STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH, N.C.

PROPOSAL

DATE AND TIME OF BID OPENING: **SEPTEMBER 18, 2018 AT 2:00 PM**

CONTRACT ID C204243
WBS 47892

Void for Bidding

FEDERAL-AID NO. STATE FUNDED
COUNTY DARE
T.I.P. NO.
MILES 0.000
ROUTE NO.
LOCATION REPLACEMENT VESSEL FOR M/V KINNAKEET

TYPE OF WORK FERRY VESSEL.

NOTICE:

ALL BIDDERS SHALL COMPLY WITH ALL APPLICABLE LAWS REGULATING THE PRACTICE OF GENERAL CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA WHICH REQUIRES THE BIDDER TO BE LICENSED BY THE N.C. LICENSING BOARD FOR CONTRACTORS WHEN BIDDING ON ANY NON-FEDERAL AID PROJECT WHERE THE BID IS $30,000 OR MORE, EXCEPT FOR CERTAIN SPECIALTY WORK AS DETERMINED BY THE LICENSING BOARD. BIDDERS SHALL ALSO COMPLY WITH ALL OTHER APPLICABLE LAWS REGULATING THE PRACTICES OF ELECTRICAL, PLUMBING, HEATING AND AIR CONDITIONING AND REFRIGERATION CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA. NOTWITHSTANDING THESE LIMITATIONS ON BIDDING, THE BIDDER WHO IS AWARDED ANY FEDERAL - AID FUNDED PROJECT SHALL COMPLY WITH CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA FOR LICENSING REQUIREMENTS WITHIN 60 CALENDAR DAYS OF BID OPENING.

BIDS WILL BE RECEIVED AS SHOWN BELOW:

THIS IS A FERRY PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

PROPOSAL FOR THE CONSTRUCTION OF:

Project No. WBS 47892

in **Dare County**, North Carolina

Department of Transportation

Raleigh, North Carolina

The Bidder has carefully examined the specifications and plans of the proposed work to be known as Project No. **WBS 47892**, which are acknowledged to be part of the proposal, the special provisions, the proposal, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned bidder agrees to bound upon his execution of the bid and subsequent award to him by the Board of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen days after the written notice of award is received by him. The undersigned Bidder further agrees to provide all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract by **12:00 Noon on March 5, 2020** and in accordance with the requirements of the Engineer, and at the unit or lump sum prices, as the case may be, for the various items given on the sheets contained herein.

The Bidder shall provide and furnish all the materials, machinery, implements, appliances and tools, and perform the work and required labor to construct and complete State Highway Project No. **WBS 47892** for the unit or lump sum prices, as the case may be, bid by the Bidder in his bid and according to the proposal, plans, and specifications prepared by said Department, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

If the proposal is accepted and the award is made, the contract is valid only when signed either by the Contract Officer or such other person as may be designated by the Secretary to sign for the Department of Transportation. The conditions and provisions herein cannot be changed except over the signature of the said Contract Officer.

Accompanying this bid is a bid bond secured by a corporate surety, or certified check payable to the order of the Department of Transportation, for five percent of the total bid price, which deposit is to be forfeited as liquidated damages in case this bid is accepted and the Bidder shall fail to provide the required payment and performance bonds with the Department of Transportation, under the condition of this proposal, within 14 calendar days after the written notice of award is received by him, as provided in the Standard Specifications; otherwise said deposit will be returned to the Bidder.

DocuSigned by:
Contract Standards and Development
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8/17/2018 | 9:28 AM EDT

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PROJECT SPECIAL PROVISIONS

GENERAL

EXECUTION OF SIGNATURE SHEETS

(6-17-82)

The Bidder's attention is directed to the various sheets in the proposal form which are to be signed, sealed or require information to be entered by the Bidder. A list of these sheets is shown below. The bid bond is inserted in the proposal form.

1. Listing of MBE and WBE subcontractors
2. Facility Location
3. Labor and Materials
4. Cost Breakdown
5. Item sheet
6. Additional Ferry Vessel bid sheet
7. Execution of Bid Sheets: 1, 2, 3, 4, 5, or 6 (Bid)
8. Bid Bond (Proposal Insert)

PROPRIETARY ITEMS ON PLANS

The Contractor's attention is directed to the fact that there may be references to proprietary items listed in the contract plans. These references shall not supersede the provisions in the contract proposal. Other products of equal quality may be used provided they meet or exceed the requirements of the special provisions and are approved for use by the Ferry Division. In those instances where there is no provision in the contract proposal to cover the work, the plan information shall apply unless otherwise directed by the Ferry Division.

LICENSURE / CERTIFICATION:

The Bidder does not need a NC General Contractors license to bid this project. However, they will be required to furnish proof of licensure and/or certifications to build passenger vessels of the size and type, as described in the Contract Drawings and Specifications, by the state in which they are performing the work and the United States Coast Guard.

MANDATORY PRE-BID CONFERENCE (Prequalifying To Bid):

(7-18-06) (Rev. 3-25-13) SPI 1-14

In order for all prospective bidders to have an extensive knowledge of the project, all prospective bidders shall attend a mandatory pre-bid conference at:

Thursday, September 6, 2018, 10:00am – 2:00pm

NCDOT State Shipyard
8550 Shipyard Rd.
Manns Harbor, North Carolina 27953
Administration Conference Room
Phone (252) 426-5104

The pre-bid conference will include a thorough discussion of the plans, contract pay items, special provisions, etc.

Only bidders who have attended and properly registered at the above scheduled pre-bid conference and who have met all other prequalification requirements will be considered prequalified to bid on this project. A bid received from a bidder who has not attended and properly registered at the above scheduled pre-bid conference will not be accepted and considered for award.

Attendance at the pre-bid conference will not meet the requirements of proper registration unless the individual attending has registered at the pre-bid conference in accordance with the following:

(A) The individual has signed his name on the official roster no later than thirty (30) minutes after the above noted time for the beginning of the conference.

(B) The individual has written in the name and address of the company he or she represents.

(C) Only one company has been shown as being represented by the individual attending.

(D) The individual attending is an officer or permanent employee of the company they are representing.

Attendance at any prior pre-bid conference will not meet the requirement of this provision.

ELECTRONIC SUBMITTAL OF COST BREAKDOWN SHEET

Bidders shall complete an electronic version of the Cost Breakdown Sheet found on page SS-5 of this proposal. The values in the electronic file shall match the values written in the chart on page SS-5 of the proposal as those numbers are considered the official bid.

If the values in the electronic version do not match the bid proposal version, the electronic values will be changed by the Department to match the bid proposal values.

The Microsoft Excel zip file is available for download on NCDOT website at the following address:

https://xfer.services.ncdot.gov/dsplan/2018%20Highway%20Letting/09-18-18/Plans%20and%20Proposals/47892%20FERRY%20VESSEL%20-%20REPLACEMENT%20VESSEL%20FOR%20MV%20KINNAKEET/

Once the electronic file is complete, the bidder shall save the Excel file to a standard USB flash drive. The flash drive shall be placed in a sealed envelope with the outer wrapping clearly marked as follows:

Mr. Joe D. Waldrep
NCDOT Ferry Division
Contract 204243
WBS 47892
Cost Breakdown Sheet

The envelope containing the flash drive shall be place in the sealed parcel containing the completed bid Price Proposal.

After opening the bid proposals on the scheduled letting date, the sealed envelopes containing the flash drives will be sent to the Ferry Division for evaluation. The information contained on the flash drives will be considered confidential and will be treated as such.

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:

(7-15-08) (Rev. 5-16-17) 108-2 SP1 G58

The Contractor's attention is directed to the Standard Special Provision entitled *Availability of Funds Termination of Contracts* included elsewhere in this proposal. The Department of Transportation's schedule of estimated completion progress for this project as required by that Standard Special Provision is as follows:

Fiscal Year		Progress (% of Dollar Value)
2019	(7/01/19 - 6/30/20)	**64**% of Total Amount Bid
2020	(7/01/20 - 6/30/21)	**36**% of Total Amount Bid

The Contractor shall also furnish his own progress schedule in accordance with Article 108-2 of the *2018 Standard Specifications*. Any acceleration of the progress as shown by the Contractor's progress schedule over the progress as shown above shall be subject to the approval of the Engineer.

DOMESTIC STEEL AND IRON PRODUCTS:

(April 19, 1994)

The requirements of this provision do NOT apply to certain ferry boat equipment and machinery items. These items include **marine diesel engines, electrical switchboards and switchgear, electric motors, pumps, ventilation fans, boilers, electrical controls and electronic equipment**. The use of these specific equipment and machinery items, which have been manufactured outside the United States, is permitted for ferry boat construction.

See Construction Specifications section for additional items waived for this project.

Except as provided in the above paragraphs, all steel and iron products which are permanently incorporated into this project shall be produced in the United States. Minimal amounts of foreign steel and iron products may be used provided the combined project cost of the bid items involved does not exceed one-tenth of one percent (0.1 percent) of the total amount bid for the entire project or $2,500.00, whichever is greater. This minimal amount of foreign produced steel and iron products permitted for use by this Special Provision is not applicable to fasteners. Domestically produced fasteners are required for this project.

All steel and iron products furnished as "domestic products" shall be melted, cast, formed, shaped, drawn, extruded, forged, fabricated, produced, or otherwise processed and manufactured in the United States. Raw materials used in manufacturing "domestic" steel and iron products may be imported; however, all manufacturing processes to produce the products, including coatings, must occur in the United States.

Before each steel or iron product is incorporated into this project or included for partial payment on a monthly estimate, the Contractor shall furnish the Resident Engineer a notarized certification certifying that the product conforms to the above requirements of this Special Provision. The Resident Engineer will forward a copy of each certification to the Materials and Tests Unit.

Each purchase order issued by the Contractor or a subcontractor for steel and iron products to be permanently incorporated into this project shall contain in bold print a statement advising the supplier that all manufacturing processes to produce the steel or iron shall have occurred in the United States. The Contractor and all affected subcontractors shall maintain a separate file for steel products permanently incorporated into this project so that verification of the Contractor's efforts to purchase "domestic" steel and iron products can readily be verified by an authorized representative of the Department or the Federal Highway Administration.

MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE:

(10-16-07)(Rev. 5-15-18) 102-15(J) SP1 G66

Description

The purpose of this Special Provision is to carry out the North Carolina Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts financed in whole or in part with State funds.

Definitions

Additional MBE/WBE Subcontractors - Any MBE/WBE submitted at the time of bid that will not be used to meet the Combined MBE /WBE Goal. No submittal of a Letter of Intent is required.

Combined MBE/WBE Goal: A portion of the total contract, expressed as a percentage that is to be performed by committed MBE/WBE subcontractors.

Committed MBE/WBE Subcontractor - Any MBE/WBE submitted at the time of bid that is being used to meet the Combined MBE /WBE goal by submission of a Letter of Intent. Or any MBE or WBE used as a replacement for a previously committed MBE or WBE firm.

Contract Goal Requirement - The approved participation at time of award, but not greater than the advertised Combined MBE/WBE contract goal.

Goal Confirmation Letter - Written documentation from the Department to the bidder confirming the Contractor's approved, committed participation along with a listing of the committed MBE and WBE firms.

Manufacturer - A firm that operates or maintains a factory or establishment that produces on the premises, the materials or supplies obtained by the Contractor.

MBE Participation (Anticipated) - A portion of the total contract, expressed as a percentage that is anticipated to be performed by committed MBE subcontractor(s).

Minority Business Enterprise (MBE) - A firm certified as a Disadvantaged Minority-Owned Business Enterprise through the North Carolina Unified Certification Program.

Regular Dealer - A firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in stock, and regularly sold to the public in the usual course of business. A regular dealer engages in, as its principal business and in its own name, the purchase and sale or lease of the products in question. A regular dealer in such bulk items as steel, cement, gravel, stone, and petroleum products need not keep such products in stock, if it owns and operates distribution equipment for the products. Brokers and packagers are not regarded as manufacturers or regular dealers within the meaning of this section.

North Carolina Unified Certification Program (NCUCP) - A program that provides comprehensive services and information to applicants for MBE/WBE certification. The MBE/WBE program follows the same regulations as the federal Disadvantaged Business Enterprise (DBE) program in accordance with 49 CFR Part 26.

United States Department of Transportation (USDOT) - Federal agency responsible for issuing regulations (49 CFR Part 26) and official guidance for the DBE program.

WBE Participation (Anticipated) - A portion of the total contract, expressed as a percentage, that is anticipated to be performed by committed WBE subcontractor(s).

Women Business Enterprise (WBE) - A firm certified as a Disadvantaged Women-Owned Business Enterprise through the North Carolina Unified Certification Program.

Forms and Websites Referenced in this Provision

Payment Tracking System - On-line system in which the Contractor enters the payments made to MBE and WBE subcontractors who have performed work on the project. https://apps.dot.state.nc.us/Vendor/PaymentTracking/

DBE-IS *Subcontractor Payment Information* - Form for reporting the payments made to all MBE/WBE firms working on the project. This form is for paper bid projects only. https://connect.ncdot.gov/business/Turnpike/Documents/Form%20DBE-IS%20Subcontractor%20Payment%20Information.pdf

RF-1 *MBE/WBE Replacement Request Form* - Form for replacing a committed MBE or WBE. http://connect.ncdot.gov/projects/construction/Construction%20Forms/DBE%20MBE%20WBE%20Replacement%20Request%20Form.pdf

SAF *Subcontract Approval Form* - Form required for approval to sublet the contract. http://connect.ncdot.gov/projects/construction/Construction%20Forms/Subcontract%20Approval%20Form%20Rev.%202012.zip

JC-1 *Joint Check Notification Form* - Form and procedures for joint check notification. The form acts as a written joint check agreement among the parties providing full and prompt disclosure of the expected use of joint checks.
http://connect.ncdot.gov/projects/construction/Construction%20Forms/Joint%20Check%20Notification%20Form.pdf

Letter of Intent - Form signed by the Contractor and the MBE/WBE subcontractor, manufacturer or regular dealer that affirms that a portion of said contract is going to be performed by the signed MBE/WBE for the estimated amount (based on quantities and unit prices) listed at the time of bid.
http://connect.ncdot.gov/letting/LetCentral/Letter%20of%20Intent%20to%20Perform%20as%20a%20Subcontractor.pdf

Listing of MBE and WBE Subcontractors Form - Form for entering MBE/WBE subcontractors on a project that will meet the Combined MBE/WBE goal. This form is for paper bids only.
http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/09%20MBE-WBE%20Subcontractors%20(State).docx

Subcontractor Quote Comparison Sheet - Spreadsheet for showing all subcontractor quotes in the work areas where MBEs and WBEs quoted on the project. This sheet is submitted with good faith effort packages.
http://connect.ncdot.gov/business/SmallBusiness/Documents/DBE%20Subcontractor%20Quote%20Comparison%20Example.xls

Combined MBE/WBE Goal

The Combined MBE/WBE Goal for this project is **0 %**

The Combined Goal was established utilizing the following anticipated participation for Minority Business Enterprises and Women Business Enterprises:

(A) Minority Business Enterprises **0 %**

(1) *If the anticipated MBE participation is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that MBEs participate in at least the percent of the contract as set forth above.

(2) *If the anticipated MBE participation is zero*, the Contractor shall make an effort to recruit and use MBEs during the performance of the contract. Any MBE participation obtained shall be reported to the Department.

(B) Women Business Enterprises **0 %**

(1) *If the anticipated WBE participation is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that WBEs participate in at least the percent of the contract as set forth above.

(2) *If the anticipated WBE participation is zero*, the Contractor shall make an effort to recruit and use WBEs during the performance of the contract. Any WBE participation obtained shall be reported to the Department.

The Bidder is required to submit only participation to meet the Combined MBE/WBE Goal. The Combined Goal may be met by submitting all MBE participation, all WBE participation, or a combination of MBE and WBE participation.

Directory of Transportation Firms (Directory)

Real-time information is available about firms doing business with the Department and firms that are certified through NCUCP in the Directory of Transportation Firms. Only firms identified in the Directory as MBE and WBE certified shall be used to meet the Combined MBE/WBE Goal. The Directory can be found at the following link.
https://www.ebs.nc.gov/VendorDirectory/default.html

The listing of an individual firm in the directory shall not be construed as an endorsement of the firm's capability to perform certain work.

Listing of MBE/WBE Subcontractors

At the time of bid, bidders shall submit <u>all</u> MBE and WBE participation that they anticipate to use during the life of the contract. Only those identified to meet the Combined MBE/WBE Goal will be considered committed, even though the listing shall include both committed MBE/WBE subcontractors and additional MBE/WBE subcontractors. Any additional MBE/WBE subcontractor participation above the goal will follow the banking guidelines found elsewhere in this provision. All other additional MBE/WBE subcontractor participation submitted at the time of bid will be used toward the Department's overall race-neutral goals. Only those firms with current MBE and WBE certification at the time of bid opening will be acceptable for listing in the bidder's submittal of MBE and WBE participation. The Contractor shall indicate the following required information:

(A) Electronic Bids

Bidders shall submit a listing of MBE and WBE participation in the appropriate section of Expedite, the bidding software of Bid Express®.

(1) Submit the names and addresses of MBE and WBE firms identified to participate in the contract. If the bidder uses the updated listing of MBE and WBE firms shown in Expedite, the bidder may use the dropdown menu to access the name and address of the firms.

(2) Submit the contract line numbers of work to be performed by each MBE and WBE firm. When no figures or firms are entered, the bidder will be considered to have no MBE or WBE participation.

(3) The bidder shall be responsible for ensuring that the MBE and WBE are certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that MBE's or WBE's participation will not count towards achieving the Combined MBE/WBE goal.

(B) Paper Bids

(1) *If the Combined MBE/WBE Goal is more than zero,*

(a) Bidders, at the time the bid proposal is submitted, shall submit a listing of MBE/WBE participation, including the names and addresses on *Listing of MBE and WBE Subcontractors* contained elsewhere in the contract documents in order for the bid to be considered responsive. Bidders shall indicate the total dollar value of the MBE and WBE participation for the contract.

(b) If bidders have no MBE or WBE participation, they shall indicate this on the *Listing of MBE and WBE Subcontractors* by entering the word "None" or the number "0." This form shall be completed in its entirety. **Blank forms will not be deemed to represent zero participation.** Bids submitted that do not have MBE and WBE participation indicated on the appropriate form will not be read publicly during the opening of bids. The Department will not consider these bids for award and the proposal will be rejected.

(c) The bidder shall be responsible for ensuring that the MBE/WBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that MBE's or WBE's participation will not count towards achieving the Combined MBE/WBE Goal.

(2) *If the Combined MBE/WBE Goal is zero,* entries on the *Listing of MBE and WBE Subcontractors* are not required for the zero goal, however any MBE or WBE participation that is achieved during the project shall be reported in accordance with requirements contained elsewhere in the special provision.

MBE or WBE Prime Contractor

When a certified MBE or WBE firm bids on a contract that contains a Combined MBE/WBE goal, the firm is responsible for meeting the goal or making good faith efforts to meet the goal, just like any other bidder. In most cases, a MBE or WBE bidder on a contract will meet the Combined

MBE/WBE Goal by virtue of the work it performs on the contract with its own forces. However, all the work that is performed by the MBE or WBE bidder and any other similarly certified subcontractors will count toward the goal. The MBE or WBE bidder shall list itself along with any MBE or WBE subcontractors, if any, in order to receive credit toward the goal.

MBE/WBE prime contractors shall also follow Sections A and B listed under *Listing of MBE/WBE Subcontractor* just as a non-MBE/WBE bidder would.

Written Documentation – Letter of Intent

The bidder shall submit written documentation for each MBE/WBE that will be used to meet the Combined MBE/WBE Goal of the contract, indicating the bidder's commitment to use the MBE/WBE in the contract. This documentation shall be submitted on the Department's form titled *Letter of Intent*.

The documentation shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 10:00 a.m. of the sixth calendar day following opening of bids, unless the sixth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 10:00 a.m. on the next official state business day.

If the bidder fails to submit the Letter of Intent from each committed MBE and WBE to be used toward the Combined MBE/WBE Goal, or if the form is incomplete (i.e. both signatures are not present), the MBE/WBE participation will not count toward meeting the Combined MBE/WBE Goal. If the lack of this participation drops the commitment below the Combined MBE/WBE Goal, the Contractor shall submit evidence of good faith efforts for the goal, completed in its entirety, to the State Contractor Utilization Engineer or DBE@ncdot.gov no later than 10:00 a.m. on the eighth calendar day following opening of bids, unless the eighth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 10:00 a.m. on the next official state business day.

Banking MBE/WBE Credit

If the bid of the lowest responsive bidder exceeds $500,000 and if the committed MBE/WBE participation submitted exceeds the algebraic sum of the Combined MBE /WBE Goal by $1,000 or more, the excess will be placed on deposit by the Department for future use by the bidder. Separate accounts will be maintained for MBE and WBE participation and these may accumulate for a period not to exceed 24 months.

When the apparent lowest responsive bidder fails to submit sufficient participation by MBE and WBE firms to meet the advertised goal, as part of the good faith effort, the Department will consider allowing the bidder to withdraw funds to meet the Combined MBE/WBE Goal as long as there are adequate funds available from the bidder's MBE and WBE bank accounts.

Submission of Good Faith Effort

If the bidder fails to meet or exceed the Combined MBE/WBE Goal, the apparent lowest responsive bidder shall submit to the Department documentation of adequate good faith efforts made to reach that specific goal.

A hard copy and an electronic copy of this information shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 10:00 a.m. on the sixth calendar day following opening of bids unless the sixth day falls on an official state holiday. In that situation, it would be due in the office of the State Contractor Utilization Engineer no later than 10:00 a.m. on the next official state business day. If the contractor cannot send the information electronically, then one complete set and 5 copies of this information shall be received under the same time constraints above.

Note: Where the information submitted includes repetitious solicitation letters, it will be acceptable to submit a representative letter along with a distribution list of the firms that were solicited. Documentation of MBE/WBE quotations shall be a part of the good faith effort submittal. This documentation may include written subcontractor quotations, telephone log notations of verbal quotations, or other types of quotation documentation.

Consideration of Good Faith Effort for Projects with a Combined MBE/WBE Goal More Than Zero

Adequate good faith efforts mean that the bidder took all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness, could reasonably be expected to obtain sufficient MBE/WBE participation. Adequate good faith efforts also mean that the bidder actively and aggressively sought MBE/WBE participation. Mere *pro forma* efforts are not considered good faith efforts.

The Department will consider the quality, quantity, and intensity of the different kinds of efforts a bidder has made. Listed below are examples of the types of actions a bidder will take in making a good faith effort to meet the goals and are not intended to be exclusive or exhaustive, nor is it intended to be a mandatory checklist.

(A) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising, written notices, use of verifiable electronic means through the use of the NCDOT Directory of Transportation Firms) the interest of all certified MBEs/WBEs that are also prequalified subcontractors. The bidder must solicit this interest within at least 10 days prior to bid opening to allow the MBEs/WBEs to respond to the solicitation. Solicitation shall provide the opportunity to MBEs/WBEs within the Division and surrounding Divisions where the project is located. The bidder must determine with certainty if the MBEs/WBEs are interested by taking appropriate steps to follow up initial solicitations.

(B) Selecting portions of the work to be performed by MBEs/WBEs in order to increase the likelihood that the Combined MBE/WBE Goal will be achieved.

(1) Where appropriate, break out contract work items into economically feasible units to facilitate MBE/WBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces.

(2) Negotiate with subcontractors to assume part of the responsibility to meet the advertised goal when the work to be sublet includes potential for MBE/WBE participation (2nd and 3rd tier subcontractors).

(C) Providing interested certified MBEs/WBEs that are also prequalified subcontractors with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

(D) (1) Negotiating in good faith with interested MBEs/WBEs. It is the bidder's responsibility to make a portion of the work available to MBE/WBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE/WBE subcontractors and suppliers, so as to facilitate MBE/WBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of MBEs/WBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for MBEs/WBEs to perform the work.

(2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including MBE/WBE subcontractors, and would take a firm's price and capabilities as well as the advertised goal into consideration. However, the fact that there may be some additional costs involved in finding and using MBEs/WBEs is not in itself sufficient reason for a bidder's failure to meet the contract goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidding contractors are not, however, required to accept higher quotes from MBEs/WBEs if the price difference is excessive or unreasonable.

(E) Not rejecting MBEs/WBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associates and political or social affiliations (for example, union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.

(F) Making efforts to assist interested MBEs/WBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or bidder.

(G) Making efforts to assist interested MBEs/WBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

(H) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; Federal, State, and local minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of MBEs/WBEs. Contact within 7 days from the bid opening the Business Opportunity and Work Force Development Unit at BOWD@ncdot.gov to give notification of the bidder's inability to get MBE or WBE quotes.

(I) Any other evidence that the bidder submits which shows that the bidder has made reasonable good faith efforts to meet the advertised goal.

In addition, the Department may take into account the following:

(1) Whether the bidder's documentation reflects a clear and realistic plan for achieving the Combined MBE/WBE Goal.

(2) The bidders' past performance in meeting the contract goal.

(3) The performance of other bidders in meeting the advertised goal. For example, when the apparent successful bidder fails to meet the goal, but others meet it, you may reasonably raise the question of whether, with additional reasonable efforts the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the advertised goal, but meets or exceeds the average MBE and WBE participation obtained by other bidders, the Department may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made a good faith effort.

If the Department does not award the contract to the apparent lowest responsive bidder, the Department reserves the right to award the contract to the next lowest responsive bidder that can satisfy to the Department that the Combined MBE/WBE Goal can be met or that an adequate good faith effort has been made to meet the advertised goal.

Non-Good Faith Appeal

The State Contractual Services Engineer will notify the contractor verbally and in writing of non-good faith. A contractor may appeal a determination of non-good faith made by the Goal Compliance Committee. If a contractor wishes to appeal the determination made by the Committee, they shall provide written notification to the State Contractual Services Engineer or at DBE@ncdot.gov. The appeal shall be made within 2 business days of notification of the determination of non-good faith.

Counting MBE/WBE Participation Toward Meeting the Combined MBE/WBE Goal

(A) Participation

The total dollar value of the participation by a committed MBE/WBE will be counted toward the contract goal requirements. The total dollar value of participation by a committed MBE/WBE will be based upon the value of work actually performed by the MBE/WBE and the actual payments to MBE/WBE firms by the Contractor.

(B) Joint Checks

Prior notification of joint check use shall be required when counting MBE/WBE participation for services or purchases that involves the use of a joint check. Notification shall be through submission of Form JC-1 *(Joint Check Notification Form)* and the use of joint checks shall be in accordance with the Department's Joint Check Procedures.

(C) Subcontracts (Non-Trucking)

A MBE/WBE may enter into subcontracts. Work that a MBE subcontracts to another MBE firm may be counted toward the anticipated MBE participation. The same holds true for work that a WBE subcontracts to another WBE firm. Work that a MBE/WBE subcontracts to a non-MBE/WBE firm does <u>not</u> count toward the contract goal requirement. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to the same certification (i.e., MBEs to MBEs and WBEs to WBEs), in order to fulfill the MBE or WBE participation breakdown. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith effort has been made to reach out to similarly certified firms and there is no interest or availability, and they can get assistance from other certified firms, the Engineer will not hold the prime responsible for meeting the individual MBE or WBE breakdown. If a MBE or WBE contractor or subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of standard industry practices, it shall be presumed that the MBE or WBE is not performing a commercially useful function.

(D) Joint Venture

When a MBE or WBE performs as a participant in a joint venture, the Contractor may count toward its contract goal requirement a portion of the total value of participation with the MBE or WBE in the joint venture, that portion of the total dollar value being a distinct clearly defined portion of work that the MBE or WBE performs with its forces.

(E) Suppliers

A contractor may count toward its MBE/ WBE requirement 60 percent of its expenditures for materials and supplies required to complete the contract and obtained from a MBE or

WBE regular dealer and 100 percent of such expenditures from a MBE or WBE manufacturer.

(F) Manufacturers and Regular Dealers

A contractor may count toward its MBE/ WBE requirement the following expenditures to MBE/WBE firms that are not manufacturers or regular dealers:

(1) The fees or commissions charged by a MBE/WBE firm for providing a *bona fide* service, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a DOT-assisted contract, provided the fees or commissions are determined to be reasonable and not excessive as compared with fees and commissions customarily allowed for similar services.

(2) With respect to materials or supplies purchased from a MBE/WBE, which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site (but not the cost of the materials and supplies themselves), provided the fees are determined to be reasonable and not excessive as compared with fees customarily allowed for similar services.

Commercially Useful Function

(A) MBE/WBE Utilization

The Contractor may count toward its contract goal requirement only expenditures to MBEs and WBEs that perform a commercially useful function in the work of a contract. A MBE/WBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the MBE/WBE shall also be responsible with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material and installing (where applicable) and paying for the material itself. To determine whether a MBE/WBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the MBE/WBE credit claimed for its performance of the work, and any other relevant factors. If it is determined that a MBE or WBE is not performing a Commercially Useful Function, the contractor may present evidence to rebut this presumption to the Department.

(B) MBE/WBE Utilization in Trucking

The following factors will be used to determine if a MBE or WBE trucking firm is performing a commercially useful function:

(1) The MBE/WBE shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there shall not be a contrived arrangement for the purpose of meeting the Combined MBE/WBE Goal.

(2) The MBE/WBE shall itself own and operate at least one fully licensed, insured, and operational truck used on the contract.

(3) The MBE/WBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.

(4) The MBE may subcontract the work to another MBE firm, including an owner-operator who is certified as a MBE. The same holds true that a WBE may subcontract the work to another WBE firm, including an owner-operator who is certified as a WBE. When this occurs, the MBE or WBE who subcontracts work receives credit for the total value of the transportation services the subcontracted MBE or WBE provides on the contract. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to the same certification (i.e., MBEs to MBEs and WBEs to WBEs), in order to fulfill the participation breakdown. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith effort has been made to reach out to similarly certified transportation service providers and there is no interest or availability, and they can get assistance from other certified providers, the Engineer will not hold the prime responsible for meeting the individual MBE or WBE participation breakdown.

(5) The MBE/WBE may also subcontract the work to a non-MBE/WBE firm, including from an owner-operator. The MBE/WBE who subcontracts the work to a non-MBE/WBE is entitled to credit for the total value of transportation services provided by the non-MBE/WBE subcontractor not to exceed the value of transportation services provided by MBE/WBE-owned trucks on the contract. Additional participation by non-MBE/WBE subcontractors receives credit only for the fee or commission it receives as a result of the subcontract arrangement. The value of services performed under subcontract agreements between the MBE/WBE and the Contractor will not count towards the MBE/WBE contract requirement.

(6) A MBE/WBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the MBE/WBE has exclusive use of and control over the truck. This requirement does not preclude the

leased truck from working for others during the term of the lease with the consent of the MBE/WBE, so long as the lease gives the MBE/WBE absolute priority for use of the leased truck. This type of lease may count toward the MBE/WBE's credit as long as the driver is under the MBE/WBE's payroll.

(7) Subcontracted/leased trucks shall display clearly on the dashboard the name of the MBE/WBE that they are subcontracted/leased to and their own company name if it is not identified on the truck itself. Magnetic door signs are not permitted.

MBE/WBE Replacement

When a Contractor has relied on a commitment to a MBE or WBE firm (or an approved substitute MBE or WBE firm) to meet all or part of a contract goal requirement, the contractor shall not terminate the MBE/WBE for convenience. This includes, but is not limited to, instances in which the Contractor seeks to perform the work of the terminated subcontractor with another MBE/WBE subcontractor, a non-MBE/WBE subcontractor, or with the Contractor's own forces or those of an affiliate. A MBE/WBE may only be terminated after receiving the Engineer's written approval based upon a finding of good cause for the proposed termination. The prime contractor must give the MBE/WBE firm 5 days to respond to the prime contractor's notice of intent to terminate and advise the prime contractor and the Department of the reasons, if any, why the firm objects to the proposed termination of its subcontract and why the Department should not approve the action.

All requests for replacement of a committed MBE/WBE firm shall be submitted to the Engineer for approval on Form RF-1 *(Replacement Request).* If the Contractor fails to follow this procedure, the Contractor may be disqualified from further bidding for a period of up to 6 months.

The Contractor shall comply with the following for replacement of a committed MBE/WBE:

(A) Performance Related Replacement

When a committed MBE/WBE is terminated for good cause as stated above, an additional MBE/WBE that was submitted at the time of bid may be used to fulfill the MBE/WBE commitment to meet the Combined MBE/WBE Goal. A good faith effort will only be required for removing a committed MBE/WBE if there were no additional MBEs/WBEs submitted at the time of bid to cover the same amount of work as the MBE/WBE that was terminated.

If a replacement MBE/WBE is not found that can perform at least the same amount of work as the terminated MBE/WBE, the Contractor shall submit a good faith effort documenting the steps taken. Such documentation shall include, but not be limited to, the following:

(1) Copies of written notification to MBEs/WBEs that their interest is solicited in contracting the work defaulted by the previous MBE/WBE or in subcontracting other items of work in the contract.

(2) Efforts to negotiate with MBEs/WBEs for specific subbids including, at a minimum:

(a) The names, addresses, and telephone numbers of MBEs/WBEs who were contacted.

(b) A description of the information provided to MBEs/WBEs regarding the plans and specifications for portions of the work to be performed.

(3) A list of reasons why MBE/WBE quotes were not accepted.

(4) Efforts made to assist the MBEs/WBEs contacted, if needed, in obtaining bonding or insurance required by the Contractor.

(B) Decertification Replacement

(1) When a committed MBE/WBE is decertified by the Department after the SAF (*Subcontract Approval Form*) has been received by the Department, the Department will not require the Contractor to solicit replacement MBE/WBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement.

(2) When a committed MBE/WBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named MBE/WBE firm, the Contractor shall take all necessary and reasonable steps to replace the MBE/WBE subcontractor with another similarly certified MBE/WBE subcontractor to perform at least the same amount of work to meet the Combined MBE/WBE Goal requirement. If a MBE/WBE firm is not found to do the same amount of work, a good faith effort must be submitted to NCDOT (see A herein for required documentation).

Changes in the Work

When the Engineer makes changes that result in the reduction or elimination of work to be performed by a committed MBE/WBE, the Contractor will not be required to seek additional participation. When the Engineer makes changes that result in additional work to be performed by a MBE/WBE based upon the Contractor's commitment, the MBE/WBE shall participate in additional work to the same extent as the MBE/WBE participated in the original contract work.

When the Engineer makes changes that result in extra work, which has more than a minimal impact on the contract amount, the Contractor shall seek additional participation by MBEs/WBEs unless otherwise approved by the Engineer.

When the Engineer makes changes that result in an alteration of plans or details of construction, and a portion or all of the work had been expected to be performed by a committed MBE/WBE,

the Contractor shall seek participation by MBEs/WBEs unless otherwise approved by the Engineer.

When the Contractor requests changes in the work that result in the reduction or elimination of work that the Contractor committed to be performed by a MBE/WBE, the Contractor shall seek additional participation by MBEs/WBEs equal to the reduced MBE/WBE participation caused by the changes.

Reports and Documentation

A SAF (*Subcontract Approval Form*) shall be submitted for all work which is to be performed by a MBE/WBE subcontractor. The Department reserves the right to require copies of actual subcontract agreements involving MBE/WBE subcontractors.

When using transportation services to meet the contract commitment, the Contractor shall submit a proposed trucking plan in addition to the SAF. The plan shall be submitted prior to beginning construction on the project. The plan shall include the names of all trucking firms proposed for use, their certification type(s), the number of trucks owned by the firm, as well as the individual truck identification numbers, and the line item(s) being performed.

Within 30 calendar days of entering into an agreement with a MBE/WBE for materials, supplies or services, not otherwise documented by the SAF as specified above, the Contractor shall furnish the Engineer a copy of the agreement. The documentation shall also indicate the percentage (60% or 100%) of expenditures claimed for MBE/WBE credit.

Reporting Minority and Women Business Enterprise Participation

The Contractor shall provide the Engineer with an accounting of payments made to all MBE/ WBE firms, including material suppliers and contractors at all levels (prime, subcontractor, or second tier subcontractor). This accounting shall be furnished to the Engineer for any given month by the end of the following month. Failure to submit this information accordingly may result in the following action:

(A) Withholding of money due in the next partial pay estimate; or

(B) Removal of an approved contractor from the prequalified bidders' list or the removal of other entities from the approved subcontractors list.

While each contractor (prime, subcontractor, 2nd tier subcontractor) is responsible for accurate accounting of payments to MBEs/WBEs, it shall be the prime contractor's responsibility to report all monthly and final payment information in the correct reporting manner.

Failure on the part of the Contractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from further bidding until the required information is submitted.

Failure on the part of any subcontractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from being approved for work on future DOT projects until the required information is submitted.

Contractors reporting transportation services provided by non-MBE/WBE lessees shall evaluate the value of services provided during the month of the reporting period only.

At any time, the Engineer can request written verification of subcontractor payments.

The Contractor shall report the accounting of payments through the Department's Payment Tracking System.

Failure to Meet Contract Requirements

Failure to meet contract requirements in accordance with Subarticle 102-15(J) of the *2018 Standard Specifications* may be cause to disqualify the Contractor.

STANDARD SPECIAL PROVISION
AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS

(5-20-08) Z-2

General Statute 143C-6-11. (h) Highway Appropriation is hereby incorporated verbatim in this contract as follows:

(h) Amounts Encumbered. – Transportation project appropriations may be encumbered in the amount of allotments made to the Department of Transportation by the Director for the estimated payments for transportation project contract work to be performed in the appropriation fiscal year. The allotments shall be multiyear allotments and shall be based on estimated revenues and shall be subject to the maximum contract authority contained in *General Statute 143C-6-11(c)*. Payment for transportation project work performed pursuant to contract in any fiscal year other than the current fiscal year is subject to appropriations by the General Assembly. Transportation project contracts shall contain a schedule of estimated completion progress, and any acceleration of this progress shall be subject to the approval of the Department of Transportation provided funds are available. The State reserves the right to terminate or suspend any transportation project contract, and any transportation project contract shall be so terminated or suspended if funds will not be available for payment of the work to be performed during that fiscal year pursuant to the contract. In the event of termination of any contract, the contractor shall be given a written notice of termination at least 60 days before completion of scheduled work for which funds are available. In the event of termination, the contractor shall be paid for the work already performed in accordance with the contract specifications.

Payment will be made on any contract terminated pursuant to the special provision in accordance with Subarticle 108-13(D) of the *2018 Standard Specifications*.

STANDARD SPECIAL PROVISION

MINIMUM WAGES

(7-21-09) Z-5

FEDERAL: The Fair Labor Standards Act provides that with certain exceptions every employer shall pay wages at the rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

STATE: The North Carolina Minimum Wage Act provides that every employer shall pay to each of his employees, wages at a rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all skilled labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all intermediate labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all unskilled labor on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

This determination of the intent of the application of this act to the contract on this project is the responsibility of the Contractor.

The Contractor shall have no claim against the Department of Transportation for any changes in the minimum wage laws, Federal or State. It is the responsibility of the Contractor to keep fully informed of all Federal and State Laws affecting his contract.

STANDARD SPECIAL PROVISION

TITLE VI AND NONDISCRIMINATION:

(6-28-77)(Rev 6/19/2018) Z-6

Revise the *2018 Standard Specifications* as follows:

Replace Article 103-4(B) with the following:

The North Carolina Department of Transportation is committed to carrying out the U.S. Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts.

The provisions of this section related to United States Department of Transportation (US DOT) Order 1050.2A, Title 49 Code of Federal Regulations (CFR) part 21, 23 United States Code (U.S.C.) 140 and 23 CFR part 200 (or 49 CFR 303, 49 U.S.C. 5332 or 49 U.S.C. 47123) are applicable to all North Carolina Department of Transportation (NCDOT) contracts and to all related subcontracts, material supply, engineering, architectural and other service contracts, regardless of dollar amount. Any Federal provision that is specifically required not specifically set forth is hereby incorporated by reference.

(1) **Title VI Assurances (USDOT Order 1050.2A, Appendix A)**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

(a) Compliance with Regulations

The contractor (hereinafter includes consultants) shall comply with the Acts and the Regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

(b) Nondiscrimination

The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

(c) Solicitations for Subcontractors, Including Procurements of Materials and Equipment

In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.

(d) Information and Reports

The contractor shall provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the FHWA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor shall so certify to the Recipient or the FHWA, as appropriate, and shall set forth what efforts it has made to obtain the information.

(e) Sanctions for Noncompliance:

In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it and/or the FHWA may determine to be appropriate, including, but not limited to:

(i) Withholding payments to the contractor under the contract until the contractor complies; and/or

(ii) Cancelling, terminating, or suspending a contract, in whole or in part.

(f) Incorporation of Provisions

The contractor shall include the provisions of paragraphs (a) through (f) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor shall take action with respect to any subcontract or procurement as the Recipient or the FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

(2) **Title VI Nondiscrimination Program (23 CFR 200.5(p))**

The North Carolina Department of Transportation (NCDOT) has assured the USDOT that, as a condition to receiving federal financial assistance, NCDOT will comply with Title VI of the Civil Rights Act of 1964 and all requirements imposed by Title 49 CFR part 21 and related nondiscrimination authorities to ensure that no person shall, on the ground of race, color, national origin, limited English proficiency, sex, age, or disability (including religion/creed or income-level, where applicable), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any programs, activities, or services conducted or funded by NCDOT. Contractors and other organizations under contract or agreement with NCDOT must also comply with Title VI and related authorities, therefore:

(a) During the performance of this contract or agreement, contractors (e.g., subcontractors, consultants, vendors, prime contractors) are responsible for complying with NCDOT’s Title VI Program. Contractors are not required to prepare or submit Title VI Programs. To comply with this section, the prime contractor shall:

1. Post NCDOT's Notice of Nondiscrimination and the Contractor's own Equal Employment Opportunity (EEO) Policy in conspicuous locations accessible to all employees, applicants and subcontractors on the jobsite.
2. Physically incorporate the required Title VI clauses into all subcontracts on federally-assisted and state-funded NCDOT projects, and ensure inclusion by subcontractors into all lower-tier subcontracts.
3. Required Solicitation Language. The Contractor shall include the following notification in all solicitations for bids and requests for work or material, regardless of funding source:

   "The North Carolina Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 US.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award. In accordance with other related nondiscrimination authorities, bidders and contractors will also not be discriminated against on the grounds of sex, age, disability, low-income level, creed/religion, or limited English proficiency in consideration for an award."
4. Physically incorporate the FHWA-1273, in its entirety, into all subcontracts and subsequent lower tier subcontracts on Federal-aid highway construction contracts only.
5. Provide language assistance services (i.e., written translation and oral interpretation), free of charge, to LEP employees and applicants. Contact NCDOT OCR for further assistance, if needed.
6. For assistance with these Title VI requirements, contact the NCDOT Title VI Nondiscrimination Program at 1-800-522-0453.

(b) Subrecipients (e.g. cities, counties, LGAs, planning organizations) may be required to prepare and submit a Title VI Plan to NCDOT, including Title VI Assurances and/or agreements. Subrecipients must also ensure compliance by their contractors and subrecipients with Title VI. (23 CFR 200.9(b)(7))

(c) If reviewed or investigated by NCDOT, the contractor or subrecipient agrees to take affirmative action to correct any deficiencies found within a reasonable time period, not to exceed 90 calendar days, unless additional time is granted by NCDOT. (23 CFR 200.9(b)(15))

(d) The Contractor is responsible for notifying subcontractors of NCDOT's External Discrimination Complaints Process.

