowed on the main deck of the vessel against the bulwarks. Owner furnished trawl nets shall be deployed from the Hydro winch, as a bridle, single main trawl wire configuration.

920 WORK BOAT

The Contractor shall provide a Demaree Inflatable Boats (D.I.B.) 14’ Mini Snout. It shall be equipped with a 30 HP Mercury manual start outboard engine with tiller controls and a 6 gallon fuel tank. Shaft length and propeller shall be per manufacturer’s recommendation.

930 TRANSDUCERS

The vessel is to be fitted with a mounting bracket and transducer pole on the bow for the deployment of a multibeam transducer or to permit swapped out transducer assemblies to be lowered below the keel depth for detailed scientific study. The Contractor shall be responsible for the design and fabrication of the supporting structure and the deployable mounting pole.

The transducer pole shall be a vertically oriented pipe when deployed, that can be swung up and stowed on deck, or lowered for deployment. The transducer pole shall be sufficiently strong to support the deployment of the multibeam transducer while operating at sea at a speed of up to 6 knots. Cable conduit access shall be provided and approved from the dry lab to the transducer pole on the bow to permit the Owner to pull cables from one location to another.

The make and model of the owner furnished Multibeam is to be determined, however for planning purposes, the Contractor can assume that the Pole and Mounting system will need to support the installation of a Teledyne Reason SeaBat T-51 Tx and T-51 Rx sonar head assembly.

The transducer will be owner furnished upon delivery of the vessel.

940 LABORATORY SPACES

940.1 General

Laboratories shall provide maximum flexibility in working arrangements. Exposed structure, brackets, pipes, cabling, or other dirt collecting surfaces shall be kept to a minimum.

940.1.1 Dry Lab

The dry lab shall be provided with sufficient space for at least 3 individuals to sit and work at laptop computers, with additional room for equipment. No additional cabinetry shall be provided above or below the countertops.

The aft bulkhead of the dry lab shall be fitted with multiple “pass through” to the aft working deck area. These pass through will permit cables to be passed through as needed for scientific purposes from the dry lab as needed. The pass through shall be a welded in, 2”, 4”, 6” diameter sch 80 pipe, provided with a hinged, dogging cap on the weather deck side. The pipe shall be located not less than 6’-0” above deck.

The bulkheads of the dry lab, above and below the countertop shall be fitted with a flush fitting securing system, such as unistrut in line with the deck socket pattern.

Along the countertop surface, 110 vac outlets shall be provided, with clean power in sufficient quantity to permit the operation of multiple computers and equipment.

Bulletin board(s) and a white board shall be mounted on the bulkhead(s).

940.1.2 Wet Lab

The wet lab should open directly to the working deck. The vertical surfaces of the wet lab walls should be sheathed with a weatherproof joiner panel system suitable for a wet marine environment.

The bulkheads of the wet lab, above and below the countertop shall be fitted with a flush fitting securing system, such as unistrut in line with the deck socket pattern.

Along the countertop surface, 110 vac outlets shall be provided, with clean power in sufficient quantity to permit the operation of multiple computers and equipment.

The space shall be of sufficient size to permit 4 to 5 person groups to work within the space.

The wet lab shall be provided with countertops throughout the perimeter of the space, with no above counter cabinetry and below counter cabinetry in way of a 30” x 24” x 12” stainless steel slop sink only. A blast freezer, Stirling SU105UE, 3.7 cubic foot under counter unit shall also be located in the wet lab under the countertop.

The wet lab shall be provided with seawater flow through in accordance with specification section 530. The wet lab sink shall drain directly overboard to the port side of the vessel. A placard shall be fitted directly over the sink stating, “This sink drains directly overboard, on the port side of the vessel, no chemicals or waste”.