1. Applicability

   Title VI and related laws protect participants and beneficiaries (e.g., members of the public and contractors) from discrimination by NCDOT employees, subrecipients and contractors, regardless of funding source.

2. Eligibility

   Any person—or class of persons—who believes he/she has been subjected to discrimination based on race, color, national origin, Limited English Proficiency (LEP), sex, age, or disability (and religion in the context of employment, aviation, or transit) may file a written complaint. The law also prohibits intimidation or retaliation of any sort.

3. Time Limits and Filing Options

   Complaints may be filed by the affected individual(s) or a representative and must be filed no later than 180 calendar days after the following:

   (i) The date of the alleged act of discrimination; or

   (ii) The date when the person(s) became aware of the alleged discrimination; or

   (iii) Where there has been a continuing course of conduct, the date on which that conduct was discontinued or the latest instance of the conduct.

   Title VI and related discrimination complaints may be submitted to the following entities:

   - North Carolina Department of Transportation, Office of Civil Rights, Title VI Program, 1511 Mail Service Center, Raleigh, NC 27699-1511; toll free 1-800-522-0453
   - Federal Highway Administration, North Carolina Division Office, 310 New Bern Avenue, Suite 410, Raleigh, NC 27601, 919-747-7010
   - US Department of Transportation, Departmental Office of Civil Rights, External Civil Rights Programs Division, 1200 New Jersey Avenue, SE, Washington, DC 20590; 202-366-4070

4. Format for Complaints

   Complaints must be in writing and signed by the complainant(s) or a representative, and include the complainant's name, address, and telephone number. Complaints received by fax or e-mail will be acknowledged and processed. Allegations received by telephone will be reduced to writing and provided to the complainant for confirmation or revision before processing. Complaints will be accepted in other languages, including Braille.

5. Discrimination Complaint Form

   Contact NCDOT Civil Rights to receive a full copy of the Discrimination Complaint Form and procedures.

6. Complaint Basis

   Allegations must be based on issues involving race, color, national origin (LEP), sex, age, disability, or religion (in the context of employment, aviation or transit). "Basis" refers to the complainant's membership in a protected group category.

TABLE 103-1
COMPLAINT BASIS

Protected Categories	Definition	Examples	Applicable Nondiscrimination Authorities
Race and Ethnicity	An individual belonging to one of the accepted racial groups; or the perception, based usually on physical characteristics that a person is a member of a racial group	Black/African American, Hispanic/Latino, Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, White	Title VI of the Civil Rights Act of 1964; 49 CFR Part 21; 23 CFR 200; 49 U.S.C. 5332(b); 49 U.S.C. 47123. *(Executive Order 13166)*
Color	Color of skin, including shade of skin within a racial group	Black, White, brown, yellow, etc.	
National Origin *(Limited English Proficiency)*	Place of birth. Citizenship is not a factor. (*Discrimination based on language or a person's accent is also covered)*	Mexican, Cuban, Japanese, Vietnamese, Chinese	
Sex	Gender. The sex of an individual. *Note:* Sex under this program does not include sexual orientation.	Women and Men	1973 Federal-Aid Highway Act; 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Age	Persons of any age	21-year-old person	Age Discrimination Act of 1975 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Disability	Physical or mental impairment, permanent or temporary, or perceived.	Blind, alcoholic, para-amputee, epileptic, diabetic, arthritic	Section 504 of the Rehabilitation Act of 1973; Americans with Disabilities Act of 1990
Religion (in the context of employment) *(Religion/ Creed in all aspects of any aviation or transit-related construction)*	An individual belonging to a religious group; or the perception, based on distinguishable characteristics that a person is a member of a religious group. In practice, actions taken as a result of the moral and ethical beliefs as to what is right and wrong, which are sincerely held with the strength of traditional religious views. ***Note:*** Does not have to be associated with a recognized religious group or church; if an individual sincerely holds to the belief, it is a protected religious practice.	Muslim, Christian, Sikh, Hindu, etc.	Title VII of the Civil Rights Act of 1964; 23 CFR 230; FHWA-1273 Required Contract Provisions. *(49 U.S.C. 5332(b);* *49 U.S.C. 47123)*

(3) **Pertinent Nondiscrimination Authorities**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest agrees to comply with the following non-discrimination statutes and authorities, including, but not limited to:

(a) Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.

(b) The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

(c) Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);

(d) Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability) and 49 CFR Part 27;

(e) The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);

(f) Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);

(g) The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

(h) Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;

(i) The Federal Aviation Administration's Nondiscrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);

(j) Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures Nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;

(k) Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of Limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

(l) Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

(m) Title VII of the Civil Rights Act of 1964 (42 U.S.C. § 2000e et seq., Pub. L. 88-352), (prohibits employment discrimination on the basis of race, color, religion, sex, or national origin).

(4) **Additional Title VI Assurances**

***The following Title VI Assurances (Appendices B, C and D) shall apply, as applicable*

(a) Clauses for Deeds Transferring United States Property (1050.2A, Appendix B)

The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of Assurance 4.

NOW, THEREFORE, the U.S. Department of Transportation as authorized by law and upon the condition that the North Carolina Department of Transportation (NCDOT) will accept title to the lands and maintain the project constructed thereon in accordance with the North Carolina General Assembly, the Regulations for the Administration of the Federal-Aid Highway Program, and the policies and procedures prescribed by the Federal Highway Administration of the U.S. Department of Transportation in accordance and in compliance with all requirements imposed by Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the U.S Department of Transportation pertaining to and effectuating the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. § 2000d to 2000d-4), does hereby remise, release, quitclaim and convey unto the NCDOT all the right, title and interest of the U.S. Department of Transportation in and to said lands described in Exhibit A attached hereto and made a part hereof.

(HABENDUM CLAUSE)

TO HAVE AND TO HOLD said lands and interests therein unto the North Carolina Department of Transportation (NCDOT) and its successors forever, subject, however, to the covenants, conditions, restrictions and reservations herein contained as follows, which will remain in effect for the period during which the real property or structures are used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits and will be binding on the NCDOT, its successors and assigns.

The NCDOT, in consideration of the conveyance of said lands and interests in lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns, that (1) no person will on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination with regard to any facility located wholly or in part on, over, or under such lands hereby conveyed [,] [and]* (2) that the NCDOT will use the lands and interests in lands and interests in lands so conveyed, in compliance with all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations and Acts may be amended [, and (3) that in the event of breach of any of the above-mentioned nondiscrimination conditions, the Department will have a right to enter or re-enter said lands and facilities on said land, and that above described land and facilities will thereon revert to and vest in and become the absolute property of the U.S. Department of Transportation and its assigns as such interest existed prior to this instruction].*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

(b) Clauses for Transfer of Real Property Acquired or Improved Under the Activity, Facility, or Program (1050.2A, Appendix C)

The following clauses will be included in deeds, licenses, leases, permits, or similar instruments entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(a):

1. The (grantee, lessee, permittee, etc. as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree [in the case of deeds and leases add "as a covenant running with the land"] that:

   (i.) In the event facilities are constructed, maintained, or otherwise operated on the property described in this (deed, license, lease, permit, etc.) for a purpose for which a U.S. Department of Transportation activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the (grantee, licensee, lessee, permittee, etc.) will maintain and operate such facilities and services in compliance with all requirements imposed by the Acts and Regulations (as may be amended) such that no person on the grounds of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.

2. With respect to licenses, leases, permits, etc., in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to terminate the (lease, license, permit, etc.) and to enter, re-enter, and repossess said lands and facilities thereon, and hold the same as if the (lease, license, permit, etc.) had never been made or issued. *

3. With respect to a deed, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to enter or re-enter the lands and facilities thereon, and the above described lands and facilities will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

(c) Clauses for Construction/Use/Access to Real Property Acquired Under the Activity, Facility or Program (1050.2A, Appendix D)

The following clauses will be included in deeds, licenses, permits, or similar instruments/ agreements entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(b):

1. The (grantee, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, "as a covenant running with the land") that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the (grantee, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the Acts and Regulations, as amended, set forth in this Assurance.
2. With respect to (licenses, leases, permits, etc.), in the event of breach of any of the above Non¬ discrimination covenants, the NCDOT will have the right to terminate the (license, permit, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued. *
3. With respect to deeds, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

STANDARD SPECIAL PROVISION

MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS

Z-7

NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (*EXECUTIVE NUMBER 11246*)

1. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, see as shown on the attached sheet entitled "Employment Goals for Minority and Female participation".

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in *41 CFR Part 60-4* shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in *41 CFR 60-4.3(a)*, and its effort to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the executive Order and the regulations *in 41 CFR Part 60-4*. Compliance with the goals will be measured against the total work hours performed.

2. As used in this Notice and in the contract resulting from this solicitation, the "covered area" is the county or counties shown on the cover sheet of the proposal form and contract.

EMPLOYMENT GOALS FOR MINORITY AND FEMALE PARTICIPATION

Economic Areas

Area 023 29.7%
Bertie County
Camden County
Chowan County
Gates County
Hertford County
Pasquotank County
Perquimans County

Area 024 31.7%
Beaufort County
Carteret County
Craven County
Dare County
Edgecombe County
Green County
Halifax County
Hyde County
Jones County
Lenoir County
Martin County
Nash County
Northampton County
Pamlico County
Pitt County
Tyrrell County
Washington County
Wayne County
Wilson County

Area 025 23.5%
Columbus County
Duplin County
Onslow County
Pender County

Area 026 33.5%
Bladen County
Hoke County
Richmond County
Robeson County
Sampson County
Scotland County

Area 027 24.7%
Chatham County
Franklin County
Granville County
Harnett County
Johnston County
Lee County
Person County
Vance County
Warren County

Area 028 15.5%
Alleghany County
Ashe County
Caswell County
Davie County
Montgomery County
Moore County
Rockingham County
Surry County
Watauga County
Wilkes County

Area 029 15.7%
Alexander County
Anson County
Burke County
Cabarrus County
Caldwell County
Catawba County
Cleveland County
Iredell County
Lincoln County
Polk County
Rowan County
Rutherford County
Stanly County

Area 0480 8.5%
Buncombe County
Madison County

Area 030 6.3%
Avery County
Cherokee County
Clay County
Graham County
Haywood County
Henderson County
Jackson County
McDowell County
Macon County
Mitchell County
Swain County
Transylvania County
Yancey County

SMSA Areas

Area 5720 26.6%
Currituck County

Area 9200 20.7%
Brunswick County
New Hanover County

Area 2560 24.2%
Cumberland County

Area 6640 22.8%
Durham County
Orange County
Wake County

Area 1300 16.2%
Alamance County

Area 3120 16.4%
Davidson County
Forsyth County
Guilford County
Randolph County
Stokes County
Yadkin County

Area 1520 18.3%
Gaston County
Mecklenburg County
Union County

Goals for Female

Participation in Each Trade

(Statewide) 6.9%

CS-1

CONSTRUCTION SPECIFICATIONS
PROJECT WBS 47892

A.0 GENERAL REQUIREMENTS

A.1 DEFINITIONS
Wherever the words defined in this paragraph or pronouns used in their stead occur in these specifications, they shall have the meanings here given.

(a) The term "Owner" or “Department” means the North Carolina Department of Transportation, and shall include its authorized Representatives and Inspectors.

(b) The terms "Contractor" or “builder” means the person, firm or corporation named as such in the contract and includes the plural number and the feminine gender when such are named in the contract as the contractor.

(c) The term "Subcontractor" means an individual, partnership, firm, joint venture, or Corporation to whom the Contractor, with written consent of the Engineer, sublets any part of the contract.

(d) The word "Vendor" shall be taken to mean suppliers and/or manufacturers of materials and equipment purchased by the Contractor for use in the work covered by these specifications.

(e) Coast Guard Inspector means Officer in Charge of Marine Inspection having cognizance over the certification of the vessel, where applicable, and includes Inspection Officers under his command.

(f) The words "approval of the Owners" or "approved" shall mean an approval in writing signed by the owners, and shall also mean approval by the cognizant U. S. Coast Guard, section or office where applicable.

(g) The words "furnish", "provide" and "install" shall be taken to mean that the Contractor shall provide and install the specified material or equipment with necessary fittings, foundations, piping, electrical wiring and fixtures, etc., and make necessary hook-up and connections even though one of the words only is used, unless it is specifically stated otherwise.

(h) The term "work" of the Contractor or Builder or subcontractor includes labor or materials or both unless specifically stated otherwise herein.

(i) The words "renew" or "replace" shall be taken to mean that the existing material or item referred to shall be removed and disposed of as directed, and other material or items installed in place of the same as in subparagraph (h) above.

(j) The word "reinstall" shall mean that existing material shall be reused in either its original or a new location, and completely installed as in subparagraph (h) above.

(k) The term "Notice" as used herein shall include all written notices, demands, instructions, claims, approvals, and disapprovals, required to obtain compliance with Contract requirements. Any written notice by either party to the Contract shall be considered sufficiently given if delivered to the other party, agent, representative or officer in person. The person to whom the notice is delivered shall sign the duplicate copy and return the same to the other party immediately after receipt.

(l) The words "or equal" shall be taken to mean of equal quality, size capacity, general configuration and suitability for the use intended, as the item or items set out. Where reference is made to "trade names" or "catalogs", the reference is descriptive and restrictive unless stated otherwise by adding "or equal".

(m) The words "best Marine quality" or "first-class material" shall be taken to mean the top grade product of an approved marine manufacturer.

(n) The words "first class workmanship" shall be taken to mean the level of quality that would be done by a capable marine mechanic experienced in construction and outfitting of passenger vessels, using proper tools in good condition and in accordance with normally accepted good shipbuilding practice.

(o) All "tons" used herein are 2,240 pounds each

(p) The term "Act of God" as used herein is defined as an unusual and extraordinary manifestation of the forces of nature that could not under normal conditions have been anticipated or expected. It includes a tornado, a hurricane, lightning, and fires caused by lightning, but it does not include strikes, or other work stoppages, rain not accompanied by a hurricane, fire not caused by lightning or hot or cold temperatures.

(q) The "Chief Engineer" means Chief Engineer of Operations Division of Highways, North Carolina Dept. of Transportation.

(r) "Division of Highways" means the division of the Department of Transportation which, under the direction of the Secretary of Transportation, carries out state highway planning, construction, and maintenance functions assigned to the Department of Transportation.

(s) The "Engineer" means the Chief Engineer of Operations, Division of Highways, North Carolina Department of Transportation, acting directly or through his duly authorized representatives.

(t) The "Inspector" means the authorized representatives of the engineer assigned to make a detailed inspection of any or all portions of the work and materials.

(u) "Department" or "Department of Transportation" means a principal department of the Executive Branch which performs the function of planning, construction, and maintenance of an integrated statewide transportation system.

(v) "Board" or "Board of Transportation" means the Board created by the provisions of NCGS 143B-350 for formulating polices for the Department of Transportation and awarding all transportation construction contracts.

A.2 BIDDING REQUIREMENTS AND CONDITIONS

A.2-1 INVITATION TO BID

After the advertisement has been made, an invitation to bid will be mailed to known qualified Contractors informing them that bids will be received for the construction of specific project. Such invitation will indicate the project number, principal characteristics, and general description; a general summary of the boat dimensions, capacity, propulsion, and hull type and material; and the time and place for the public opening and reading of bids received. Information concerning the cost of and the availability of plans and proposal forms will also be indicated in the invitation to bid.

A.2-2 PREQUALIFYING TO BID

Prospective Bidders shall prequalify with the Department. The requirements for prequalification will be furnished each prospective Bidder by the Contractual Services Management office, Raleigh, NC (919-707-4803). All required statements and documents should be filed with the Contractual Services Management office by the prospective Bidder at least **two (2) weeks prior to the date of opening of bids.** A bid will not be opened unless all prequalification requirements have been met by the bidder and have been found to be acceptable by the Contractual Services Management office.

A.2-3 CONTENTS OF PROPOSAL FORMS

A proposal form will be furnished by the Department upon request. Each proposal form will be marked on the front cover by the Department with the name of the prequalified firm or individual to whom it is being furnished. It will set forth the date and time for the opening of bids. The form will include any requirements which vary from or are not contained in the plans. It will also include a bid sheet on which the Contractor shall place his lump sum bid for the project. All papers bound with the proposal form are necessary parts thereof and **shall not be detached, taken apart, or altered.**

The plans, specifications and other documents designated in the proposal form shall be considered a part of the proposal form whether attached or not. The prospective Bidder will be required to pay the Department of Transportation the sum stated in the invitation to bid for each copy of the proposal form and each set of plans requested.

A.2-4 EXAMINATION OF PLANS AND SPECIFICATIONS

The Bidder shall carefully examine the proposal form, plans and specifications, before submitting a bid. It is mutually agreed that submission of a bid shall be considered prima-facie evidence that the Bidder has made such examinations and is reasonably satisfied as to the conditions to be

encountered in performing the work, and as to the requirements of the proposal form and contract.

A.2-5 PREPARATION AND SUBMISSION OF BIDS

All bids shall be prepared and submitted in accordance with the following listed requirements:

1. **THE PROPOSAL FORM FURNISHED BY THE DEPARTMENT SHALL BE USED AND SHALL NOT BE TAKEN APART OR ALTERED.** The bid shall be submitted on the same proposal form which has been furnished to Bidder by the Department, as identified by the Bidder's name marked on the front cover by the Department.
2. All entries including signatures shall be written in ink.
3. The Bidder shall submit a unit or lump sum price for every item in the proposal form other than items which are authorized alternates to those items for which a bid price has been submitted.
4. The total amount bid shall be written in figures in the proper place in the proposal form.
5. Changes in any entry shall be made by marking through the entry in ink and making the correct entry adjacent thereto in ink. A representative of the bidder shall initial the change in ink.
6. The bid shall be properly executed. In order to constitute proper execution, the bid shall be executed in strict compliance with the following:

a. If a bid is by an individual, it shall show the name of the individual and shall be signed by the individual with the word "Individually" appearing under the signature. If the individual operates under a firm name, the bid shall be signed in the name of the individual doing business under the firm name.

b. If the bid is by a corporation, it shall be executed in the name of the corporation by the President or Vice President. It shall be attested by the Secretary or Assistant Secretary. The seal of the corporation shall be affixed. If the bid is executed on behalf of a corporation in any other manner than as above, a certified copy of the minutes of the Board of Directors of said corporation authorizing the manner and style of execution and the authority of the person executing shall be attached to the bid or shall be on file with the Department.

c. If the bid is made by a partnership, it shall be executed in the name of the partnership by one of the partners.

d. If the bid is a joint venture, it shall be executed by each of the joint ventures in the appropriate manner set out above. In addition, the execution by the joint ventures shall appear below their names.

7. The bid shall not contain any unauthorized additions, deletions, or conditional bids.
8. The Bidder shall not add any provision reserving the right to accept or reject an award, or to enter into a contract pursuant to an award.
9. The bid shall be accompanied by a bid bond on the form furnished by the Department or a bid deposit. The bid bond shall be completely and properly executed in accordance with the requirements of Section A.2-6. The bid deposit shall be a certified check or cashier’s check in accordance with Section A.2-6.
10. The bid shall be placed in a sealed envelope and shall have been delivered and received by the Department prior to the time specified in the invitation to bid.

A.2-6 BID BOND OR BID DEPOSIT

Each bid shall be accompanied by a corporate bid bond or a bid deposit of a certified or cashier's check in the amount of at least 5% of the total amount bid for the contract. No bid will be considered or accepted unless accompanied by one of the foregoing securities. The bid bond shall be executed by a Corporate Surety licensed to do business in North Carolina and the certified check or cashier's check shall be drawn on a bank or trust company insured by the Federal Deposit Insurance Corporation and made payable to the Department of Transportation in an amount of at least 5% of the total amount bid for the contract. The condition of the bid bond or bid deposit is: the Principal shall not withdraw its bid within sixty (60) days after the opening of the same, and if the Board of Transportation shall award a contract to the Principal, the Principal shall within fourteen (14) calendar days after the notice of award is received by him give payment and performance bonds with good and sufficient surety as required for the faithful performance of the contract and for the protection of all persons supplying labor and materials in the prosecution of the work; in the event of the failure of the Principal to give such payment and performance bonds as required, then the amount of the bid bond shall be immediately paid to the Department as liquidated damages or, in the case of a bid deposit, the deposit shall be forfeited to the Department.

When a bid is secured by a bid bond, the bond shall be on the form furnished by the Department. The bid bond shall be executed by both the Bidders and a Corporate Surety licensed under the laws of North Carolina to write such bonds.

The execution by the Bidder shall be in the same manner as required by Section A.2-5 for the proper execution of the bid. The execution by the Corporate Surety shall be the same as is provided for by Section A.2-5, Item 6b, for the execution of the bid. The seal of the Corporate Surety shall be affixed to the bid bond. The bid bond form furnished is for execution of the Corporate Surety by a General Agent or Attorney in Fact. A certified copy of the Power of Attorney shall be attached if the bid bond is executed by a General Agent or Attorney in Fact. The Power of Attorney shall contain a certification that the Power of Attorney is still in full force and effect as of the date of execution of the bid bond by the General Agent or Attorney in Fact. If the bid bond is executed by the Corporate Surety by the President or Vice President, and attested to by the Secretary or Assistant Secretary, then the bid bond form furnished shall be modified for such execution, instead of execution by the Attorney in Fact or the General Agent.

When a bid is secured by a bid deposit (certified check or cashier's check), the execution of a bid bond will not be required.

A.2-7 DELIVERY OF BIDS

All bids shall be placed in a sealed envelope having the name and address of the Bidder, and the statement **"Bid for the Construction of Project No. WBS 47892 in Dare County"** on the outside of the envelope.

If delivered prior to the Bid Date, or on the day the bids are to be received, Bids may be delivered in person or by USPS, Federal Express, etc. to the State Contract Officer, at:

North Carolina Department of Transportation
Contract Standards and Development Unit
Century Center Building B (Delivery)
1020 Birch Ridge Drive
Raleigh, NC 27610
Attention: State Contract Officer
(919) 707-6900

If delivered in person to the State Contract Officer, bids shall have been received prior to **2:00 pm** on the day of the bid opening. If delivered by mail, bids shall have been received prior to **2:00 pm** on the day of the bid opening. Bids received after the times specified above **WILL NOT** be accepted and will be returned to the Bidder unopened.

A.2-8 WITHDRAWAL OR REVISION OF BIDS

A Bidder may, without prejudice to himself, withdraw a bid after it has been delivered to the Department of Transportation, provided the request for such withdrawal is either in writing or by telegram to the Chief Engineer of Operations or the Engineer presiding over the public opening of bids before the date and time set for the opening of bids. The Bidder may then submit a revised bid provided it is received prior to the time set for opening of bids.

Only those persons authorized to sign bids under the provisions of Article A.2-5, Item 6 shall be recognized as being qualified to withdraw a bid.

A.2-9 RECEIPT AND OPENING OF BIDS AND NON-COLLUSION AFFIDAVIT

(a) RECEIPT AND OPENING OF BIDS

Bids will be opened and read publicly at the time and place indicated in the invitation to bid. Bidders, their authorized agents, and other interested parties are invited to be present.

A bid will be received and opened from any Bidder who:

1. Is prequalified in accordance with the provisions of Article A.2-2, and
2. Has delivered the bid to the place indicated in the Specifications prior to the time indicated in the invitation to bid, and
3. Has attended the Mandatory Pre-Bid Meeting as required elsewhere in this contract.

A bid received from a Bidder who has not complied with the above requirements will be returned to the Bidder unopened and under no circumstances will be considered for award.

(b) NON-COLLUSION AFFIDAVIT

In compliance with Section 112(c) of Title 23 USC and current regulations of the Department, each and every Bidder will be required to furnish the Department with an affidavit certifying that the Bidder has not entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with his bid on the project.

Affidavit will be included in the proposal form as part of the Signature sheets. Execution of Signature sheets will also constitute execution of Non-Collusion Affidavit. Signature sheets shall be notarized.

A.2-10 REJECTION OF BIDS

Any bid submitted which fails to comply with any of the requirements of Articles A.2-5, A.2-6 and A.2-7 shall be considered irregular and may be rejected, except that any bid which fails to comply with Section A.2-5, Item 3 shall be considered irregular and will be rejected.

In addition to the above, any bids submitted by any Bidder who has failed to comply with the following requirement will be rejected.

Any bid submitted by a Bidder who at the time of the submission is bankrupt, insolvent, or has committed an act of bankruptcy or financially unable to meet its outstanding obligations, shall be considered irregular and will be rejected.

Any Bidder who has been disqualified from bidding shall have been requalified prior to the time set for receiving bids. The right to reject any and all bids shall be reserved to the Board.

A.2-11 DISQUALIFICATION OF BIDDERS

Any one of the following causes may be justification for disqualifying a Contractor from further bidding until he has applied for and has been requalified in accordance with Article A.2-2:
1. Unsatisfactory progress in accordance with Section A.7.
2. Being declared in default in accordance with Section A.32.
3. Uncompleted contracts which, in the judgement of the Chief Engineer of Operations, might hinder or prevent the prompt completion of additional work if awarded.
4. Failure to comply with prequalification requirements.
5. The submission of more than one bid for the same work from an individual, partnership, joint venture, or corporation under the same or different names.
6. Evidence of collusion among Bidders. Each participant in such collusion will be disqualified.
7. Failure to furnish a non-collusion affidavit upon request.

A.3 AWARD AND EXECUTION OF CONTRACT

A.3-1 CONSIDERATION OF BIDS

After the bids are opened and read, the amount bid for each item and the total bid will be checked and made known to the public.

The right is reserved to reject any or all bids, to waive technicalities, to request the low bidder to submit an up-to-date financial and operating statement, to advertise for new bids, or to proceed to do the work otherwise, if in the judgment of the Board, the best interests of the State will be promoted thereby.

A.3-2 AWARD OF CONTRACT

The award of the contract, if it be awarded, will be made by the Board to the lowest responsible Bidder whose bid complies with all the requirements prescribed. The lowest responsible Bidder will be notified by letter mailed to the post office address shown on his bid that his bid has been accepted and that he has been awarded the contract. This letter shall constitute the notice of award. The notice of award, if the award be made, will be issued within sixty (60) calendar days after the opening of bids, except that with the consent of the successful Bidder the decision to award the contract to such Bidder may be delayed for as long a time as may be agreed upon by the Department of Transportation and such Bidder. In the absence of such agreement, the lowest responsible Bidder may withdraw his bid at the expiration of the sixty (60) calendar days without penalty if notice has not been issued.

A.3-3 CANCELLATION OF AWARD

The Board of Transportation reserves the right to rescind the award of any contract at any time before the receipt of the properly executed contract and contract bonds from the successful Bidder.

A.3-4 RETURN OF BID BOND OR BID DEPOSIT

All bid bonds will be retained by the Department until the contract is executed by the successful Bidder, after which all such bid bonds will be destroyed unless the individual bid bond form contains a note requesting that it be returned to the Bidder or the Surety.

Checks which have been furnished as a bid deposit by all Bidders other than the three (3) lowest responsible Bidders will be retained not more than ten (10) days after the date of opening if bids. After the expiration of such period, Department of Transportation warrants in the equivalent amount of checks which were furnished as a bid deposit will be issued to all Bidders other than the three (3) lowest responsible Bidders.

Checks which have been furnished as a bid deposit by the three (3) lowest responsible Bidders will be retained until after the contract bonds have been furnished by the successful Bidder, at which time Department of Transportation warrants in the equivalent amount of checks which were furnished as a bid deposit will be issued to the three (3) lowest responsible Bidders.

A.3-5 CONTRACT BONDS

The successful Bidder, within 14 calendar days after the notice of award is received by him, shall provide the Department with a contract payment bond and contract performance bond each in an amount equal to 100 percent of the amount of the contract. All bonds shall be in conformance with *GS44A-33*. The Corporate Surety furnishing the bonds shall be authorized to do business in the State.

A.3-6 EXECUTION OF CONTRACT

As soon as possible following receipt of the properly executed contract bonds, the Department will complete the execution of the contract, retain the original contract and return one certified copy of the contract to the Contractor.

A.3-7 FAILURE TO EXECUTE CONTRACT

The successful Bidder's failure to file acceptable bonds within fourteen (14) calendar days after the notice of award is received by him shall be just cause for the forfeiture of the bid bond or bid deposit and rescinding the award of the contract. Award may then be made to the next lowest responsible Bidder or the work may be re-advertised and accomplished under contract or otherwise, as the Board of Transportation may decide.

A.4 INTENT

(a) It is the intent of these specifications that the Contractor shall build, equip, launch, test and deliver to the Owner one (1) vessel, as described, complete and ready for service in every respect as concerns the work covered herein. The Contractor shall provide the necessary plant, launch/railway and lay days to construct the vessel, all tools, materials, machinery, equipment, fittings and labor, including upkeep of the vessel until final acceptance by the Owner.

(b) The Contractor shall make removals and replacements as necessary to affect the work covered by these specifications as a part of the contract if required.

(c) The Contractor shall coat all new work and restore and recoat all areas disturbed due to the work required by these specifications as a part of the Contract.

(d) Any work, equipment, machinery, or other part or parts of the vessel injured or damaged while the vessel is in the custody of the Contractor during the progress of the work covered by these specifications shall be repaired by the Contractor to the satisfaction of the Inspector, at no cost to the Owner.

(e) Any work or detail omitted from these specifications or plans, but necessary to complete the specified construction covered herein in accordance with good shipbuilding practice shall be furnished by the Contractor as a part of the Contract at no additional cost to the Owner, and nothing herein or on the plans shall be construed as meaning otherwise.

(f) Whereas the true intent and meaning is manifest, the Contractor shall not be relieved from fulfilling the full requirements of the contract plans, contract guidance plans and specifications, or of the responsibility for producing satisfactory results, or of properly performing any work by any of the following:

Absence of the details where the essential features, functions and arrangements are defined. Mistakes in description of hull or machinery details which, if not corrected, would interfere with the proper performance of the items involved.

The Contractor is responsible for proper performance of the Contract in accordance with the full manifested intent of these specifications despite any error, omission, discrepancy or lack of clarity in the plans or specifications which should reasonably have been apparent to an experienced Contractor upon a careful and critical review.

(g) The intent above given is of the essence of these specifications.

A.5 INSPECTION

(a) All work and materials entering into the construction of the vessel, it's machinery, fittings and equipment shall be subject at all times to the inspection and approval of the Inspector and where applicable the U.S. Coast Guard.

(b) It is the duty of the Inspector to insist that the Contractor perform all work and supply all materials as called for in these specifications. The Contractor shall perform all work in a satisfactory manner. In the event that any work or materials fail to comply with these specifications the Inspector will notify the Contractor in writing of the deficiency or unsatisfactory work as soon as it comes to his attention.

(c) Any work not satisfactory, whether from defective material, departure from specifications, or poor workmanship, or any work performed in the absence of the Inspector and later found to be unsatisfactory, shall be removed and replaced promptly to the satisfaction of the Inspector, at the Contractor's expense.

(d) The Owners, the Inspector, the U. S. Coast Guard, and any person employed by the same shall be allowed access to the work at any time during the regular working hours of the Contractor, or at such other times as will not entail additional expense to the Contractor, and the Contractor shall furnish all reasonable facilities and give ample time for such inspection.

A desk, desk chair, 4-drawer legal file cabinet with lock and keys, three (3) chairs, a 3' x 6' x 32" drawing board, compact copy machine, refrigerator at least 2 cubic feet, access to coffee maker, adequate lighting, access to sanitary facilities, and a dedicated parking space, shall be provided in a private office, and apart from facilities occupied by contractor's personnel. Office shall have lockable doors with keys and shall be for the Inspector's and Owner's sole use during the contract period. Office shall be provided with telephone service and internet connection with broadband service. Contractor shall provide internet service access as a part of this contract.

(e) The Inspector shall determine the amount, quality, acceptability, and witness all parts of the work. He shall interpret the specifications, Contract Documents and supplemental agreements, if any, and he shall decide all other questions in connection with the work. The Inspector shall have no authority to approve or order changes in the work which alter the terms or conditions of the Contract. The Inspector shall confirm in writing within five (5) days any oral order, direction, requirement, or determination. The decision of the Inspector shall be final and binding on both Contractor and Owner.

(f) Nothing herein shall be taken to relieve the Contractor of complete responsibility for unsatisfactory workmanship, faulty materials or other deficiencies of any kind whatsoever that are the result of his work, his sub-contractors work, or material purchased or provided and installed by him.

(g) The Inspector shall have general surveillance of the work. All orders and communications from the Contractor shall be transmitted through him. He shall have authority to stop the work whenever such stoppage may be necessary to ensure the proper execution of contract, said stoppage is to be a Contractor caused delay in computing liquidated damages, if any, for late delivery.

(h) As the Inspector is, in the first instance, the interpreter of the conditions of the contract and the judge of its performance, he shall use his powers under the contract to enforce its faithful performance.

(i) The Contractor shall notify the Inspector prior to all Contractor scheduled meetings or inspections relevant to this contract which involve any representative of the U.S. Coast Guard. The Inspector shall be given the opportunity, at his option, to be present on such occasions. At no time shall the Contractor allow access to any portion of this contract by personnel other than those employed by the Contractor without first receiving the Inspectors approval.

A.6 LAWS, PERMITS, AND REGULATIONS

(a) The Contractor shall obtain and pay for all licenses and permits and shall pay for all fees and charges for connection to outside service and use of property other than the site of the work for storage of materials and other purposes.

(b) The Contractor shall comply with all laws, ordinances, and regulations applicable to the work unless in conflict with contract requirements. If the Contractor ascertains at any time that any requirements of this Contract are at variance with applicable laws, ordinances, or regulations he shall promptly notify the Inspector and Owner and any necessary adjustment of the Contract shall be made as specified under Changes in the work.

(c) Any questions arising under this contract shall be determined under the laws of the State of North Carolina.

(d) The Contractor shall furnish the Inspector copies of affidavits upon request giving the original dates, renewal dates and expiration dates of all labor contracts, if any, related to any phase of the work to be performed in the shipyard under this contract.

A.7 PROSECUTION OF WORK (LIQUIDATED DAMAGES)

(a) Date of completion is the essence of any contract resulting from these specifications and plans. The Contractor will be required to complete all work no later than the date stated in the contract.

(b) Should progress of the work lag or fall behind schedule, the Contractor shall direct sufficient additional labor to work, including overtime if required, to maintain the contract delivery date, at no additional cost to the Owner.

(c) The Contractor will be required to pay liquidated damages for each and every day that delivery is delayed beyond the contract date for its completion. The timely completion of the performance of this contract has a substantial financial value to the Owners, which value is difficult or impossible to forecast or evaluate exactly. It is, therefore, stipulated and agreed that the value to the Owners for each calendar day of delay in delivery of the vessel by the Contractor to the Owners beyond the contract completion date of the work to be performed by the Contractor under this contract shall be a fixed sum and shall be set in advance. Upon the foregoing consideration and for the purpose of this contract, the sum of **One Thousand Dollars ($1,000.00) per calendar day** is hereby mutually agreed upon as the sum which the Contractor shall give to the Owners as liquidated damages for each calendar day delayed beyond the contract completion date that the work remains unfinished and said vessel remains undelivered.

(d) For the purpose of these specifications in determining the calendar days for which liquidated damages will be charged the Contractor shall be entitled to an extension of the contract time or to an apportionment and remittance of liquidated damages when a contract is not completed within the contract time to the extent that delays to the current controlling operations, or operations, were caused by acts of God as defined herein, or acts of the Boards or its agents. The Contractor, however, shall be entitled to an extension of contract time, or an apportionment and remittance of liquidated damages, only to the extent and in the proportion that such delays were caused by acts of God or acts of the Board, and it is understood that the Board does not hereby waive or release any claim against the Contractor for liquidated damages when the contract is not completed within the contract time for any reason whatsoever other than the said acts of God or acts of the Board. A request by the Contractor for an extension of time shall be made to the Inspector within five (5) days after such delay has occurred and he shall make a determination as to the cause of the delay and the amount of time that the contract should be extended by reason of such delay.

(e) It is understood and agreed that if a claim is filed for an extension of contract time, or an apportionment and remittance of liquidated damages, the burden of proof shall be upon the Contractor to establish the acts of God or the acts of the Board causing the alleged delay; and if the Contractor fails to sustain the burden of proof, he shall not be entitled to an extension of contract time, or to an apportionment and remittance of liquidated damages. The burden of proof herein referred to shall be the same that in other cases of like nature exists. Proof by the Contractor of delays due to an act of God or act of the Board to enforce or collect liquidated damages due to any other reason whatsoever.

(f) The Contractor is hereby notified that no consideration will be given to requests for remissions of liquidated damages for any reason whatsoever, except as covered by Paragraph A.7 herein. The Contract date for completion will be changed on a negotiated basis for any work authorized or deleted by supplemental agreements to the original contract.

A.7-1 WORK PROGRESS

(a) It is the intent of these specifications that the Contractor shall commence work on the date of availability as noted elsewhere herein. The Contractor shall not begin work prior to the date of availability without written approval of the Inspector. If such approval is given and the Contractor does begin work prior to the date of availability, the Department will assume no responsibility for any delays caused prior to the date of availability by any reason whatsoever, and such delays, if any, will not constitute a valid reason for extending the completion date.

(b) The Contractor shall not perform any work on the project until the Department has received the properly executed contract and contract bonds.

(c) It is further the intent of these specifications that the Contractor shall pursue the work diligently with workmen in sufficient numbers, abilities, and supervision and with equipment, material, and method of construction as may be required to complete the work described in the contract, or as may be amended by the completion date.

A.7-2 MASTER CONSTRUCTION SCHEDULE

(a) The Contractor shall prepare and submit for approval by the Inspector, a Master Construction Schedule of his proposed working progress on the project. The Contractor shall submit to NCDOT, the preliminary Master Construction Schedule showing the Contractor's plan and construction sequence proposed to accomplish the work with the Contract period. The preliminary and all subsequent Master Construction Schedule submittals shall be in PDF format and in MS Project native file format. NCDOT will review this document, comment, and return review comments within ten (10) working days to the Contractor. NCDOT will then meet with the Contractor to discuss the comments. The Contractor shall schedule the review meeting to be held within ten (10) working days after receipt of NCDOT comments. The Master Construction Schedule shall be updated by the Contractor within two (2) working days after the review meeting, and then resubmitted to NCDOT for final approval as the working document.

(b) The Master Construction Schedule shall sequence and schedule all work detailed in the Contract Documents, in accordance with the generally accepted practices for project management. The Master Construction Schedule shall be a time-phased/resource loaded Gantt Bar Chart. The Contractor shall decompose the activities indicated in the Contract Documents, down to a sufficient number of discrete tasks, to adequately control and monitor the work and to clearly report progress for the duration of the project. Progress shall be shown as a percentage by task, by boat and by overall project completion. Indicate, by table or directly on the Gantt Bar Chart, the start and stop dates, free float, and total float for each task. Indicate, by table or by link lines, all predecessor and successor dependencies for each task. Develop and clearly indicate the critical path through the project.

(c) The proposed Master Construction Schedule shall be submitted no later than the date of the project preconstruction conference (Section A.7-3) and before any work is begun on the project.

(d) When conditions beyond the Contractor's control have adversely affected his progress, the Contractor may submit a revised Master Construction Schedule to the Inspector for approval. Such revised Master Construction Schedule will not be approved unless accompanied by a detailed written statement giving the Contractor's reasons for the proposed revision.

(e) When, at any time during construction or repair of the project, the Contractor's progress deviates substantially from the latest approved Master Construction Schedule, the Inspector may request the Contractor to submit a revised Master Construction Schedule. Revised Master Construction Schedule requested by the Inspector shall be submitted within two (2) working days after the date of such request.

(f) The Master Construction Schedule shall additionally indicate the starting and completion dates of the following items:

A. The Contract award date.
B. Commencement and completion of engineering.
C. Regulatory body submittal dates for calculations and drawings.
D. Long lead time purchase order submittals. Anticipated date of delivery of all long lead time equipment and components and all major equipment.
E. Construction of the demi-hull erection jig.
F. USCG Dry Search of Hull (Fit-up and welding completed).
G. Prefabrication, fabrication, assembly and erection of all structural components.
H. Installation of major machinery components and packaged assemblies: Piping, mechanical, electrical, ventilation, coating, and outfitting systems installation.
I. Builder's trials.
J. Dock trials.
K. Sea trials.
L. Delivery of vessel to NCDOT.
M. Anticipated Owner's acceptance of the vessel.
N. Start, duration and completion of all significant task items.
O. Anticipated date of all items described in this Specification for NCDOT Representative's Review or Approval.

Review of the Master Construction Schedule by the NCDOT Representative does not relieve the Contractor of its responsibility to adjust labor force, equipment resources, or work schedule, as necessary, to anticipate and ensure completion of the work within the prescribed contract period.

A.7-3 PRECONSTRUCTION CONFERENCE

Immediately after receipt of notice of award, the Owner, Design Firm Elliott Bay Design Group (EBDG) and the Contractor will establish a mutually agreeable date on which the preconstruction conference will be held. The Contractor's project superintendent and other individuals representing the Contractor who are knowledgeable of the Contractor's proposed progress schedule or who will be in charge of major items of the work shall attend the preconstruction conference. Contractor shall provide necessary personnel to take, transcribe, correct, reproduce and distribute minutes of the pre-construction meeting.

A.7-4 CONSTRUCTION CONFERENCES

(a) After work on the project has begun, initially construction conferences shall be held monthly and adjusted to suit construction. The construction conferences are to be scheduled at times which are mutually agreeable to both the Contractor's project superintendent and the Inspector. It shall be the superintendent's responsibility to attend the conference. Contractor may elect to have other members (See Section A.7-3) of his staff attend construction conferences. Contractor shall provide necessary personnel to take, transcribe, reproduce and distribute minutes of each meeting.

(b) The Contractor shall schedule and chair a monthly progress meeting, starting the first week, with the NCDOT Representative and the Contractor's key production persons. The Contractor shall provide an updated Master Construction Schedule and a progress report (expressed as a percentage of work complete) by Activity in a tabular form, and a list of completed milestones. The updated Master Construction Schedule shall reflect opened items, additional work, deleted work, and modifications, in addition to work progress and completions. In the last seventy five (75) calendar days of the scheduled performance period, the Contractor shall additionally prepare and submit an Open Task Report. The Contractor shall update and submit the Open Task Report at each subsequent progress meeting, and then daily starting the first day of the last thirty (30) calendar days of the scheduled performance period.

A.8 MATERIALS

(a) All materials intended for use, and all equipment used shall be new and as specified or as shown on plans except where Owner furnished (Paragraph A.17). Should the Contractor desire to substitute any material or equipment for that specified he must first obtain an order from the Owner in writing. (See also paragraphs A.5 and A.11 herein.)

(b) It is the responsibility of the Contractor to furnish sufficient data and information on materials he wishes to substitute to allow the Owner to make a decision.

(c) All equipment, where required, shall be of U. S. Coast Guard approved type and manufacture, and details or plans shall be submitted for U. S. Coast Guard approval by the Contractor where required and not previously approved. (See Section A.10 & A.11 "Plans and Specifications").

(d) Steel plate, shapes and other metal work shall be of the best quality domestic metal products for its particular purpose.

(e) Paints, electrical, piping, and all other materials shall conform to the standards of first class material for passenger vessels, as specified herein.

(f) All galvanizing shall be "hot dip" process.

(g) All plywood shall be waterproof marine type in all cases, with all edges sealed before installation, but after cutting to shape.

(h) Two (2) copies of each purchase order for all materials, articles, and equipment purchased by the Contractor shall be furnished to the Inspector prior to issue to the vendor. Purchase orders shall show unit and total price of materials, articles and equipment purchased and vendor's complete address.

(i) Materials requiring specified approval, which are ordered by the Contractor before approval, shall be entirely at the risk of the Contractor.

(j) Where material herein specified is not available on the present market, alternate materials of equal quality at no additional cost may be processed for approval of the Inspector by the Contractor.

(k) Any material or equipment provided by the Contractor which proves defective and unfit for service either before or after installation and whether previously approved or not shall be replaced by the Contractor with satisfactory items without additional cost to the Owner.

(l) Buy America compliance - This is a 100% North Carolina funded project. Source of supply and quality of materials shall comply with NCDOT requirements, as specified in *Standard Specifications for Roads and Structures 2018*. The Buy America requirements as required by NCGS 136-28.7 and 23 CFR 635.410 for federal aid highway projects shall apply to this project.

In accordance with 23 CFR 635.410, a nationwide waiver has been granted for certain ferryboat equipment and machinery items: **marine diesel engines, electrical switchboards and switch gear, electric motors, pumps, ventilation fans, boilers, electrical controls, and electronic equipment**. Items not specifically included in the waiver remain subject to the Buy America requirements. While waivers may be requested for other items, the basis of successful waiver applications is the non-availability of a functionally equivalent and serviceable product in which all steel and iron is of wholly US origin. Any waiver request must be submitted by NCDOT, therefore the Contractor must apply to NCDOT to make a waiver application on their behalf. Any delay associated with any waiver application is the sole responsibility of the Contractor, and is not grounds for additional time or receipt of additional payment.

The Contractor shall be responsible for ensuring that its subcontractors also comply with these requirements.

The Contractor shall monitor the Buy America compliance throughout the duration of the Contract.

The Contractor shall provide monthly updates of Buy America certification, inclusive of detailed, current status of contract percentages.

In addition to the national waiver listed above, a waiver for this project has been approved. The items approved are listed in the chart on the following page.

NCDOT - FERRY Division

New Ferry Project Contract C204243 WBS 47892

August 1, 2018

Material Description	Group	Manufacturer	Vendor	Material Specification	Comments
Stainless Steel Plate	Hull Material	Unknown	Aluminum & Stainless	A-316	Deck Inserts at A & B Ends
Gate Valves - 2"	Piping	Unknown	WO Supply	A-385 Cast Steel	Not made in USA
Swing Check Valve	Piping	Unknown		Carbon Steel A-216	Not made in USA
Ball Valves - 1", 1 1/2", 2"	Piping	Unknown	Carbon Steel and Stainless	A-105 and A-316	Not made in USA
Globe Valves - 3/4" and 1" NPT	Piping	Unknown	WO Supply	A-105 Carbon Steel	Not made in USA
Gate Valve - 4", 3" and 2"	Piping	Unknown	WO Supply	A-216 Carbon Steel	Not made in USA
Butterfly Valves - 3"	Piping	Unknown	WO Supply	A-216 Carbon Steel	Not made in USA
Davit for Rescue Boat	Outfitting	Palfinger	Palfinger	Steel A-36	Minimal Amount of Material Foreign
Propulsion Unit, Azimuth Twin Blade	Propulsion	Schottel	Schottel	Iron	Not made in USA
Nuts and Bolts - 1/4" thru 3/4"	All	Unknown	Unknown	A-316 Stainless Steel	Not made in USA

NOTE TO CONTRACTOR - The items listed above have been waived out of the Buy America requirements

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A.8-1 MATERIAL SUBSTITUTION

This Specification and the Contract Guidance Drawings describe features, salient characteristics, and systems' performance in conjunction with equipment and outfit items as a means of describing the general quality of design and construction of the various items and articles. It shall be understood that this quality of design and construction is NCDOT's preference. Substitutions for such items must be of "equivalent" quality and performance, and must be approved by NCDOT in writing.

An "equivalent" substitution is one which exhibits the same size, weight, characteristics, performance, reliability, and maintainability of the system and of the vessel as the item or material described by this Specification and Contract Guidance Drawings. The Contractor shall be wholly responsible for demonstrating the equivalent status of any substitution.

Requests for substitutions shall be made in writing to NCDOT, setting forth the reason for the proposed substitution and providing documented evidence of the substitute's equivalence or superiority to the equipment, component or material integrated in the design. The request shall also provide the Contractor's assurance that the substitution, if approved, will not result in any increase in the Contract Price nor an extension of the delivery date of the vessel.

Requests for substitutions must include in writing:

(a) Regulatory Body approval (as applicable).

(b) Compliance with Buy America requirements (as applicable).

(c) Comprehensive comparison of construction features and materials between the design guidance item and the proposed item. Complete drawings and dimensional data shall be submitted for each item. The weight of each item will be provided.

(d) Comprehensive comparison of performance characteristics between the design item and the proposed item.

(e) Comprehensive list of impacts that the substitution will cause to arrangements, structure and interfacing of piping, ventilation, electrical and control systems.

(f) Valid manufacturers' price quote for the proposed item.

(g) Location of the nearest distributor stocking parts and providing field service for the proposed item.

(h) Verification that the item has similar or longer history of in use experience in commercial marine service.

(i) Statement from Contractor indicating that the proposed substitution will not be a cost increase and will not extend the delivery date of the vessel.

Incomplete substitution requests will not be considered.

Substitutions will be considered if based upon Contractor preference or familiarity with an item or equipment, provided it can be demonstrated that the item is equivalent (as defined above) to or better than the design item.

Substitutions will not be considered based upon cost savings alone. For each substitution proposed, a valid price quote shall be obtained by the Contractor from the manufacturer of the item integrated into the design and the proposed substitution. If the substitution is approved, any such cost savings will be subject of a change order providing a credit for the full difference to the Owner. Substitutions for more expensive items will only be considered if they result in no cost change to the Owner, unless there is substantial benefit for the Owner.

NCDOT will respond to complete written requests within ten (10) working days. NCDOT's decision will be final.

The Contractor shall be responsible for all engineering costs and construction costs associated with any substitution.

A.8-2 PURCHASE TECHNICAL SPECIFICATIONS, REQUISITIONS AND PURCHASE ORDERS

The Contractor shall submit all purchase technical specifications, requisitions, purchase orders, or similar descriptive data for review of compliance with the contract requirements by NCDOT prior to purchasing equipment. Each document shall contain a full technical description of the material to be ordered. If the Contractor wishes to purchase or supply equipment, fittings, or outfit other than that specified, the Contractor shall first inform NCDOT of the details of the intended purchase, and secure specific written approval in each such instance.

The Contractor shall, at a minimum, develop detailed purchase technical specifications for the following major equipment and systems:

(a) Propulsion engines and generators
(b) Reduction gears
(c) Cycoidal Drive Units - 600 HP (300 Azimuth Propulsion Units)
(d) Ship service generators
(e) Ship service switchboard
(f) Control systems
(g) Alarm and monitoring systems
(h) Fire suppression system
(i) Shafting No Shafting required
(j) Propulsion Exhaust System
(k) All purchases over $5,000.00

For all other equipment, purchase orders shall be submitted for review by NCDOT. This includes

all fans, pumps, electrical and electronic equipment, pipe, valves, pipe components, propulsion shafting components, bearings, couplings and components, paint and vinyl, windows and doors. Deliver electronic copies, in PDF format, of all vendor drawings or documents to NCDOT no later than the date the equipment is delivered to the Contractor's facilities.

Furnish a copy of all correspondence and technical data affecting design features of vendor items along with the submittal of the drawings showing these items.

A.9 WORKMANSHIP

(a) Workmanship throughout shall be first class and high grade in all respects for passenger vessels. Particular care shall be taken to insure fair lines, adequate and proper fastening, suitable butts and scarfs, smooth surfaces, neat and substantial work, and the maximum degree of water tightness. All welding shall be done by competent USCG/ABS certified welders. All plating shall be free of uneven and wavy lines or wrinkles after welding. (See paragraph A.27 herein also).

(b) The work shall be executed by competent workmen, in each trade, experienced in marine construction, and under adequate supervision to assure first class workmanship throughout.

(c) Ragged edges or sharp projections which are hazardous to operating personnel, contribute to additional maintenance, or detract from the finished appearance shall be eliminated.

(d) Dimensional tolerances, fit alignment, fairness and finish shall be in accordance with approved working plans. Where tolerances are not given on working drawings or specified elsewhere, a standard of plus or minus 1/16 of an inch will be assumed for non-machined fits. Machined fits shall be in accordance with S.A.E. Standards for tolerance and finish.

(e) Fittings at openings through decks and bulkheads for pipes, cables, etc., shall be properly designed to maintain watertight integrity, reduce transmission of heat and eliminate transfer of machinery vibration and noise to the hull structure. Doubler plates, inserts or other suitable strengthening shall be fitted at all bulkhead and hull penetrations.

(f) Piping and cables shall be run as indicated on plans and shall pierce the bulkheads as close under the decks and as near the top of the bulkheads as practicable.

A.9-1 ON SITE PROJECT SUPERVISION

(a) At all times that work is actually being performed, the Contractor shall have present on the project one competent individual who has been authorized to act in a supervisory capacity over all work on the project including work subcontracted. This individual who has been so authorized shall be experienced in the type of work being performed and is to be fully capable of managing, directing and coordinating the work; of reading and thoroughly understanding the contract; and of receiving and carrying out directions from the Inspector. He shall be an employee of the Contractor.

(b) The project Supervisor shall be authorized to accept and sign for notices and instructions, if and when found necessary, from the Inspector.

(c) The Project Supervisor shall be identified at the time of the Pre-construction Conference, Section A.7-3, and shall meet with the Inspector's approval. Should it become necessary to assign another individual in this position, the Contractor shall provide the Inspector written notification within five (5) working days of the proposed change. The individual assigned shall be approved by the Inspector and shall be capable of assuming the duties as outlined in Section A.9-1 (a) and (b) herein.

A.10 PLANS AND SPECIFICATIONS

(a) All work shall conform to these specifications, the plans, the Notice to Bidders and the Bid Proposals, which are made a part hereof by reference.

(b) The plans and these specifications are to be considered as mutually explanatory or supplementary, and any feature shown on one and not on the other shall have the same force and effect as though shown on both. Should any discrepancy appear or any misunderstanding arise as to the importance of anything contained in them it shall be called to the attention of the Marine Engineer or Inspector immediately, and no further work performed on the item in question until a decision is reached. Work performed based on such an error, omission, discrepancy or lack of clarity shall be at the Contractor's risk and expense. These plans and specifications shall be used by the Contractor as guides in the prosecution of the work required.

(c) The following plans will be furnished by the Owner to the Contractor: (List of plans is attached ahead of the Technical Specifications). These drawings were produced by computer aided drafting methods. CAD drawings were developed using AUTODESK, AutoCAD Release 2016.

(d) Contract Plans **HAVE NOT BEEN** submitted to the U.S. Coast Guard for approval. However, they have been stamped by a P.E. from EBDG and are thought to conform to all requirements.

(e) It is expressly understood that the Contractor shall verify all quantities and figures will be held responsible for the proper coordination of all dimensions and the work, and that the furnishing of the drawings herewith will not relieve the Contractor from responsibility for errors or omissions in dimensions and quantities. No addition to the cost will be entertained for errors, omissions or for discrepancies found between actual details and the plans and specifications after the proposal has been received.

(f) The Owner reserves the right to alter the drawings to correct or avoid impossible conditions created by prosecution of the work. The alterations necessary in the work, if any, are to be made by the Contractor without additional cost to the Owner.

A.11 DETAIL WORKING DRAWINGS

(a) Detail working drawings shall be prepared in accordance with contractor prepared working drawings list provided ahead of the Technical Specifications. Two (2) copies of each contractor prepared and/or revised drawing shall be submitted to the owner for review and comments. Owner comments, if any, shall be incorporated in drawings and two (2) copies re-submitted to the Owner

for final approval prior to submittal to U.S. Coast Guard Marine Safety Center, Washington, D.C. if required. Owner's drawing review action can be expected in one of the following manners:

(1) "APPROVED" - Drawing is acceptable and ready for U.S. Coast Guard review and/or or construction.
(2) "APPROVED SUBJECT TO COMMENTS" - Owner's comments shall be included on drawing at next normal issue, U.S. Coast Guard submittal or issue for construction.
(3) "RETURNED FOR REVISION" - Drawing is not in accordance with contract specification and/or applicable regulatory body (U.S. Coast Guard EEE45, etc.) rules and regulations. Drawing shall be revised resubmitted to owner for approval prior to issue and/or Coast Guard submittal.
(4) "REJECTED" - Drawing is not in compliance with Contract Specific and shall be redeveloped and resubmitted to owner for review.
(5) "EXAMINED" - Plans, calculations, sketches, etc., are found to be in accordance with contract specifications and do not require specific Owner approval. General data of this nature is supporting documentation.

(b) Contractor shall provide all engineering services necessary for the development and construction of the vessel, including technical calculations, and prepare and submit to the Engineer two (2) copies each for his approval all calculations, shop and working drawings as required. Working and shop drawings will be reviewed, and approved, or returned for correction, as promptly as the conditions will permit. No deviations from approved working drawings shall be made without the written approval of the Inspector.

(c) Plans/Drawings shall be prepared by the Contractor's Engineering Design personnel or by subcontract with an approved Engineering Design Agent. All plans shall be prepared using AUTODESK, AutoCAD Release 2016. All plans shall be revised providing details, assembly arrangements and material list to indicate "as built" condition. AutoCAD original drawings shall reflect all changes to "as built" conditions. AutoCAD drawings shall be REPLOTTED on plain bond paper in accordance with Section A.11 (d) herein.

(d) Original drawings shall be of uniform size 24”x 36” (arch size D) prepared on 20 lb. plain bond paper and to comply with sample format for title block etc. as provided to the contractor. All original drawings shall be capable of reproduction in clear and legible copies. Drawing number sequence shall be maintained in accordance with Owner furnished drawings. Original drawings prepared by the Owner and identified in the list ahead of Part II shall be provided to the contractor. Drawings shall be revised for resubmittal to the U.S. Coast Guard, if required and to reflect final "as built conditions". All drawings shall be stamped to indicate final U.S.C.G. approval date and letter file number. One (1) copy of all Contractor and Coast Guard correspondence relating to plan approval shall be submitted to the Owner and Inspector in PDF format. A copy of all USCG letters of approval and subject plans shall be provided to the Owner.

(e) In developing the working plans and detailed design, the Contractor shall adhere to all salient features and characteristics embodied in the specifications and plans, and the intent thereof. Modifications to the drawings which become necessary during development, or which may be sired by the Contractor to suit his standard practice, shall be brought to the attention of the

Inspector at the time of submittal of working drawings for approval. Failure to notify the Inspector of such modifications will not constitute approval even though the working drawing was approved.

(f) Within twenty (20) calendar days after execution of the Contract, the Contractor shall submit a Plan Schedule of working drawings for approval by the NCDOT Representative. The Plan Schedule shall list all drawings and documents required for submittal in this Specification and Contract Guidance Drawings and as required for all regulatory approval requirements. The schedule shall be submitted as a PDF file and as an Excel spreadsheet. The schedule shall include the following:

(1) A drawing number for each drawing listed.
(2) The drawing title.
(3) The scheduled date the drawing will be submitted by the Contractor for approval to NCDOT.
(4) The scheduled date the drawing will be submitted by the Contractor for approval by the regulatory agencies.
(5) Columns for recording the actual date of the initial submittal, the dates for approvals, and a column showing the current letter revision of each drawing.
(6) A list of drawings prepared by all subcontractors and vendors.

The Contractor shall revise and submit the Plan Schedule by the first of each month to show all changes, progress, and delays. Upon completion of the vessel and prior to delivery to NCDOT, the Contractor shall furnish a final copy of this schedule to the NCDOT Representative.

(g) The Inspector will cooperate with the Contractor in developing a plan approval procedure in order to expedite plan approval with minimum delay. Approval will be given subject to correction by the Contractor of any errors, omissions, and/or interferences contained thereon and compliance with the plans and specifications as previously noted. All revisions made to approved working plans shall be concisely described in a suitable revision column and copies forwarded to the Inspector for comments. Such revisions shall not negate the intent of the original approval without written consent of the Owner.

(h) Upon completion of the contract and at time of vessel delivery, all original drawings and CD's shall become the property of the North Carolina Department of Transportation and it is under stood that the Department of Transportation shall reproduce and issue above noted drawings in any manner for future use. One (1) set of the final approved copies and one (1) set of as-built originals shall be delivered with the vessel along with one (1) copy in PDF format on a thumb drive. Each set of drawings shall be individually packaged or boxed and shall be labeled as to contents. A list of drawings shall be included in each set.

(i) Shop sketches and templates shall be prepared by the Contractor as required for his shop use. One (1) copy of shop sketches shall be provided to the Owner on 20 lb. plain white bond paper along with one (1) copy in PDF format on a thumb drive. Each set of drawings shall be individually packaged or boxed and shall be labeled as to contents. A list of drawings shall be included in each set.

(j) The Contractor shall keep, on the work site, a copy of the drawings (latest revision) and specifications including all authorized supplemental agreements and shall at all times give the Owner and their authorized representatives access thereto. All drawings and specifications, except the signed contract, shall be returned to the Owner at the completion of work.

A.12 ALTERATIONS (CHANGES)

(a) The Owner reserves the right to make any deletions or additions to the work to be performed without invalidating the contract, or giving notices to the sureties. Any change in cost due to alterations or deletions shall be negotiated prior to accomplishment, or performed on a time and material basis as hereinafter provided in this section, at the Owner's option, and approval of any such changes shall be authorized by the Owner and accepted by the Contractor in writing on the Standard form provided prior to start of the work. Optional items, if any, may be approved by issue of a supplemental agreement by the Owner at the cost quoted therefor.

(b) In making any alteration on a time and material basis, the charge or credit for the change shall be determined by the labor rates submitted with the bid proposal and purchase orders for materials to be used. Material shall be at invoiced cost to the Contractor plus 15%. Deletion of equipment and/or material is to be negotiated on a cost of material and labor estimated basis.

(c) The Contractor shall, within five (5) working days, when required by the Owner, furnish to the Owner an itemized breakdown of the man-hours, quantities, and prices used in computing the value of any change that might be ordered. The above shall be published using Microsoft Excel Spreadsheet. All material shall be broken down (itemized) when pricing. The above shall only be approved in a Supplement Agreement signed by both parties.

(d) The completion date will be changed to cover additions to, or deletions from the contract, on a negotiated basis. (Paragraph A.7 (d) is to be used for guidance).

(e) The Contractor may not substitute other material for that specified, except as covered by Paragraph A.8 herein.

A.13 CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE

(a) The Contractor shall not commence work under this contract until he has obtained all the insurance required here under and such insurance has been approved by the Owner; nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance has been so obtained and approved. Approval of the insurance by the Owner shall not relieve or decrease the liability of the Contractor hereunder.

(b) COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE
The Contractor shall take out and maintain during the life of this contract the statutory Workmen's Compensation and Employer's Liability Insurance for all his employees to be engaged in work under this contract and in case of any such work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation and Employer's Liability Insurance for all of the latter's employees to be engaged in such work and shall save the Owner harmless.

(c) BODILY INJURY LIABILITY AND PROPERTY DAMAGE LIABILITY INSURANCE
The Contractor shall take out and maintain during the life of this contract such Bodily Injury Liability and Property Damage Liability Insurance as shall protect him from claims for damages for personal injury, including death, as well as from claims for property damage, which may arise from operations under this contract whether such operations be by himself or by anyone directly or indirectly employed by either of them, and shall save the Owner harmless.

(d) INSURANCE ON VESSEL
The Contractor shall, at his expense, from the time construction starts at his facility to the time of final acceptance at Hatteras, N.C. after completion of all work and testing, furnish all risk insurance as provided in American Institute Builder's Risk Form dated February 8, 1979, amended by striking out line 217 covering the value of the vessel in the full amount and shall save the Owner harmless from any damage whatsoever while the vessel is in custody of the Contractor. The insurance shall be in a responsible company or companies authorized to transact such business in the State in which the construction is being accomplished, and in the State of North Carolina. A statement agreeing to accept service of legal action in North Carolina must accompany the policy. The policy shall be made payable to the Owner. Where the Contractor carries a blank plant policy a rider must be obtained designating the Owner as first beneficiary under the policy in the amount stated.

For the purpose of this Contract the value of the vessel shall be placed as the Total Bid Amount.

A.14 ACCIDENT PREVENTION

Precaution shall be exercised at all times for the protection of persons, including employees, and property. The safety provisions of applicable laws shall be observed. Machinery equipment and all hazards shall be guarded or eliminated in accordance with the best marine construction safety practices.

A.15 SUBCONTRACTS

The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the contract or any portion thereof; or of his right, title, or interest therein; without written consent of the Engineer. In case such consent is given, the sublet work shall be performed by the Subcontractor unless otherwise approved in writing by the Inspector. A firm which has been disqualified because of its failure to maintain satisfactory progress will not be approved as a subcontractor until the firm demonstrates the ability to perform the work in a satisfactory manner. Contractor shall submit a certified copy of the actual subcontract agreement executed between the Contractor and Subcontractor prior to written consent being issued by the Inspector. In case such consent is given, the Contractor will be permitted to sublet a portion thereof, but shall perform with his own organization, work amounting to not less the 75 percent of the total original contract amount.

Extra work performed in accordance with Section A.12 will not be considered in the computation of work required to be performed by the Contractor.

An assignment by operations of law or assignment for the benefit of creditors, or the bankruptcy of the Contractor, shall not vest any right in this contract in the Trustee in bankruptcy, the Contractor's creditors, or the agent of the creditors.

A Subcontractor shall not sublet, sell, transfer, assign, or otherwise dispose of his contract with a Contractor or any portion thereof; or of his right, title, or interest therein; without written consent of the Inspector. When directed by the Inspector, the Contractor shall submit a certified copy of the actual subcontract agreement executed between the Subcontractor and the Second Tier Subcontractor. In the event of an assignment by operations of law or the bankruptcy of the Subcontractor, the Contractor shall have the right, power, and authority, in its discretion, without violating the contract or releasing the surety, to terminate the subcontract. An assignment by operations of law or assignment for the benefit of creditors or the bankruptcy of the Subcontractor shall not vest any right in this contract in the Trustee in bankruptcy, nor the Subcontractor's creditors or agents of the creditors.

Neither the Contractor, nor any Subcontractor, shall enter into any written or oral equipment lease or rental agreement, materials purchase agreement, and/or labor agreement which circumvents the provisions of this article.

If the Contractor or a Subcontractor enters into a lease or rental agreement for equipment based upon payment for a unit of work, such agreement will be considered subletting of the contract unless the lease or rental agreement is with a commercial equipment company, manufacturer, and/or commercial leasing agency and such firm has been approved by the Inspector. An equipment lease or rental agreement which is based upon unit price per unit of time will not be considered subletting of the contract.

The approval of any subcontract will not release the Contractor of his liability under the contract and bonds, nor will the Subcontractor or the second tier Subcontractor have any claim against the Department of Transportation by reason of the approval of the subcontract.

The Contractor shall as soon as practicable after the signing of the Contract, notify the Owner in writing of the names of the Subcontractors proposed for parts of the work and shall not employ any that the Inspector may within a reasonable time object to as incompetent or unfit.

The Contractor agrees that he is as fully responsible to the Owner for the acts and omissions of his Subcontractors and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

Failure of the Contractor to comply with any of the provisions of this article may be justification for disqualifying the Contractor from further bidding in accordance with the provisions of Section A.2-11.

A.16 PROTECTION AND CUSTODY OF VESSEL

(a) The Contractor shall take suitable means of protecting the vessel, the engines, and all other

machinery, outfit, equipment, piping, wiring, etc. from the start of construction and until the vessel is accepted by the Owner, and he will be held responsible for any damage that may be sustained during this period. (See paragraph A.13 herein also).

(b) The vessel is agreed to be in the custody of the Contractor from the start of work at his plant until the completion of the vessels, including the tests and trials if required by the Technical Specifications herein, and until delivery to the Owner.

(c) The Contractor shall keep all litter and debris removed from the vessels, and shall conform to normal standard safety practices in the prosecution of the work and condition of the shipyard area.

A.17 MATERIAL FURNISHED BY OWNER AND TO BE RETAINED BY OWNER

The Contractor shall receive, handle, and install all Owner furnished material and equipment, if any, and shall provide the required foundation, piping, wiring, etc., to make a complete and satisfactory installation at no additional cost to the Owner as a part of this contract. **The Owner shall furnish a list of Owner Furnished Material at the Pre-Bid Conference.**

A.18 HAULING AND LAY-TIME

(a) The Contractor shall provide a suitable safe means for hauling the vessel and sufficient lay days to complete all work as required, or that may become necessary.

(b) The vessel shall enter the drydock or railway without list and without excessive trim. If any strain or possible damage to the vessel be suspected or observed, the docking operation shall be suspended and necessary corrective measures taken. Blocking and shores shall be arranged in accordance with standard practice, leaving room in way of water jet thrusters, and other obstructions. The vessel shall remain on the drydock or railway until the underwater work has been satisfactorily completed, then it shall be carefully undocked.

A.19 RAILWAY CERTIFICATION

Upon award of the contract, the Contractor shall submit to the Ferry Division Engineer, a certificate of condition and capacity of Railway, Crane, Travel Lift or Drydock intended for use during docking if required. Certificate shall indicate capacity, maximum width, and condition of facility which has been inspected within thirty (30) days of bidding by a Certified Marine Inspector or Registered Professional Engineer.

A.20 GUARANTEE

(a) The Contractor shall guarantee all materials furnished and all workmanship performed by him under these specifications for a period of twelve months following final acceptance date by the Owner. This guarantee shall be limited to replacement (including labor) of any parts giving out under normal service because of defect in material or workmanship, and not because of carelessness or neglect on the part of the Owner, his officers or agents; provided further, that any work necessary under this warranty shall be performed without delay by the Contractor at a

shipyard or such other place as may be approved by the Owner, and said Contractor shall not be liable for any expense or damages other than as herein called for above. The regular manufacturer's warranty shall be furnished with all equipment, machinery, fitting, etc., provided by the Contractor.

(b) Manufacturer's warranties shall be filed by the Contractor for all equipment provided and installed and said warranties shall be transferred and/or filed in the Owner's name for all equipment, machinery, fittings, etc.; regular warranty periods will apply for all component items not hereinafter listed.

(c) The Contractor shall make good all damage to the vessel or its equipment or contents thereof, which is the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the terms of the contract and shall restore all disturbed work resulting from the same.

(d) If the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected and the Contractor and his surety shall be liable for all expenses incurred.

(e) All special guarantees applicable to definite parts of the work that may be stipulated in the specifications or other papers forming a part of the contract shall be subject to the terms of this paragraph during the life of such special guarantees. **All guarantees shall begin on the date of final acceptance by the Department.**

A.22 CERTIFICATES, DOCUMENTS, ETC.

(a) Upon completion of vessel and prior to acceptance the Contractor shall turn over to the Owner "Consent of Surety," "Affidavit of Payment of Labor and Materials" which shall include a list of material and equipment that is unpaid, waivers from suppliers and a statement that the vessel is free and clear of all liens and any other documents called for in other paragraphs herein.

(b) Upon completion of the vessel and after it is delivered, the Owner shall turn over to the Contractor a (notarized) certified statement (that all work required by these specifications, including any extra work is complete and satisfactory on the date of delivery. This statement in no way affects or reflects on the guarantee covered herein.

A.23 DELIVERY

(a) The vessel shall be delivered by the Contractor to the Owner at the North Carolina State Shipyard, located at 8550 Shipyard Road, Manns Harbor, North Carolina 27953.

(b) The Owner shall upon delivery turn over to the Contractor all documents required by these specifications, (paragraph A.22(b)).

(c) The Contractor shall upon delivery turn over to the Owner all documents required by these specifications (paragraph A.22(a)).

A.24 ACCEPTANCE

When the trials and all tests have been made, and all work completed to the satisfaction of the Owner, the vessel will be formally accepted by the Owner after delivery upon presentation of all necessary documents as described herein. See section A.39 for final acceptance requirements and permanent USCG COI at owner's facility in Manns Harbor, NC. All vessel items must be 100% complete prior to acceptance.

A.25 FAILURE TO RECOGNIZE

Failure of the Contractor to recognize the need for performance of work or furnishing of materials required to complete the vessel in accordance with the true intent of these specifications shall not be grounds for additional payments or charges under this contract or these specifications.

A.26 PATENT RIGHTS

The Contractor shall pay all royalties and assume defense and indemnity and save harmless the Owner and his officers, from any patent infringements.
There is no knowledge of any infringement.

A.27 WELDING

(a) Qualifications of Welders
All welding performed under this specification shall be done by welders holding a valid qualification certificate issued by the U. S. Coast Guard, or the American Bureau of Shipping, for the class of work to be accomplished. A list of welders and their certification shall be provided to the Owner. List shall be updated as required.

Qualified welding supervisors shall be employed to assure conformity with standards of workmanship required.

(b) Standards
In general, the design of joints and the amount and type of welding shall conform to the A.B.S. Rules for Building and Classing Steel Vessels under 90 Meters (295 Feet) in Length, 2017, Part 2, Chapter 4. A more detailed description of the workmanship required can be found in the IACS Guide No. 47, Shipbuilding and Repair Quality Standard and the Ninth Edition of the Welding Handbook, published by the American Welding Society. Electrodes used for welding shall be of type approved by the U. S. Coast Guard for the various types of materials to be welded. Plates shall be smooth and free from wrinkles, uneven joints, wavy surfaces, etc.

No welding is to be done on hull plating below or near the waterline while the vessel is afloat. Welds shall be uniform and properly sized. Unsatisfactory welding shall be removed, ground smooth and re-welded in a satisfactory manner.

The striking of an arc on any principal hull plate surface is prohibited unless the plate surface on which the arc is struck is to be incorporated in a welded joint. Marks left by an accidental striking of an arc shall be ground out to a smooth contour, taking care that the plate thickness is not reduced more than ten (5) percent. Arc marks which exceed ten (10) percent of the plate thickness shall be reported at once to the Inspector, and corrective action taken as he directs. U.S. Coast Guard and/or ABS approved welding procedures shall be provided prior to starting construction.

Hull Protection - The Contractor shall maintain rigid control of welding and grounding for protection of the hull, its systems and appendages during the entire time the vessel is in the custody of the Contractor. Grounding connections shall be bolted as opposed to clamped.

A.28 CARE DURING CONSTRUCTION

All parts of the vessel, including, but not limited to, structure, deck coverings, fittings, equipage, outfit, furniture, insulation, paint work, machinery, auxiliaries, appliances and apparatus, shall be maintained in satisfactory condition during the entire period of construction and fitting out. All dirt, chips, and scrap material shall be cleaned out at frequent intervals during construction, and no water shall be allowed to remain in the vessel. The vessel must be thoroughly cleaned throughout at the time of delivery to the Owner. Special measures shall be taken to minimize damage incident to storage, installation and construction and to prevent corrosion or other deterioration, especially to all unpainted, polished, and moving parts. All defects, damage, and deterioration of the vessel, its parts, fittings, and outfit that occur before acceptance of the vessel shall be corrected and repaired by the Contractor at his expense. Equipment, prefabricated parts, furniture, and items such as life floats, lines, and canvas, which are stored in warehouses or on piers during the construction period of the vessel, shall be thoroughly examined for and rid of rats and vermin before being placed on board.

Fire Protection - During construction, flammable material shall not be stored onboard the vessel in such a manner to create a serious fire hazard. The Contractor shall exercise special care to prevent the possible outbreak of fire. The Contractor shall maintain a **Fire Watch** during all construction phases of the project. This person or persons shall be properly trained and equipped with adequate communications equipment to conduct a **Fire Watch**. The Contractor shall provide a charged fire hose and adequate number of portable fire extinguishers to adequately provide a safe working environment. At no time shall the Contractor conduct any welding where joiner work has been installed unless he notifies the Owner’s Representative 24 hours in advance.

Where hot work is being carried out in the vicinity of combustible material, a fire watch whose sole purpose shall be to watch for fires and keep firefighting equipment on hand shall be constantly on duty.

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A.29-1 PAYMENTS AND ACCEPTANCE

(a) Payments shall be made as set out in the Contract.

(b) All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for all materials and work upon which payments have been made or the restoration of any damaged work or any responsibility of the Contractor as herein set forth or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the Contract.

(c) The final payment will not become due until the Contractor shall deliver to the Owner through the Inspector, Consent of Surety for final payment and an Affidavit of Payments of Claims that all subcontractors and suppliers of either labor or materials have been paid all sums due them for work performed or materials furnished in connection with this Contract or that satisfactory arrangements have been made by the Contractor with such subcontractors and suppliers with respect to the payment of such sums as may be due them by the Contractor (See paragraph A.35 also).

(d) ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE
No certificate for payment issued by the Inspector and no payment, final or otherwise, nor partial or entire use or occupancy of the work by the Owner, shall be an acceptance of any work or materials not in accordance with the contract, nor shall the same relieve the Contractor of responsibility for faulty materials on workmanship or operate to release the Contractor or his surety from any obligations under the contract or the Performance Bond. North Carolina *General Statute 136-29 (2)* applies.

A.29-2 MILESTONE PAYMENT SCHEDULE

Note – Partial payments will be processed based upon progress estimates as prepared by the Engineer in accordance with the following payment schedule and Section 109-4 of the Standard Specifications.

Item	Item Description	Milestone Percent
1.	Engineering	5%
2.	Hull Structure and Foundations	18%
3.	Superstructure, Bulwarks, Ladders and Handrails	4%
4.	Ventilation – Machinery Space and HVAC	3%
5.	Piping Systems and Pumps	8%
6.	Electrical Switchboards, Machinery Controllers and Wiring	14%
7.	Interior Finish, Cabinets, Consoles, Seating, Appliances	3%
8.	Independent Tanks – Fuel, Water, Sewage, Zero Discharge and Lube Oil	1%
9.	Exterior Doors, Interior Doors, Manholes, Hatches and Windows	3%
10.	Azimuth Thrusters, Controls and Alarms	14%
11.	Electronic, Alarm System, ADA Comm., Vessel Comm., Radios, etc.	2%
12.	Fire Fighting, Safety Gear, Rescue Boat, Life Rafts, PFD, Fire Control	2%
13.	Blasting, Painting, Signage, Draft Mark Labels	6%
14.	Testing, Dock Trials, Sea Trials, and Final Acceptance Trials	1%
15.	Ship's 600 kW Generators, Emergency Generator and AC Drive Motors	6%
16.	Mobilization	3%
17.	Spares (Machinery and Electrical)	4%
18.	Delivery and Bonds	3%
	Contract Total	**100%**

A.30 CONTRACTOR'S TITLE TO MATERIALS

No materials or supplies for the work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by the seller. The Contractor warrants that he has good title to all materials and supplies for which he accepts partial payment.

A.31 CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

If the work should be stopped under an order of any court or other public authority for a period of three (3) months, through no act or fault of the Contractor or of anyone employed by him, or if the Inspector should fail to issue any certificate for payment within a reasonable time after it is due, or if the Owner should fail to pay to the Contractor within a reasonable time any sum certified by the Inspector, then the Contractor may, upon fourteen (14) calendar days of written notice to the Owner via the Inspector, stop work or terminate this contract and recover from the Owner payment for all work executed.

A.32 OWNER'S RIGHT TO TERMINATE CONTRACT

(a) If the work to be done shall be abandoned or if the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if this contract or any part thereof shall be sublet without previous approval of the Owners; or if this contract or any claim thereunder shall be assigned by the Contractor; if any materials or any tools, machinery or other equipment shall be attached or encumbered, which attachment or encumbrance remains undissolved for a period exceeding ten (10) days; or if at any time the Inspector shall be of the opinion, and shall so certify in writing to the Contractor, that the said work is being unnecessarily delayed by the Contractor, or is not executing said contract in good faith, or is not making such progress in the execution of the work as to indicate its completion within the required time, or if he should persistently or repeatedly refuse or should fail to supply enough properly skilled workmen or proper materials, or persistently disregard laws, ordinances, or the instructions of the Inspector, the Owners shall have the power and right to notify the Contractor to discontinue all work or any part thereof under this contract and thereupon the Contractor shall discontinue such work or such part thereof as the Owner shall designate and the Owners shall thereupon have the power, by contract or otherwise as they may determine, to enter the premises of the Contractor where said vessel is being constructed and complete the work herein described, or such part thereof as they deem necessary; and to use such tools and other equipment and such materials of every description as may be found upon or designated to be used upon said work, and to procure additional tools and other equipment and additional materials for the completion of the same; and to debit to the Contractor the expense of labor and of additional materials and of additional tools and other equipment so procured, which additional tools and other equipment shall be and remain the property of the Contractor upon the completion of the work; and to credit him with the value of the work so done, as estimated by the Inspector.

(b) The excess of any cost to the Owners caused by or arising from its having taken over the completion of said vessel including compensation for additional inspection, managerial and

administrative services shall be paid to said North Carolina Department of Transportation by the Contractor or by the surety on its performance bond, and in such accounting, the Owners shall not be held to obtain the lowest cost for the work of completing the contract, or any part thereof, but all sums actually paid therefore shall be charged to the Contractor.

(c) It is further agreed that in case the Contractor shall not fully complete the contract work at the time stipulated, the Owners, in lieu of the foregoing provision, may at its option pay the Contractor for the parts already done, according to the provisions of the contract, and these specifications, and may treat and consider the parts remaining undone as if the contract was cancelled or abandoned by said Contractor or as if they had never been included in or contemplated by this contract.

(d) No action, proceeding or notice contemplated by the contract on the part of the Owners or Inspector and nothing herein contained shall operate as a waiver or release of any rights of the North Carolina Department of Transportation under this agreement against either the Contractor or its Surety.

(e) For purposes of the above "Abandonment of Work" shall mean any consecutive period of ten (10) calendar days without performance of work on the vessel by the Contractor.

A.33 CLIMATIC CONDITIONS

When so ordered by the Inspector, the Contractor shall suspend any work that may be subject to damage by climatic conditions existing or predicted for the area within 24 hours.

A.34 TAXES

The Contractor shall without additional expense to the Owner pay all applicable federal, state and local and other taxes which are assessed against this work.

A.35 ASSIGNMENTS

The Contractor shall not assign any part of the contract nor shall the Contractor assign any claim due under the contract or monies due or to become due under the contract.

A.36 SPECIAL NOTES

(a) All bidders are cautioned to clarify any questions prior to submission of proposal.

(b) The submission of a bid will be considered an acceptance of all requirements of these specifications and all governing laws and ordinances without exception.

(c) There may be requirements for manufacturers or their representative personnel to perform work on some items of the ship's equipment not covered by these specifications, while at the Contractor's plant. These persons shall be allowed access to the vessel during normal working hours to perform their work. The Contractor shall provide a reasonable amount of electric power for hand tools and light if required.

(d) Any questions concerning these specifications should be addressed to:

North Carolina Department of Transportation
Contract Standards and Development Unit
Century Center Building B
1020 Birch Ridge Drive
Telephone: (919) 707-6900
Fax: (919) 250-4127
Attn: State Contract Officer

(e) The Owners reserve the right to waive informalities or to reject any or all bids.

(f) All bidders shall be prequalified by the Department of Transportation at least two (2) weeks prior to bid opening.

(g) Proposals received after the date and time set for the opening regardless of the cause will be returned unopened.

(h) COAST GUARD inspection of this vessel is required during construction and at final delivery to Owner.

A.37 GUARDING

All moving parts of machinery, shafts, etc., shall be shielded to prevent injury to personnel. Shielding fitted on items requiring frequent attention shall have doors, covers or be readily portable.

A.38 QUALITY CONTROL

(a) A competent employee of the Contractor, satisfactory to the Owner, shall from the start of work until the completion of the vessel, maintain quality control over the job. He shall make such inspections and investigations as are necessary to insure that the quality of workmanship, materials and testing is in accordance with that specified.

(b) The quality control employee shall prepare and maintain records of his actions, provide copies to the Inspector and cooperate with the Inspector.

(c) The Inspector shall have access to the quality control employee and his records at all reasonable times during working hours.

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A.39 CONTRACT TIME

Contract time shall be the number of calendar days inclusive between the date of availability and the completion date, said dates as being set forth below, including authorized extensions to the completion date.

Date of Availability for this contract is: OCTOBER 29, 2018.

Final contract completion date for this contract is: 12:00 Noon MARCH 5, 2020.

The completion date shall include at least five (5) working days of Contractor's representative(s) at Manns Harbor, N.C. to provide operational instructions to Ferry Division personnel prior to final acceptance. Local USCG OCMI shall provide permanent COI before vessel can be accepted. The OWNER shall provide vessel crew and fuel for test and operation of vessel prior to acceptance by Owner.

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LIST OF WORKING DRAWINGS TO BE PREPARED AND SUBMITTED BY THE CONTRACTOR FOR USCG APPROVAL:

183’-7” x 46’-0” x 11’-0” Double-Ended River Class “H” Passenger/Vehicle Ferry

1. Outboard Profile
2. General Arrangement
3. Scantling Inboard Profile
4. Hull Structural Plans (All)
5. Main Engine Foundations
6. Door, Window and Hatch Schedule
7. Fire Boundary Layout
8. Structural Fire Protection
9. Bulwarks Details
10. Handrails and Ladder Details and Layout
11. Passenger Lounge Structure
12. Crew Lounge Structure
13. Wheelhouse Structure
14. Wheelhouse Console Layout
15. Machinery Foundations
16. Machinery Layout (Arrangement)
17. Joiner Layout and Material Details
18. Propulsion System Details, Shafting Details and Layout
19. Fire Piping and Seachest Details
20. Ballast Piping and Details
21. Bilge Piping and Details
22. Vents, Fills and Sounds and Details
23. Deck Drains
24. Potable Water Piping and Details
25. Sanitary Water Piping and Details
26. Exhaust Piping and Details
27. Engine Cooling and Details
28. Compressed Air Diagram
29. Electrical One-Line Diagram
30. Electrical Load Analysis 208/120 Volt AC
31. Electrical Load Analysis 24/12 Volt DC
32. Fault Current Analysis
33. Power Wiring Layout
34. Lighting Plan Layout
35. Navigation Light Diagram and Arrangement
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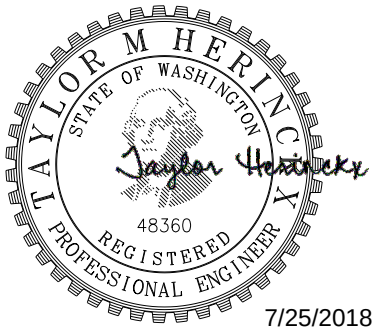

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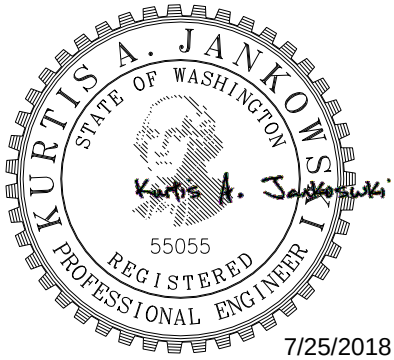

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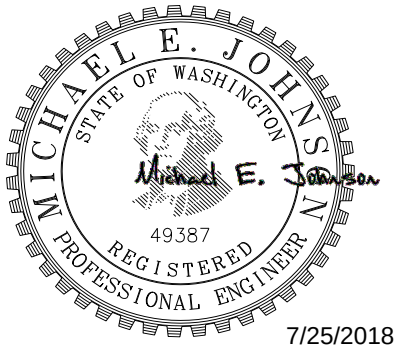

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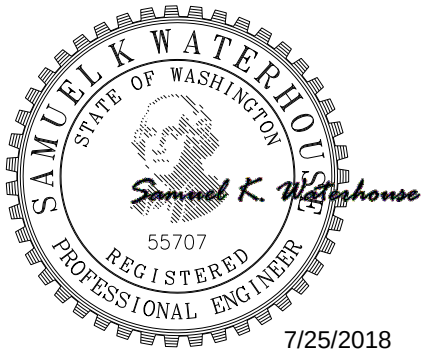

7/25/2018

TS-1 DOUBLE-ENDED AZIMUTH DRIVE FERRY

Technical Specification

Prepared for: NCDOT • Raleigh, North Carolina

Ref: 18026-200-832-1 Rev. - June 25, 2018

Elliott Bay Design Group
Architectural & Engineering Services for the Marine Industry

TS-2

PREPARED BY

Elliott Bay Design Group – North Carolina, PLLC
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GENERAL NOTES

1. Taylor Herinckx, WA PE# 48360 is the engineer in responsible charge for the electrical systems. Kurt Jankowski, WA PE# 55055 is the engineer in responsible charge for naval architecture design. Michael Johnson, WA PE# 49387 is the engineer in responsible charge for the machinery systems. Sam Waterhouse, WA PE# 55707 is the engineer in responsible charge for the structural design. Refer to the sealed Contract Guidance drawings for a more detailed subdivision of responsible engineer subdivision.