940.1.3 Working Deck Areas

Working deck areas shall be as clear as possible to accommodate large and heavy temporary equipment. The working deck area on the main deck and the winch deck area on the ’01 level shall be provided with a standard deck sockets per section 620.2 in the form of aluminum, countersunk 1”-8NC Helicoil threaded deck inserts on a 24” c.c. pattern with a tolerance of +/- 1/16” c.c. in order to support the fastening of equipment and interchangeability of equipment. The bolt down pattern is to be referenced to an identifiable and relevant location on the deck to facilitate design of equipment foundations. The inserts shall be flush with the top of the deck and tied to the deck structure to provide a maximum holding strength (rated strength should be tested and certified, to not less than 750 lbsf). Tie down points should be provided for any clear deck space that might be used for the installation of equipment including the main weather deck and portion of 01 deck aft of the pilothouse.

All bolt-down fittings threaded into the deck sockets shall be of CRES 316 with a minimum thread length of two bolt diameters. Bolt holes shall not penetrate watertight decks. The Contractor shall provide removable nylon bolts with flush slot heads, to fill all deck bolt sockets. The vessel shall be delivered with the bolts installed.

The weather decks of the vessel shall be provided with sufficient deck camber to ensure water freely clears from the deck and no standing water will be permitted.

Provision for tie downs port and starboard alongside the bulwarks shall be made to secure two (2) 200-quart coolers for education programs, or to secure four (4) 50”x36”x24” dive boxes.

Weather decks shall be provided with sufficient sure footing, either in the form of a textured coating system or textured adhesive backed system to prevent slips, trips, and falls.

Port & Starboard bulwarks shall be fitted with opening doors to permit safe access to the vessel on either side from a pier or the use of a gangway. These bulwark doors shall be located in way of the aft deck, aft of the deckhouse and final location and arrangements for securing shall be subject to Owner Review and Approval.

940.1.4 Diving Platform

Accessible from the main deck area aft, shall be a platform on the transom approximately 1’ above the loaded waterline. Extruded rubber fendering shall be installed around the edge of the platform and cleats shall be provided for securing a workboat to the platform while loading/unloading. Steps and handrails shall be configured to permit a diver to access the platform from the main deck. The platform shall be clear of the A-frame deployment and retrieval zone. A folding dive ladder shall be provided such that a diver can easily access the water for diving operations.

940.2 Layout and Construction

Flexibility and support for different types of science operations within limited space are important design criteria.

Items not directly related to laboratory services and science operations such as valve controls, breaker panels, and other equipment shall not be located in labs to the maximum extent possible. Breaker panels for laboratory power and lighting shall be installed in the laboratory served.

Breaker panels shall not interfere with laboratory benches or science operating stations. Ship’s equipment shall not encroach on lab space to the maximum extent possible.

945 SHIPBOARD NETWORK/COMPUTERS

There shall be no provision for a permanent computer half height rack for network systems onboard the vessel. This rack shall be located under the countertop in the Dry Lab.

Wire chases shall be routed from the dry lab directly to the following locations, Pilot House, Mast above Pilot House, Wet Lab, Transducer Pole Mount on the bow. The final location of all access points to the individual chases shall be approved by the vessel Owner.

Additionally, Cat 6 cables and jacks shall be routed from the rack location to the Dry Lab (2 above countertop jacks), Wet Lab (2 above countertop jacks), Wheelhouse (2), Galley/Mess (1 near the dining table) and a single drop to a central location in the main deckhouse for the installation of a wireless router. Ethernet cables shall be run separately from power cables to avoid signal interference, in accordance with section 300a.

ATTACHMENT L: TECHNICAL BID SUBMISSION

The following will be considered as a part of the evaluation of Bid and included in the order below as Attachment L to the bid.
Bid submission must include the following information specific to the requirement:

1. Experience / Past Performance
2. Facilities and Production Capabilities
3. Key Personnel
4. Project Planning/Engineering
5. Schedule

1. EXPERIENCE / PAST PERFORMANCE

Demonstrate experience during the past ten (10) years in the detail design, construction, and testing of vessels similar in mission and complexity. There are two sub factors, as provided below.