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
-	Initial Release	7/25/18	MEJ 49387

TABLE OF CONTENTS

GROUP 000 – GENERAL GUIDANCE AND ADMINISTRATION

000 GENERAL

It is the intent of this Specification and the accompanying Drawings to describe the construction of one car and passenger ferry for the North Carolina Department of Transportation (NCDOT). The vessel shall be complete in all respects, fully equipped and fitted out in accordance with this Specification, and comply with all applicable requirements of the United States Coast Guard (USCG).

It is not the intent of this Specification and the accompanying Drawings to cover every minor detail of construction and equipment. Any material or parts, the omission of which would be detrimental to the seaworthiness, serviceability or regulatory compliance of the vessel, or the inclusion of which is generally accepted good shipbuilding practice, shall be provided by the Contractor to the satisfaction of the NCDOT's Representative and without increase in cost to NCDOT.

011 PRINCIPAL CHARACTERISTICS AND GENERAL DESCRIPTION

The vessel described herein is a double-ended car and passenger ferry outfitted for year-round service within the Outer Banks of North Carolina.

The hull shall be constructed of welded mild steel. Construction shall utilize a longitudinal system of framing. There are six transverse watertight bulkheads, which extend to the Main Deck, including the collision bulkheads at Frame 40, each end. The Engine Room is at midships.

Propulsion shall be provided by four azimuth thrusters, two at each end of the vessel. Each thruster will be driven by an electric motor via a diesel electric power plant.

Electrical power for propulsion and ship's services loads shall be met by three diesel generators. Emergency electrical power shall be supplied by one diesel generator set located above the Main Deck.

Vessel principal characteristics are as follows:

Length overall (LOA)	183'-7"
Length on design load waterline (LWL)	178'-3/8"
Breadth over guard	46'-10"
Breadth (molded) at DLWL	45'-1-1/2"
Depth (molded) amidships at side	10'-6"
Draft (molded) at DLWL	4'-6"
Regulatory gross tonnage	Less than 400 GT
Installed Power	3 x 565 kW
Automobile capacity	40 Cars (NCSV)
Crew complement	7 persons
Passengers	300 passengers
Trial speed, 20 ft water depth	11.5 knots

Service speed, full load, 85% MCR, 10ft water depth	8.5 knots
Fuel oil capacity (95%)	3,500 Gallons
Potable water capacity (100 %)	1,500 Gallons
Sewage capacity (100%)	1,000 Gallons
Endurance	2 Days + 15% Reserve

012 DEFINITIONS

A.	Owner, Owner's Representative, NCDOT or NCDOT Representative	Where the terms "Owner", "Owner's Representative", "NCDOT" or "NCDOT's Representative" are used, they refer to the North Carolina Department of Transportation, or its authorized representative who shall have exclusive authority to approve work performed, changes, substitutions, etc.
B.	Contractor or Shipyard	Where the terms "Contractor" or "Shipyard" appear in this Specification, such terms refer to the individual, firm, or corporation undertaking the execution of the work under the terms of the Contract.
C.	Integrator, Electric Propulsion System Integrator	Where the terms "Integrator" or "Electric Propulsion System Integrator" appear, it shall refer to the individual, firm, or corporation responsible for the complete functionality of the electric propulsion system propulsion, including interactions between equipment items provided by different vendors. The Integrator shall ensure that the entire electric propulsion system operates as a unified whole. See Section 200.5
D.	Naval Architect	Where the term "Naval Architect" appears in this Specification, this term refers to Elliott Bay Design Group – North Carolina, PLLC, Naval Architects and Marine Engineers (EBDG)
E.	USCG	United States Coast Guard
F	Port, Starboard	Throughout this specification where Port and Starboard are referenced, the A-End of the vessel is considered the bow. (i.e. the super structure is located on the starboard side of the vessel)

030 CONTRACT AND CONTRACT GUIDANCE DRAWINGS

This Technical Specification, the Contract Drawings, and Contract Guidance Drawings referenced herein form a part of the complete Contract for construction of the vessel. The vessel shall be built in accordance with the drawings listed below, which form part of this Specification. The Contract is the most senior document. The remaining documents in descending order of precedence are The Specification, the Contract Drawings, and the Contract Guidance Drawings.

The Contract Documents are intended to supplement each other. Items contained in one, but omitted from another, are intended to be provided and installed by the Contractor.

Changes to work shown on the Drawings or in the Specification shall not be made without the written approval of NCDOT.

The shape of hull shall conform to the Lines Plan, and all lines shall be carefully faired. Except for fairing, the Lines Plan (a Contract Drawing) shall not be deviated from without prior written approval from NCDOT.

The Contract Guidance Drawings show acceptable arrangements and features to guide the Contractor in development of the additional details required for construction, and for regulatory agency and NCDOT approvals. The Contract Guidance Drawings are not intended to show a complete and detailed design.

Contract Guidance Drawings are not intended to restrict the Contractor to the procedures and details shown therein. Equivalent details and procedures, which may make use of more readily available material or permit the use of Contractor's standards or procedures of equal merit and quality will be favorably considered. Such changes shall be submitted to the NCDOT Representative and Resident Engineer for approval.

Working Drawings as used herein include all drawings and documents required for the construction of the ship. Working Drawings include all required drawings and documents even though prepared by a subcontractor or vendor.

The Contractor shall develop the Working Drawings as appropriate and as necessary for construction using sources of information not available during contract design development including certified vendor drawings, templating from actual equipment, or other information provided by equipment vendors under contract to the Contractor. The Contractor may use the Contract Guidance Drawings as the basis for development of detailed design for construction and for regulatory approval as described in Sections 072 and 810 as appropriate.

Working Drawings and shop detail drawings required to perform the work shall be submitted to NCDOT for review. Working Drawings shall also be submitted to Regulatory Agencies for their review and approval in accordance with Regulatory Body requirements.

Any work undertaken in advance of the receipt of approval by the Owner and by Regulatory Agency shall be at the Contractor's own risk. Approval of any Working Drawings shall not constitute approval to deviate from this Specification or Contract Guidance Drawings, unless the deviation is specifically pointed out to NCDOT and approval has been given in writing.

The Contractor's book of regulatory agency approved standard details and all production drawings, such as spools and shop drawings shall be submitted to the NCDOT Representative and Resident Engineer for review.

System drawings are diagrammatic. The Contractor shall develop the systems and conduct an interference survey. Machinery and equipment shall be arranged so that proper clearance for operating the vessel and performing repairs can be conveniently carried out.

The Contractor is cautioned to check and verify dimensions and sizes from the manufacturer's certified drawings or the actual machinery or equipment itself, to ensure that any change in machinery or equipment size does not cause interferences. Large changes in equipment size that may significantly affect the arrangement of equipment must be promptly called to the attention of the NCDOT Representative and Resident Engineer. All additional costs, both engineering and production resulting from changes in equipment will be the Contractor's sole responsibility.

Drawing Number	Title
Contract Drawing	
18026-200-100-1	Lines Plan
Contract Guidance Drawings	
18026-200-101-1	Profiles and Deck Arrangements
18026-200-101-3	Lifesaving Equipment Arrangement
18026-200-101-7	Fire Zone Plan
18026-200-101-8	Emergency Evacuation Plan
18026-200-110-1	Bottom and Side Shell
18026-200-120-1	Midship Section
18026-200-120-3	Hull Transverse Bulkheads
18026-200-120-4	Hull Transverse Frames
18026-200-120-5	Hull Longitudinal Bulkheads and Girders
18026-200-130-2	Main Deck
18026-200-150-1	Superstructure Main Deck to 01 Deck
18026-200-150-2	Superstructure 01 Deck to Pilot House Top
18026-200-150-3	Main Deck Bulwarks
18026-200-170-1	Masts
18026-200-180-1	Main Machinery Foundations
18026-200-201-1	Machinery Arrangement
18026-200-256-1	Cooling System Schematic
18026-200-259-1	Exhaust Arrangement
18026-200-261-1	Fuel Oil Piping System Schematic
18026-200-320-1	Propulsion and Ships Service Electrical One Line Diagram
18026-200-330-1	Power and Lighting Plan
18026-200-422-1	Navigation Lighting Arrangement and Block Diagram
18026-200-506-1	Fills, Vents, and Sounds
18026-200-513-1	Machinery Ventilation Arrangement

Drawing Number	Title
18026-200-521-1	Fire Main System Schematic
18026-200-526-1	Deck Drain Piping Schematic
18026-200-528-1	Sanitary Drain Piping Schematic
18026-200-529-1	Bilge and Ballast Piping Schematic
18026-200-529-2	Lube Oil and Waste Oil Piping Schematic
18026-200-533-1	Potable and Sanitary Water Piping Schematic
18026-200-551-1	Compressed Air Piping Schematic
18026-200-624-1	Window Schedule
18026-200-624-2	Door Schedule
18026-200-624-3	Hatch Schedule

Electronic format, modifiable files of the above drawings will be provided to the Contractor for use on this project.

The following supporting documents and files will also be provided to the Contractor for information:

Document Number	Title
18026-200-100-0	Hull Form Model*
18026-200-061-1	Scantling Calculations
18026-200-200-1	Design Basis Equipment List
18026-200-300-1	AC and DC Electrical Loads Analysis
18026-200-505-1	Piping System and Mechanical Calculations
18026-200-833-1	Weight Estimate
18026-200-835-1	Tonnage Assessment
18026-200-843-5	Stability Assessment

*The 3D hull model is provided as a .3dm file constructed in Rhinoceros Version 5 format. The model has been used to develop the design and will be provided to the Contractor for information only.

The design described by this Contract Specification and the above listed drawings and documents are proprietary to Elliott Bay Design Group – North Carolina, PLLC. They are assigned to the Contractor, its subcontractors, and agents for use in the construction of one vessel for NCDOT. They shall not be used in whole or in part for any other purpose. This restriction in use does not extend to design details wholly developed by the Contractor, its subcontractors, or agents that may be used in the construction of these ferries.

070 REQUIREMENTS FOR DESIGN AND CONSTRUCTION

071 Overhead and Headroom Clearances

Finished ceiling height shall be 7 feet, 6 inches above Main Deck. Deviations may be approved on a case-by-case basis where this minimum headroom requirement is impractical. Headroom clearance below Main Deck, including the Engine Rooms, will be kept to the maximum height practical.

072 Government Regulation and Other Requirements

The vessel will be designed and constructed in accordance with the applicable requirements of the USCG for Subchapter H vessels. The vessel structure shall be designed to comply with the requirements of ABS Rules for Building and Classing Steel Vessels under 90 meters. Classification Society approval is not required.

The ferry will be delivered to the Owner, with a USCG Certificate of Documentation and Certificate of Inspection, for service on "Lakes, Bays, and Sounds" as a Subchapter H passenger ferry. The Certificate of Inspection shall allow the ferry to operate with up to 300 passengers and seven or fewer crew members.

A Certificate of Admeasurement for Regulatory Tonnage and International Tonnage Convention will be required. The Contractor shall contract with the American Bureau of Shipping or an equivalent classification society to obtain the Certificate of Admeasurement. The Contractor will assist and facilitate the work of the vessel admeasurers.

With the exception of the Owner's crew demonstrating familiarity with the vessel operation, lifesaving and firefighting, the Contractor shall be entirely responsible for obtaining certificates and documentation, and provide all testing, failure analyses, components, and signage as necessary for the vessel to be put into passenger carrying service as described above. Final testing and demonstration of lifesaving equipment arrangement and operation is to be completed in coordination with and to the satisfaction of local North Carolina USCG OCMI Inspectors to ensure the requirements of the North Carolina Ferry system routes are met.

The following certificates are required prior to delivery:

1. Tonnage Certificate, to include both international and US Regulatory tonnages
2. Builder’s Certificate (required to obtain Certificate of Documentation by Owner).
3. Steel Certificates for domestic US steel to include Origin, Heat Number, Size of member and Quantity.
4. Generator Manufacturer Certificates by ABS
5. Azimuth Thruster Certificates by ABS
6. Stability Letter, USCG
7. Stability Data Package, USCG stamped including tank tables
8. Temporary Certificate of Inspection COI by USCG OCMI at vessel origin
9. Permanent Certificate of Inspection COI by USCG OCMI NCDOT
10. FCC Bridge to Bridge Radio Certificate (Owner Furnished)
11. FCC Radio Certificate (Owner Furnished)
12. Certificate of Documentation "COD" (Owner Furnished)
13. Certificate of Financial Responsibility "COFR" (Owner Furnished)
14. Certificate of Liability Insurance

15. EPIRB Registration Certificate, if required by USCG for delivery of vessel
16. Consent of Surety Certificate
17. Certificate for Official Number [Documentation Center] (Owner Furnished)
18. EPA Response Plan (Owner Furnished)
19. Station Bill (Owner Furnished)
20. Security Certification (Owner Furnished)
21. Security Officer Certification (Owner Furnished)
22. Drug Testing Audit (Owner Furnished)
23. Drug Testing Proof List (Owner Furnished)
24. Vessel Response Plan (Owner Furnished)
25. Design Verification Test Procedures (DVTP) and Periodic Safety Test Procedures (PSTP), USCG Stamped, for all equipment required by USCG: including main generators, azimuth thrusters, electric propulsion system, propulsion controls, etc.) See Section 982.4
26. Payment of Final Estimate (NCDOT State Construction Engineer Furnished)
27. Life Raft Certificate (Dated within 30 days of vessel delivery date)
28. Letter of Payment Certification (Stating all vendors have been paid in full prior to vessel delivery)
29. Delivery and Acceptance Certificate
30. EPA NPDES Certificate (Owner Furnished)
31. Extended Warranty Certificate for main generators, 5 years
32. Extended Warranty Certificate for electric propulsion system, 5 years
33. Extended Warranty Certificate for azimuth thrusters, 5 years
34. Torsional Analysis (Propulsion Motors, Shafting, and Azimuth Thrusters)
35. Right of Way Field Certification (Owner Furnished)
36. Portable Fire Extinguisher Certification, including tags on each extinguisher
37. Fire Extinguishing Flooding System Installation and Testing Certificate
38. Potable Water Tank Laboratory Testing Certificate
39. Horn Decibel Certification
40. Navigation Light Certificate of Alternate Compliance (if required)

The Contractor shall develop and submit all plans, details, calculations, material and equipment certifications, documents, and any other information necessary to obtain USCG approval based on this design developed by EBDG. The list of plans to be submitted shall be at least the list of contract and contract guidance drawings listed herein and others as required by USCG MSC. All email and written correspondence to or from the USCG shall immediately be copied to the NCDOT Representative.

Where an EBDG contract or contract guidance drawing has been developed for this project, the Contractor may submit it for USCG approval after it has been revised by the Contractor to include sufficient information and details required by the USCG for approval. Such drawing revisions shall be clearly and explicitly identified with a revision note and revision mark at the revision. The EBDG title block shall remain on all drawings utilized by the Contractor.

Fees entailed in securing certificates, including associated inspection fees and expense of Regulatory Body inspectors, shall be paid by the Contractor.

The applicable requirements of the various regulatory bodies and rules noted below, in force at the time of submission of bids, shall be complied with:

A. 46 CFR Subchapter H: "Passenger Vessels" and other applicable CFRs and USCG Navigation and Vessel Inspection Circulars (NVIC)

B. ABS Rules for Building and Classing Steel Vessels under 90 meters, 2018.

C. IEEE Standard No. 45: "Recommended Practice for Electrical Installations on Shipboard"

D. U.S. Public Health Service: "Handbook on Sanitation of Vessel Construction"

E. Federal Communications Commission

F. U.S. Access Board: Proposed Passenger Vessel Accessibility Guidelines

073 Vibration and Noise

During sea trials, the Contractor shall conduct noise and vibration surveys in all the spaces listed in Table 1. All HVAC equipment and ventilation fans shall be operating normally during the trials.

The vessel and components shall be free from excessive vibration. Vibration is excessive when it exceeds the explicit requirements given in Table 2, results in damage or clear potential damage to vessel structure, machinery, equipment, or systems, or interferes with the proper operation of the vessel or components. Dangerous resonances at normal operation speeds will not be acceptable. The design speed of machinery shall not be reduced to avoid resonances.

The vibration limits in Table 2 apply specifically to the deck of passenger and crew working spaces. Vibration criteria are an overall, frequency weighted root mean square (RMS) value that is summed between 1 and 80 Hz, in accordance with ISO 6954:2000.

The vessel's local structure outside of the spaces listed in Table 2 shall have a single frequency peak response component, structural vibration velocity limit of 30 mm/s for structural response frequencies at or above 5 Hz. The NCDOT Representative may, at his/her discretion, approve vibration velocities in excess of 30 mm/s if the Contractor can satisfactorily demonstrate that vibration velocities in excess of this limit will not result in fatigue cracking or other structural damage.

The Contractor shall be responsible for locating and correcting unsatisfactory vibration or noise conditions arising during tests or trials, or subsequently during the guarantee period, which can be attributed to the design or construction of those elements provided by the Contractor.

Final vibration and noise reading locations and testing conditions shall be subject to approval by the NCDOT Representative.

Table 1: Noise Limits

Space	dB(A)
Interior Passenger Area	65

Space	dB(A)
Crew Dayroom	65
Pilot House	65
EOS	70

Table 2: Vibration Limits

Space	Vibration Velocity Limit (mm/s)
Main Deck Interior Passenger Area	4
Upper Deck Accommodations	4
Pilot House	4

074 Welding

Weld procedures shall be developed in accordance with the American Welding Society standards and all welders will be certified to the approved procedures by either USCG or a classification society. A welder's certifications shall be provided to the NCDOT Representative and Resident Engineer prior to the welder working on the project.

The Contractor shall develop a weld schedule using ABS Rules. Intermittent welding shall only be used where permitted by the classification society rules. Welds shall be smooth in appearance with a uniform cross section and the throat dimension shall not exceed class rules by more than 3/32 inches. Care shall be taken with stops and starts, crater cracks shall be ground out and re-welded. Welds will be wrapped at all rat holes, snipes, edges etc. Backing bars shall be provided for all plug welds. Plug welds shall be minimum 3/4" wide and shall be filled with an epoxy fairing compound. Slot welds shall not be used without prior approval from NCDOT Representative.

Electric arc welding shall be used for assembly of all construction elements in the hull and superstructures. Automatic welding is to be used to the greatest possible extent. Good grounding connections shall be ensured for all welding, and care is to be taken with all welding to avoid undue stresses. Electrodes selection and quality shall meet all ABS requirements.

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

All welding shall be performed in carefully scheduled sequences. The welding sequence shall ensure a minimum of strain and deformation of the finished hull. Care is to be taken in the welding sequence to relieve stresses that might cause inherent weakness in the structure or

excessive buckling of plates. Special care is to be taken regarding welding sequence in narrow places or places having difficult access (i.e. skegs, forepeak, etc.).

Plate welding shall be achieved with a minimum weld crown and shall not be sanded smooth.

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

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

Back gouging shall be carried out by air gouging or pneumatic chipping methods when necessary.

Temporary welding shall be carefully removed by chipping and/or grinding and steelwork in way made good to the satisfaction of Owner's and Regulatory Body surveyors. Tacks may not be incorporated into the final weld.

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

Continuous welding is required in the fresh water tank, ballast tanks, waste oil tank, toilet/shower spaces, Engine Room and Thruster Room bilges (structure below the floor plate level), and similar spaces where intermittent welding would result in corrosion to the weld ends, edges, or faying surfaces of attached members. All welding exposed to the weather shall be double continuous. A welding schedule shall be submitted for Regulatory Body and Owner's approval.

The Contractor shall develop a list of all electronic and electrical equipment that could be damaged by welding operations on the vessel. This equipment shall always be disconnected during welding. Care shall be taken to correctly ground the hull during welding operations.

074.1 Testing and Inspection

The Contractor shall develop a weld-testing program for the vessel including the acceptance criteria to be used in accordance with Reference (1T) and USCG requirements. This program shall include a minimum of ten (10) hull seam radiographs (RT) to be taken early in the construction, each being 12" long. In addition, there shall be two (2) additional RT's at each hull module connection as directed by the NCDOT Representative. In the event that a weld fails RT, the area shall be repaired and two additional radiographs shall be taken, the location to be decided by the USCG, NCDOT Representative and Resident Engineer.

In addition to the required amount and location of NDT specified by USCG, the Contractor shall provide additional NDT inspection for major machinery foundations including the azimuth thruster and generator foundations. The extent and location of NDT on the foundations shall be to the satisfaction of the NCDOT Representative. Approximately twenty (20) additional checkpoints beyond the ABS minimum requirements are anticipated for the foundations.

The final quantity and locations of NDT checkpoints are contingent upon the observed assembly quality. If any non-conforming welds are found, the Contractor shall repair and retest until passed. Additional NDT shall be provided at no additional cost to the Owner.

All necessary certificates and/or documents covering approval and indicating compliance of the contracted work shall be obtained by the Contractor and provided to the NCDOT Representative.

074.2 Pipe Welding

Pipe welding shall comply with USCG regulations and ASTM F722-82. Copper nickel pipe shall be TIG welded, brazing is not acceptable.

078 Materials and Workmanship

The Contractor shall supply the necessary labor, material, skill, and equipment required to complete and test the construction of the vessel. Materials shall be new and of current manufacture unless specific approval to the contrary is obtained from NCDOT in writing.

Materials used and the workmanship shall be of the best description and quality throughout and of adequate sizes to accomplish the purpose intended. The work, in every respect, shall be made under the supervision and to the complete satisfaction of NCDOT and their Representatives.

Defects appearing at any stage of the work shall be cause for rejection even though the piece in question may have previously been passed as satisfactory.

Unless otherwise noted in the Contract Guidance Drawings, steel plates, shapes, and bars for use in the hull structure shall be new ABS Grade A or ASTM A36 minimum meeting ABS requirements. ABS and material certificates for all steel shall be provided to the Owner and Regulatory Bodies. Certification to include origin (domestic US steel), heat number, size of member, and quantity.

Materials subject to test and inspection used in the construction of the vessel shall comply with the rules of the USCG.

Where fasteners, pipe, tube, sheet metal, or plates and shapes are described as being "stainless steel," marine grade 300 series stainless steel shall be used in all cases. Fasteners and piping described as stainless steel shall be 316 or 316L stainless steel unless otherwise specified in the Technical Specification or Contract Guidance Drawings.

079 Environmental Conditions

Machinery, structure, and outfit shall be designed to withstand the resultant forces from the following conditions of service environment:

A. Permanent list of 10 degrees

B. Permanent trim of 5 degrees

C. Double amplitude roll of 22.5 degrees in a period of 4 seconds

D. Double amplitude pitch of 7.5 degrees in a period of 5 seconds

E. Worst case ambient air and seawater temperatures as tabulated below:

Parameter	Units	Summer	Winter
Air Temperature (dry bulb)	°F	95	27
Seawater Temperature	°F	86	32

084 EQUIPMENT STORAGE

Equipment purchased by the Contractor for use in the construction of the vessel shall be securely warehoused by the Contractor and segregated from the equipment of other projects. The NCDOT Representative shall be provided with access to stored equipment at any time upon his/her request.

The equipment shall be kept in a covered, clean, dry environment of low humidity and relatively constant temperature (less than 30 degrees +/- from 70 degrees F ambient). Equipment requiring special handling by its manufacturer shall be stored in accordance with manufacturer's requirements.

The Contractor shall adequately protect equipment from overspray of solvents, paints, impact damage, and weld or cutting materials contact while in storage and onboard. Temporary fire-resistant covers or enclosures shall be placed over all equipment where overhead or adjacent hot work is being performed. Scaffolding or work platforms shall be placed over equipment to stand on, or walk across for access overhead or beyond. The Contractor and subcontractors shall not stand on equipment or furnishings to work overhead.

The Contractor shall immediately comply with all directives from NCDOT's Representative to protect or improve protection of installed equipment and components from physical damage.

096 WEIGHT CONTROL PROGRAM

Minimizing weight growth during construction is important. The Contractor shall not change the structural sizes, exceed the scantlings, or increase the pipe sizes and wall thicknesses described by the Contract Specification and Contract Guidance Drawings unless it can be demonstrated by the Contractor to be necessary for the suitability of the vessel for its service. Scantlings shall be kept to a reasonably minimum size for foundations, floor plate supports and other details developed by the Contractor.

The Contractor shall be responsible for preparing a builder's weight estimate. This estimate shall be submitted to NCDOT within forty-five (45) calendar days after the Contract award. The estimate shall be done in SWBS format, to facilitate comparison with the contract design weight estimate. The builder's weight estimate shall be developed and submitted in Excel format.

Disparities between the two estimates shall be identified and resolved, in order to establish an approved maximum vessel light ship weight. Throughout the construction period, the Contractor shall monitor the actual weight of equipment and materials against the weight estimate. The builder's weight estimate shall be updated and resubmitted twice monthly to the NCDOT Representative. All equipment shall be weighed upon receipt by the shipyard. Weight growth

shall be brought to the attention of NCDOT. The Contractor shall be responsible for delivering the vessel within the limit of the agreed maximum light ship weight.

NCDOT and the Contractor shall conduct a weight survey at the time of launching to compare estimated weight at completion with the observed displacement.

099 PHOTOGRAPHS

Submit a set of at least thirty-six (36) digital format (JPEG) progress photographs every two weeks during the construction period, illustrating the progress of the work. With the submittal, provide a digital photo file index describing the date, subject, and location corresponding to each file name. Deliver the file index and digital photo files electronically to the NCDOT Representative and Resident Engineer.

GROUP 100 – STRUCTURE

100 GENERAL STRUCTURE REQUIREMENTS

100.1 References

Reference ID	Number	Title
(1A)	18026-200-100-1	Lines Plan
(1B)	18026-200-101-1	Profiles and Deck Arrangements
(1C)	18026-200-101-3	Lifesaving Equipment Arrangement
(1D)	18026-200-101-7	Fire Zone Plan
(1E)	18026-200-101-8	Emergency Evacuation Plan
(1F)	18026-200-110-1	Bottom and Side Shell
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(1I)	18026-200-120-4	Hull Transverse Frames
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(1L)	18026-200-150-1	Superstructure Main Deck to 01 Deck
(1M)	18026-200-150-2	Superstructure 01 Deck to Pilot House Top
(1N)	18026-200-150-3	Main Deck Bulwarks
(1O)	18026-200-170-1	Masts
(1P)	18026-200-180-1	Main Machinery Foundations
(1Q)	18026-200-624-1	Window Schedule
(1R)	18026-200-624-2	Door Schedule
(1S)	18026-200-624-3	Hatch Schedule
(1T)	N/A	ABS Rules for Building and Classing Steel Vessels Under 90 Meters (295 Feet) in Length
(1U)	N/A	IACS Guide No. 47, Shipbuilding and Repair Quality Standard
(1V)	N/A	NVIC 9-97, CH-1, Guide to Structural Fire Protection

100.2 Introduction

This section outlines the general steel construction requirements for the vessel. This section is intended to provide guidance, along with the referenced Contract and Contract Guidance Drawings and applicable regulations, for the development of a detailed structural design package for the vessel.

The Contractor shall be responsible for all structural alignment, connections, interaction, clearances, and the proper design and construction of all structural components of the vessel.

101 MATERIAL AND SCANTLINGS

See Section 078 for material requirements.

The structural arrangement and scantlings reflected on the Contract Guidance Drawings have generally been developed in accordance with Reference (1T). Structural details and scantlings developed by the Contractor shall be in accordance with Reference (1T). Scantlings specified on Contract Guidance Drawings that exceed those required by Reference (1T) shall not be reduced. Dimensional tolerance, fit, alignment, general workmanship, and finish of new structure shall be in accordance with Reference (1T) and (1U).

Install brackets and clips as required to develop the full strength of the members shown on the Contract Guidance Drawings. Brackets and clips shall be in accordance with the requirements of Reference (1T).

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

Local reinforcements, for special loads and vulnerable areas subject to high wear, and for reinforcement of penetrations, doors and stairway openings, etc., shall be provided in accordance with ABS rules, Reference (1T).

In general, doubler plates shall not to be used, unless specifically identified in the contract guidance plans. Reinforcements shall be insert plates of increased thickness. Wherever insert plates are used, rounded corners with a radius of not less than 3 in shall be provided. Insert plate edges shall be tapered 3:1 in thickness to minimize abrupt plate thickness changes.

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

Unless otherwise noted in the Contract Guidance Drawings, the radii of cuts in longitudinal structural bulkheads and in superstructure sides shall be 1/8 of the vertical dimension of the cut but need not exceed 6 inches. In strength decks and the shell, the radii of cuts shall be 1/8 of the transverse dimension of the opening.

Unless otherwise noted in the Contract Guidance Drawings, the radii of cuts in transverse structural bulkheads of considerable extent such as main transverse watertight bulkheads shall be equal to 1/20 of the vertical dimension of the cut. These radii need not exceed 6 inches and shall be no less than 2 inches.

Unless otherwise noted in the Contract Guidance Drawings, the radii of cuts in transverse structural bulkheads of lesser extent, such as racking webs shall be equal to 1/10 the vertical dimension of the cut. These radii need not exceed 6 in nor shall they be less than 2 in.

Coamings installed in the way of deck cuts shall be welded continuously in way of radii. Cuts in non-structural steel shall have 2-inch minimum radii. No cuts shall be allowed in the flanges of structural members.

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

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

Prior to fabrication all structural steel used for the construction of the vessel shall be blasted and primed with inorganic zinc preconstruction primer immediately after blasting. Blasting, priming, and coating welded assemblies after weld out will not be accepted by the NCDOT Representative. See Section 631 for detailed surface preparation requirements.

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

Penetrations of fire boundaries shall be collared and insulated as required to meet the requirements of NVIC 9-97, Reference (1V).

101.1 Fairness Requirements

Plating for bulkheads, shell plating, decks, and plate structural members shall meet the fairness standards of Reference (1U). Distortion of completed assemblies that exceeds the fairness standards of Reference (1U) shall be brought within the fairness standard at no additional cost to the Owner. Methods used to remedy the unfairness shall be to the approval of USCG and the NCDOT Representative.

The Owner requires a delivered vessel that is not only structurally sound, but which is also aesthetically pleasing. It is emphasized that fillers and paint are no substitute for fair plate work. Coverings, fillers, etc., shall not be used to mask unfair plate. Plate will be inspected and measured for unfairness by the NCDOT Representative during all stages of the construction process and are subject to rejection. The Contractor must be fully aware that repairs to bring plate within tolerances specified, including the removal and replacement of interferences such as insulation and coatings damaged during the repair process are to the Contractor's account.

In addition to the aforementioned requirements, unfairness of plating between frames, stiffeners, or deck beams shall in no place exceed 1/4".

101.2 Temporary Construction Requirements

The Contractor shall provide adequate temporary shoring, stiffening, or other means of load distribution where required to adequately support the vessel's structure during construction.

Provide adequate support or constraint for plating during assembly and welding to minimize distortion.

Where hull modules, components, foundations, and other structural members are prefabricated in a shop or assembly area, they shall be well supported and stiffened as necessary to avoid buckled surfaces or other objectionable irregularities. Fitting prefabricated structures to the vessel shall employ a proven and documented welding sequence to avoid warping and stress concentrations.

Clips, lugs, temporary handling fittings, and padeyes used for erection purposes shall be removed as work progresses, in such a fashion so as not to damage plating or other structural members. All pitting, gouging or other damage exceeding the allowable imperfection limits in Reference (1U) resulting from improper removal shall be repaired by welding and grinding.

In the fabrication and erection of hull structure, discontinuities, undercutting, notches, or other mechanical damage that might initiate or propagate cracks in the structure shall be eliminated or repaired.

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

110 HULL

110.1 Shell Plating and Keel

The thickness of plating shall be as shown in Reference (1F). Maintain the boundaries of differing plate thickness as shown. Locate seams and butts to suit the Contractor's standard practice, and in accordance with these Technical Specifications. Avoid four-way joint intersections where practicable. The Contractor may employ four-way joints at the hull modules provided the Contractor has a pre-existing, regulatory body approved process Compensate for shell openings with insert plates of increased thickness with radiused corners. Insert edges shall be tapered 3:1 to connecting deck plate.

The Contractor shall fabricate the center vertical keels (CVK) from flat steel plate per Reference (1J). The CVK shall be continuously welded the full length of the ship and of continuous construction throughout the engine room, respectively

120 FRAMING

The Contractor shall detail, layout, and construct frames as shown in the Contract Guidance Drawings. Frames shall be efficiently bracketed to deck beams, girders, and floors where required.

120.1 Stanchions

Stanchions shall be provided as shown in References (1I), (1J), and (1M). Stanchions shall be constructed of steel pipe.

Hull stanchions shall be fitted at both the top and bottom with sole plates, and the associated girders or plating to which they are attached shall be reinforced with sufficient bracketing to provide full support. Stanchion ends shall have 100 % contact prior to welding to avoid putting weld in shear under loading.

121 HULL STRUCTURAL BULKHEADS

The Contractor shall detail, layout, and construct transverse and longitudinal bulkheads in accordance with References (1H) and (1J). Special strengthening shall be used in way of the skegs and girders supporting deck machinery. Double continuous welding shall be used on the perimeter of the hull bulkheads.

125 TANKS AND VOIDS

Tanks shall be constructed as indicated on the Plans. All welds in tank structure shall be double continuous throughout.

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

Install hatches on each tank as indicated in Reference (1S). Tanks shall have sumps and suctions arranged for near complete emptying.

Provide and install an emergency generator fuel oil tank of 50-gallon minimum capacity. The emergency generator fuel oil tank shall be rectangular and integrated with the emergency generator foundation. Provide four-inch threaded half couplings, as needed for complete access to inside of tank for inspection and cleaning. All tank penetrations shall enter through the top of the tank.

Provide tank level indication as described in Section 436.2.

125.1 Independent Tanks

The contractor shall design and fabricate three independent tanks as shown on Reference (1B); two fuel tanks and one potable water tank. The tanks shall have at least the capacities listed in Reference (1B), and the fuel tank capacity must be achieved with the tanks no greater than 95% full. Independent tanks shall be externally stiffened with little or no internal structure.

130 HULL DECKS

The Contractor shall detail, layout, and construct the Main Deck in accordance with Reference (1K).

The Contractor shall install insert plates with well radiused corners and provide headers under machinery, davits, heavy equipment, mooring fittings, and fixtures. Design and provide under deck strengthening as required and as shown on the Contract Guidance Drawings.

Deck beams shall be either slotted through bulkheads and girders, or bracketed each side in way of tight bulkheads to develop the full strength of the beams through the intersection.

Use flush welds where practicable for deck plating. Remaining weld crown height shall be compatible with the application of deck coverings and not cause visible discontinuity in the finished covering surface. Weld crown shall not exceed the depth of the deck underlayment screed near the weld.

Weather Decks, and interior decks in way of wet spaces, shall be continuously welded and proven watertight prior to the installation of any deck or bulkhead covering.

Install 1/2" stainless steel plate insert plates forward and aft as noted on plans for wear plates in-way of ramp structural girders that contact the main deck. All deck framing in-way of stainless steel doubler plates shall be continuously welded both sides.

130.1 Tire Rail

Detail, fabricate, and install tire rails as shown on Reference (1B). Tire rails shall be constructed of 3-inch Schedule 80 steel pipe, constructed in removable sections no more than twenty feet in length. Rail ends shall be terminated with welded pipe caps. Rails shall be arranged to the satisfaction of the NCDOT Representative. Tire rails shall have no sharp edges to prevent injury or damage. Tire rails shall be continuously welded. Tire rails shall be blasted and painted prior to installation. Provide ½" stainless couplings and bronze plugs for air testing of tire rails.

130.2 Mesh Vehicle Barrier Sockets

Install deck sockets for the mesh vehicle screen on each end of the Main Deck as shown on Reference (1K). Deck Sockets shall be fabricated from 316L SCH XS stainless steel pipe.

130.3 Emergency Ladder Deck Sockets

Install deck sockets for the emergency ladders on each end of Main Deck as shown on Reference (1K). Deck Sockets shall be fabricated from 316L square tube.

150 DECKHOUSE STRUCTURE

150.1 Deckhouse Bulkheads

The Contractor shall detail, layout, and construct superstructure transverse and longitudinal bulkheads in accordance with References (1L) and (1M). Interior bulkhead corners shall incorporate radiused corner for exposed outside corners.

150.2 Deckhouse Decks

The Contractor shall detail, layout, and construct superstructure decks in accordance with References (1L) and (1M). Arrange deck stiffeners to align with girders, other stiffeners, or brackets to develop full section at the stiffener ends or intersections.

Use flush welds where practicable for interior deck plating which will have deck coverings. Remaining weld crown height shall be compatible with the application of deck coverings and not cause visible discontinuity in the finished covering surface. Weld crown shall not exceed the depth of the deck underlayment screed near the weld.

Weather decks and interior decks in way of wet spaces shall be continuously welded and proven watertight prior to the installation of any deck or bulkhead covering.

150.3 Pilot House

Detail, layout, and fabricate the Pilot House generally as shown in References (1B) and (1M).

Corners of openings for doors, ladders, etc. shall be radiused to reduce stress concentrations. Compensation shall be fitted in way of large openings as required, to maintain strength.

151 BULWARKS

Detail, layout, and fabricate the Main Deck bulwarks generally as shown in Reference (1N).

The bulwark cap tube shall be seal welded watertight. Welding on the bulwark cap shall be ground smooth. Provide 1/2" stainless steel pipe couplings with bronze plugs at each end for air testing.

The Bulwark gate shall be detailed and designed for simple and efficient operation. Hinges and latches shall be heavy-duty stainless steel. The gate shall swing inboard towards the 'B' end as shown on Reference (1B). Latches shall be provided to secure the gate in both open and closed positions, and the gate shall be lockable to ensure safety while at sea.

Bulwark cutouts and freeing ports shall be suitably radiused to reduce stress concentrations. Support for all mooring and anchoring equipment shall be designed, detailed, and constructed to ensure smooth operation.

With exception of the chocks, no openings within the bulwark shall exceed 4 inches across the smallest dimension.

160 SPECIAL STRUCTURES AND CLOSURES

160.1 Deck Fittings

Cast steel cleats and chocks shall be provided on the Main Deck as shown on Reference (1B). Corners and weld bead shall be ground smooth to prevent chafing of mooring lines.

Bulwark chocks shall be at least 8"x12" cast steel chocks inserted into the bulwark plate and suitably framed. Kevels shall be at least 24" in length. Bulwark chocks, deck kevels, and their supports shall be designed for 125% of the breaking strength of the intended mooring lines.

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

Insert plates and local under-deck stiffening shall be provided to accommodate the kevel installation. Doubler plates are not acceptable. Structure in-way of insert plates shall be continuously welded both sides.

170 MASTS

Navigation light masts shall be provided and located as shown on References (1B) and (1O). The navigation light masts shall be of steel construction, hinged and counterbalanced sufficiently for convenient and safe one-man operation. Maximum force required to raise or lower mast shall not exceed 50 lbs. The hinged arrangement is intended to permit changing of navigation light bulbs without use of a ladder. The masts shall be provided with a locking mechanism to lock the mast in either the vertical or horizontal positions. Hinge and locking hardware shall be

constructed of corrosion resistant materials or 316 stainless steel. The mast on the wheelhouse shall be provided with an all-around white horn indicating light.

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

180 FOUNDATIONS

180.1 General

The Contractor shall design, layout, and install machinery foundations for all machinery and equipment that conform to manufacturer-furnished certified installation drawings.

Detailed drawings shall be prepared for all foundations. Main machinery foundation drawings shall be submitted to USCG for approval. Details of foundations supporting equipment over 200 pounds shall be submitted to the NCDOT Representative and Resident Engineer for review and comments.

Appropriate support structure (brackets, etc.) shall be provided for all equipment, such as electrical panels and instrumentation, regardless of weight. Holes shall not be drilled in structure for attaching equipment. Small items shall be attached to structure using reusable weld studs or weld-on threaded fittings.

Containment coamings shall be incorporated into foundations around all equipment where oil leakage may occur. Drip pans with drains and cocks shall be fitted where warranted by the nature of the equipment supported.

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

Foundation design shall provide adequate strength to support and maintain alignment of the mounted equipment while operating under maximum loads. Loadings to be considered in design of foundations include the weight of equipment, weight of fluids, dynamic loadings induced by equipment in operation, weights of supported ancillary components and/or systems (e.g., wiring, piping, control equipment, safety shields) and ship motions.

Foundations shall be adequately supported by and braced to the vessel's structural members so that equipment loadings are properly distributed. Additional structural support members, headers, and chocks shall be provided as required. Foundations shall not be attached directly to unsupported plate.

Design of foundations shall provide for alignment and such other special criteria as may be specified by the equipment manufacturer. Design of foundations shall permit equipment access as required, as well as access for maintenance of foundations and adjacent hull structure. Equipment shall be removable without cutting foundations or attachments.

Avoid pockets and inaccessible places where corrosion cannot be controlled or where dirt and debris can accumulate. Foundations shall incorporate suitable supports to prevent excessive or unusual vibration, or vibration that causes excesses of the vessel's noise and vibration requirements provided in Section 073, under the normal range of vessel operating conditions.

Welding of all foundations in bilges, below machinery space gratings, or exposed to weather shall be continuous.

The Contractor shall either fully enclose all Weather Deck foundations or permit unrestricted access to all surfaces for maintenance. Enclosed foundations shall be fitted with drain plugs.

180.2 Main Machinery Foundations

The Contractor shall layout and install foundations for main machinery generally as shown in Reference (1P) and in strict accordance with the manufacturer's requirements. Detailed foundation design drawings and mounting details shall be submitted to the NCDOT Representative, Resident Engineer and USCG for approval prior to construction.

Generator set foundations shall be efficiently transitioned to the adjacent hull structure. Brackets shall be installed at every frame except where such brackets interfere with the bolting arrangements. Additional gussets shall be installed under the mounts.

180.3 Azimuth Thruster Foundations

The Contractor shall layout and install foundations for each azimuth thruster per Reference (1P), and in strict accordance with the manufacturer's requirements.

Welding of the azimuth thruster foundations shall be double continuous. Final design and installation shall be performed in accordance with the thruster manufacturer's recommendations.