a. Subfactor 1: Mission - Demonstrated experience in the construction of fisheries research vessels capable of conducting:
   i. Bottom trawl surveys
   ii. Midwater trawl surveys
   iii. Fisheries acoustic surveys
   iv. General oceanographic over-the-side operations (CTDs, plankton tows, water sampling, ROV operations and similar missions)

b. Subfactor 2: Vessel Complexity - Demonstrated experience in the construction of vessels similar to the requirements described in the Technical Specification in terms of the complexity of on-board systems and system integration including:
   i. Principal dimensions
   ii. Mission support systems
   iii. Hull material and arrangement
   iv. Construction/design standards
   v. Cruising speed
   vi. Main propulsion system
   vii. Dynamic Positioning system
   viii. Electrical systems
   ix. Auxiliary systems
   x. Deck machinery
   xi. Hydraulic system
   xii. Electronics and navigation systems

2. FACILITIES AND PRODUCTION CAPABILITIES

The Vendor shall provide a detailed layout of the facilities that will be dedicated to the construction of the UNCW Research vessel. The Vendor shall provide a description of all shipyard facilities, capacities and certifications that are expected to be utilized for the UNCW vessel and provide a discussion of how production will flow throughout the facility or facilities related to:

Fabrication design and engineering support
b. Lofting, nesting, cutting
c. Welding
d. Load Handling and Rigging
e. Machine Shop
f. Staging area/storage facility for major equipment, vessel outfit
g. Coatings
h. Launching

Provide a description of office space and resources that will be made available to the project team for the duration of the contract.

3. **KEY PERSONNEL**

Provide an organizational chart of the project team assigned to the project and provide qualifications of the key design, construction, and managerial personnel. Identify if key personnel are employed by the Contractor or are a subcontractor. During contract performance of the requirement, the Vendor must utilize the key personnel and subcontractor(s) proposed or replace with the same or better qualifications, subject to customer approval.

Specifically identify the person(s)/subcontractor responsible for:

a. Contract administration
b. Project technical management
c. Quality control
d. Detailed design and engineering
e. Production design support
f. Systems integration
g. Systems installation
h. Warranty/guarantee
i. Other key personnel

4. **PROJECT PLANNING / ENGINEERING**

a. Describe how the Vendor will manage the overall Project Management, Logistics Support and Administration of the contract.
b. Describe how the Vendor and/or proposed design subcontractor will provide final detail design, engineering, USCG plan review and vessel documentation related to the requirements described in Technical Specification Section 000.
c. Describe how the Vendor will manage the Quality Assurance related to the requirements described in Technical Specification Section 030 and elsewhere.
d. Describe how the Vendor will manage the system integration between the propulsion engines, marine gear, controllable pitch propeller, rudder/steering, and bow thruster to ensure a seamless propulsion and dynamic positioning system interface related to the requirements described in Technical Specification Section 200.
e. Describe how the Vendor will manage the final design, installation, testing and commissioning of the hydraulic system, as it relates to providing power to the deck machinery onboard as well as its role within the propulsion system.
f. Describe how the Vendor will manage the needs of the various distributive systems as it relates to vessel size, available space for routing, penetrations, and interferences in the fabrication planning phase as well as during the installation, testing and commissioning phases of the project.
g. Describe how the Vendor will manage the acceptance tests and trials related to the requirements described in Technical Specification Section 074.
h. Describe how the Vendor will manage any guarantee and warrantee issues including the time period for claims, scope of services, process for claims, responsiveness to claims and place of performance for repairs and service.

5. **SCHEDULE**

Provide a Project Schedule which identifies the critical path and duration in calendar days of milestones. After the Contract Award and the issuance of Notice to Proceed, the Contractor is expected to perform in accordance with the proposed Project Schedule. Include all major milestones identified in the Technical Specification.

6. ADDITIONAL REQUIRED DOCUMENTS

a. Provide a General Arrangement of the design proposed.
b. A Bill of materials/Equipment list for the design that is proposed.
c. A copy of the yard Standard contract. Note: State of North Carolina and UNCW Terms take precedence in all matters.