180.4 Auxiliary Equipment Foundations

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

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

GROUP 200 – PROPULSION SYSTEM

200 GENERAL

200.1 References

Reference ID	Number	Title
(2A)	18026-200-101-1	Profiles and Deck Arrangements
(2B)	18026-200-180-1	Main Machinery Foundations
(2C)	18026-200-201-1	Machinery Arrangement
(2D)	18026-200-256-1	Cooling System Schematic
(2E)	18026-200-259-1	Exhaust Arrangement
(2F)	18026-200-261-1	Fuel Oil Piping System Schematic

200.2 Introduction

The propulsion system is for a double ended design. The propulsion machinery arrangement shall consist of four (4) azimuth thrusters, two at each end of the vessel. Each azimuth thruster shall be driven by an electric motor. Electrical drive power shall be provided by three (3) diesel generator sets as specified in Section 310.

The propulsion motors, propulsion control system, and associated equipment listed herein shall be furnished and installed by the Contractor. The propulsion system and its controls shall be in compliance with all applicable USCG requirements including all regulatory documentation, failure modes analysis, and testing and verification procedures.

NCDOT's approval shall be required in writing for each item of propulsion equipment prior to the Contractor's purchase. If an item of equipment is identified by manufacturer and part number within the Specification or Contract Guidance Drawings, it shall be considered approved for purchase provided the Contractor has verified that:

A. Part numbers are current with manufacturer numbers. Note that part numbers provided by the Specification and Drawings are not intended to describe every feature required. For example, a pump part number may not describe the requirements of the motor, or may not include such required features as mechanical seals.

B. The item meets the performance and material requirements of the system as installed by the Contractor and as required by the Specification and the Contract Guidance Drawings.

C. The item complies with USCG requirements for material, construction, and performance.

A foundation shall be provided for each piece of machinery. See Section 180 for additional guidance on foundations.

Each piece of equipment shall be installed, aligned, and fastened within the tolerances prescribed by the manufacturer. Equipment shall be removable without cutting foundations or attachments.

Refer to Sections 500 through 505 for general piping requirements.

Insofar as practicable, similar items of machinery and equipment such as electric motors, pumps, starters, controllers, and distribution panels shall be identical and supplied by a single manufacturer for spare parts interchangeability.

200.3 Machinery Arrangement

Machinery shall be arranged as generally shown on Reference (2C).

The arrangement of machinery and development of systems reflected on the contract guidance drawings is based on the propulsion motor manufacturer and models listed in the Design Basis Equipment List. The contractor is responsible for engineering of the machinery arrangements and systems based on the equipment selected and approved during construction

Machinery shall be installed to allow access for maintenance and disassembly. The final location of all machinery shall be subject to the approval of NCDOT.

Obstructions or interferences shall be avoided where possible. The Contractor shall pay particular attention to sharp edges, corners, protruding appendages, equipment, and structure where operating personnel are likely to pass or work. Such obstructions, if unavoidable, shall be provided with guards or other means to protect personnel from injury.

To facilitate future machinery removal and reinstallation, route all wiring, piping, and ducting in the Engine Room, Void, Switchboard Room, and Thruster Room overheads clear of the machinery removal hatches. Pad eyes or lifting points shall be designed and installed in the overhead of the machinery space to facilitate future removal of major machinery items.

Removable personnel safety guards shall be installed over shafting and other exposed rotating components. The safety guards shall be expanded-metal or aluminum with stainless steel fasteners. All safety guards shall be painted safety yellow.

All engines, fuel oil filters, and other equipment requiring maintenance or likely to drip fuel or lube oil, such as filters, shall have removable galvanized drip pans fitted below them of sufficient volume and fitted with a 3/4” drain plug with adequate clearance for one-gallon capacity bucket type container.

200.4 Propulsion System Calculations and Alignment

Calculations

The Contractor shall perform calculations as required to finalize design of the propulsion system.

The propulsion train shall be free from excessive torsional, longitudinal, and flexural vibrations throughout the full range of engine operating speeds in accordance with ABS Rules. The Contractor shall require the thruster manufacturer to provide a torsional vibration analysis of the

complete thruster drivetrain, including the azimuth thruster, shafting, and electric motor. The analysis and findings shall be submitted to the NCDOT Representative for review, and each drivetrain component supplier for approval prior to finalizing the system arrangement and start of component fabrication. Approval from each drivetrain component supplier shall include confirmation of the mass and elastic strain data used in the analysis, and confirmation that the findings are within acceptable limits.

Alignment

The main propulsion machinery shall be installed and aligned within the tolerances prescribed by the manufacturers and in accordance with ABS requirements. Installation and alignment shall be performed to the satisfaction of the NCDOT Representative and the equipment manufacturer's representatives. The Contractor shall engage the services of manufacturers' representatives to attend this process, along with start-up and sea trials.

200.5 Electric Propulsion System Integrator

The Contractor shall contract with a single vendor for design, supply, and integration of the electrical propulsion system. The electric propulsion system integrator shall be responsible for supply of the main propulsion switchboard, propulsion electric motor variable frequency drives, power management system, and the Integrated Monitoring Alarm and Control System (IMACS). See Group 300 and Section 436 for details on these items. In, addition the electric propulsion system integrator shall be responsible for coordinating and performing design integration, analyses, documentation, and orientation for all aspects of the electric propulsion system. This shall include, but not be limited to, physical and mechanical design, thermal management, overcurrent protection and coordination, and harmonics analysis and mitigation. The PSI is responsible for ensuring that all propulsion system components operate together as an integrated system, and that the system as a whole is functional and reliable as described within the Specifications.

Prior to commencing work on the propulsion system, the electric propulsion system integrator shall schedule a propulsion system kick-off meeting to establish roles, responsibilities, interface requirements, frequency of subsequent meetings, and communication protocols between the various propulsion equipment manufacturers. Representatives from each equipment manufacturer (to include azimuth thruster, generator, electrical propulsion, propulsion control, and IMACS systems), the Contractor, and the Owner’s Representative shall be in attendance. Subsequent progress meetings shall be held as required to coordinate detail design and installation of the electric propulsion system.

The PSI shall prepare regular progress reports summarizing the status of propulsion system development, integration, and installation. Progress reports shall note current, upcoming, and recently completed propulsion system tasks, and shall indicate known issues and risks along with actions to address or mitigate them. Progress reports shall be submitted to the Owner's Representative on a monthly basis.

The PSI shall be an experienced electrical propulsion system manufacturer with a successful history of designing, constructing, and integrating diesel electric propulsion systems on marine installations classed by ABS, DNV, or LR on vessels inspected by the USCG. The Contractor

shall provide the qualifications and experience of the PSI for approval by the Owner's Representative prior to the purchase of the electric propulsion system.

200.6 Tests and Trials

Complete tests of all machinery and equipment installations, including dock and sea trials, shall be as described in Section 982.

233 PROPULSION MOTORS

The propulsion motors are described in Section 302.2.

245 AZIMUTH THRUSTERS

Provide and install four (4) azimuth thrusters. The azimuth thrusters shall be designed, constructed and certified in accordance with ABS requirements and provided with all required approvals and certificates. Installation shall be in strict accordance with the manufacturer's installation guidelines. Each thruster shall be provided with all necessary features and accessories including, but not limited to the following:

- Fixed pitch, twin propeller thruster
- Thru-hull, top mount installation. Thrusters shall be removable from hull without disassembly of the thruster
- Rated input power 250 kW
- 2.438:1 reduction ratio between motor and propeller shaft
- Propeller arm length, 1375mm
- 1050mm diameter, four blade Ni-Al bronze propellers, manufactured to ISO 484/2 Class 2 tolerances (propeller design and number of blades subject to detail design and confirmation by TVA)
- Integrated liquid cooled permanent magnet motor as described in Section 302.2
- Integral lube oil system
- Integral electric steering system
- Propulsion control system as described in Section 252
- Manually actuated locking device to prevent wind milling during maintenance and repair
- Local gauges and thermometers
- Process connections and sensors for monitoring all USCG required and manufacturer recommended parameters
- Process connections and sensors for alarming all USCG required and manufacturer recommended parameters
- Cathodic protection anodes

Alarm and monitoring points for each azimuth thruster shall be provided as required by Regulatory Body requirements and per manufacturer recommendations, generally as noted in Section 436. Alarms shall be enunciated by the IMACS as described in Section 436

Provide the spare parts listed in Table 3 with the azimuth thrusters and deliver as directed by the Resident Engineer.

Table 3: Azimuth Thruster Spare Parts

Qty	Item
1	One azimuth thruster complete with well, electric motor, and propeller shall be included as a spare.
1	Additional parts as suggested by Manufacturer for five (5) years of operation.

Provide one (1) complete set of special tools as required for azimuth thruster operation and maintenance. Special tools are any non-commercial tools, repair appliances, test equipment, diagnostic computers and software, or specialized adaptors, which do not conform to ANSI or other internationally recognized standards. Diagnostic computers or software shall include software updates for the duration of the warranty. A propeller nut wrench shall be provided as part of complete set of thruster special tools.

The Contractor shall install removable bolted watertight flush deck hatch above each thruster. The hatches shall be of suitable size to allow for thruster and electric drive motor removal without disassembling the thruster. Refer to Section 624.4.

252 PROPULSION CONTROL SYSTEM

252.1 General

The vessel shall have an electronic propulsion control system. Controls for the azimuth thrusters shall be supplied by the thruster vendor. Controls for the electric propulsion system be supplied by the electric propulsion system integrator. The propulsion control systems shall be installed and adjusted under the supervision of the manufacturers' authorized representatives.

The control system shall have two (2) control stations, one (1) in each Pilot House console. Control layout shall be generally as shown in Reference (2A). Final control layout is subject to review and approval as described in Sections 640.3 and 640.4.
Pilot House control of each azimuth thruster and its propulsion motor shall be achieved using combined thrust/direction control joysticks. Two joysticks shall be provided at each station, one controlling both the thrusters on End A of the vessel and a second controlling both thrusters at End B of the vessel. In addition, each Pilot House remote control station shall include four (4) sets of identical thruster control panels, one (1) for each thruster. The thruster controls supplied by the azimuth thruster manufacturer shall consist of:

- Two (2) full follow-up thrust/direction control joystick
- Four (4) azimuth thruster control panels, each panel shall provide:
  - Thruster status indication
  - Non-follow-up controls for thruster RPM and direction of thrust
  - Control station selection and active station indication
  - Dimmer and lamp test

- Four (4) Thrust direction indicators
- Four (4) Tachometers, indicating propeller speed

In addition, each Pilot House control station shall be also fitted with an Integrated Monitoring Alarm and Control System (IMACS) panel for control and monitoring of the electric propulsion plant, and four (4) guarded emergency stop buttons. The IMACS and emergency stop controls shall be provided by the electric propulsion system integrator. See Sections 302 and 436.

In addition to the remote propulsion controls described herein, local controls located at the equipment shall be provided in accordance with USCG requirements.

252.2 Control System Functions

The thruster control system shall be capable of controlling all necessary propulsion system parameters for each driveline, including:

- Selection of active control station
- Indication of control system status
- Thrust quantity and direction of each thruster

Each remote station shall have a control pushbutton that will allow an operator to take control when the button is depressed. Control transfer between stations will not occur unless the throttles at both stations are set to the zero rpm position.

Startup and shutdown of the generators shall be provided in the Engine Room at the local generator control panel, from the Propulsion Switchboard using the PMS, and via the IMACS screens in the EOS and Pilot House.

Emergency shutdown of the generators shall be actuated by local Engine Room shutdown switches located in the EOS. The switches shall be the guarded type to prevent accidental shutdown. An engine overspeed or an Engine Room fire suppression system release shall cause an automatic emergency shutdown of the generators.

Indicator lights and displays shall be dimmable. Dimmer and lamp push to test controls shall be provided at each station.

The azimuth thruster control system shall provide an output signal indicating which control station, A-end or B-end, is in control to the navigation light control panel described in Section 422.

256 MACHINERY COOLING SYSTEMS

256.1 General

Design, provide and install freshwater and seawater cooling circuits for propulsion machinery generally as shown in Reference (2D), and in accordance with manufacturer requirements for installed equipment.

256.2 Freshwater Cooling Systems

Provide and install a freshwater cooling loop serving the azimuth thruster electric propulsion motors, generally as shown on Reference (2D). The cooling loop shall be served by two (2) identical freshwater cooling pumps, each sized to meet the cooling water flow rate required by the propulsion motors.

Provided and install a plate heat exchanger with gasketed titanium plates on a common steel frame with four (4) process connections conforming to ANSI B16.5 150# flange bolting patterns. The heat exchanger shall be sized for vessel operation within the outer banks of North Carolina and ambient seawater temperatures listed in Section 079 and 20% margin on required heat rejection from the electric propulsion motors.

Azimuth thruster freshwater cooling piping shall be schedule 316L Schedule 10S stainless steel. Route piping branches to and from thruster motors symmetrically so cooling water flow to each thruster is naturally balanced. If maintaining flow balance via pipe routing is impractical, the Contractor shall insert balancing orifices in each branch line as required to balance flow rates to each propulsion motor.

Each main generator shall be factory equipped with on-engine freshwater cooling system that includes a gasketed titanium plate heat exchanger. See section 310.1 for details.

The propulsion motor variable frequency drives shall be factory equipped with a fresh water cooling system which includes a gasketed titanium plates heat exchanger. See section 302.2 for details.

256.3 Propulsion Seawater Cooling Systems

Each main generator shall be factory equipped with heat exchangers and engine mounted and driven seawater cooling pumps. Provide and install seawater suction and discharge lines for each ship's service generator, generally as shown on Reference (2D). Provide USCG approved flexible hoses at all engine-piping connections. Hoses shall be supplied complete from the manufacturer with high strength clamps. Verify that the installation meets all manufacturer requirements.

Design, provide and install an auxiliary sea water cooling system serving the propulsion electric motor heat exchangers, the thruster cooling heat exchanger, and the chillers serving the switchboard room air conditioning system, generally as shown on Reference (2D). The system shall take suction from the seawater cross over line serving the main generators and discharge overboard. The system shall have two (2) identical seawater cooling pumps, each sized to meet the cooling water flow rate and head required by the connected equipment.

Seawater cooling piping shall be class 200 copper nickel pipe.

259 EXHAUST SYSTEM

259.1 General

Provide and install exhaust systems generally as shown on Reference (2E). Each main generator diesel engine shall have an independent exhaust system led to above wheelhouse top as shown on plans. The Contractor shall ensure that static and dynamic loads on equipment exhaust flanges and exhaust backpressure are in accordance with manufacturer's recommendations. Each system shall be complete with all components necessary for satisfactory operation.

Exhaust systems piping shall be fabricated from ASTM A106 seamless or ASTM A53 ERW steel pipe. Piping above the stack shall be SCH 20 316L stainless steel. With the exception of proprietary engine turbo connections, exhaust pipe, flexible bellows, and silencer flange connections shall have an ANSI B16.5, 150# bolting pattern.

Provide drain pots with 1 1/2" inch gate valves at the low end of each vertical exhaust pipe run. Piping and valves shall be insulated.

Provide and install flexible bellows at each engine outlet to allow for vibration and thermal deflection. Additional flexible bellows shall be installed in the piping system as needed, to provide for thermal expansion of exhaust piping. Flexible bellows shall be multi-ply, convoluted, Type 321 stainless steel tube with fine pattern convolutions, flow liners, and flanged ends with ANSI B16.5, 150# bolting pattern. Permanently mark the flow direction on the exterior.

Design, provide, and install hangers and supports for each exhaust pipe and silencer to accommodate thermal expansion and vibration without straining the piping, machinery, or ship structure. The exhaust system shall employ adjustable support hangers purchased from the exhaust system vendor that allow adjustment to the system to avoid vibration.

The Contractor shall perform thermal expansion, bellows, and hanger support calculations for the exhaust system and submit them to the NCDOT Representative. The calculations shall demonstrate that expansion bellows have sufficient length to allow for thermal growth and ensure adequate life each bellows. They shall also demonstrate that the loads at engine exhaust connections meet the manufacturer's requirements.

Provide and install a collar and rain hat on each exhaust system where it exits the ship's structure to weather. The rain hat, centering clips, and the weather-exposed portion of each pipe shall be 316L stainless steel.

Fit the main generator engine exhaust systems with thermocouples and thermowell assemblies for interface with the vessel's alarm system. Install thermocouples near the turbocharger outlet(s).

259.2 Exhaust Insulation

The Contractor shall provide and install insulation and lagging on engine exhaust piping and silencers from the equipment exhaust outlet up to the stack top plate at the bridge deck level

Insulation shall be 2-inch thick removable exhaust blankets. Exhaust blankets shall be fabricated from high temperature needled or woven fiberglass insulation sandwiched between a stainless-steel mesh interior liner and silicone impregnated glass cloth exterior. Blankets shall be fastened using stainless steel hooks and lacing. Exhaust insulation sections within the machinery spaces shall be no greater than 6 feet to permit removal for maintenance. Insulation shall be rated for 1500 degrees F service minimum.

Provide aluminum sheet metal cover over lagging in way of access areas where the insulation might be damaged, such as walkways. The emergency generator exhaust run above the 01 Deck shall have a stainless steel perforated 316L stainless steel guard 2" clear of exhaust pipe. Guard shall be bolted on to allow for easy removal and maintenance.

Provide and install a heat shield around the exterior exhaust at the bridge deck level as shown on Reference (2E). Heat shield shall be 3/16" thick perforated 316L stainless steel with removable panels. The steel framework for the panels shall be designed to prevent entrapment of water on the deck and around the rain hats.

261 FUEL OIL SYSTEM

Provide and install fuel oil system as shown on Reference (2F). The vessel will have two (2) primary fuel oil tanks as described in Section 125.1 and a third fuel oil tank shall for the emergency generator. Provide all necessary tanks, pumps, filters, thermometers, gauges, controls, strainers, piping, valves, fittings, indicators, etc. required for efficient operation. Fuel will be No. 2 low sulfur diesel oil.

The system shall be arranged so that the main generators can draw fuel from two tanks, one located at each end of the vessel, via a common supply line. Fuel return lines from each engine shall combine and return to the tanks. The common supply and return lines shall be arranged so that the system is normally operated with one or two generators served by each fuel oil tank, with cross-connect valves closed.

The emergency generator shall tank suction from and return directly to the emergency generator fuel oil tank located in the emergency generator room. Provide and install a hand operated transfer pump and piping as shown on Reference (2F) for filling the emergency generator fuel tank.

Fuel oil piping shall be fabricated from SCH 40 seamless steel pipe ASTM A53 or ASTM A106. Fuel piping shall utilize welded fittings except at end connections, valves, and takedown joints.

Each engine shall have an independent primary filter installed between the supply tank and the engine's fuel pump. Provide manifold duplex coalescing turbine-type filters for each generator. Provide a simplex coalescing turbine-type filter with a maximum clean filter pressure drop of 0.43 psi at a maximum flow rate of 180 gph for the emergency generator. All fuel filters shall use the same filter element. All filter units shall be equipped with metal bowls and meet ASTM F1201.

Provide and install approved flexible fuel hose assemblies at engine connections meeting the requirements in Section 505.2 Length shall not exceed 30”.

Provide and install remote valve operators to satisfy the requirements for fuel oil tank shutoff valves found in 46 CFR 56.50-60. The tank shutoff valves shall be equipped with flexible reach-rod operators. Terminate the remote valve reach rods with flush deck access boxes, on the main deck, in easily accessible locations outboard of the tire rails. Vinyl signage shall be located on the bulwark above each deck box indicating "EMERGENCY FUEL SHUT OFF". The valves shall be operable locally as well as remotely.

See Section 436.2 for tank level indication.

GROUP 300 – ELECTRICAL

300 GENERAL

300.1 References

Reference ID	Number	Title
(3A)	18026-200-300-1	Electrical Loads Analysis
(3B)	18026-200-320-1	Propulsion and Ships Service Electrical One Line Diagram
(3C)	18026-200-330-1	Power and Lighting Plan
(3D)	18026-200-101-1	Profiles and Deck Arrangements
(3E)	18026-200-201-1	Machinery Arrangement

300.2 Introduction

The Contractor shall provide a complete electrical system, including wiring and equipment, as described in this Specification. This Specification outlines the general electrical requirements for the vessel. It is intended to provide guidance, along with the Contract Guidance Package and all required Regulations, for the development of a detailed electrical design for the vessel. Provide a complete electrical system, including wiring and equipment, as described in this Specification and References (3A), (3B),(3C), (3D), and (3E).

It shall be understood that anything that is omitted in any part of this Specification and/or Contract Guidance Package, but which may be necessary for, or a usual part of, a complete electrical design package shall be considered as included. Any such item or arrangement shall be provided and installed by the Contractor at no additional cost to the Owner. The installation of electrical equipment and wiring required for items called out in other sections of this Specification shall be provided and installed whether or not specifically called for in the electrical sections of this Specification. The Contractor shall be responsible for all alignment, connections, interaction, clearances, and proper design, installation, and construction of all electrical components of the vessel.

The electrical system shall be constructed in two portions: 1) the electrical propulsion system and 2) the ship service electrical system. The propulsion system shall be a 600 VAC 3-phase, three wire, ungrounded, 60Hz system. It shall include three generators, though typically will operate on only two generators in parallel on the propulsion bus. The propulsion system will include a propulsion switchboard, which shall be subdivided into two sections. The sections will be interconnected by a bus tie circuit breaker. The propulsion switchboard will supply power to the propulsion motors via variable frequency drives (VFDs), and also to transformers which will supply the ship service electrical system. The VFDs will use diode front ends to supply the DC bridges, and pulse width modulation to approximate an AC waveform to drive the permanent magnet motors which provide propulsion. An active filter on each VFD shall mitigate harmonic

distortion produced by the drive, and a braking resistor on each DC bridge shall dissipate regenerated energy.

The ship service electrical system shall derive power from either the ship's propulsion electrical system, or from the shore power connection. Power shall be distributed via the ship service switchboard and associated power distribution panels. See Section 320 for switchboard operations. The Ship Service Switchboard distribution voltage shall be 208/120 VAC, 60Hz, three phase, four wire, grounded neutral. Power for control and alarm systems shall be 120V or less. The shore power connection shall accept a 208 VAC 3-phase, four wire supply.

Auxiliary machinery control voltages shall be 120 volts or less, provided by internal and suitably sized and fused control power transformers, when the control circuit extends outside the control enclosure. This includes such circuits as thermostats, remote shutdowns, and indicator and operator controls.

Any deviations from the assigned voltages shall be subject to approval by NCDOT. All equipment, materials and workmanship shall fully comply with the requirements of 46 CFR Subchapter J, and the standards of all other agencies invoked or referenced by Subchapter J. It will be necessary to submit drawings to the USCG for review and approval.

All equipment, materials and workmanship associated with the electrical propulsion system shall comply with 46 CFR Subchapter J and the standards of all other agencies invoked or referenced by Subchapter J. The installation of electrical equipment and wiring required by items specified in other sections of this Specification shall be provided and installed whether or not specifically called for in the electrical sections of this Specification.

The Contractor shall maintain a continuous record of changes in electrical load conditions due to design development during construction and from final selection of equipment. Electrical load changes shall be reported to NCDOT in an electrical loads analysis.

300.3 Degree of Protection

All electrical equipment throughout the vessel shall include enclosures with IP Ratings as specified in 46 CFR Subchapter J. These enclosures shall suitably protect the equipment from moisture, dust, personnel contact, and other debris and contamination.

300.4 Materials and Equipment

Unless otherwise specified, all equipment and material shall be new, suitable for marine use, and shall meet the requirements of all regulatory agencies for the intended service. Equipment shall operate under conditions of temperature, humidity, vibration, roll, and pitch commensurate with service on protected waters in North Carolina. Intermittent voltage and frequency transients and excursions identified in ABS Under 90 Meter Rules shall not cause damage to or interruption of service to equipment.

Equipment requiring external wiring shall have terminal boards or blocks with compression type or ring connector and screw type terminations. Ring connector and screw type terminations shall be made with ring or bent fork terminal lugs, which shall be installed using a manufacturer's-

approved crimping device. Wire shall not be directly installed on any connector type terminal strip. Insulation between adjacent terminals shall be ensured, either through barriers integral to the terminal strip, or by the use of lugs insulated with soft vinyl.

Locate all electrical equipment to be readily accessible for operation, repairs, or removal. Equipment shall be accessible for servicing and adjustment without dismantling linings, insulation, panels, etc.

In watertight bulkhead, deck, equipment, and enclosure penetrations, penetrations shall be made through appropriately sized cable gland fittings or multi cable transits (MCTs).

Connection boxes, outlet boxes, junction boxes, light fixtures, and similar wiring fittings and fixtures installed in locations exposed to weather, condensation, or excessive dampness shall be watertight. They shall be stainless steel, brass, bronze, or other approved corrosion and flame-resistant material. Non-metallic enclosures shall not be used in locations subject to physical damage, such as near the vehicle paths on the car deck.

Electrical system components shall be securely fastened to ship structure by bolting, or welded studs and nuts. In Owner approved locations and applications, alternative USCG approved mechanical fastening systems may be used. Threaded fasteners shall include provisions to prevent loosening, such as nylon insert nuts, locking washers, or thread adhesive. Cable hangars may be welded to ship structure. Electrical equipment shall be installed independently from piping, ventilation, and other mechanical systems.

300.5 Bonding

Ground non-current carrying metallic parts of electrical machinery and equipment to the structure, either by the mounting bolts and foundations, or by separate grounding straps or conductors sized per the National Electrical Code (NEC). Ground metal frames of portable lamps, tools and other similar cord and plug appliances supplied as ship equipment or Owner-Furnished Equipment (OFE) through a suitable conductor in the power supply cord at the ground pole of all receptacles. All conductive electrical enclosures or equipment shall be electrically bonded to the vessel's structure. Provide bonding/equipment grounding systems in accordance with 46 CFR 111.

Bonding shall be ensured by mounting equipment directly to ship structure, or by use of flexible copper cable or grounding straps. Either method shall form a positive ground connection from the enclosure to vessel's structure. The Contractor shall test each installed item for ground impedance, and reduce impedance as necessary. The Contractor shall document tests and results of equipment grounding, and present the document to the Owner.

Each 120V receptacle circuit shall include an independent equipment grounding conductor included in the cabling supplying the circuit, and connected to the grounding connection on the receptacle. In circuits supplying multiple loads, such as receptacles, heaters, and lights, the removal of any device shall not interrupt the continuity of the grounding conductor.

Ensure bonding of the azimuth thrusters.

300.6 Nameplates and Labels

Each electrical enclosure or equipment item shall be labeled with an engraved phenolic nameplate using black text on a white field. Nameplates shall provide concise descriptions with minimal abbreviation, and shall be affixed with screws or a very high bond (VHB) tape system.

Each cable shall be labeled with its cable name per the cable schedule on the exterior of each enclosure, equipment, or junction box penetration, and on each side of each deck or bulkhead penetration. The labels shall be embossed aluminum, robustly banded to the cable. An assembled sample shall be submitted to the Owner for acceptance, and acceptance shall be obtained prior to installation aboard the vessel.

Wires within control, alarm and monitoring, and communications enclosures shall be labeled with adhesive labels, alpha-numeric floaters, or via labeling of the terminal to which the wire is connected. Labels shall correspond to design drawings.

Provide each emergency lighting fixture with an engraved laminated phenolic label having a white letter **E** on a red background. Locate the label in relation to the fixture to clearly associate one with the other. The letter E shall be 1/2 in high.

300.7 Documentation

The Contractor shall develop an updated version of Reference (3A) with actual loads of selected equipment to verify circuit arrangement, bus sizing, cable sizing, and distribution breaker selection. Perform fault current and overcurrent protective device coordination studies as required by regulatory agencies. Perform voltage drop calculations to ensure regulatory compliance. The Contractor shall submit the updated version of Reference (3A) to the Owner for review, to USCG MSC for approval, and shall maintain its accuracy throughout the project. At completion of the project, the Contractor shall deliver the final version in editable electronic format to the Owner.

The distribution of electrical power shall be in general accordance with Reference (3B). The Contractor shall develop an updated version of Reference (3B) which incorporates any changes that arise during detail design and construction. The updated version shall be submitted to the Owner and to USCG MSC. Provide three (3) laminated, single sided, 11 in × 17 in sized copies of the final as-built electrical one-line diagram. One (1) near the propulsion switchboard, one (1) near the ship service switchboard, and one (1) in the emergency generator room. The Contractor shall submit Reference (3B) to the Owner for review and maintain its accuracy throughout the project. At completion of the project, the Contractor shall deliver the final version in editable electronic format to the Owner.

Circuit design schematics shall be mounted on the inside cover of motor controllers along with other pertinent system data such as overload heater and fuse sizes.

The Contractor shall develop a cable schedule of all cables aboard the vessel for power distribution, control, indication, communication, alarm, and monitoring systems. The cable schedule shall list cable name, cable model or insulation materials, conductor quantity, conductor size, approximate length, and shall identify end points by enclosure or equipment to which it is

connected. Grounding straps, and local cables six feet or shorter may be omitted. The Contractor shall submit the cable schedule to the Owner for review, and maintain its accuracy throughout the project. At completion of the project, the Contractor shall deliver the final version in editable electronic format to the Owner.

The Contractor shall provide documentation of all electrical tests and trials, including test method, item tested, pass/fail criteria, and measured or observed results. Test date, personnel, instrumentation, and instrumentation calibration or certification as applicable shall also be listed.

The Contractor shall develop a booklet of data for each motor aboard the vessel. The booklet shall contain, at a minimum, the motor's function, location aboard the vessel, complete nameplate data, manufacturer's name, address, and contact information for local representative.

300.8 Electrical Test and Trials

The Contractor shall perform tests and trials of all equipment and provide documentation of such tests and trials. All regulatorily required tests and trials shall be performed, as well as operational tests of all equipment functions, controls, indicators, interlocks, and safety features. Conductor to conductor and conductor to ground insulation resistance tests shall be performed for all conductors, except for specialized cables such as network cables (CAT5/6). Sensitive equipment shall be disconnected for insulation resistance testing.

For power distribution circuits, steady state voltage drop shall be measured at the point of longest cable run. Voltage drop tests shall be performed with the served equipment operating at maximum load. The tests may be dismissed for circuits for which it can be established that a more severe combination of load, conductor size, and cable length exists and has been tested. Results shall be compared to regulatory requirements, and any non-compliant installations rectified.

The bus work, connections, and cabling of each switchboard, panelboard, generator set connection, shore power receptacle, and motor 20 horsepower or larger shall be inspected with an infrared camera to identify excessively high temperature or impedance points in the system. The inspection shall be performed while operating the system at maximum load, and thermal steady state shall be verified before recording results.

With any variable frequency drives (VFDs) operating at normal service and at sprint speed load, harmonic content, and total harmonic distortion on the main bus and ship service bus shall be measured and recorded.

The propulsion system integrator shall shop test the switchboard, VFDs, and generator control systems. The test shall derive power from, and control, diesel engine driven generator sets. Generator sets may be those to be provided to the ship, or generator sets owned by the propulsion system integrator.

300.9 Spare Parts and Tools

The following spare parts shall be provided:

Fuses	50% of each type and size installed, with a minimum of five each stored in a well-marked box in one of the metal cabinets in the Engine Room. This cabinet shall be labeled "ELECTRICAL SPARE PARTS" in 1" vinyl letters on the front of the cabinet. Letters shall be black on white background.
Switches	10% of each type and size installed, with a minimum of one each stored in ELECTRICAL SPARE PARTS cabinet.
Circuit Breakers	As specified for switchboards (see subsequent sections). Spares for distribution circuit breakers in switchboards and distribution panels shall be provided and stored in the ELECTRICAL SPARE PARTS cabinet. 10% of each type and trip rating of distribution circuit breakers shall be provided.

Provide an electrical lockout kit to be located on the exterior of the ELECTRICAL SPARE PARTS cabinet. It shall contain a minimum of ten (10) keyed locks.

See individual sections below for further spare parts requirements for specific equipment items. The Contractor shall provide one set of any special tools required to operate, maintain, or service any electrical equipment. The Contractor shall supply one (1) laptop computer with carrying case and all software, cables, and adapters required to service the electric propulsion system. Software supplied shall have valid licenses assigned to the Owner and include software maintenance and updates for five (5) years.

302 MOTORS AND CONTROLLERS

302.1 General

Fit control enclosures located in the weather with heaters to preclude condensation and ensure operation in the ambient conditions listed in Section 079.

302.2 Propulsion Electric Motors

The propulsion main motors shall be synchronous AC permanent magnet motors. There shall be four motors total, one per azimuth thruster. Each motor shall be rated 250kW minimum at 1,171 rpm, 600 VAC, 3-phase, 156Hz, vertical mount, liquid cooled, IP-54. The motors shall be designed to operate with PWM type VFDs under variable torque loads, from 0 to 1171 RPM in either direction. Each motor shall be supplied with and integrated into the azimuth thruster.

302.3 Propulsion Electric Motor Variable Frequency Drives

Each propulsion main motor shall be controlled through a variable frequency drive (VFD) assembly. Each VFD shall be a 6-pulse with active filter, two (2) quadrant, reversing, non-regenerative, variable torque, AC variable frequency drive. The drive shall be rated for 600 volts AC, 3-phase, 60Hz input and 230kW minimum, 270 amps AC continuous and at 110 % for 1 minute.

The VFD assemblies shall be liquid cooled via a segregated freshwater cooling system. The system consisting of two separate cooling loops, each serving two VFD's. Each loop shall be shall incorporate a gasketed titanium heat exchanger capable of accepting sea water, circulating pumps, stainless steel piping, valves and required monitoring and controls. The VFD cooling system shall be provided by the electric propulsion system integrator.

The drives shall have the following features:

1 3-phase AC line reactor

1 6-Pulse Diode Front End (DFE) converter/rectifier

1 Active harmonic filter module, liquid cooled

1 Inverter section, pulse width modulation (PWM) type

1 Brake Chopper circuit for regenerative current, sized for corresponding load profile

1 Dynamic braking resistor, stainless steel enclosed, 50% duty cycle, remotely mounted

Each VFD shall be complete with the following:

1 Set of IP-22 enclosures.

1 Operator Keypad, door mounted

1 PROFIBUS or PROFINET communication card

1 Emergency stop pull-button, guarded against inadvertent operation.

5 Drive indicating pilot lights (VFD ready, VFD fault, VFD running, power available, and power limit)

1 Cooling accessories as necessary to maintain equipment within manufacturer specified temperature limits.

VFD Propulsion Control shall consist of the following:

Marine specific propulsion control software, including the following features:

- Redundant PROFIBUS or PROFINET communication
- Fast acting characteristics to adapt propeller load to generator capability to prevent possible black outs and overloads
- Characteristics to reduce propeller speed during propeller ventilation or emergence out of water, and to smooth load increases when returning into water
- Control of propeller acceleration and deceleration rate, and maximum RPM.
- Speed mode control for maneuvering and immediate response

- No limitation in power draw from gensets depending on sea and operational conditions, i.e. each genset can be loaded 100% and ensure an optimum utilization of the power station
- Handling of azimuth drive propellers
- Standardized interface to propeller control
- Emergency stop controls

Dynamic Load Limitation

The power management system shall be equipped with a dynamic load limitation (DLL) function which limits the load imposed by the drive motors according to actual generator capacity. The internal control system shall limit the power consumption to the actual generator maximum load capability, and shall adjust for the quantity of generator sets on line.

In case of trip of one generator, the remaining generator will be overloaded. The DLL system shall detect this and limit the power consumption of the propulsion system. The system shall respond sufficiently fast that a "Black-Out" of the remaining generator(s) will be avoided. The PMS (or operator) shall start an additional generator. Then the VFD shall increase power up to the new limit, and so on.

302.4 Ship Service Electric Motors

Motors shall be commercial marine grade, with corrosion resistant coating meeting the applicable requirements of the USCG. Motors shall be of one manufacturer to the maximum extent possible. Exceptions are special electronic equipment and small fractional horsepower units. Motors shall be TEFC. Motors installed in the engine room and emergency generator room, and their associated trunks, shall be rated to operate at 50 degrees C; other motors shall be rated for operation at 45 degrees C.

302.5 Motor Controllers

All motor controllers shall be of the combination type.

Provide complete motor control wiring diagrams on the interior of all motor controllers. This includes OEM controllers supplied with and/or integral with the equipment

Motor controllers shall be marine type, complying with the requirements of the UL Standard for Industrial Control Equipment and the USCG 46 CFR Subchapter J. Controllers shall be manufactured by a nationally recognized company and shall all be from one manufacturer.

Provide contactors with as many auxiliary contacts as required for each control, alarm and monitoring function.

Mount operating controls in the front of the enclosure. Provide power available lights, and illuminated pushbuttons or separate indicating lights for Motor Running indication on each motor controller. Motor running indicators shall be green. In addition, provide and speed and direction indication where applicable. Provide lamp test capability.

Reduced voltage type controllers may be required for larger motors to limit inrush current to acceptable limits for the generator and to minimize voltage dip. It is the Contractor's responsibility to prepare voltage dip calculations and to select proper controllers for the service intended.

Motor controllers having a working power rating of 1 HP or greater shall typically be provided with low voltage protection (LVP) to avoid excess starting currents when power is lost and then re-established, unless otherwise required by regulation. Employ low voltage release (LVR) on motors as required by regulation. Single-phase fractional horsepower motors may use manual motor starters, also known as low voltage release effect controllers.

Nameplate and Wiring Diagram

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

Service	Manufacturer, type and serial numbers
Voltages and phases	Current or horsepower
Operating instructions, if any	Circuit designation (Panel number and circuit number)

A laminated copy of the wiring diagram for each controller as installed shall be permanently mounted inside the cover. Terminals shall be clearly identified.

Spares

The Contractor shall provide the following spares for controllers:

One set of each type of contactor	One operating coil of each type
One overload protection heater of each size, for each phase	One pilot light lens and lamp for each 10 identical parts, or fraction thereof.

302.6 Ship Service Variable Speed Drives

Design variable speed motor controllers to meet the requirement of the system load and be of the pulse width modulation type. Supply all variable speed controllers with line filtering and choke circuits or equivalent such that the ship suffers no adverse effects from harmonics.

302.7 Fire/Ventilation Shutdown Circuit

Ventilation fans and fuel oil pumps shall be supplied from dedicated circuits, which are supplied by under-voltage trip circuit breakers that will shut down upon interruption of a fire relay (FR) shutdown circuit. Equivalent relay or contact based arrangements may be provided in place of under-voltage trip circuit breakers.

Engines shall have similar relay-based emergency shutdowns powered from the same supply. Two segregated circuits shall be provided, each controlling at least one generator set engine and dividing other support equipment. The intent is that the failure of one shutdown relay not render all generators inoperable.

Manual switches capable of tripping the undervoltage trip circuit breakers and shutdown relays shall be located in the pilot house and EOS. A red phenolic placard shall be provided adjacent to the switch labeled Fire Relay Shutdown and shall include reset procedures.

A shutdown switch for the emergency generator shall be provided at an open deck location approved by the Owner.

The Contractor shall provide complete wiring diagrams for all emergency shutdown circuits. The diagrams shall show all buttons, cabling, items controlled, power supplies, control relays, wire terminal connections, and other pertinent details. Locations aboard the vessel and cable names shall be identified.

303 CIRCUIT BREAKERS

303.1 General

Circuit breakers shall be molded case type, with thermal magnetic trip units, unless electronic adjustable trip units are necessary to ensure coordination. Each circuit breaker shall be clearly labeled with its nominal trip rating, and shall indicate ON or OFF position. Circuit breakers in the Engine Room or Emergency Generator Room shall be calibrated for operation at 50 degrees C.

Circuit breakers used for switching shall be switch duty rated.

Within each panel, one spare circuit breaker and space for an additional circuit breaker shall be provided for every ten active circuits, or fraction thereof. Spare circuit breakers shall be of representative sizes of the circuits used in the panel.

303.2 Generator Circuit Breakers

The generator circuit breakers shall be trip-free, draw-out type with adjustable over current trips.

Provide under-voltage protection to prevent the generator circuit breaker from closing when the generator is not generating voltage within the specified limits. The long time over-current protection is not to exceed 115% of the continuous load rating of the generator set.

Provide any special tools required for removing the draw-out type circuit breakers. Provide pilot lights to indicate circuit breaker status. Each draw out circuit breaker must be able to be removed from the switchboard without disconnecting the power to the circuit breaker or switchboard. Circuit breakers serving as transfer and/or tie switches shall be capable of more than 3000 full current switching cycles without requiring service.

Mount each generator circuit breaker in an independent section. In turn, each circuit breaker section shall be compartmentally segregated with sheet metal barrier construction. This

construction shall provide a physical barrier between bus-work, control, metering, and distribution compartmental sections.

304 Cableways and Wiring

304.1 Cables

Electrical distribution cable shall meet the specifications of IEEE-1580 (2010) or MIL-C-24643, shall be low smoke zero halogen, and labeled as suitable for shipboard use. No cable smaller than 14AWG may be used for general power and lighting distribution. Cables shall be unarmored unless otherwise noted on the Contract Guidance Drawings.

Cable for power distribution, machinery alarm and monitoring, control, communications, instrumentation, and other cable directly purchased by the prime Contractor or electrical subcontractor shall be low smoke, zero halogen cable. Cable provided as part of vendor supplied systems, or directly specified by vendors, need not be low smoke zero halogen type. Ethernet, coaxial, fiber optic, or other network or specialized cables shall be industrial quality.

Propulsion motor cables used in variable frequency drive (VFD) applications shall include three radially symmetrical ground conductors, and shall be shielded.

304.2 Cable Installation

Cables shall be installed, single banked wherever possible. Double banking with necessary cable derating is acceptable in locations of particular cable density. Cables shall be installed in cable trays, wireways, or cable hangers as appropriate, and secured with stainless steel bands. Plastic tie-wraps are not to be used for securing cable except under consoles and within electrical cabinets.

Exercise extreme care during installation of cable, wire, and other equipment that the external jacket of the cable or wire is not nicked, scraped, abraded, cut, burned, or otherwise damaged. Any cable or wire that is damaged in any way shall be replaced in its entirety. Splices **are not** permitted to repair or extend cables.

304.3 Cable Routing

Cables shall be routed in wire-ways wherever possible. Cables shall be routed as directly as reasonable, and shall minimize interference with vessel systems and access clearances. Cables shall not be routed over engine exhaust piping, or across access hatches. Cable shall be concealed from weather to the maximum extent possible, and behind ceilings and linings when in finished interior spaces.

Main wire-ways shall be provided between the Engine Room, EOS, Switchboard Room, and Thruster Rooms, and between the Engine Room and the Pilot House. Wire-ways containing 600 VAC propulsion cables shall be single banked without exception. Wire-ways containing control, indication, and communication cables shall be separate from power cable wire-ways.

Cableways and MCTs shall be sized to provide 40% capacity unused and available for future installations. Cables transiting through watertight or A-class boundaries shall be fitted or

insulated, as appropriate, to maintain the integrity of the boundary. Signal, communication, and control and cables shall be separated from power cables by utilizing separate MCTs. Segregate critical circuits as required by 46 CFR 111.

Interference experienced on any control or communication circuit shall be eliminated by the Contractor before acceptance of the vessel by the Owner. Low voltage or control cables shall not be run near power cables or DC cables.

Diesel Engine starting battery cables shall be secured every 18” to prevent cables from rubbing on adjacent structure or floorplate.

304.4 Cableways and Hangers

Cableways and hangers shall be affixed to ship structure, via welding or bolting. Cableways, hangars, and grouped cables shall not be supported by piping, ducting, insulation, or machinery. Cables shall be installed on cableways and hangers, and secured with stainless steel bands. Cableways and hangers shall be steel protected from corrosion by painting or galvanizing, or shall be stainless steel.

304.5 Penetrations

Where cables penetrate watertight bulkheads or decks, watertight integrity of the penetration shall be ensured by individual cable glands, or by multi cable transit systems. Where cables penetrate decks, the penetrations shall have steel or pipe stubs at least 9" tall to protect the penetration from kicking damage. The specific penetration sealing system shall be submitted to the Owner for approval prior to purchase.

Where cables pass through non-tight openings, the openings shall be ground smooth and the cables secured near the openings to prevent chafing or abrasion damage.

Where cables penetrate electrical enclosures, cable gland or stuffing tube fittings shall be used to ensure a watertight seal.

304.6 Junction Boxes

Junction boxes shall be accessible, and those for vital or emergency circuits shall be metallic. When junction boxes are located behind joiner bulkhead and ceiling panels, provide access doors. Clearly label the location of hidden junction boxes on the outside of the bulkhead or ceiling panel. Identify junction boxes with phenolic tags, black with white lettering, which corresponds with the circuit that supplies power to the box.

310 GENERATOR SETS

310.1 General

Install the main generators and emergency generator as shown in References (3A) and (3B). Each generator shall be provided with an electric heater to prevent condensation in the windings. The heaters shall automatically switch, ON when the generator is not running, OFF when the generator is running. Each diesel engine shall be provided with an electric thermostatically controlled jacket water heater sized by manufacturer.

Each generator set shall be resiliently mounted to reduce vibration and noise transmission to the ship structure. All cables, pipes, exhaust, and hoses connected to the generator sets shall be suitably flexible to withstand normal generator vibration without damage.

Each generator shall be complete with manual and automatic voltage regulation control modules, and shall include local and remote monitoring and control. Power the governors, voltage regulators, and other control power consumers from battery banks or uninterruptible power sources. Jacket water pump, jacket water heater, water cooled exhaust manifold, flywheel with housing, and simplex fuel filter shall be provided and mounted to each generator set. Hoses shall be fire resistant. Cooling water expansion tanks shall be provided.

Each generator set shall have alarm, monitoring, and safety shutdown functions as required by regulation. Each generator set shall have high jacket water temperature and high lube oil temperature alarms, and automatic shutdown upon overspeed or low lubricating oil pressure. Additionally, main generators shall have high jacket water temperature automatic shutdown. Each generator set shall automatically shut down upon release of firefighting media in its respective space.

Provide each generator with manufacturer specified air filters, fuel filters, oil filters, lubricating oil, coolant, belts, and other consumables necessary to provide an operational installation.

310.2 Main Generator Sets

Furnish and install three (3) ABS certified, marine continuous duty diesel generator sets rated 565 kW, 600 VAC, 3 phase, 3 wire, 0.8 PF and equipped for automatic parallel operation. The engines shall be four-cycle turbocharged/ aftercooled engines meeting EPA Tier 3 emissions standards. The engines shall be provided with all necessary documentation to demonstrate compliance with EPA emissions requirements and ABS type approval.

These generators shall provide all electrical power for the propulsion system, and for the ship service electrical system. The generator sets shall meet all applicable regulatory and rules requirements set out in Specification Section 072.

Each generator shall be factory equipped for seawater cooling with a gasketed titanium plate heat exchanger and engine mounted and driven seawater cooling pumps, complete engine driven jacket water and SCAC systems, dry exhaust, and 24 VDC electric starting. Each generator shall also have an automatic voltage regulator and voltage regulator cutout switch on the front panel of each generator control section of the propulsion switchboard.

The generators shall not be barred over or started for the first time after installation without the prior approval of the NCDOT Representative and the manufacturer's technical representative. The shipyard Subcontractor shall provide one (1) week notice to the owner’s representative prior to starting generators. Generators shall have initial startup performed by the generator supplier.

310.3 Emergency Generator

Furnish and install one (1) emergency generator powered by a diesel engine with a continuous rating of at least 65 ekW at 1800 rpm, 208 volts, 3-phase, 4 wire, 0.80 power factor, 60

hertz. The engines shall be four-cycle turbocharged/ aftercooled engines meeting EPA Tier 3 emissions standards. The engines shall be provided with all necessary documentation to demonstrate compliance with EPA emissions requirements.

The generator shall be radiator cooled, with 24 VDC electric starting and engine driven radiator fan. The generator and radiator shall be skid mounted and installed as shown in (3D). The generator shall have an automatic voltage regulator. In addition, the emergency generator shall have a voltage regulator cutout switch and a manual voltage regulator, both located on the front panel of the emergency switchboard.

320 SWITCHBOARDS

320.1 Main Propulsion Switchboard

The Main Propulsion Switchboard (MPS) shall provide for the control and protection of the main generators, and distribution of 3-phase, 600 VAC electrical power as shown on Reference (3B). The switchboard shall provide for automatic parallel operation and control of the generators. The MPS, located in the Switchboard Room, shall be deck mounted and sway braced to the surrounding structure through vibration isolation mounts.

The MPS shall be designed and provided by the electric propulsion system integrator as described in this Specification. The switchboard shall be constructed by a UL-891 certified facility. Verification of certification shall be provided to the Owner.

The switchboard shall be designed, built, and installed in accordance with regulatory requirements referenced in Section 072. The electric propulsion system integrator shall prepare and submit a switchboard arrangement plan to the NCDOT Representative and Resident Engineer prior to commencement of construction. The arrangement plan shall be detailed, and complete with a description of features and technical data on all devices.

The electric propulsion system integrator shall provide wiring diagrams and shop drawings of the switchboard to the Contractor, and the Contractor shall provide same to the NCDOT Representative for approval prior to fabrication. The drawings shall clearly show design, construction material, finish installation, front layout, point to point wiring diagrams, material list, mounting details, and label plate list including floaters for terminal blocks.

The manufacturer shall provide three complete sets and one electronic set of as-built drawings of the switchboard and cut sheets of the components to the contractor for delivery to the NCDOT Representative.

Switchboard components listed in this specification and all others required for a complete system shall be provided. The switchboard shall be furnished as specified herein and shown on Reference (3B), and shall be installed and fully integrated into the ferry electrical system by the Contractor and electric propulsion system integrator.

Factory tests shall be performed to show the full functionality of the Power Management System (PMS) and main propulsion switchboard automation to properly control all generators and the distribution of power in automatic mode.

The electric propulsion system integrator shall perform Short Circuit and Device Evaluation Studies, a Protective Device Coordination Study, and a Harmonic Study. The studies shall include all AC electrical power distribution systems aboard the vessel. The propulsion system integrator shall also provide design verification testing procedures (DVTP), periodic safety testing procedures (PSTP), and failure modes and effects analysis (FMEA) or qualitative failure analysis (QFA) as required by regulation.

Main Propulsion Switchboard Construction

Enclosure

The switchboard shall have a drip proof enclosure at a minimum, and be of dead front, all steel construction. All operating controls and indicators shall be front mounted and fully accessible. All other components shall be accessible by hinged front or removable side and rear panels. The switchboard front shall be adequately illuminated by attached normal and battery backup lighting. Construction shall allow for cables entering the bottom of the switchboard.

The switchboard base shall have appropriately sized openings for possible cable entrance. All front instrument panels shall be formed approximately 1 in on all sides and hinged. Front panels covering molded case distribution circuit breakers shall be formed, hinged and bolted. Side and rear panels shall be flat sheets, bolted on. All formed and bolted panels shall be fastened with center seeking, knurled head, captive screws and floating nut block assemblies. All formed and hinged front panels shall be fastened with open and turn flush clamps. All hinged panels shall be equipped with door positioners for holding the panel in the open position during access to internally mounted components. Non-conducting grab rails shall be provided across the entire front of the switchboard. The switchboard shall be mounted 6” above the floor to prevent water from entering the cabinet when floors are washed.

Bus Bars

Bus bars shall be made of commercially pure copper. All bus bars shall be tin or silver plated over their entire length. Bolts, washers and nuts used to maintain bus contact shall be of corrosion resistant material or appropriately plated. All bolts in bus connections shall be torque wrench tightened to an appropriate uniform value for each size bolt and marked across all joints with permanent marker or paint pen. The mechanical strength, bracing and supports of the bus shall be designed for a symmetrical RMS short circuit current of 50kA.

Components

All electrical components shall be selected to operate satisfactorily in a 45°C ambient temperature and shall be as described below.

Circuit Breakers:

Circuit breakers shall be quick-make, quick-break, trip free, with tripping mechanisms capable of safely opening the circuit they protect while subjected to the maximum available fault current. All poles shall be opened simultaneously by a common trip mechanism. Trip elements or sensors shall be calibrated or ambient compensated for operation in a 45°C ambient temperature, or properly de-rated in accordance with the

circuit breaker manufacturer's instructions for use in ambient temperatures above 40°C. Breaker frame size, nominal trip setting, and de-rated trip setting shall be shown on the main propulsion switchboard design drawings, as-built electrical one-line diagram, and on the engraved breaker ID plate attached to the front of the switchboard.

All circuit breakers shall be mounted in such a manner that the breakers may be removed from the front without disconnecting line or load bus or power cable terminations.

Generator and Bus Tie main feeder circuit breakers:

These circuit breakers shall be removable draw-out Insulated Case or Metal Clad type, with motorized spring charged operators and adjustable electronic trip logic units, rated 50kAIC minimum. They shall accept remote open and close signals from the Power Management System or switchboard mounted manual actuation switches, and shall be equipped with auxiliary contacts, under voltage trips, and shunt trips as necessary to provide a functional and operable system. Each shall be provided with means to lock in the open position.

Instruments:

Instruments shall be constructed to minimize damage from dust or moisture.

The system shall include relays or electronic I/O as necessary to interface with the Integrated Alarm System (IMACS) (see Section 436) to display all pertinent alarms.

Instrument and Control Switches:

All rotary type instrument, control, and circuit breaker switches shall be oil-tight and clearly labeled for function.

All under-voltage trip (UV) devices shall be 24 VDC from a battery source, to prevent tripping during power transfer operations.

Fuses:

Instrument fuses shall be of the non-renewable cartridge type. They shall be accessible from the front of the switchboard through the hinged panels containing the instruments and controls they protect.

Indicating Lights:

Indicating lights will be long-life LED type.

Wiring:

Instrument and control wire shall be a minimum of 14AWG, type SIS, except for electronic component connections, which can be 18AWG, flame retarding, flexible switchboard wire, or equal. Each wire end shall be fitted with a permanent sleeve type wire number and terminated with vinyl insulated compression lugs, applied with a closed cycle tool, where component terminations permit. Wires terminating in DIN Rail type screw compression terminal blocks shall have compression end sleeves over the

conductor for protection and strength. Switchboard wiring shall be neatly run and properly supported. Grommets shall be provided to protect wiring where it passes through metal panels. Components required to be interconnected with external equipment shall be wired to barrier type terminal boards that are readily accessible and clearly marked. The secondary of all current transformers are to be wired to shorting type terminal blocks. Wiring duct, cable tie mounting devices, clamps or clips shall be permanently fastened. Any adhesives used shall be epoxy type. Foam or double sided tape is specifically prohibited.

Nameplates and Labels

Components mounted on the front of the switchboard shall be provided with engraved nameplates that clearly indicate their use. Nameplates shall be black letters engraved on white background. Nameplates for circuit breakers shall give the circuit designation, breaker frame size, trip setting and load served. All instruments, switches, and front mounted components shall have nameplates, appropriately engraved. Internal to the switchboard, easily readable identification shall be provided for all fuses and other components. Main buses shall be marked with their phase designation. All terminal blocks shall be numbered and keyed to circuit designations on wiring diagrams.

Main Propulsion Switchboard Components:

It is the electric propulsion system integrator's responsibility to furnish all components required for a complete and workable system. The electric propulsion system integrator shall provide sufficiently detailed descriptive information about the switchboard, including all drawings, parts lists, operating descriptions, and other documentation necessary to obtain regulatory and owner approvals.

Minimum control components for each generator control compartment (3 each):

- One (1) Generator power circuit breaker, 800 AF, draw-out, electrically operated, with ST, 4a & 4b auxiliary contacts, long time, short time and instantaneous trip with a bell alarm
- Three (3) Circuit breaker lights indicating breaker status; open, closed and tripped
- One (1) Control power transformer with fusing
- Three (3) CT's, for relays and metering, ratio to suit generator
- One (1) CT, ratio to suit AVR
- Two (2) Potential transformers for the generator voltage with fusing
- One (1) automated digital generator protection and load sharing relay
- One (1) electronic automatic voltage regulator
- One (1) Digital governor control module if required for generator engine control
- One (1) Generator Power Available light
- Generator heater circuit consisting of:
    - One (1) Generator Heater On light
    - One (1) Generator heater switch, 2 position
    - One (1) Generator heater thermostat
    - One (1) Generator heater power relay

- Cubicle heater circuit consisting of:
  - One (1) Vertical section heater thermostat
  - One (1) 250W strip heater for vertical section
- One (1) Emergency stop push-pull button, 40mm head
- One (1) Lot of control relays with bases
- One (1) Lot of terminal blocks for internal and external connections
- One (1) Lot of control circuit fused terminal blocks

Minimum components for Bus Tie Section (1 each):

- One (1) Bus tie circuit breaker, 1000 AF, draw-out, electrically operated, with ST, 4a & 4b auxiliary contacts, long time, short time and instantaneous trip and a bell alarm
- Three (3) Circuit breaker lights indicating open, closed, and tripped
- Two (2) Digital bus ground detection modules (Bus "A" & "B")
- One (1) Set of bus CT's
- Two (2) Sets-bus potential transformers (Bus "A" & "B") with fusing
- One (1) electronic synchronization check and circuit breaker control module, with display
- Two (2) Bus voltage surge suppression systems comprised of distribution grade fused MOV sets
- Cubicle heater circuit consisting of one (1) Vertical section heater thermostat and one (1) 250W strip heater for vertical section
- One (1) Dead bus relay
- One (1) Lot of control relays with bases
- One (1) Lot of terminal blocks for internal and external connections
- One (1) Lot of control circuit fused terminal blocks
- Two (2) 480W 24Volt DC power supplies (Bus A / Bus B) with diodes
- One (1) DC – DC converter for incoming customer supplied 24 Volt DC power

Minimum components for Port Distribution Section (1 each):

- One (1) 400 AF End 2 Port main propulsion drive feeder breaker, electrically operated, draw-out with ST, 2a & 2b auxiliary contacts, long time, short time and instantaneous trip
- One (1) 400 AF End 1 STBD main propulsion drive feeder breaker, electrically operated, draw-out with ST, 2a & 2b auxiliary contacts, long time, short time and instantaneous trip
- One (1) 250 AF 150 kVA 600 Volt AC ship service transformer XMR2 feeder breaker, electrically operated, draw-out with UVT, 2a & 2b auxiliary contacts, and thermal magnetic trip
- One (1) 160AF Steering feeder breaker, manually operated, draw-out with instantaneous trip only
- Vertical section heater circuit consisting of:
  - One (1) Vertical section heater thermostat
  - One (1) 250W strip heater for vertical section

Minimum components for Starboard Distribution Section (1 each):

- One (1) 400 AF End 1 Port main propulsion drive feeder breaker, electrically operated, draw-out with ST, 2a & 2b auxiliary contacts, long time, short time and instantaneous trip
- One (1) 400 AF End 2 STBD main propulsion drive feeder breaker, electrically operated, draw-out with ST, 2a & 2b auxiliary contacts, long time, short time and instantaneous trip
- One (1) 250 AF 150 kVA 600 Volt AC ship service transformer XMR1 feeder breaker, electrically operated, draw-out with UVT, 2a & 2b auxiliary contacts, and thermal magnetic trip
- One (1) 160AF Steering feeder breaker, manually operated, draw-out with instantaneous trip only
- Vertical section heater circuit consisting of:
    - One (1) Vertical section heater thermostat
    - One (1) 250W strip heater for vertical section

Minimum components for Power Management System (PMS):

- One (1) Programmable Logic Controller, (PLC)
- One (1) 7" Touch screen HMI display
- Two (2) generator PMS Sections for Generators 1 and 2 consisting of:
    - One (1) industrial grade PLC
    - Three (3) Sixteen channel digital input signal modules
    - Two (2) Sixteen channel digital output signal modules
    - One (1) Managed FO/IE network switch
- One (1) generator PMS Sections for Generator 3 consisting of:
    - One (1) industrial grade PLC
    - Three (3) Sixteen channel digital input signal modules
    - Two (2) Sixteen channel digital output signal modules

Main Propulsion Switchboard Operations

General Description

The switchboard shall control the three main generators. The switchboard shall be arranged for automatic and manual parallel operation of propulsion generators in any combination. The Power Management System (PMS) will, in automatic mode, monitor and control the power available to the propulsion motors, automatically starting a standby generator and placing it online upon the loss of one or more operating generators. Generator start priority switches or controls shall be provided for each generator to determine the start order of generators when the PMS is in control.

Remote indication in the EOS will show the current status of each generator set as "connected," "standby," or "manual."

Load Monitoring and Limiting

The switchboard PMS shall include automatic load monitoring and shall provide operator warnings via switchboard indicators and through the IMACS whenever the operating propulsion generators reach 85% (adjustable) full combined output. Overload/blackout of the propulsion generators shall be avoided through automatic propulsion motor power demand limiting by the

VFDs, until additional power has been brought onto the MPS, either automatically by the PMS or manually, or load has been reduced.

Main Propulsion Switchboard Spares

The main propulsion switchboard shall be supplied with critical operational spare parts sufficient for five years of operation. Spare parts shall be stored in the "SPARE ELECTRICAL PARTS" cabinet in the engine room. The main switchboard spares shall include one generator set main circuit breaker, and one bus tie circuit breaker, packaged for transport and warehouse storage off the vessel. If the generator set and bus tie circuit breakers are interchangeable (with adjusted settings or programming), then one spare circuit breaker may be provided.

Spare parts shall include, at a minimum:

Qty	Item
2 ea.	Spare fuses for each fuse installed
1 ea.	Molded case distribution circuit breaker for each group of 10, or fraction thereof, identical breakers installed, where non-interchangeable units are used
1 ea.	Control relay/module of each type installed

Spare switchboard parts shall be stored in the "SPARE ELECTRICAL PARTS" cabinet.

320.2 Ship Service Switchboard

The ship service (SS) switchboard shall provide for the control and distribution of 3-phase, 208/120 VAC electrical power as shown on Reference (3B). The switchboard shall provide for non-parallel supply of power from either ship service transformer or the shore power feed. The ship service switchboard, located in the EOS, shall be deck mounted.

The switchboard shall be constructed by a UL-891 certified facility. Verification of certification shall be provided to the NCDOT's Representative.

The switchboard shall be installed in accordance with U.S. Coast Guard 46 CFR 111.30-1. The Contractor shall prepare and submit a switchboard arrangement plan to NCDOT prior to placement of the purchase order. The arrangement plan shall be detailed, complete with features and technical data on all devices.

Provide and install an isolation transformer between the switchboard and shore power transfer switch to isolate grounding issues.

The switchboard manufacturer shall provide wiring diagrams and shop drawings of the switchboard to the contractor, and the contractor shall provide same to NCDOT for approval prior to fabrication. The drawings shall clearly show design, construction material, finish installation, front layout, point to point wiring diagrams, material list, mounting details, and label

plate list including floaters for terminal blocks. The manufacturer shall provide to the Contractor three complete sets, as well as electronic sets in .PDF format, of as-built drawings of the switchboard and cut sheets of the components. The Contractor shall in turn provide the physical and electronic documents to the NCDOT Representative.

Switchboard components listed in this specification and all others required for a complete system shall be provided. The switchboard shall be furnished as specified herein and shown on Reference (3B), and shall be installed and fully connected into the ferry electrical system by the Contractor.

The switchboard shall be demonstrated during onsite tests at the manufacturer's facility, or Contractor's facility to fully provide operating logic that accomplishes the functionality and operation specified in the below paragraphs.

Ship Service Switchboard Construction

Switchboard construction shall meet the requirements of 46 CFR 111.30.

Enclosure

The switchboard shall be drip proof and of dead front, all welded steel construction. All operating controls and indicators shall be front mounted and fully accessible. All other components shall be accessible by hinged front, or removable side and rear panels. The switchboard front shall be adequately illuminated by normal and emergency lighting. Construction shall allow for cables entering the top or bottom of the switchboard.

The switchboard frame shall be constructed of 12 gauge cold rolled formed steel and/or structural steel angles welded together into a rigid framework. The bottom shall be completely open for possible cable entrance. All front instrument panels shall be formed approximately 1 in on all sides and hinged. Front panels covering molded case distribution circuit breakers shall be formed and bolted. Side and rear panels shall be flat sheets, bolted on. All formed and bolted panels shall be fastened with center seeking, knurled head, captive screws and floating nut block assemblies. All formed and hinged front panels shall be fastened with open and turn flush clamps. All hinged panels shall be equipped with door positioners for holding the panel in the open position during access to internally mounted components. Non-conducting grab rails shall be provided across the entire front of the switchboard.

Bus Bars

Bus bars shall be made of commercially pure copper and sized in accordance with the table in the 2002 revision of IEEE-45. All bus bars shall be tin or silver plated over their entire length. Bolts, washers and nuts used to maintain bus contact shall be of corrosion resisting material or appropriately plated. All bolts in bus connections shall be torque wrench tightened to an appropriate uniform value for each size bolt. After final tightening, each bus bolt, nut and washer shall be marked with a line going across them to an adjacent area of the bus with a permanent marker or paint pen. The mechanical strength, bracing and supports of the bus shall be designed for a symmetrical RMS short circuit current of 10 kA.

Components

All electrical components shall be selected to operate satisfactorily in a 45°C ambient temperature and shall be as described below.

Circuit Breakers:

Circuit breakers shall be quick-make, quick-break, trip free, with tripping mechanisms capable of safely opening the circuit they protect while subjected to the maximum fault current of 10 kA. All poles shall be opened simultaneously by a common trip mechanism. Trip elements or sensors in the EOS shall be calibrated or ambient compensated for operation in a 45°C ambient temperature, or properly de-rated in accordance with the circuit breaker manufacturer's instructions for use in ambient temperatures above 40°C. Breaker frame size, nominal trip setting, and de-rated trip setting shall be shown on the switchboard design drawings, as-built electrical one-line diagram, and on the engraved breaker ID plate attached to the front of the switchboard.

The circuit breakers shall be mounted in such a manner that the breakers may be removed from the front without disconnecting line or load bus or power cable terminations through use of draw-out breakers or heavy-duty plug-in bases for molded case circuit breakers. Molded case distribution circuit breakers shall be manually operated with frame and trip ratings as shown on Reference (3B).

All under-voltage trip (UV) devices shall be 24 VDC, to prevent tripping during power transfer operations.

Instruments:

All instrumentation shall be provided by one or more generator multifunction digital meters, arranged to sense the supply from any of the sources. Instruments shall be constructed to minimize damage from dust or moisture.

The system shall include relays or contacts as necessary to interface with the Integrated Monitoring Alarm and Control System (IMACS) (see Section 436) to display all alarms.

Instrument and Control Switches:

All instruments, controls, and circuit breaker switches shall be clearly labeled for function.

Fuses:

Fuses shall be of the non-renewable cartridge type. Instrument fuses shall be accessible from the front of the switchboard through the hinged panels containing the instruments and controls they protect.

Indicating Lights:

Indicating lights will be LED type.

Wiring:

Instrument and control wire shall be a minimum of 14AWG type SIS, (except for electronic component connection which can be 18AWG), flame retarding, flexible switchboard wire. Each wire end shall be fitted with a permanent sleeve type wire number and terminated with vinyl insulated compression lugs, applied with a ratchet tool, where component terminations permit. Switchboard wiring shall be neatly run and properly supported. Grommets shall be provided to protect wiring where it passes thorough metal panels. Components required to be interconnected with external equipment shall be wired to barrier type terminal boards that are readily accessible and clearly marked. The secondary of all current transformers are to be wired to shorting type terminal blocks. Plastic wiring support devices and materials on the back pans, side pans or rear of doors shall meet UL 94V-0 flame retardant standard. Wiring duct, cable tie mounting devices, clamps or clips shall be permanently fastened. Any adhesives used shall be epoxy. Foam tape is specifically unacceptable.

Nameplates and Labels:

Components mounted on the front of the switchboard shall be provided with engraved nameplates that clearly indicate their use. Nameplates for circuit breakers shall give the circuit designation, breaker frame size, trip setting and load served. All instruments, switches, and front mounted components shall have nameplates, appropriately engraved. Internally, easily readable, use identification shall be provided for all fuses and any other components. Main buses shall be marked with their phase designation. All terminal blocks shall be numbered and keyed to circuit designations on wiring diagrams. Engraved nameplates shall be white letters engraved on black background.

Ship Service Switchboard Components:

The following description of components required within various compartments is for guidance only and does not relieve the manufacturer of responsibility for the final design and arrangement. It is the manufacturer's responsibility to furnish all components required for a complete and workable system. Switchboard manufacturer shall provide sufficiently detailed descriptive information about the switchboard including all drawings, parts lists, operating description and other documentation to obtain regulatory and owner approvals.

Minimum control components for each transformer monitoring compartment:

1 Set of potential transformers with primary and secondary fuses, as required

3 Current transformers, as required

1 Control power transformer

1 Transformer feed multifunction meter

1 Circuit breaker control switch, two positions (open and close)

1 Circuit Breaker Closed indicator light

1 Circuit Breaker Open indicator light

1 Power Available Light

b. Master control minimum components:

1 Ground Detection Panel

c. Minimum components for all distribution feeder circuit breaker sections as shown on the one-line diagram.

Ship Service Switchboard Operations

General Description

This switchboard shall control two (2) ship service transformers and one shore power supply. The switchboard shall be interlocked so that only one supply may feed the switchboard at any time. It shall be electrically interlocked to provide OPEN TRANSITION transfers only between shore power supply and ship service transformer supply, and from one ship service transformer to the other. Supply transfers shall be purely manual, not automatically initiated.

Ship Service Switchboard Spares

Spare parts for the ship service switchboard installation shall be provided as follows:

Qty	Item
2 ea.	Spare fuses for each fuse type installed
1 ea.	Molded case circuit breaker for each group of 10, or fraction thereof, identical breakers installed, where non-interchangeable units are used
1 ea.	Miniature circuit breaker for each group of 10, or fraction thereof, identical breakers installed, where non-interchangeable units are used
1 ea.	Control relay/module of each type installed

Spare switchboard parts shall be stored in the "SPARE ELECTRICAL PARTS" cabinet.

320.3 Emergency Switchboard

Arrange the emergency switchboard for control, operation and protection of the emergency generator set, including automatic transfer equipment, and distribution of emergency power. Under normal operations, the emergency switchboard loads shall be supplied by the ship service switchboard via the emergency bus tie. The emergency switchboard shall be mounted at least 18" above the floor in the ES space to prevent water from entering the board when floor is washed.

Provide the emergency generator control system with an automatic generator starting system including starting battery bank. The battery shall be capable of providing six (6) consecutive starts. Per regulatory requirements, protect the battery from depletion by the automatic starting system.

320.3.1 Emergency Switchboard Operation

If the power from the ship service bus drops to 80% of rated voltage, the circuitry shall signal the emergency generator to start. As the emergency generator reaches 90% of rated output voltage, emergency switchboard loads shall shift from the ship service bus to the emergency generator. After restoration of rated voltage to the ship service bus, the power supply to emergency loads shall require transfer via a manual circuit breaker from the emergency generator to the ship service bus. An indication light on the face of the ship service switchboard shall indicate when the emergency generator is operating. The emergency switchboard automation shall sense voltage at the point where the emergency bus tie feeder connects to the supply transfer arrangement in the emergency generator room.

320.3.2 Emergency Switchboard Arrangement and Location

The emergency switchboard shall be located in the emergency generator room and installed in accordance with 46 CFR. The Contractor shall prepare and submit a switchboard arrangement plan to the Owner prior to construction of the switchboard. The arrangement plan shall be detailed, complete with features and technical data on all devices.

320.3.3 Emergency Switchboard Spares

Spare parts for the emergency switchboard installation shall be provided as follows:

Qty	Item
2 ea.	Spare fuses for each fuse installed
1 ea.	Molded case circuit breaker for each group of 10, or fraction thereof, identical breakers installed, where non-interchangeable units are used
1 ea.	Miniature circuit breaker for each group of 10, or fraction thereof, identical breakers installed, where non-interchangeable units are used
1 ea.	Control relay/module of each type installed

321 POWER DISTRIBUTION EQUIPMENT

321.1 Distribution Panels and Load Centers

Power distribution panels supplied by switchboards or transformers shall be provided as necessary to supply the necessary number of circuits in the necessary locations. Panels shall be sourced from a leading American manufacturing company. Distribution panels shall comply

with U.S. Coast Guard 46 CFR 111.40 and shall be Underwriters Laboratories listed, bearing the UL label.

Distribution panels and load centers shall have main lugs only. Bus bars and internal conductors shall be tin or silver plated copper. Circuit breakers shall be plug on type, removable from the front of the panel. Panel bussing shall be braced to withstand the maximum available fault current. Provide removable sheet metal front covers with a cutout for the circuit breaker toggle, set point, and trip mechanism. Cutouts shall provide a gasket to seal the covers around the cutout.

321.2 Enclosures and Interiors

The enclosures shall be manufactured of gray painted sheet steel in all areas except those exposed to weather. In areas exposed to weather, enclosures shall be 316 stainless steel.

Electrical enclosures shall prevent the ingress of solids and liquids, and shall meet the Ingress Protection ratings outlined by the ABS Rules. Electrical enclosures within mechanical spaces shall generally be NEMA 12, however the switchboards may be NEMA 1 with drip shields. Enclosures in areas exposed to weather shall be NEMA 4X. Enclosures within the Pilot House may be NEMA 1.

All panels accessible to passengers shall have latches with locks keyed alike.

Fit a circuit directory frame and card with a clear plastic covering on the inside of each distribution panel door as required by 46 CFR 111. The directory card **shall not** be permanently attached to the door but shall be removable for modification. Circuit designations and load description of the circuit shall be typed in the proper place on the directory card. The circuit designations and load description shall correspond exactly to the installed condition and to the final Contractor prepared version of References (3A) and (3B).

321.3 24 VDC Power Distribution Panels

Provide 24 VDC panels for navigation, control, communication, monitoring, and other DC electronic loads as required. These panels shall be powered from dedicated power supplies.

Circuit breaker and panel labeling shall be similar to the panel labeling requirements outlined above in this Specification.

321.4 Transformers

Two power transformers shall be provided to supply the ship service switchboard; transformers will be supplied by the Main Switchboard. Powers, voltage levels, and connection configurations are shown in References (3A) and (3B), and general locations are shown in Reference (3E). Transformers shall be mounted on dedicated foundations and shall be set away from bulkheads and equipment to allow adequate cooling air circulation.

The ship service transformers shall be ABS type approved and encapsulated with electrical grade silica and resin.

321.5 Switches

Switches shall have positive snap action to maintain open or closed position. Power switches, other than area lighting toggle switches and control switches, shall be equipped to allow locking the switch in the open position. Switches shall be labeled to indicate the function of each handle position. The rated ampacity of each switch shall be at least that of the circuit breaker supplying the circuit.

Area lighting switches shall be 125-volt, 20 ampere, with handle set vertically. The UP position shall correspond to ON for all toggle switches unless the switch is installed in a three or four-way switching configuration. Use watertight switches on and below the car deck, and in exterior locations.

Switches mounted in lining panels or non-structural bulkheads shall be mounted with cover plates flush with the surface of the lining panel or non-structural bulkhead wherever possible. Use corrosion resistant fasteners to attach the wiring device enclosure to the plate.

322 RECEPTACLES

Provide electrical receptacles in the Pilot House, Crew Lounge, Heads, Passenger Lounge, EOS, Switchboard Room, Engine Room, Voids, Thruster Rooms, open deck areas, and elsewhere as shown on Reference (3C).

Install 120 VAC hospital grade duplex receptacles, 2-pole, 3-wire (grounded) for portable equipment. Receptacles shall be rated for 15A or 20A, to match the circuit breaker supplying the circuit, and shall use side mounted screw terminals. Push-in type connections shall not be used. Grounding conductors shall be extended to the panel supplying the circuit, and solidly grounded to the ship structure.

Each space and each workbench shall have at least one (1) unassigned receptacle.

Unless noted otherwise, receptacles shall generally be located approximately 18 inches above the finished floor or deck surface; however, receptacles on the car deck shall be located at least 24 inches above the deck. Where receptacles are located at tables, counters, consoles, or workbenches, they shall be placed above that surface.

All receptacles installed in machinery spaces, the car deck, or in exterior areas shall be watertight.

Provide receptacles with GFCI protection in machinery and void spaces, at the crew lounge counter, cleaning gear lockers, passenger and crew toilet areas, car deck, exterior areas, and at workbenches. GFCI protection may be provided via the branch circuit breaker, or with individual GFCI receptacles.

Receptacles mounted in lining panels or non-structural bulkheads shall be mounted with cover plates flush with the surface of the lining panel or non-structural bulkhead wherever possible. Use corrosion resistant fasteners to attach the wiring device enclosure to the plate.

Electrical Receptacles in the Passenger Lounge and Crew Lounge shall have integrated USB charging ports.

322.1 Shore Power Connections

One shore power connection shall be located at each end of the vessel, in an Owner specified location. Each shall include a local disconnect. Each shore power feeder should connect to the main switchboard via a selector switch or pair of interlocked circuit breakers, so that only one connection is energized at a time. Each inlet shall include a cap or cover to provide a weathertight seal when the connection is not in use. Shore Power shall be rated at 200 Amps. the inlet shall be standard Ferry Division manufacturer and model number to match existing docks.

322.2 Transfer Span Supply

One receptacle, 208V, 3ph, 30A, shall be installed at each end of the vessel, in an Owner specified location. The receptacle shall include local disconnect, and cover to provide a weathertight seal when not in use. The receptacles will be used to supply the transfer spans (i.e. loading ramps) in the event of a power outage ashore.

330 LIGHTING

330.1 General

Provide and install a complete, functional, operational lighting system, including all wiring, fixtures, switches, controllers, junction boxes, cable transits, cable glands, and other items and devices. All lighting except searchlights shall be LED.

Lighting systems are classified as Normal if they are supplied from the ship service switchboard, and Emergency if they are supplied from the emergency switchboard. These supplies may be direct or indirect via distribution panels. No switches, except as noted, shall be placed in emergency light circuits.

Provide and install lighting fixtures generally as shown on Reference (3C). Lighting locations are approximate, and the Contractor shall be responsible for adjusting fixture location to avoid interferences with structure, piping, ventilation, cableways, and other items. Exact fixture locations may be modified as required to satisfy general illumination requirements, as well as task lighting for gauges, instruments, switchboards, sinks and counters, workbenches, etc.

Light fixtures in machinery spaces shall be mounted in plane or below the overhead structure, ducting, piping, and cableways, to avoid significant light obstruction. However, consideration shall also be given to adequate headroom along primary walking paths.

330.2 Interior Lighting

The interior of the vessel shall be adequately lit throughout with marine-type LED fixtures of a style applicable to the location and suitable for the service required. In addition to area lighting, lights shall be provided at each desk and workspace. Arrangements of lights and lighting level shall be guided by the ABS Guide for Crew Habitability on Workboats. Lighting shall be arranged to provide even and consistent illumination, with minimal dark spots. Switches shall not be located in areas accessible to the public.

330.3 Exterior Lighting

A complete exterior lighting system shall be installed. In general, the quantity, type, and arrangement of lighting fixtures shall provide illumination in accordance with the ABS Guide for Crew Habitability on Workboats. In general, exterior lighting which could affect the pilot's night vision shall be controlled from the Pilot House. Any miscellaneous switches shall be watertight if in weather locations.

332 LIGHTING FIXTURES

Fixtures shall meet UL 1598A, and shall operate on 120 VAC, using LED type lighting fixtures.

Engine Room, Void, Emergency Generator Room, and Thruster Room lighting fixtures shall be surface-mounted and drip proof. Passenger Space, Pilot House, and other finished interior location lighting fixtures shall be recessed and compatible with the ceiling system. Pilot House lighting shall have separately switched white and red lighting. Lighting in exterior locations shall have bird spikes or other bird deterrents added.

Fixtures in weather areas, on the car deck, and in mechanical spaces and voids, shall have unused cable entry holes plugged with drip-proof plugs. Sealing entry holes with caulking **does not** satisfy this requirement. Fixtures on the car deck and exposed to weather shall be mounted with 316 stainless steel fasteners.

332.1 Exit Lighting

Illuminated exit signs will be installed above doorways as required by regulation. If electric, they shall be supplied by the emergency bus.

332.2 Floodlights

Four LED deck floodlights will be installed under the bridge deck where directed by NCDOT. One will face each end of the vessel. The remaining two will face inboard towards the main deck. Lights shall be switched from the Pilot House. Floodlights shall be from the same manufacturer as others in the fleet.

332.3 Searchlights

Four (4) 1000W xenon, 80 million CD, remotely controlled searchlight systems shall be provided. The searchlights shall be marine grade aluminum and steel with salt-resistant powder coat finish, remote electric beam focus, and electric joystick remote control. One searchlight shall be located on each corner of the Pilot House top, elevated to clear the Pilot House visor and provide clear illumination. Searchlights shall be remotely controlled by joystick on each console.

332.4 Switches and Junction Boxes

Provide local switching for the lighting as shown in Reference (3C). When a lighting circuit is required to have a switch, the switch is to be T rated.

Junction boxes used in emergency lighting circuits are to be watertight with watertight cable glands.

340 BATTERIES AND CHARGERS

340.1 General

All batteries are to be Absorbed Glass Mat (AGM) construction, sealed valve regulated lead acid, 12-volt, sized and wired in series/parallel as required. Engine starting batteries shall be commercial marine grade. Battery connections shall be pressure type lugs. Each battery bank shall be located in a vented battery boxes securely mounted in a foundation.

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

Battery chargers shall not be installed directly over batteries.

Batteries and battery chargers shall be provided for engine starting and backup power as necessary. Provide one 24V backup power battery bank for the Pilot House, and two for the Engine Room. Size banks to provide backup power for the duration required by regulation.

Four engine starting banks will be provided, three for the Engine Room, one for the Emergency Generator Room.

GROUP 400 - COMMAND AND SURVEILLANCE / ELECTRONICS

400 GENERAL

400.1 References

Reference ID	Number	Title
(4A)	18026-200-101-1	Profiles and Deck Arrangements
(4B)	18026-200-201-1	Machinery Arrangement
(4C)	18026-200-422-1	Navigation Lighting Arrangement and Block Diagram

421 NAVIGATION EQUIPMENT

421.1 Barometer

One (1) 6-inch marine barometer shall be provided and installed in the Pilot House.

421.2 Thermometer

A thermometer shall be provided and installed in the Pilot House for outside air temperature.

421.3 Clinometers

Four (4) bubble in tube type clinometers with graduated scales of ± 15 degrees shall be provided and installed.

Two (2) clinometers shall be mounted in the Pilot House. One clinometer shall be mounted over the Pilot House window at each end, centered over the pilot's control station.

Two (2) clinometers shall be mounted in the EOS. Locate the clinometers over the EOS windows, one on the transverse bulkhead and the second on the longitudinal, in clear view from the EOS console.

421.4 Clock

One (1) 6-inch, 12/24 hour, battery operated quartz marine clock shall be provided and installed in the Pilot House.

421.5 Ship's Horn

Two complete air horn systems shall be installed, one for each end of the vessel. Each system shall consist of an air horn, a combination electric/manual solenoid valve, and a signal controller with fog timer.

One air horn shall be installed at each end of the Pilot House, generally where shown on Reference (4A). Air horns shall be constructed of cast bronze and spun brass, have a loudness greater than 130 dBA at 1 meter, and meet the requirements of 33 CFR 86.01.

The signal controller shall provide at-will and automatic control of the horn and the Morse light on the midship mast. The controller shall be capable of providing automatic, timed sound and light signals for restricted visibility (fog) codes and automated maneuvering signals.

The horn system shall be arranged so that the manual pushbutton activates the horn only at its own end, but so that the automated signal controller activates the horns at both ends.

421.6 Fog Bell

One (1) 12-inch diameter cast bronze fog bell shall be provided with the vessel's name engraved on the surface. The bell shall be mounted, with brackets on the side of the Pilot House. The bell shall have a polished finish with a preservative coating. The clapper shall be provided with a lanyard.

422 NAVIGATION LIGHTS

Provide and install navigation lights meeting COLREGS and all applicable USCG requirements. The lighting system shall be suitable for a double-ended ferry, configured generally as shown on Reference (4C). The arrangement depicted will require a Certificate of Alternate Compliance from the USCG, NCDOT will assist the shipyard the approval process for this vessel.

Navigation lights shall be commercial marine grade LED. Each required light shall have duplicate light sources powered by isolated circuits.

Electrical cables on the navigation light masts shall be fitted with watertight receptacles and plugs at each light fixture and adjacent to the mast base to facilitate light replacement. The receptacles and plugs shall be clearly labeled to ensure proper wiring is maintained.

The lights shall be controlled by a navigation light control panel in the Pilot House as shown in Reference (4C). The panel shall provide visual/audible alarm in the event of a navigation light failure, and shall comply with the requirements of 46 CFR 111.75-17.

The navigation light panel shall have an automatic transfer switch to select/transfer the energized navigation lights for "A"-End forward or "B"-End forward operation. A signal from the propulsion control system, indicating "A"-End or "B"-End in control, shall be provided. Manual transfer from the navigation light control panels shall also be possible.

Provide and install an all-around white Morse light on the center mast, where shown on Reference (4C) and connect to the horn circuits so the light activates when either horn sounds.

426 NAVIGATION ELECTRONICS

426.1 General

The electronic systems shall be in accordance with the applicable regulations of the Federal Communications Commission, Part 83, and USCG regulations. The installation and testing of equipment shall be supervised by the equipment manufacturer's representative. All antennae shall be installed to avoid interference with each other and provide maximum clear reception.

The Contractor shall be responsible for accomplishing FCC inspection and obtaining certification. The systems shall be considered complete only when the FCC inspection and certification has been accomplished. All equipment shall be of commercial marine grade quality. Additionally, the Contractor shall obtain NCDOT's approval of the selected equipment prior to purchasing.

426.2 Radar and GPS System

The vessel shall be supplied with an integrated radar/GPS/chart plotter/AIS/Depth sounder system consisting of four (4) multi-functional displays, (MFD), two dedicated chart plotter displays and two (2) dedicated radar displays connected to 4-foot open array antennas, a GPS antenna, and a Class A AIS transceiver with antenna. All equipment for this system shall be from the same manufacturer to ensure proper integration.

Each MFD shall have the following characteristics

- 15.6 inch wide touch screen
- Integrated depth sounder
- Inputs for at least two radars antennas, but one operational at a time

Each dedicated chart plotter MFD shall have the following characteristics.

- 15.6 inch wide screen
- Interfaced to the same external GPS antenna

The radars shall have the following characteristics

- X band type
- Range detection up to 96 NM
- Minimum range detection of 20 m
- Output power of 12kW
- 1.9° horizontal beam width
- 22° vertical beam width

The AIS transceiver shall have the following characteristics

- 4.5 inch display
- Built in 12 channel GPS receiver
- Able to monitor Class A and Class B AIS
- Graphical display of AIS target data
- DSC channel 70 receiver
- AIS target orientation shall be capable of being adjusted for orientation with the Pilot House in control

The Contractor shall supply and install all interconnecting cabling, interface units, junction boxes, antennas, and support brackets for a complete and functional system. The displays shall be located in the Pilot House as directed by NCDOT.