The following will be considered as a part of the evaluation of Bid.
Bid submission must include the following information specific to the requirement:

1. Experience / Past Performance
2. Facilities and Production Capabilities
3. Key Personnel
4. Project Planning/Engineering
5. Schedule

1. **EXPERIENCE / PAST PERFORMANCE**

Demonstrate experience during the past ten (10) years in the detail design, construction, and testing of vessels similar in mission and complexity. There are two sub factors, as provided below.

a. Subfactor 1: Mission - Demonstrated experience in the construction of fisheries research vessels capable of conducting:
   i. Bottom trawl surveys
   ii. Midwater trawl surveys
   iii. Fisheries acoustic surveys
   iv. General oceanographic over-the-side operations (CTDs, plankton tows, water sampling, ROV operations and similar missions)

b. Subfactor 2: Vessel Complexity - Demonstrated experience in the construction of vessels similar to the requirements described in the Technical Specification in terms of the complexity of on-board systems and system integration including:
   i. Principal dimensions
   ii. Mission support systems
   iii. Hull material and arrangement
   iv. Construction/design standards
   v. Cruising speed
   vi. Main propulsion system
   vii. Dynamic Positioning system
   viii. Electrical systems
   ix. Auxiliary systems
   x. Deck machinery
   xi. Hydraulic system
   xii. Electronics and navigation systems

2. **FACILITIES AND PRODUCTION CAPABILITIES**

The Vendor shall provide a detailed layout of the facilities that will be dedicated to the construction of the UNCW Research vessel. The Vendor shall provide a description of all shipyard facilities, capacities and certifications that are expected to be utilized for the UNCW vessel and provide a discussion of how production will flow throughout the facility or facilities related to:

a. Fabrication design and engineering support
b. Lofting, nesting, cutting
c. Welding
d. Load Handling and Rigging
e. Machine Shop
f. Staging area/storage facility for major equipment, vessel outfit
g. Coatings
h. Launching

Provide a description of office space and resources that will be made available to the project team for the duration of the contract.

3. **KEY PERSONNEL**

Provide an organizational chart of the project team assigned to the project and provide qualifications of the key design, construction, and managerial personnel. Identify if key personnel are employed by the Contractor or are a subcontractor. During contract performance of the requirement, the Vendor must utilize the key personnel and subcontractor(s) proposed or replace with the same or better qualifications, subject to customer approval. Specifically identify the person(s)/subcontractor responsible for:

a. Contract administration
b. Project technical management
c. Quality control
d. Detailed design and engineering
e. Production design support

f. Systems integration
g. Systems installation
h. Warranty/guarantee
i. Other key personnel

4. **PROJECT PLANNING / ENGINEERING**

a. Describe how the Vendor will manage the overall Project Management, Logistics Support and Administration of the contract.
b. Describe how the Vendor and/or proposed design subcontractor will provide final detail design, engineering, USCG plan review and vessel documentation related to the requirements described in Technical Specification Section 000.
c. Describe how the Vendor will manage the Quality Assurance related to the requirements described in Technical Specification Section 030 and elsewhere.
d. Describe how the Vendor will manage the system integration between the propulsion engines, marine gear, controllable pitch propeller, rudder/steering and bow thruster to ensure a seamless propulsion and dynamic positioning system interface related to the requirements described in Technical Specification Section 200.
e. Describe how the Vendor will manage the final design, installation, testing and commissioning of the hydraulic system, as it relates to providing power to the deck machinery onboard as well as its role within the propulsion system.
f. Describe how the Vendor will manage the needs of the various distributive systems as it relates to vessel size, available space for routing, penetrations and interferences in the fabrication planning phase as well as during the installation, testing and commissioning phases of the project.
g. Describe how the Vendor will manage the acceptance tests and trials related to the requirements described in Technical Specification Section 074.
h. Describe how the Vendor will manage any guarantee and warrantee issues including the time period for claims, scope of services, process for claims, responsiveness to claims and place of performance for repairs and service.

5. SCHEDULE

Provide a Project Schedule which identifies the critical path and duration in calendar days of milestones. After the Contract Award and the issuance of Notice to Proceed, the Contractor is expected to perform in accordance with the proposed Project Schedule. Include all major milestones identified in the Technical Specification.