426.3 Depth Sounders

Two depth sounder transducers shall be provided and installed, one in each end of the vessel. The transducers shall be from the same manufacturer as the MFD system. Each radar MFD shall be interfaced to one depth sounder transducer. The installation shall include all interfacing hardware and cabling.

One (1) transducer shall be installed at each end of the vessel, at the bottom of the skeg near Frame 39. Stainless steel Sch. 80 pipe shall be used for cable conduit and shall be carried from the transducer pipe enclosures at the bottom to the skeg to a point at least 6 feet above baseline in the forepeak area. The open end of the pipe shall be fitted with a stuffing box. Pipe conduit shall be maintained watertight throughout its length. Transducer cables may be carried in open wireways from top of the pipe conduit to its final termination point. Final location of transducers shall be approved by the NCDOT Representative.

426.4 Digital Compass

A digital compass system shall be provided and installed in each Pilothouse console. Each installation shall have one digital display, and a remote sensing unit. The remote sensing unit shall be installed on the Pilot House top, on a non-metallic pedestal, a minimum of 18 inches from any possible magnetic influence. The installation shall include all required interfacing hardware and cabling.

The digital compass shall have the following characteristics

- Standard NMEA output capable of integration with the four (4) MFD units
- Heading displayed in large digital numerals along with familiar points of compass
- Selectable damping levels
- Black in color
- Remote sensing unit

426.5 Weather Station

One ultrasonic weather station shall be provided and installed. The weather station shall measure wind speed and direction, barometric pressure, and temperature. The sensor shall be mounted on the Pilot House top and integrated with the four (4) MFD units. The anemometer shall be installed in a location such that the airflow is not significantly affected by house top features.

The weather station shall be from the same manufacturer as the MFD system.

426.6 Night Vision System

Two (2) infrared night vision systems shall be provided and installed. Each infrared system shall have the following features

- 640 X 480 Resolution infrared camera with pan and tilt.
- Flush mount Camera control panel
- Compatible with ship's MFD system

Mount one (1) infrared camera on the Pilot House top visor, on each end of the Pilot House, above the Pilot's station. Install one (1) camera control panel in each Pilot House console for control of the camera installed at that end. Integrate the camera systems with the ships MFD system for video display at each Pilot House console.

433 INTERIOR COMMUNICATIONS

An integrated Interior Communications System (ICS) shall be furnished and installed. The system shall integrate the telephone, public address and general alarm (PA/GA), paging, talkback, loudhailer, emergency phone, and alarm annunciation. The system shall meet all applicable requirements for internal communications and emergency alarm systems as set forth in 46 CFR Subchapter H.

The system shall support the use of pre-recorded messages. The Owner will provide the Contractor with a list of pre-recorded messages to be loaded into the system. The system shall be capable of providing an external signal to allow public address announcements to be mimicked by visual signage.

The PA/GA system shall include the following features:

- Audio messaging with loudspeakers throughout the passenger spaces as required to adequately broadcast messages
- A control panel in the Pilot House to select prerecorded messages
- A hand microphone at each Pilot House console

Two Loudhailer speakers shall be provided on the Pilot House top, one facing each end of the vessel. The loud hailers shall be configured as independent zones in the system.

Command intercom/talkback stations shall be installed as required to meet regulatory requirements. Stations shall be installed in the following locations, at minimum:

- Pilot House
- Engineer's Operating Station
- Rescue Boat & IBA Station, at B end outside of Crew Lounge located under the inclined ladder.
- Main Deck, one near each bulwark-end goal post.

Emergency phone stations shall be installed as required to meet regulatory requirements. Stations shall be installed in the following locations, at minimum:

- Pilot House, End A
- Pilot House, End B
- Crew Lounge
- Emergency Generator Room
- Engineer's Operating Station
- Engine Room
- Switchboard Room

- Thruster Room A
- Thruster Room B

Emergency phone stations in the engine room and thruster rooms shall be equipped with external visual and audible annunciators and noise cancelling headsets.

The system shall include an uninterruptible power supply (UPS), duplicate tone generators, redundant controls, and speaker placement, wiring, and zoning as required to comply with applicable USCG requirements.

The system shall include an ADA visual messaging system with the following capabilities:

- Visual messaging on two (2) 40” LED HD 1080P flat screen TVs in the passenger lounge, one located at each end of the space.
- Capability of showing advertising for future needs
- Capability of future satellite connection

The system shall be tested and verified by the manufacturer's Technical Representative.

Nameplates and markings shall be provided in accordance with USCG regulations.

436 ALARM AND MONITORING SYSTEMS

436.1 Machinery Alarm and Monitoring System

An Integrated Monitoring Alarm and Control System (IMACS) shall be supplied and installed by the Contractor. The IMACS shall be part of the electric propulsion system integrator supply. It shall collect and display information from discrete or analog inputs, or from digital communications. The system shall monitor and display all propulsion related information, as well as incorporate specified control functions. The system shall also display all other ships alarm and monitoring points and systems. The system shall include level sensors, signal conditioning between all sensors and the system, control and display units, and interface with the ICS for ship-wide alarms (if required). The system shall comply with all applicable USCG regulations.

The system shall be PLC based, with digital and analog I/O modules. A series of collection/junction I/O boxes shall receive inputs directly from the various system sensors, and transmit them to the PMS PLC over redundant PROFINET communications networks as required by USCG. The system shall include two (2) 12" and one (1) 15" color HMI touch screen display panels. One (1) 15" main alarm and monitoring panel shall be installed in the EOS console. Two (2) remote 12" alarm and monitoring panels shall be installed in the Pilot House, one in each Pilot House console.

Bilge alarms and watertight door status shall be shown on a virtual mimic panel showing the vessel hold plan and indicating location of the alarm in the vessel.

Under no circumstances shall alarm and monitoring devices contain mercury.

The PLC will interpret the input signals and generate outputs that will be read at each touchscreen display. The Engine Room display shall be drip-proof NEMA 12. The EOS HMI display shall have an audible alarm annunciator, an alarm acknowledge button, and controls to allow scanning and viewing various screens. The HMI alarm annunciator shall be supplemented by sirens and strobe lights mounted throughout the below deck compartments.

The Engine Room audible alarm circuit shall be extended to include a weather-proof horn mounted on the side of the Deckhouse. The EOS HMI panel shall have a selector switch with two positions: 1) "normal" operation and 2) "in-port" operation. The horn shall be activated when an alarm sounds while the selector switch is in the "in-port" position.

Alarm system logic shall be such that the alarms are self-monitoring, fail safe. All required software and hardware shall be provided to the Owner for future system modifications (additions/deletions of monitoring/alarm points and/or modifications to set points). See Software Programming in Section 856.

The alarm system shall have time delay and programming capabilities to prevent nuisance alarms from occurring when transient alarm conditions exist. Alarms shall not occur during normal startup or shutdown of equipment, or during normal maneuvering operations such as rapid throttle and direction changes from the operator. The Contractor shall demonstrate this capability during trials.

The system shall have a self-diagnostic feature that is activated upon power-up to identify any system errors or deficiencies. The normal display screen and alternate system display screens shall be developed in consultation with and approved by NCDOT. When an alarm condition is detected, the alarm(s) on the display shall be activated. The display screen will show a flashing message indicating which alarm is active. If the acknowledge button is pushed, the alarms shall be silenced. Once an alarm has been acknowledged, the display will return to the normal display. Acknowledged alarms will remain active until the alarm condition clears. Acknowledged alarms can be viewed in sequence by selecting the Alarm Page screen. Acknowledging one alarm shall not prevent operation or display of subsequent alarms.

The following table represents, as a minimum, the machinery and system alarms that shall be integrated into the alarm system panel. The Contractor shall verify that the alarms installed meet the minimum requirements of the USCG 46 CFR for alarms. The Contractor shall update the table below as the detail design progresses to provide a system which senses conditions which could develop into hazardous or damaging conditions. The system shall include capacity for the future addition of at least 32 discrete and 12 analog input signals.

Table 4: Alarms List

Description		Digital/ Analog	Units	Display	Alarm
Bilge Level Alarms					
	Lazarette A Bilge Level	D		Alarm	HL
	Lazarette B Bilge Level	D		Alarm	HL
	Thruster Room A Bilge Level	D		Alarm	HL

Description		Digital/ Analog	Units	Display	Alarm
	Thruster Room B Bilge Level	D		Alarm	HL
	Void A Bilge Level	D		Alarm	HL
	Void B Bilge Level	D		Alarm	HL
	Engine Room End A Bilge Level	D		Alarm	HL
	Engine Room End B Bilge Level	D		Alarm	HL
	Switchboard Room Bilge Level	D		Alarm	HL
Watertight Doors					
	Thruster Room A WT Door	D		X	OP
	Void A WT Door	D		X	OP
	Void B WT Door	D		X	OP
	Thruster Room B WT Door	D		X	OP
Tanks					
	Fuel Oil Service Tank A	A	Gallons	X	HL/LL
	Fuel Oil Service Tank B	A	Gallons	X	HL/LL
	Waste Oil Tank	D		Alarm	HL
	Emergency Generator FO Tank	A	Gallons	X	LL
	Potable Water Tank	A	Gallons	X	HL/LL
	Zero Discharge Tank 1	D		Alarm	HL
	Zero Discharge Tank 2	D		Alarm	HL
	Ballast Tank A - Port	A	Gallons	X	HL
	Ballast Tank A - Stbd	A	Gallons	X	HL
	Ballast Tank B - Port	A	Gallons	X	HL
	Ballast Tank B - Stbd	A	Gallons	X	HL
MSD					
	MSD Failure	D		Alarm	S
	MSD Level	D		Alarm	HL
Azimuth thruster - End A Port					
	Failure AC/DC Converter	D		Alarm	LE
	Failure 24V DC	D		Alarm	LE
	Control System Failure	D		Alarm	S
	Failure NFU System	D		Alarm	S
	Failure FFU RPM Control	D		Alarm	S
	Failure FFU Steering Control	D		Alarm	S
	Steering locked	D		Alarm	S
	Failure Power Supply Ground Fault	D		Alarm	S
	Failure brake	D		Alarm	S
	Phase failure feedline	D		Alarm	S
	Failure Steering motor	D		Alarm	S
	Overload Steering Motor	D		Alarm	OV
	Failure brake steering motor	D		Alarm	S
	Failure frequency converter	D		Alarm	S

Description		Digital/ Analog	Units	Display	Alarm
	Over temperature brake resistor	D		Alarm	HT
	Over temp. frequency converter	D		Alarm	HT
	Over temp. switch cabinet	D		Alarm	HT
	Failure lube oil pump	D		Alarm	HT
	Liquid monitoring motor	D		Alarm	S
	Low lube oil level	D		Alarm	LL
	Lube oil temperature high	D		Alarm	HT
	Lube oil filter clogged	D		Alarm	HP
	Lube oil flow low	D		Alarm	LF
	Water sealing leakage SCD	D		Alarm	OL
Azimuth thruster - End A Starboard					
	Failure AC/DC Converter	D		Alarm	LE
	Failure 24V DC	D		Alarm	LE
	Control System Failure	D		Alarm	S
	Failure NFU System	D		Alarm	S
	Failure FFU RPM Control	D		Alarm	S
	Failure FFU Steering Control	D		Alarm	S
	Steering locked	D		Alarm	S
	Failure Power Supply Ground Fault	D		Alarm	S
	Failure brake	D		Alarm	S
	Phase failure feedline	D		Alarm	S
	Failure Steering motor	D		Alarm	S
	Overload Steering Motor	D		Alarm	OV
	Failure brake steering motor	D		Alarm	S
	Failure frequency converter	D		Alarm	S
	Over temperature brake resistor	D		Alarm	HT
	Over temp. frequency converter	D		Alarm	HT
	Over temp. switch cabinet	D		Alarm	HT
	Failure lube oil pump	D		Alarm	HT
	Liquid monitoring motor	D		Alarm	S
	Low lube oil level	D		Alarm	LL
	Lube oil temperature high	D		Alarm	HT
	Lube oil filter clogged	D		Alarm	HP
	Lube oil flow low	D		Alarm	LF
	Water sealing leakage SCD	D		Alarm	OL
Azimuth thruster - End B Port					
	Failure AC/DC Converter	D		Alarm	LE
	Failure 24V DC	D		Alarm	LE
	Control System Failure	D		Alarm	S
	Failure NFU System	D		Alarm	S
	Failure FFU RPM Control	D		Alarm	S

Description		Digital/ Analog	Units	Display	Alarm
	Failure FFU Steering Control	D		Alarm	S
	Steering locked	D		Alarm	S
	Failure Power Supply Ground Fault	D		Alarm	S
	Failure brake	D		Alarm	S
	Phase failure feedline	D		AL	S
	Failure Steering motor	D		AL	S
	Overload Steering Motor	D		AL	OV
	Failure brake steering motor	D		AL	S
	Failure frequency converter	D		AL	S
	Over temperature brake resistor	D		AL	HT
	Over temp. frequency converter	D		AL	HT
	Over temp. switch cabinet	D		AL	HT
	Failure lube oil pump	D		AL	HT
	Liquid monitoring motor	D		AL	S
	Low lube oil level	D		AL	LL
	Lube oil temperature high	D		AL	HT
	Lube oil filter clogged	D		AL	HP
	Lube oil flow low	D		AL	LF
	Water sealing leakage SCD	D		AL	OL
Azimuth thruster - End B Starboard					
	Failure AC/DC Converter	D		AL	LE
	Failure 24V DC	D		AL	LE
	Control System Failure	D		AL	S
	Failure NFU System	D		AL	S
	Failure FFU RPM Control	D		AL	S
	Failure FFU Steering Control	D		AL	S
	Steering locked	D		AL	S
	Failure Power Supply Ground Fault	D		AL	S
	Failure brake	D		AL	S
	Phase failure feedline	D		AL	S
	Failure Steering motor	D		AL	S
	Overload Steering Motor	D		AL	OV
	Failure brake steering motor	D		AL	S
	Failure frequency converter	D		AL	S
	Over temperature brake resistor	D		AL	HT
	Over temp. frequency converter	D		AL	HT
	Over temp. switch cabinet	D		AL	HT
	Failure lube oil pump	D		AL	HT
	Liquid monitoring motor	D		AL	S
	Low lube oil level	D		AL	LL

Description		Digital/ Analog	Units	Display	Alarm
	Lube oil temperature high	D		AL	HT
	Lube oil filter clogged	D		AL	HP
	Lube oil flow low	D		AL	LF
	Water sealing leakage SCD	D		AL	OL
Main Generator 1					
	Bearing Temperature	A	Degrees	DIS	HT
	Phase A Voltage	A	Volts	DIS	OL
	Phase B Voltage	A	Volts	DIS	OL
	Phase C Voltage	A	Volts	DIS	OL
	Port Bus Voltage	A	Volts	DIS	OL
	Frequency	A	Hz	DIS	OL
	Phase A Current	A	Amps	DIS	
	Phase B Current	A	Amps	DIS	
	Phase C Current	A	Amps	DIS	
	Phase A Winding Temperature	A	Degrees	DIS	HT
	Phase B Winding Temperature	A	Degrees	DIS	HT
	Phase C Winding Temperature	A	Degrees	DIS	HT
	Lube Oil Pressure	A	PSI	DIS	LP
	Lube Oil Filter Differential Pressure	D		AL	HP
	Lube Oil Temperature	D		AL	HT
	Lube Oil Level	D		AL	LL
	Fuel Oil Filter Differential Pressure	D		AL	HP
	Fuel Oil Pressure	D		AL	LL
	Coolant Temperature	D		AL	HT
	Cooling Water Expansion Tank Level	D		AL	LL
	Coolant Pressure Low	D		AL	LP
	Exhaust Temperature	D		AL	HT
	Main Power Supply (Control)	D		AL	LE
	Emergency Power Supply (Control)	D		AL	LE
	Over Speed	D		AL	UA
	Automatic Safety Shutdown	D		AL	UA
Main Generator 2					
	Bearing Temperature	A	Degrees	DIS	HT
	Phase A Voltage	A	Volts	DIS	OL
	Phase B Voltage	A	Volts	DIS	OL
	Phase C Voltage	A	Volts	DIS	OL
	Port Bus Voltage	A	Volts	DIS	OL
	Frequency	A	Hz	DIS	OL
	Phase A Current	A	Amps	DIS	
	Phase B Current	A	Amps	DIS	
	Phase C Current	A	Amps	DIS	

Description		Digital/ Analog	Units	Display	Alarm
	Phase A Winding Temperature	A	Degrees	DIS	HT
	Phase B Winding Temperature	A	Degrees	DIS	HT
	Phase C Winding Temperature	A	Degrees	DIS	HT
	Lube Oil Pressure	A	PSI	DIS	LP
	Lube Oil Filter Differential Pressure	D		AL	HP
	Lube Oil Temperature	D		AL	HT
	Lube Oil Level	D		AL	LL
	Fuel Oil Filter Differential Pressure	D		AL	HP
	Fuel Oil Pressure	D		AL	LL
	Coolant Temperature	D		AL	HT
	Cooling Water Expansion Tank Level	D		AL	LL
	Coolant Pressure Low	D		AL	LP
	Exhaust Temperature	D		AL	HT
	Main Power Supply (Control)	D		AL	LE
	Emergency Power Supply (Control)	D		AL	LE
	Over Speed	D		AL	UA
	Automatic Safety Shutdown	D		AL	UA
Main Generator 3					
	Bearing Temperature	A	Degrees	DIS	HT
	Phase A Voltage	A	Volts	DIS	OL
	Phase B Voltage	A	Volts	DIS	OL
	Phase C Voltage	A	Volts	DIS	OL
	Port Bus Voltage	A	Volts	DIS	OL
	Frequency	A	Hz	DIS	OL
	Phase A Current	A	Amps	DIS	
	Phase B Current	A	Amps	DIS	
	Phase C Current	A	Amps	DIS	
	Phase A Winding Temperature	A	Degrees	DIS	HT
	Phase B Winding Temperature	A	Degrees	DIS	HT
	Phase C Winding Temperature	A	Degrees	DIS	HT
	Lube Oil Pressure	A	PSI	DIS	LP
	Lube Oil Filter Differential Pressure	D		AL	HP
	Lube Oil Temperature	D		AL	HT
	Lube Oil Level	D		AL	LL
	Fuel Oil Filter Differential Pressure	D		AL	HP
	Fuel Oil Pressure	D		AL	LL
	Coolant Temperature	D		AL	HT
	Cooling Water Expansion Tank Level	D		AL	LL
	Coolant Pressure Low	D		AL	LP
	Exhaust Temperature	D		AL	HT

Description		Digital/ Analog	Units	Display	Alarm
	Main Power Supply (Control)	D		AL	LE
	Emergency Power Supply (Control)	D		AL	LE
	Over Speed	D		AL	UA
	Automatic Safety Shutdown	D		AL	UA
Emergency Generator					
	Lube Oil Pressure	D		AL	LP
	Lube Oil Filter Differential Pressure	D		AL	HP
	Lube Oil Temperature	D		AL	HT
	Lube Oil Level	D		AL	LL
	Coolant Temperature	D		AL	HT
	Cooling Water Expansion Tank Level	D		AL	LL
	Exhaust Temperature	D		AL	HT
	Over Speed	D		AL	UA
	Automatic Safety Shutdown	D		AL	UA
	Low Voltage	D		AL	LE
	Low Frequency	D		AL	UA
	Connected to Emergency Bus	D		AL	UA
Propulsion Motor 1					
	Bearing Temperature Side A	A	Degrees	DIS	HT
	Bearing Temperature Side B	A	Degrees	DIS	HT
	Cooling Water Temperature Inlet	A	Degrees	DIS	
	Cooling Water Temperature Outlet	A	Degrees	DIS	
	Winding Temp Phase U Side B	A	Degrees	DIS	HT
	Winding Temp Phase V Side B	A	Degrees	DIS	HT
	Winding Temp Phase W Side B	A	Degrees	DIS	HT
Propulsion AC Motor 2					
	Bearing Temperature Side A	A	Degrees	DIS	HT
	Bearing Temperature Side B	A	Degrees	DIS	HT
	Cooling Water Temperature Inlet	A	Degrees	DIS	
	Cooling Water Temperature Outlet	A	Degrees	DIS	
	Winding Temp Phase U Side B	A	Degrees	DIS	HT
	Winding Temp Phase V Side B	A	Degrees	DIS	HT
	Winding Temp Phase W Side B	A	Degrees	DIS	HT
Propulsion AC Motor 3					
	Bearing Temperature Side A	A	Degrees	DIS	HT
	Bearing Temperature Side B	A	Degrees	DIS	HT
	Cooling Water Temperature Inlet	A	Degrees	DIS	
	Cooling Water Temperature Outlet	A	Degrees	DIS	
	Winding Temp Phase U Side B	A	Degrees	DIS	HT
	Winding Temp Phase V Side B	A	Degrees	DIS	HT
	Winding Temp Phase W Side B	A	Degrees	DIS	HT

Description		Digital/ Analog	Units	Display	Alarm
Propulsion AC Motor 4					
	Bearing Temperature Side A	A	Degrees	DIS	HT
	Bearing Temperature Side B	A	Degrees	DIS	HT
	Cooling Water Temperature Inlet	A	Degrees	DIS	
	Cooling Water Temperature Outlet	A	Degrees	DIS	
	Winding Temp Phase U Side B	A	Degrees	DIS	HT
	Winding Temp Phase V Side B	A	Degrees	DIS	HT
	Winding Temp Phase W Side B	A	Degrees	DIS	HT
Propulsion VFD 1					
	DC Bridge Voltage	A	Volts	DIS	
	DC Bridge Current	A	Amps	DIS	
	High Current Overload Condition	D	Amps	AL	UA
Propulsion VFD 2					
	DC Bridge Voltage	A	Volts	DIS	
	DC Bridge Current	A	Amps	DIS	
	High Current Overload Condition	D	Amps	AL	UA
Propulsion VFD 3					
	DC Bridge Voltage	A	Volts	DIS	
	DC Bridge Current	A	Amps	DIS	
	High Current Overload Condition	D	Amps	AL	UA
Propulsion VFD 4					
	DC Bridge Voltage	A	Volts	DIS	
	DC Bridge Current	A	Amps	DIS	
	High Current Overload Condition	D	Amps	AL	UA
Auxiliary Seawater Cooling System					
	Seawater System Pressure	A	PSI	DIS	LP
	Auxiliary SW Pump 1 Running	D		DIS	
	Auxiliary SW Pump 2 Running	D		DIS	
	Aux SW Pump Failover Alarm	D		AL	OL
Thruster FW Cooling System					
	FW Cooling System Pressure	A	PSI	DIS	LP
	FW Pump 1 Running	D		DIS	
	FW Pump 2 Running	D		DIS	
	Aux FW Pump Failover	D		AL	OL
Summary Alarms					
	Propulsion and associated machinery Failure	D		AL	S
	Fire Detection System Fault	D		AL	S
IMACS					
	Failure or Malfunction of System	D		AL	UA
	Power Supply Failure	D		AL	LE
Alarm Abbreviations					

Description		Digital/ Analog	Units	Display	Alarm
	A = Analog				
	D = Digital				
	OL = Out of Limit				
	AL = Alarm				
	DIS = Display				
	HT = High Temperature				
	LP = Low Pressure				
	LF = Low Flow				
	UA = Multi Parameter				
	HL = High Level				
	LL = Low Level				
	LE = Electrical Power Failure				
	S = Summary Alarm				
	OV = Overload				
	OP = Open				

436.2 Tank Level Indication

Provide and install a remote tank level indication (TLI) system, level alarm system, and visual tank level indicators. The TLI system shall be comprised of a series of individual sensors for continuous or discrete measurement of the liquid level in vessel tanks interfaced with the IMACS.

Tank level shall be displayed graphically and numerically at each IMACS display. In addition, a remote display with cover shall be provided near each fuel fill station. Each remote display shall indicate main fuel oil tank and potable water tank levels, and shall have an audible alarm for high tank levels.

Level indication shall be provided as noted in Table 5.

Table 5: Tank Level Indication Schedule

Tank	Continuous Level Indication			Level Alarms	
	sounding tube	sight gauge	remote	high	low
FO Tank A	✓	✓	✓	✓	✓
FO Tank B	✓	✓	✓	✓	✓
E GEN FO Tank	✓	✓	✓		✓
Potable Water Tank		✓	✓	✓	✓
Lube Oil Tank	✓	✓			
Waste Oil Tank	✓	✓		✓	
Zero Discharge Tank 1				✓	
Zero Discharge Tank 2				✓	
Ballast Tank A - Port	✓		✓	✓	

Ballast Tank A - Stbd	✓		✓	✓	
Ballast Tank B - Port	✓		✓	✓	
Ballast Tank B - Stbd	✓		✓	✓	

Sight gauges shall be magnetic type tank level indicators with stainless steel bodies.

The Contractor shall also provide a calibrated measuring stick for the fuel tanks, calibrated for INNAGE, and matching sounding tables.

436.3 Fire Detection and Alarm System

A USCG approved and UL listed addressable fire detection and alarm system shall be provided and installed. Remote smoke detectors, heat detectors, and manual pull boxes shall be located in the vessel and interfaced with the alarm system in accordance with the manufacturer's type approved manual. The Passenger Lounge shall be fitted with two (2) manual call stations, one at each end of the passenger space, in readily visible locations.

The Pilot House, Crew Day Room, Passenger Lounge, and Voids shall be fitted with ionization type smoke detectors. The Engine Room and Emergency Generator Room shall be fitted with rate compensated temperature detectors.

The main alarm panel shall be mounted in the Pilot House, and a remote alarm panel shall be mounted in the EOS. Audible and visual alarms shall be issued in the Pilot House and EOS when a zone alarm becomes active. If the alarm is not acknowledged within two minutes, an audible alarm shall be automatically sounded throughout the crew spaces, control stations, and manned machinery spaces.

The fire alarm panel shall provide a summary fault alarm output to the IMACS.

439 CCTV SYSTEM

439.1 System Equipment

A CCTV system shall be provided with coverage of all passenger accessible spaces with monitoring capabilities at each Pilot House control station. Locate nine (9) cameras in the passenger areas where directed by NCDOT during detailed design.

Provide one 19-inch flat screen monitor and system controls at each Pilot House control station. The system installation shall include all cabling, foundations, power supplies, and mounting hardware for a complete, functional system. Cabling will consist of CAT 6E cable capable of power over Ethernet. External cameras shall be weatherproof.

Cameras shall be high resolution, outdoor ready, vandal-resistant, dome type cameras with mirrored domes.

Final direction and location of cameras shall be approved by the NCDOT Representative.

439.2 Modes of Operation

All camera inputs will be recorded and stored on a DVR system for a minimum of 72 hours. Camera views at the displays in the Pilot House and EOS shall be user selectable.

A UPS shall be integrated to the DVR to provide an orderly shutdown of the DVR after loss of power and before the UPS batteries are depleted.

441 VHF RADIOS

The vessel shall use VHF radio as the principal means of external communication. The Contractor shall furnish and install four (4) complete systems consisting of a VHF radio, with a 4-foot antenna. Supply and install all interconnecting cabling and support brackets for a complete functional system.

The VHF radios shall have the following characteristics

- 25W output power
- Horn/fog horn feature built in
- Active noise canceling
- IPX8 waterproofing
- Weather and alert channels

GROUP 500 - AUXILIARY MACHINERY

500 GENERAL

500.1 References

Reference	Document Number	Title
(5A)	18026-200-101-1	Profiles and Deck Arrangements
(5B)	18026-200-201-1	Machinery Arrangement
(5C)	18026-200-256-1	Cooling System Schematic
(5D)	18026-200-506-1	Fills, Vents, and Sounds
(5E)	18026-200-513-1	Machinery Ventilation Arrangement
(5F)	18026-200-521-1	Fire Main System Schematic
(5G)	18026-200-526-1	Deck Drain Piping Schematic
(5H)	18026-200-528-1	Sanitary Drain Piping Schematic
(5I)	18026-200-529-1	Bilge and Ballast Piping Schematic
(5J)	18026-200-529-2	Lube Oil and Waste Oil Piping Schematic
(5K)	18026-200-533-1	Potable and Sanitary Water Piping Schematic
(5L)	18026-200-551-1	Compressed Air Piping Schematic

500.2 Introduction

This section describes requirements for the vessel's auxiliary systems. The general requirements for all piping systems are addressed herein and the HVAC, seawater, waste oil and oily water, drainage, sanitary systems are covered in detail.

Piping system design, equipment, materials, and workmanship shall fully comply with the applicable USCG regulations.

503 PUMPS

Provide pumps that meet the performance requirements and construction features as described herein and elsewhere in the Specification. Pumps shall be commercial marine grade, built in accordance with the standards of the Hydraulic Institute, and shall meet applicable regulatory requirements. The performance requirements listed are based upon preliminary equipment selection, pipe sizes, and estimated system routing. The Contractor shall supply pumps meeting the required flow and head requirements of the installed piping systems.

In general, the use of through-bolts and studs is required for securing pump parts where thread corrosion or seizure may be expected in service. Fasteners shall be stainless steel with threads coated with a compatible anti-seize compound.

Each pump shall have pressure gauges as indicated on the Contract Guidance Drawings. The gauges shall be 2 1/2 inch diameter, liquid filled. Pressure gauges shall be fitted with ball type root valves and snubbers, and shall be mounted directly at each pump. Gauge piping assemblies shall meet the requirements of ASTM F721-81, except that gauge tubing shall be 316 stainless steel. Under no circumstances shall any gauges contain mercury.

Where pump nozzles are of a different size than the connected piping, a tapered transition piece of adequate length shall be used.

A vent tube with a valve shall be located at the top and drain with cap shall be located at the bottom of each casing of all centrifugal pumps. Alternatively, only where it is not possible to provide a vent line directly from the top of the pump casing, the vent line may be located at the discharge from the pump. Vents on seawater pumps shall be fitted with a tube routed to the bilge. Priming vents shall be 1/4 to 1/2 inch in size and fitted with a ball valve and goose neck discharge tube. In general, priming vent tubing and valve shall be stainless steel or copper in copper nickel systems.

Mechanical seals shall be provided for all pumps. All pumps shall be equipped with suitable thrust bearings to absorb any primary residual thrust that may occur during operation or when the pump loses suction. In general, pumps shall be equipped with sealed ball bearings contained in housings and removable as a unit with the pump shaft.

Fire, bilge and ballast pumps shall have shall have drip pans with 3/4 inch drain collars located so that a bucket can be placed below to drain each drip pan.

505 PIPING

505.1 General

Piping system requirements shall be as described in the various sections of the Specification and as shown on the piping system diagrams. Piping systems shall be designed and installed in accordance with the requirements of the USCG. The piping diagrams shall be used as guidance.

Pipe, valves, and fitting materials shall conform to the materials schedules on the diagrams. The Contractor shall verify the pipe sizes given on the diagrams.

Piping shall be led as directly as practicable with a minimum number of bends and fittings and with sufficient joints to provide for removal, inspection, servicing, and replacement of piping, valves, fittings, and equipment. Piping shall not be routed through structure, except where passing through bulkheads or decks.

Pockets in pipe lines shall be avoided, and piping in each system shall be arranged for complete drainage wherever practicable. Where pockets do occur, bosses and valves or screwed plugs shall be provided for draining. Each system shall be provided with fittings, valves, or traps to enable complete drainage of pipes for winter layup.

Piping systems shall be fit up utilizing good ship building practice and appropriate tolerances. All flanged joints shall be made up free of excessive strain.

Vent fittings shall be provided for removal of air in piping installed with unavoidable high points.

Under no circumstances shall thermometer or pressure gauge devices contain mercury.

Unions are not acceptable in piping located behind linings, false ceilings, or in other inaccessible locations.

Cleanout plugs shall be provided in all drain lines.

Exercise care to develop the system arrangements and installation of piping aboard the vessel to permit the following:

A. Free passage along walkways and ladders
B. Free access to perform maintenance
C. Free access to all doors, hatches, and openings
D. Ready removal of the vessel's equipment and system components

Pipe bends shall be used to the maximum extent possible in lieu of elbows. The Contractor shall lay out piping systems, regardless of size or material, for machine bending to pipe to a minimum radius of three times the nominal diameter.

Where piping penetrates a watertight bulkhead, a deck, or a tank boundary an approved penetration fitting shall be used to ensure the tightness of the structure. Penetration details shall be developed as shown on the Contract Guidance Drawings or as approved by the USCG. In no case shall the structural plating form part of the pipe joint.

The Contractor shall ensure that any penetrations through tonnage frames shall be made tight around the pipe, or shall be spaced such that the distance between two edges of two openings is equal, or greater, to the largest dimension of the larger of the two openings.

In order to prevent damage to piping and joints at bulkheads and decks, expansion bends shall be provided as necessary to allow for sufficient piping movement due to the working of the ship's structure. Expansion joints shall not be used except where required in engine exhaust.

Where joints of ferrous and nonferrous materials cannot be avoided, the connection shall be made with a flanged takedown joint fully isolated with gasket and sleeved fasteners using isolating washers under the fastener.

Pipe welding shall comply with USCG regulations and ASTM F722-82.

Piping systems containing oils shall be installed so that flanged connections are located away from exposed surfaces having a temperature in excess of 450 degrees Fahrenheit. Protective shielding shall be provided around flanged connections to prevent the possibility of spray onto exposed hot surfaces. Piping shall be located at least 18 inches away from surfaces that have temperatures under the insulation of 450 degrees Fahrenheit.

Pipe fittings shall not be located directly over or within 2 feet of electrical switchboards, panels, disconnects, switches, or receptacles. Pipes shall not be routed directly over engines except for systems which connect to the engine.

505.2 System Design

Piping sizes indicated on the Contract Guidance Drawings are given for reference purposes. The final selection of pipe sizes for fabrication and installation is the responsibility of the Contractor. Fluid velocity criteria given in the following table shall be used in piping system sizing, where D is the internal pipe diameter.

	Velocity (ft/sec)	
Service	Nominal	Maximum
Fuel Oil Suction	$2D^{1/2}$	7
Fuel Oil Discharge	$5D^{1/2}$	12
Lube Oil Suction	$D^{1/2}$	4
Lube Oil Discharge	$2D^{1/2}$	6
Seawater Suction	$3D^{1/2}$	7
Seawater Discharge	$5D^{1/2}$	9
Fresh Water Suction	$3D^{1/2}$	15
Fresh Water Discharge	$5D^{1/2}$	20

Pumps shall be provided with ensured suctions through submergence or priming systems in order that the pump operation is immediate and positive. Pumps for seawater service shall be installed so they remain flooded at lightship draft or equipped with automatic priming systems.

Flexible connections shall be provided to isolate vibration and to accommodate thermal growth. In general, fluid piping systems shall use flexible hose assemblies with 37-degree flare swivel-end connections on both ends for connections 2 inches and smaller, or flanged flexible connections, for larger connections. Hose assemblies conveying fuel or lube oil shall be USCG-approved flame resistant type. In general, flexible hose assemblies shall not be less than 9 inches long or more than 30 inches long.

Flexible connections shall meet the requirements of 46 CFR 56.60-25. Flanged flexible connections where supplied, shall additionally meet the requirements of ASTM F1123.

Flexible hoses shall not be painted.

Isolation capability is required so that individual components may be secured while the vessel is in service. In order to meet operational requirements and to facilitate on-board maintenance, isolation valves shall be incorporated for individual and sectional subdivision, to include all branch lines, mains, and equipment as shown on References (5D) through (5L).

Piping systems and components shall be insulated in accordance with Section 505.6

505.3 Valves, Fittings, and Instrument Piping

Valves shall be accessible unless provided with reach rods, remote operators, or some other suitable means of access.

Valve remote operating gear will be provided where suction lines penetrating the collision bulkheads, for remote fuel tank closure, where required by USCG requirement, and elsewhere as needed to provide convenient access for operation. Where not otherwise specified, ABS type approved flexible reach rods shall be used.

Actuators for sea valves and overboard valves shall be easily accessible.

In general, manually operated valve stems shall be installed with the valve stem rotated above the horizontal plane. Ball valve and butterfly valves shall be installed in such a manner that the valve opens and the handle points with the media flow under normal operating conditions.

Valves shall be right-hand closing and shall have either a rising stem, or an indicator to show where the valve is open or closed.

Unless otherwise noted in the Specification or Drawings, valves that are 2-1/2 inch and larger, except for butterfly valves, shall be flanged, with bolted bonnets and packing glands. Valves that are 2 inches and smaller may have union ends and bonnets.

Ball valves shall be bolted body construction. Seats and seals shall be PTFE for all services unless otherwise noted in the Specifications or Drawings.

Check valves shall be installed wherever flow reversal in the system would be detrimental to the operational requirements.

Spindles, seats, and disks of valves shall all be corrosion resistant material.

Valves, except for small valves with obvious function, shall be provided with labels. See Section 602.

Valve locking devices shall meet the requirements of ASTM F993-86, Type II.

505.4 Takedown Joints

Unless otherwise noted in the Specification or Contract Guidance Drawings, flanged takedown joints shall be provided in piping 2-1/2 inches and over, and unions may be used in piping 2 inches and smaller.

Takedown joints shall be provided to allow removal of all in line equipment, or to allow removal of equipment normally blocked by the pipe. Takedown joints with isolation shall be installed wherever dissimilar metals are used as described elsewhere in this section.

Within the hold, piping systems shall have takedown joints spaced so that piping systems may be disassembled and removed from the vessel without cutting structure. Where piping passes

through bulkheads a takedown joint shall be placed on both sides of the bulkhead. Takedown joint spacing within the hold shall not exceed 20 feet.

Flanges in piping shall conform to ANSI standards for appropriate service.

Flat face flanges with full-face gaskets shall be used when interfacing with cast material. Flange gaskets shall be asbestos free.

Flange gaskets for CPVC in sanitary discharge systems shall be EPDM rubber. Flange gaskets for engine cooling, fuel oil, vents and fills, and firefighting shall be inorganic fiber with a nitrile binder appropriately selected for the system fluid and pressure.

Unions in metal piping shall be ground joint type.

505.5 Pipe Hangers

In general, pipe hangers shall meet the requirements of ASTM F708. The Contractor shall adjust the design, spacing, and installation of pipe hangers, as necessary, to provide an installation suitable for carrying the weight of the pipe and its contents, including dynamic loading imposed by the operating conditions of the vessel, and to prevent damage from vibration and thermal expansion. The flowing hanger types, applied to suit the Contractor's needs for ease of installation, facilitate maintenance, and minimize maintenance disruption to service may be used:

- Split cap with standoffs
- Key lock hangers
- J-band hangers
- Poly-block clamp hangers
- Clamp hangers with mounting channel

With the exception of exhaust piping, all hangers shall be resiliently lined with an approved isolation material.

Hangers shall be attached to the pipe with bolted clamps and welded or bolted to the basic ship structure. Hangers shall not be welded directly to pipes. Care shall be exercised to place pipe hangers so that strain is avoided where piping is connected to machinery.

All fill and discharge connections shall be compatible with existing NCDOT shore side facilities.

505.6 Piping Insulation

Insulation materials and installation details shall be in accordance with ASTM F683-10, except as modified herein.

Prior to installation of any insulation and/or lagging, the applicable piping installation must have all tests and inspections completed.

Provide piping insulation for hot and cold fluid piping systems including chilled water, and hot water piping and valves. Cold water piping such as sanitary, fresh water, and drains where dripping condensate could cause damage shall be insulated.

Engine exhaust insulation requirements are described in Section 259.

506 FILLS, VENTS, AND SOUNDS

Arrange fills, vents, and sounding tubes generally as shown on Reference (5D).

Vent terminals shall be aluminum, flanged, vertical ball-check type vent heads with protective mesh screens. Provide stainless steel flame screens for fuel oil, lube oil, oily water, and sewage tanks vents that meet the requirements of USCG 46 CFR 56.50-85. Potable water tank vents shall be fitted with an insect screen.

Fuel Oil and Lube oil vents and fills shall be surrounded by spill containment of at least 21 gallons.

512 HEATING, VENTILATION, AND AIR CONDITIONING

Design, provide, install, and commission heating, ventilation and air conditioning systems for the vessel as follows:

- Provide mechanical ventilation systems and heat for the Engine Room, Voids, and Thruster Rooms as described in Section 512.7 below.
- Provide heat, ventilation and air conditioning for the Switchboard Room and EOS as described in Section 512.8 below.
- Provide heat, ventilation, and air conditioning for the Pilot House, Crew Lounge, and Passenger Space as described in Section 512.9 below.

The systems shall be complete, with all components and controls necessary for satisfactory operation and performance. The Contractor shall be responsible system design, final component selection, and system commissioning. The installation shall be completed to the satisfaction of the NCDOT Representative.

The HVAC systems shall be sized in accordance with SNAME T&R 5-14, Recommended Practices for Ship Heating, Ventilation, and Air Conditioning Design Calculations. Glass solar loading shall be modified to correct for use of glass with low specific heat gain coefficient. Ventilation rates for passenger spaces shall conform to ASHRAE 62.l, Ventilation for Acceptable Air Quality. The system design, equipment, materials, and workmanship shall fully comply with the applicable USCG regulations.

512.1 Design Conditions

The heating, ventilation, and air conditioning equipment installed shall be capable of maintaining the indoor design conditions at the design outdoor air conditions noted in Table 6.

Table 6: HVAC Design Conditions

Design Condition	Winter	Summer
Outdoor Air	27ºF	95ºF, 75% RH

Design Condition	Winter	Summer
Air-Conditioned Crew and Passenger Spaces	70ºF	74ºF, 55% RH
Machinery Spaces	45ºF	22.5 ºF max temperature rise
Thruster Rooms	45 ºF	40 ºC (104 ºF)
Switchboard Room	45 ºF	95 ºF

Winter heating requirements assume spaces are empty of people. No credit shall be taken for heat from adjacent spaces, lighting, or equipment.

512.2 Ducting

Ductwork shall be fabricated from steel sheet metal in accordance with the standards of the Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) and USCG requirements. Where practicable, round ducting is preferred for ease of fabrication and installation. Ducts shall be smooth inside with no protruding edges. All ducts shall be airtight.

Duct joints may be flanged, or they may have approved clamp or sleeve joints with an approved adhesive tape and duct sealer as suitable for size, shape, and tightness requirements of the duct.

Fabricate machinery space ventilation ducts from 16-gauge hot dipped galvanized sheet steel. Install ducting as close to the overhead as possible.

512.3 Weather Louvers and Mist Eliminators

Fit air inlets leading directly from weather with aluminum or stainless-steel mist eliminators. Inlet velocities through mist eliminators shall not exceed 1,300 feet per minute based on face area. Demisters shall be fitted with drains.

Fit exhausts to the weather with aluminum weather louvers. Weather louvers shall be removable and held in place with stainless steel fasteners. Velocities across exhaust louvers shall generally be limited to 750 feet per minute based on gross face area.

Weather louvers and mist eliminators shall be removable, and fitted with removable stainless-steel insect screens. They shall be bolted in place with stainless steel fasteners, and arranged for easy removal and repair.

512.4 Ventilation Insulation and Lagging

Acoustical insulation will be installed as required to limit sound levels in passenger areas.

512.5 Fire Dampers

Provide and install fire dampers where required by regulation. Fire dampers shall be installed in accordance with applicable USCG regulations including the provisions of NVIC 9-97 using stainless steel fasteners. The use of fire dampers shall be minimized through use of structural or heavy gauge insulated steel ducts.

Fire dampers shall be automatic with electric actuators, power to open/spring to close, and 165 degrees Fahrenheit thermal tripping device.

All fire dampers shall be capable of manual operation. Provide remote closure controls for all fire dampers. Locate remote closure controls in the Pilot House adjacent to the fire detection panel.

Fire damper actuators shall be provided with power from the 120 VAC power distribution system and configured so that interruption of the power will initiate closing of dampers and shutdown of ventilation fans. Dampers shall close automatically upon actuation of the fire suppression system. Dampers and fan shutdowns for each system shall be independent.

512.6 Fans

All fans shall be selected for efficient and quiet operation consistent with the nature of the spaces involved. Variations in sizes, types, rotation, and discharge shall be kept to a minimum.

All fans, with the exception of those incorporated into air-handling units, shall be direct drive (no belts). All fans and air handlers shall be mounted on rubber-in-shear vibration isolators with a natural frequency below 10 Hz. Provide flexible duct connectors, properly rat-proofed, at the inlet and discharge of each fan as appropriate

512.7 Machinery Spaces

Engine Room

Provide and install engine room ventilation and heating generally as shown on Reference (5E). The system shall provide mechanical supply of 100% outdoor via ventilation trunks in the port-side bulwarks. Ventilation air shall be exhaust via the machinery exhaust trunk and exhaust louvers located on the 01 Deck.

Four (4) identical supply fans shall be provided and installed. Fans shall be marine grade with aluminum bodies and composite blades. Locate fans in the engine room, generally where shown on Reference (5E). Install ducting to distribute air into the engine room.

Supply fans shall be provided with VFDs with control and a sensing system to vary airflow in response to engine room temperature. The engine room temperature set point shall be adjustable. The ventilation control system shall also allow manual control of the fan speed. This shall be verified on sea trials. The fan control interface for the Engine Room fans shall be located in the EOS console.

Fire dampers shall be as shown on Reference (5E) and described in Section 512.5.

Fit weather terminals with demisters or louvers as described in Section 512.3. Provide weather tight closures to USCG requirements.

The Engine Room shall be fit with two (2) electric unit heaters, each rated for 5 kW. Unit heaters shall be corrosion resistant with stainless steel construction, powder coated aluminum fan blades, stainless steel heating elements, and non-metallic NEMA 4X terminal enclosures. Unit heaters shall be provided with built in controls and stainless-steel swivel mounting brackets.

Voids and Thruster Rooms

Provide and install ventilation in each Void and Thruster Room generally as shown on Reference (5E). Each space shall be fitted with a supply fan providing 100% outdoor air ventilation.

Fit weather terminals with demisters and louvers as described in Section 512.3.

Heaters are not required in the Voids or thruster rooms.

Emergency Generator Room

Provide and install supply and exhaust louvers and fire dampers in the emergency generator room, generally as shown on Reference (5E). The louver and fire damper assembly shall be weather tight in the closed position. The emergency generator fire dampers shall be configured to open on generator start and close on generator stop.

512.8 Switchboard Room and EOS HVAC System

Design, provide and install a complete HVAC system serving the switchboard room and EOS, generally as show on Reference (5E). The system shall be sized to maintain the EOS at 74 ºF switchboard room at space temperature of 95 ºF with the diesel electric propulsion equipment in the switchboard room operating at full power, at the outdoor ambient air and seawater conditions listed in Section 079.

The system shall consist of three (3) marine chilled water fan coil units, two (2) located in the switchboard room and one (1) in the EOS, served by a modular chilled water system. Chilled water for the fan coil units shall be provided by a dedicated shilled water system consisting of four (4) marine grade seawater cooled chillers and a closed chilled water circulating system, generally as shown on Reference (5E). The chillers shall be sized so that cooling for the switchboard room is maintained with three of four chillers in operation.

Pipe condensate drains from each air handler to a packaged condensate removal pump that discharges into the gray water system or overboard. Condensate piping shall slope the drainpipe continuously for complete drainage.

Provide one (1) complete spare chiller, and sufficient spare parts for five years of operation. At minimum, spare parts provided shall include one complete set of electrical and control components and one blower and motor of each size and configuration supplied with the system. Deliver spare parts as directed by the Resident Engineer.

Switchboard Room

Provide and install two (2) chilled water fan coil units port and starboard in the switchboard room as shown in Reference (5E). Install ducting to distribute air through the switchboard room.

Outdoor replenishment air shall be provided by a dedicated supply fan.

Install one (1) electric unit heater, rated at 2 kW in the switchboard room.

EOS

Install one (1) chilled water fan coil unit in the EOS overhead generally as shown in Reference (5E).

Outdoor replenishment air for the EOS shall be supplied via a supply louver with manual weather closure located on the Port side house, above the main deck. A dedicated supply fan with a capacity of 50 CFM shall supply air to the EOS. Exhaust air, equal in volume to the outside air shall be discharged from the EOS via an exhaust louver located on the Main Deck, near the top of the EOS stair.

512.9 Passenger and Crew Space HVAC Systems

Design, provide, and install complete HVAC systems serving the Pilot House, Crew Lounge, and Passenger Lounge. The system shall consist of ductless mini-split heat pumps with additional electric heat strips for winter demand. Heat strips shall be capable of meeting the winter heat demand in each space.

Each heat pump shall have an outdoor unit paired with one (1) ductless, recessed ceiling cassette type indoor unit.

Heat pumps shall be suitable for marine service and provided with marine coated coils, low ambient kits, and a wind baffle. Pipe condensate drains from each indoor unit to the nearest deck drain or overboard, taking care to slope the drainpipe continuously for complete drainage. Neither the indoor air-handling unit, nor the condensate drain piping shall be led over or near electrical equipment. With the exception of a short piece of hose between the indoor unit and the drain piping, condensate drains shall be fabricated from copper tubing with approved mechanical or brazed fittings.

Heat pumps shall be selected to have low noise and vibration, shall allow the vessel to meet the noise and vibration requirements of Section 073.

Pilot House

Install two (2) heat pump indoor units in the Pilot House overhead, one at each end.

Outdoor replenishment air for the Pilot House shall be provided by opening windows.

Provide and install two (2) independent electric window-defrosting systems, one in each end of the Pilot House. The systems shall recirculate air in the Pilot House, discharging air towards the end windows. Each defrosting system shall have two (2) adjustable outlet diffusers, installed in

the Pilot House console immediately below the end-facing Pilot House window, a variable speed fan, and a duct heater with a minimum rating of 800W. The system shall discharge air at a temperature of 108 °F. Provide controls at each Pilot House console that allow for three (3) levels of defogging.

Crew Lounge and Crew Head

Install one (1) heat pump indoor unit in the Crew Lounge overhead.

Outdoor replenishment air for the crew lounge shall be supplied via a supply louver with manual weather closure located on the 01 Deck, ducted to the recessed ceiling unit. Exhaust air, equal in volume to the outside air, shall be extracted from the crew head and discharged to weather via a gooseneck located on the Bridge deck, B-End, starboard side.

Fit the crew head with a commercial grade ceiling ventilator. The ventilator shall have a capacity of 50 CFM, integrated backdraft damper, and a noise rating of 0.7 Sones or lower.

Passenger Lounge

Install three (3) heat pump units in the Passenger Lounge overhead.

Outdoor replenishment air for the crew lounge shall be supplied via a ventilation gooseneck with manual weather closure located on the 01 Deck, ducted to the recessed ceiling units. Exhaust air, equal in volume to the outside air, shall be extracted from the passenger restrooms and discharged to weather.

Fit each passenger restroom with a commercial grade ceiling ventilator. The ventilator shall have a capacity of 100 CFM, integrated backdraft damper, and a noise rating of 0.7 Sones or lower.

520 SEA WATER SYSTEMS

520.1 Sea Chests

Provide and install three (3) sea chests, as shown on References (5C) and (5F).

Each sea chest shall be 1/2" minimum thickness with a gate valve at each penetration. The gate valves shall have ASTM A395 ductile iron body with bronze trim and rising stem. Sea chests shall be vented to the overhead of the space in which they are located.

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

The Contractor shall provide and install an acoustic anti-fouling system to protect the sea chests and seawater piping from marine fouling. Specifically, the system shall be arranged to protect each sea chest, the piping between the sea chests and pumps in seawater service, and all piping normally filled with seawater during operation. The system shall consist of vendor provided control panel, junction boxes, and emitters. The location and quantity of emitters and junction boxes shall be as directed by the anti-fouling system vendor.

520.2 Seawater Cooling Systems

The propulsion sweater cooling system is described in Section 256.3.

521 FIRE MAIN SYSTEM

Provide and install a fire main system as shown on Reference (5F) and in accordance with USCG requirements. Two electrically driven fire pumps, shall supply water to six (6) hose stations. The hose stations shall be located to suit USCG and Owner requirements.

Fire pumps shall be self-priming, end suction, horizontal centrifugal pumps with stainless steel body and impeller, and mechanical seals.

Each fire station shall have a stainless-steel cabinet equipped with a 50-foot length of 1-1/2 inch fire hose, valve, nozzle, hose wrench and storage rack. Hose, valve, and nozzle shall be USCG approved. Fire nozzles shall be combination type.

Fire Pump No. 1 shall be capable of remote start from each fire station. Provide a start/stop pushbutton with running light at each fire station.

Each fire pump shall have a duplex strainer installed in its suction line.

Both fire pumps shall be capable of remote start from the Pilot House and EOS. Provide a fire pump control panel with a start/stop button with running light for each pump and a pressure gage indicating system pressure at each Pilot House console, and the EOS console.

Provide one (1) 48-inch long AFFF wand and two (2) 5-gallon containers of AFFF foam concentrate. AFFF model shall be provided by NCDOT. Stow in the Emergency Generator compartment or as directed by the NCDOT Representative.

526 WEATHER DECK DRAINS

Provide and install weather deck drains as shown on Reference (5G). Drains shall be led inboard of the structure and hidden from view where possible. The 01 Deck drains shall be led over the side on the Main Deck as shown on Reference (5G).

Slope weather deck drain piping for complete drainage. Arrange drains and drain outlets to minimize water pooling on deck, particularly in traffic areas.

Trough drains with stainless steel grating shall be installed in front of the Passenger Lounge doors and at the top of each stair to the 01 Deck.

Deck drains shall be commercially manufactured heavy-wall steel weld-in style deck drains with bronze strainer plates. Drains shall be welded flush with the finished deck surface with no weld or other protrusions that would prevent water from flowing into the drain.

528 SANITARY SYSTEM

Provide and install a sanitary drain system as shown on Reference (5H) serving black and gray water drains. The black and gray water will be collected via a gravity system into a marine

sanitation device (MSD) in the engine Room. The MSD shall be arranged to discharge overboard or into a pair of zero-discharge holding tanks.

The MSD shall be a USCG approved type II marine sanitation device that utilizes an extended aeration biological water treatment process. The MSD shall have a designed hydraulic capacity of at 750 gallons (2.9 m3) per day and a biological oxygen demand (BOD) capacity of 3.0 kg/day. The MSD shall be skid mounted with 1/4 inch steel plate chamber construction, with all required equipment and controls mounted on the unit. The MSD shall be arranged for gravity feed and pumped discharge.

Provide and install two rectangular high-density polyethylene waste tanks. Each tank shall have a capacity of 500 gallons, a 16" diameter locking clean-out lid, and fill, vent, and drain fittings to suit the installation. Tank level indication shall be as described in Section 436.

Drain piping shall be routed as directly as possible and shall be provided with a sufficient number of accessible cleanout connections for clearing the drainpipes by use of a plumber's snake or a pressurized water hose.

Where a drain is combined with other drains, "Y" or "Y-Tee" branches or fittings shall be used to facilitate flow. All drains shall be independently trapped and provided with an accessible cleanout connection.

Furnish lavatory fixtures complete with valves, faucets, stops, drain fittings, vents, and hangers. Install fixtures and accessories to the vessel's structure in a manner that does not impair the integrity nor damage decorative linings.

Deck drains shall be commercially manufactured heavy-wall steel weld-in style deck drains with removable strainer plates and integral traps. Drains shall be flush with the finished deck surface with no protrusions that would prevent water from flowing into the drain.

Except where noted on Reference (5H), sanitary drain piping shall be CPVC having USCG certification and meeting low frame spread and toxicity requirements of FTP Code Annex 1, parts 2 and 5.

Test piping system in accordance with Section 982.

Provide and install two (2) self-priming centrifugal pumps, sized for 105 gpm at 75ft TDH. The pumps shall be arranged to take suction from the zero-discharge holding tanks and discharge overboard or to a deck connection on the main deck as shown in Reference (5H).

529 DRAINAGE AND BALLAST SYSTEMS

529.1 Bilge System

Provide and install bilge system meeting all USCG requirements and as shown in Reference (5I).

Each watertight below deck compartment shall have a bilge suction lead to one of two bilge manifolds in the Engine Room. The Engine Room shall have two (2) bilge suctions, one at each, end of the engine room, led to the nearest bilge manifold. In addition to these suction lines, the

Engine Room bilge pump shall be fitted with a bilge suction line independent of the bilge manifolds and an emergency bilge suction fitted to a fire pump.

Bilge suctions shall terminate as close to the vessel's centerline as feasible. All bilge suctions shall be located as close as possible to the lowest point of the space served.

Provide and install two bilge pumps. One bilge pump shall be installed in the Engine Room, and the second in Void A. Bilge pumps shall be self-priming, end suction, horizontal centrifugal pumps with bronze body and impeller, and mechanical seals.

Each bilge pump shall have a bronze body duplex strainer installed between the suction manifold and pump.

Bilge piping shall be schedule 80 steel. Bilge piping will be routed inboard of $1/5^{th}$ of the vessel's beam.

Pencil zincs shall be fitted in the bilge lines and bilge main. Install one pencil zinc per hull compartment in each bilge branch and the bilge main.

Strainer boxes built in accordance with ASTM F986 shall be installed at the suction end termination of all bilge suction lines. Strainer boxes shall have an open area not less than three times the area of the bilge pipe and shall be hot dip galvanized after fabrication.

Each compartment in the hold shall be fitted with a bilge level sensor to provide bilge level alarms via the IMACS as described in Section 436.

529.2 Ballast System

Provide and install a ballast system as shown in Reference (5I). The ballast system will be used to maintain draft, trim, and heel of the vessel within normal operational limits via the transfer of water to, from, and between the ballast tanks. The system shall be capable of pumping water to or from a single ballast tank at rate of 200 GPM with a single ballast pump, and shall also be capable of pumping water to or from multiple ballast tanks at a rate of 400 GPM with both ballast pumps in operation.

Provide and install two identical ballast pumps in the Engine Room, located generally where shown on Reference (5B). Ballast pumps shall be self-priming, end suction, horizontal centrifugal pumps with bronze body and impeller, and mechanical seals.

Each ballast pump shall have a simplex strainer installed between the ballast suction manifold and pump.

The ballast manifolds shall be arranged as shown in Reference (5I).

Provide and install a complete valve automation package for remote ballast system control from the EOS and Pilot House. The system shall have the following components:

- One (1) main touch screen control panel with 10" touch screen, mounted in the EOS Console
- One (1) remote touch screen control panel, mounted in the Pilot House
- Power supply with UPS
- Ten (10) pneumatically actuated valves
- I/O modules, wiring, and ancillary components as required for a complete system

The control panels shall provide a graphical display depicting the layout of the ballast system. The panels shall provide on-screen controls for opening/closing each actuated valve, and starting/stopping each ballast pump. The display shall indicate:

- Ballast manifold valve status (open/closed) for each valve
- Ballast pump status (running / stopped) for each ballast pump
- Ballast discharge manifold pressure (psi)
- Ballast tank level for each ballast tank (percent capacity)

The control panels shall be ruggedized, full color SVGA resolution touch screen HMI (human machine interface) panels, suitable for marine use. ABS type approval is acceptable evidence of suitability.

Valves on the ballast suction and ballast manifold be equipped with pneumatic actuators for ballast system control from the EOS. Actuated ballast valves shall have the following features:

- Single acting pneumatic actuator with spring return, pressure to open/spring closed for fail-safe operation.
- Air control solenoid
- Declutchable manual override for local valve operation
  Valve control/communication module with discrete I/O and visual indicator

Ballast piping shall be Class 200 90/10 copper nickel pipe. Pencil zincs shall be fitted in each ballast pipeline. Install one (1) pencil zinc per hull compartment in each ballast pipe.

529.3 Lube Oil and Waste Oil System

Provide and install lube oil and waste oil systems as shown in Reference (5J). The waste oil system will be used to drain engine sumps into a waste oil tank located in the engine room, and to transfer oil from the waste oil tank to the main deck for removal from the vessel. The lube oil system will be used fill engine sumps manually from a container.

Lube Oil and Waste Oil piping shall be fabricated from SCH 40 seamless steel pipe, ASTM A53 or A106. Piping shall utilize welded fittings except at end connections, valves, and takedown joints.

<u>Waste Oil System</u>

Fit each engine shall sump with a locking ball valve and 1" female camlock fitting.

Provide and install a fifty-foot long flexible suction rated hose, stowed on a manual hose reel. Locate the hose reel near and above the waste oil tank, so the stowed hose drains naturally into the waste oil tank.

Provide a second hose approximately three feet long with a male camlock fitting on one end, for draining the emergency generator sump into a bucket. Stow this hose in the emergency generator room where directed by the NCDOT Representative.

The waste oil tank shall be a 60-gallon independent steel tank with fittings and connections as shown on Reference (5J).

Provide and install one waste oil pump in the Engine Room, located generally where shown on Reference (5B). The waste oil pump shall be a foot mounted gear pump with ductile iron housing, integral pressure relief, hardened steel gears, bronze bearings, hardened steel drive shafts, and mechanical seals.

Install the pump and valves immediately above the tank and arrange for convenient operation. Install waste oil piping so it naturally drains to the tank.

Lube Oil System

Provide and install a 60-gallon independent steel tank with fittings and connections as shown on Reference (5J). Locate the lube oil tank so that the drain valve is approximately 18" above the engine room grating. Install a drip tray at the grating level directly below the drain valve. Install the drip pans with adequate clearance to allow placement of a 5-gallon bucket underneath the drain valve.

The lube oil tank shall be clean and free of paint, rust, or primer on its inside surface. Subsequent to NCDOT's inspection and approval, and prior to delivery, the tank shall be filled with oil appropriate for the propulsion and generator engines.

533 POTABLE AND SANITARY WATER SYSTEM

Provide and install a potable water system as shown in Reference (5K). The system shall meet all the applicable requirements of the USCG and FDA.

The potable water tank shall be located as shown in Reference (5B). The potable water tank shall be an independent steel tank with a capacity of 1,750 gallons. Tank level indication shall be as described in Section 436.2.

Provide filling stations for the potable water system located at each end of the Main Deck as shown in Reference (5D). The fill connection shall be 24 inches above the deck fitted with a female camlock fitting and plug. Mark with an engraved label plate stating POTABLE WATER ONLY. The filling station must meet the requirements of FDA.

The Contractor shall provide two (2) potable water pumps with integral flow and pressure switches. Each pump shall be capable of 8 gpm at 50 psig. During normal operation, one (1)

pump will pressurize the system and the other shall be on standby. Pumps shall be equipped to start at 40 psig and turn off at 60 psig.

One (1) ASME rated diaphragm-type potable water pressure tank shall be provided. The pressure tank shall have a minimum volume of 68 gallons and a pressure rating of 125 psig.

Install piping to distribute potable water to the vessel's lavatories, toilets, hot water system and hose bibs located as shown in References (5K). All components in the system shall be rated for a minimum working pressure of 100 psig minimum. Piping shall be seamless, type K or L copper tubing.

Mount a stainless steel hose reel at each hose bib and equip with 50 ft of red rubber hose and a handle-type hose nozzle.

Exterior hose bibs shall be frost-free type above the main deck. Provide an isolation valve on exterior hose bibs to be used during freezing conditions. Isolation valves shall be located inside the vessel, easily accessible by crew, and fitted with proper signage.

Provide four (4) hose bibs above the main deck. On the main deck, locate one (1) hose bib inside the Mop Locker aft and one in the Emergency Generator Room forward. One the 01 deck, locate one (1) hose bib at the forward end of the house, such that the inboard side of the valve is under the cabinet in the Crew Lounge. The final valve shall be installed on the forward “A” end of wheelhouse with the valve inboard side of the valve inside the console.

Provide and install one (1) hot water heater with a twenty-gallon tank and 2 kW heating element. The water heater shall have a pressure/temperature relief valve installed that cannot be isolated from the water heater.

Appropriate backflow prevention devices shall be provided and installed.

Provide and install window-washing jets over the A-End and B-End Pilot House windows. The quantity and location of the jets shall be selected to provide good spray coverage. Install a solenoid valve in the wash supply line to each window. Wire each solenoid valve to a momentary push button located in the Pilot House console facing that window. Collocate the window wash pushbutton with the wiper controls for the same window.

551 COMPRESSED AIR SYSTEM

Provide and install a compressed air system as shown in Reference (5L). The system will provide compressed air to drive the ship's horns, pneumatically actuated valves in the ballast system, and service air stations.

Provide and install two (2) two-stage, two-cylinder, air-cooled, air compressors each mounted on an 80-gallon horizontal air receiver. Each compressor shall deliver not less than 17 SCFM and shall discharge at 150 psig. Each compressor shall be V-belt driven by a 5 HP 208V/3PH/60Hz electric motor. Removable personnel safety guards shall be fitted over the drive belts.

Air compressors shall have load-less starting and a controller with hand-off-auto switch. In the "auto" position, the compressor motor controllers shall be configured for automatic start/stop based on the pressure in the common supply header. The system shall be equipped with two pressure switches to initiate compressor start and stop. One pressure switch shall be set for compressor start at 120 psig and stop at 150 psig; the other shall be set for compressor start at 100 psig and stop at 150 psig. Provide lead/lag style control so that one compressor starts at a higher pressure, with the ability to manually select which compressor starts at the higher pressure.

The air receivers provided with the compressors with the requirements of Section VIII, Division 1 of the ASME Code, stamped with the ASME "U" symbol, and approved for use on U.S. Coast Guard inspected vessels.

The main air receivers shall discharge to a common header. A pressure reducing station in the common header shall regulate the main air supply to 100 PSI. The reducing station shall include a relieving pressure-reducing valve preceded by a wye strainer, isolation valves, and a globe bypass valve. The ship's horn, ballast valve air supply, and service stations shall be supplied by branches off the main supply header.

Each service station shall be fit with a combination filter/regulator rated for 14 SCFM with a relieving regulator, 5-micron filter with metal bowl, manual drain, and an adjustable outlet pressure range of 5 to 125 psi.

The ballast valve air supply shall be fitted with an 80 psi regulating station, pre-filter, oil removal filter, and desiccant cartridge air dryer. The reducing station shall include a relieving pressure-reducing valve preceded by a wye strainer, isolation valves, and a globe bypass valve. The air dryer shall be a desiccant air dryer rated for 6000 cubic feet air drying capacity, with a one-quart metal bowl. Provide a 5-micron air pre-filter and oil removal filter that meets or exceeds the flow rating of the air dryer.

555 FIXED FIRE EXTINGUISHING SYSTEMS

Provide and install fixed fire extinguishing equipment as required by 46 CFR Subchapter H Part 76 and as described herein.

Provide and install a fixed, manually operated, total flooding clean agent fire extinguishing systems to protect the Engine Room, EOS, Switchboard Room, and Emergency Generator Room. The fixed fire system shall utilize a USCG approved flouroketone based fire suppression agent that is electrically non-conducting and non-hazardous at design concentrations.

The design, installation, testing, and maintenance of the clean agent fire extinguishing systems shall be in accordance with USCG and NFPA 2001 Rules and Regulations. Agent quantities shall meet the vendor specified minimum design concentrations.

All components of the fire extinguishing system shall be products of the same manufacturer or listed by the manufacturer as compatible with those devices, components, and equipment. The Contractor shall utilize the manufacturer's authorized technicians for final connections and system tests of the fire extinguishing systems.

The clean agent storage cylinders for the engine room, switchboard room, and EOS shall be stowed in Void B, and in accordance with USCG regulations. The cylinder for the emergency generator room shall be stowed inside that space.

Clean agent cylinders shall be new, fully charged, and fitted level indicators. When required to protect discharge heads during handling and transportation, safety caps shall be provided.

Mount all fixed clean agent cylinders on elevated foundations and securely fastened in a vertical position. Secure cylinders with circumferential band/steel strap type bolted clamps around the cylinder body. Use individual band clamps for each bottle to permit maintenance service and removal.

The system shall include all necessary storage cylinders, piping and control systems, alarms, warning lights, relief valves, discharge nozzles, solenoid shut down and pressure release cylinders, and interfaces with engine, damper, and ventilation controls.

Arrange nozzles to evenly distribute and diffuse the clean agent throughout the protected spaces. Design size and flow requirements per the manufacturer's approved design manual USCG requirements.

Configure pressure switches to stop the ventilation supply and exhaust fans, close the fire dampers, and shut down fuel transfer pumps and all diesel-fired equipment in the protected space upon release of the clean agent system serving the space protected.

The remote manual release for each space shall be located immediately outside the space served, in a location approved by the NCDOT Representative.

581 ANCHOR AND MOORING

Provide and install a 400 lb lightweight type, hinged fluke anchor with 25 ft of 13/16" Grade 2 stud-link chain and 100 ft of braided nylon line with a minimum strength of 50,000 lb. The anchor will be stowed on a slide built into the bulwark. Provide and install a rope locker near the anchor slide. No anchor recovery system shall be provided.

GROUP 600 - EQUIPMENT AND OUTFIT

600 GENERAL

600.1 References

Reference ID	Number	Title
(6A)	18026-200-101-1	Profiles and Deck Arrangements
(6B)	18026-200-101-3	Lifesaving Equipment Arrangement
(6C)	18026-200-101-7	Fire Zone Plan
(6D)	18026-200-101-8	Emergency Evacuation Plan
(6E)	18026-200-201-1	Machinery Arrangement
(6F)	18026-300-330-1	Power and Lighting Plan
(6G)	18026-200-624-1	Window Schedule
(6H)	18026-200-624-2	Door Schedule
(6I)	18026-200-624-3	Hatch Schedule
(6J)	18026-200-130-2	Main Deck

600.2 General Requirements

This section describes requirements for the vessel's outfitting and equipment. The interior and exterior finishes, outfitting and equipment items described herein shall be provided by the Contractor and installed in strict accordance with the manufacturer's recommendations and requirements, and with applicable regulatory requirements listed under Section 070 of these Specifications.

The contractor shall prepare schedules, samples, and plans where described herein and as required to obtain NCDOT Representative and Regulatory approvals prior to order and installation.

602 NAMEPLATES AND MARKINGS

The Contractor shall furnish all notices, nameplates, notice frames, markings, and labels required to complete the vessel to the satisfaction of the USCG, the Access Board proposed Passenger Vessel Accessibility Guidelines, other regulatory agencies, and the Owner. This includes, but is not limited to, the following items:

- Ship's name and hailing port on the port and starboard B-End bulwarks
- Ship's name on the port and starboard A-End bulwarks
- Builder's plaque to be installed in coordination with NCDOT's Representative
- Vessel name boards mounted on the bridge deck handrail, port and starboard, in accordance with Owner preference. Vessel name boards will be owner furnished.

- Intermittent weld at the boot stripe to facilitate future painting operations
- Official Number
- Draft marks forward and aft on the outboard side of each hull per Section 603 of the Contract Specification

The vessel will be outfitted with all applicable nameplates, signs, labels, notices, and other similar markings as required by USCG and all other regulatory agencies, whether local, state, or federal, and as directed by NCDOT.

Signage and information signs in passenger accessible areas shall comply with the United States Access Board Proposed Passenger Vessel Accessibility Guidelines (ADAAG July 2013).

Wording shall be clear and concise with a minimum of abbreviations. Particular attention shall be given to the wording intended for use by the public to ensure that the message is clear and unambiguous. Abbreviations, where used, shall be common to the Owner's standards and the marine transportation industry (in that order of precedence), and as set forth in ASME Y14.38-2007, or equal. The Owner’s representative shall approve all signage and location.

The Owner shall provide additional signs to the contractor for installation.

All sign mounts shall use welded 3/8-inch stainless steel mounting studs. Under no circumstances shall screw holes be made in structure. Provide mounting details to NCDOT for approval prior to fabrication.

602.1 Vessel Identification

The name of the vessel shall be placed on the A-End bulwarks, port and starboard, as shown on Reference (6A). Vessel's name and hailing port shall be placed on the B-End bulwarks port and starboard, as shown on Reference (6A). The letters for the name and hailing port shall be approximately 12 inches and 8 inches high respectively. Name and hailing port letters shall be cut from 1/4 inch plate, welded to the vessel, and painted. Welding shall be continuous. Lettering style, size, and color shall be approved by the Owner. Paint shall be applied as described in Section 631.

Name boards shall be installed on the bridge deck handrails, port and starboard. Name boards shall be Owner furnished.

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

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

VESSEL NAME

Date of build (e.g. October 18, 2018)
North Carolina Department of Transportation
Ferry Division
North Carolina Governor's Name
North Carolina Secretary of Transportation's Name
Designed by Elliott Bay Design Group – North Carolina, PLLC
Builder's name
Builder's Hull number

602.2 Labeling

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

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

All wiring cables shall be labeled with metal tags secured to cable at sufficient intervals to allow ready identification of cable and circuit if it should become necessary to trace circuits after shipboard installation is complete. Where wires and cables penetrate decks or bulkheads, tags shall be attached on both sides. Wire tags shall be aluminum with raised lettering and clamped to wiring with metal bands approved by the owner.

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

Paint lines to indicate vehicle lanes and safety zones on decks, colors, and markings as specified by the Owner and Reference (6A).

Provide "No Smoking" signs as required by 46CFR78.40-10.

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

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

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

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

Provide signs to indicate location of life jacket stowage and life jacket instructions

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

Provide labels over entrances to each space: Passenger Lounge, Toilets, Emergency Generator Room, etc.

Provide and install 3/16" stainless steel, deeply engraved labels adjacent to each sounding plug, remote valve operator, fill, discharge, vent, quick acting hatch, watertight door, and joiner door on the vessel exterior. Labels shall identify service and/or space served and be continuously welded in place. Lettering shall be filled with black enamel paint.

All signs, notices, and labels required to be placed on vessel shall be fabricated of vinyl, 3 to 4 mil material, unless otherwise specified herein. All signs, notices, and labels, required to be painted shall be produced by a qualified sign painter or shipyard sign shop approved by the Owner.

The Contractor shall provide and install, as directed by Owner, all notices required by USCG such as station bills, stability letter, radio station license, etc. Notices shall be installed in glass-faced frames of brushed aluminum, which shall complement the vessel's interior finish. The Contractor shall provide frames for at least the following items plus any additional display documents as required by USCG, locations to be determined by NCDOT's Representative:

- Stability Letter
- FCC Certificate (Owner Furnished)
- Certificate of Documentation
- Certificate of Inspection
- Tonnage Certificate
- Fire & Safety Plan

The Contractor shall mount four Owner-furnished state emblem decals, about 36" diameter, on 12 gauge galvanized sheet metal or 1/8" thick aluminum plates. Each decal shall be installed on vessel with six 1/4" stainless steel studs and nuts equally spaced, length as required. Mounting location on vessel shall be as directed by the Owner and shall be installed to facilitate easy removal for future maintenance.

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

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

602.3 Labeling and Identification of Hand Wheels and Piping

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

System	Color	FED.STD.NUMBER
Fire Main	Red	11105

System	Color	FED.STD.NUMBER
Fresh Water	Blue (light)	15200
Fuel Oil	Yellow	13538
Compressed Air	Orange	12246
Bilge	Black (dark gray)	16081
Hydraulic	Purple	17141
Sea Water	Green	14062
Sewage	Gray (light)	16376

All piping in the engine room, voids, and propulsion rooms shall be color coded, using the same scheme as above. Exposed piping shall be stenciled to indicate the medium contained in the system with an arrow denoting normal direction of flow. Mark piping at sufficient intervals to allow ready identification, at least once between takedown joints, on each side of bulkhead penetrations, and at least once in each compartment through which the pipe passes. All fuel oil, hydraulic oil, and fire main piping shall be marked in the same manner throughout the vessel. Provide and mount in frame in EOS, one 8 1/2" × 11" color code key plan.

602.4 Additional Labeling Requirements

In addition to the aforementioned requirements, the following additional labeling shall be provided.

The following are among the signs required. The Owner will provide specific information regarding quantity, exact wording, placement, size, color, lettering, etc.:

- No smoking
- Video surveillance
- Seats reserved for the elderly and disabled
- No admittance, Crew Only
- Lighted exit signs
- Restroom door

Lifesaving equipment locations:

- Boarding direction signs
- Instructions for using lifesaving equipment
- Signs denoting mobility impaired (wheelchair) facilities
- Fire stations shall be marked with the station number and extinguishers shall be marked as per USCG requirements of local NC inspectors.

The Contractor shall also provide the following:

- All fills, vents, and shore connections shall be labeled and any restrictions on their use
- All tactile and announcement boards required by the Access Board Guidelines
- Lifejacket locker/box labels
- The Contractor shall mark all of the required life rings, IBAs, and lifejackets with the vessel name as required by USCG

The Contractor shall provide NCDOT specific branding items and logos as directed by the Owner so that the vessel matches the exterior appearance of the NCDOT fleet. The Owner will provide information on size, location, quantity, colors, etc. along with the associated graphics files.

603 HULL MARKS

The Contractor shall develop a detailed hull marking and docking plan and submit to NCDOT for approval. The Owner shall provide docking plan details from its Manns Harbor shipyard to assist Contractor in developing the docking plan.

Hull markings shall include all regulatory required markings and cathodic protection anode locations.

Draft marks shall be cut from 1/4" plate and installed fore and aft, port and starboard. Numerals shall be expanded so that the vertical projected height of each numeral is 6" and shall be painted in a contrasting color.

604 LOCKS, KEYS, AND TAGS

Spaces to be fitted with lockable doors are the Pilot House, passenger lounge, crew lounge, EOS access, and emergency generator room. When locked, lockable doors shall be capable of being unlocked from inside the space without a key.

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

- Lock sets provided for public spaces and crew spaces are standard marine hardware
- Lock sets shall be keyed alike
- Latch sets provided for public spaces and crew spaces are standard marine hardware
- Door closers as required by USCG
- Emergency panic bars as required by USCG
- High security locks for the Pilot House and EOS access doors
- Magnetic hold backs as required by USCG

Hardware shall be heavy-duty, suitable for marine use and constructed of brass, bronze, or stainless steel.

605 RODENT AND VERMIN PROOFING

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

611 DOCKING PLUGS

Stainless steel docking plugs with bronze 1-1/2" socket head plugs shall be provided for inaccessible voids to permit proper drainage during dry-docking of the vessel. The docking plugs shall be fabricated and installed in accordance with ASTM F991. Docking plugs shall be labeled with weld bead on the hull identifying the void it drains.

612 INTERIOR AND EXTERIOR RAILINGS

Rails and guards shall be provided and installed to meet USCG requirements, and as shown on Reference (6A). All rails shall be 1 1/4" Schedule 40 stainless steel pipe, smooth and free of abrasions, sharp corners, and defects that could injure persons sliding a hand on or along the same.

Railings around the 01 deck, Pilot House, and Pilot House top shall be three-course, 39-1/2" high.

Storm rails of l-1/4" Schedule 40 stainless steel pipe shall be fitted along the inboard bulkhead of the house at the Main Deck, the sides and ends of the 01 Deck crew space, and on the curtain plate adjacent to the rescue boat access opening. Storm rails shall be set 4" out from bulkheads.

All handrails shall be removable for maintenance.

612.1 Safety Barriers

Contractor shall provide and install a 42" high, 6" × 6" mesh nylon web barrier at each end of the Main Deck between bulwark stanchions. Barrier shall be fabricated from MIL-W-23223 nylon 1-3/4" wide, minimum 0.075" thick material. Barrier shall be fabricated with a minimum three loops at each end to facilitate attachment to bulwark stanchions. Attachment to bulwark stanchions shall be accomplished by using minimum 3/8" stainless steel chain shackles at one side and a series of three short lengths of 3/8" stainless steel chain attached to barrier on the opposite side. A minimum three 3/8" stainless steel chain hooks shall be welded to bulwark stanchions at each end of Main Deck, spaced to accommodate loop spacing in barrier to allow attachment of 3/8" chain to bulwark stanchions.

Provide and install two equally spaced portable 2" Sch. 40 stainless steel pipe stanchions at each end of the Main Deck in line with bulwark stanchions to support net barriers. Stanchions shall be fitted with 1/2" stainless steel round bar hooks to hold net barriers in place. Provide and install reinforced stainless-steel pipe sockets recessed in the Main Deck to support portable stanchions. Provide stainless steel pipe sockets, total of 4, on the Main Deck adjacent to bulwark stanchions to be used to store portable stanchions when net barriers are open.

612.1 Interior Railings

Two course handrails shall be provided where required for safety, particularly adjacent to the propeller shafts in the Engine Room, voids, and thruster room, at grating edges, on both sides of incline ladders, and elsewhere as directed by NCDOT. All interior handrails shall be removable to allow for maintenance and overhaul activities.

622 FLOORS PLATES AND GRATINGS

Contractor shall develop necessary drawings for the installation of aluminum and steel deck plates in the Engine Room, Switchboard Room, Voids, and Thruster Rooms.

Deck plates shall be installed to provide complete coverage of Engine Room and Switchboard Room, except for areas directly below machinery and manifolds. Deck plates shall be installed to provide walkways and convenient access to and around all machinery and equipment in the Voids and Thruster Rooms.

Grating shall be 1/4" aluminum diamond plate supported by 3" × 2" × 1/4" angles (beams and stanchions). Steel floor plates shall be installed only where required by USCG regulations. Grating shall be portable, and bolted down with 3/8" diameter socket flat head countersunk stainless steel machine screws. Angle frames shall be drilled and tapped. Install 1/8" thick rubber between angles and aluminum decking to provide di-electric separation.

Flush hinged plates shall be provided for quick access to valves and bilge suction foot valves located below grating line. Hinges shall be stainless steel.

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

Floor plates will be installed in sections no heavier than 55 lb each, and shall be removable to allow for maintenance.

623 LADDERS

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

623.1 Vertical Ladders

Install vertical ladders for access to all voids, and at each manhole and access hatch.

Vertical ladders shall be provided for access to the bottom of voids, tanks, house tops, and elsewhere, as required. Vertical ladders shall be portable, secured with stainless steel fasteners, and constructed with 3" × 3/8" flat bar stringers and 3/4” square bar rungs spaced 12" apart. The minimum ladder width shall be 16" between stringers. Where independent ladder rungs are required, they shall be fabricated with a 3" drop center to prevent a foot from slipping off an open side. Rungs shall be aligned vertically and attached to 1/2" doubler plates at the bulkhead.

Ladders and independent rungs shall provide a foothold of 7" minimum depth. Ladders shall not be recessed under the deck more than is reasonably necessary to keep the ladder clear of the access opening.

Vertical ladders shall be installed at all escapes and elsewhere as required for access to compartments.

623.2 Inclined Ladders

Inclined ladders shall be portable and secured with stainless steel fasteners. Inclined steel ladders shall have MC 10" × 8.4 # channel side stringers, with MC 10" × 6.5 # channel treads. Special care shall be taken that tread heights vary no more than 1/4" – any variation greater than this will be cause for rejection. Fit inclined ladders with safety treads as described in Section 634.5.

624 DOORS, HATCHES, AND MANHOLES

624.1 General

Doors, hatches, and manholes will be provided as shown on References (6A), (6H), and (6I) and in full compliance with USCG requirements.

Door sill heights shall comply with all applicable regulations, and be kept to the minimum height allowed by the requirements. Door sill heights in passenger accessible spaces shall comply with ADAAG July 2013. Hardware installed on doors that are passenger accessible shall comply with ADAAG July 2013.

624.2 Doors

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

Exterior surfaces of all doors shall be stainless steel and not painted. Passenger Lounge entrance doors shall have interior panic bars with exterior lever type handles. All hardware to be heavy duty stainless steel marine construction for passenger service. Exterior door hydraulic closers shall be heavy duty marine type, suitable for high winds with two-step closing action to prevent injury, with adjustable backcheck and dead stops.

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

Weather doors shall be filled with fibrous glass thermal insulation. Fire-rated doors shall be filled with USCG-approved structural insulation necessary to comply with the structural fire protection requirements. Doors to weather from the Passenger Lounge shall be fitted with panic bars.

The EOS access door from the Main Deck shall be weather tight with suitable closure and sill height.

Joiner doors shall be marine grade flush, hollow core doors. All joiner doors and doorframes shall be of welded stainless steel construction.

All doors shall be fitted with hooks with bumpers to secure them in the open position, except watertight doors.

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

Joiner doors opening to the weather shall be fitted with weather and fume tight frames, with sills of a style designed for bolted installation. Apply sealant between frame and structure.

Restroom doors, frames, and sills shall be of stainless steel construction. Restroom doors shall be fitted with stainless steel hinges and lever type closing devices.

The EOS joiner doors shall be stainless steel construction with weather and fume tight frame. Door shall have thermal and acoustic insulation, and shall be fitted with stainless steel hinges and stainless steel mortise lock set without lock.

624.3 Watertight Doors

Hinged watertight doors shall be provided in the hold spaces as shown on References (6A) and (6H). Doors shall be quick-acting, handwheel-operated, six or eight dog. There shall be no provisions for locking watertight doors. All doors shall be labeled on both sides using engraved stainless plates in accordance with 46CFR 78.47-37 (a) and (b).

An indicator light for each watertight door which warns when the door is open shall be installed in the Pilot House is accordance with 46CFR 170.255 (e), and door open/closed status shall be indicated in the alarm and monitoring system.

The Owner shall provide USCG approvals for use of QAWT doors in hold.

624.4 Hatches and Manholes

The Contractor shall provide, layout, and install hatches and manholes generally as indicated on References (6A) and (6I). Provide manholes for access to all tanks, voids, and other spaces unless other types of openings are specified. Hatches and manholes opening onto the main deck shall be installed such that they are flush with the finished deck surface. Except for quick acting escape hatches, hatches and manholes do not require hinges.

Hatches and manholes shall have a zinc primer coating and shall be finished to a similar schedule as the surrounding bulkheads after installation. Hardware and mechanisms of quick-acting hatches shall retain their factory applied finish or be left unpainted, per manufacturer guidance.

Flush deck, hinged, watertight quick-acting hatches, 22 inch diameter, shall be installed in the Main Deck as shown on References (6A) and (6I) for emergency access to and from compartments and voids. Escape hatches shall have stainless steel mechanism, inside handle and stainless steel deck ring. Escape hatches shall be located where they are not obstructed or blocked from opening.

The Contractor shall provide and install 15 inch × 23 inch oval manholes in all tanks and accessible voids. Manholes shall be in accordance with the standards of ASTM F1142 and ASTM F1143. Manhole hatch rings and covers shall be designed and fabricated in accordance with a standard marine fitting configuration. Raised and deck ring type bolted manholes shall be

fitted with hex bolt, nut, and washer fasteners made of stainless steel, with the head welded to the underside of the angle flange to permit nut installation from the topside. Flush manholes shall be configured with blind tapped holes and socket head countersunk machine screws.

Manholes on fuel and potable water tanks shall be raised type.

Manholes on inclined or vertical surfaces shall use bulkhead-mounted studs for ease of hanging and aligning the hatch cover. Manholes and access hatches on inclined or vertical surfaces shall be provided with handles. Where the lower edge of the manhole is more than three feet above the tank bottom or working platform, bent round bar rungs spaced at 12" intervals shall be provided for safe access. In addition, a bent round bar grab rung shall be provided above the manhole.

Machinery access hatches shall be fabricated and installed over each azimuth thruster and generator to facilitate maintenance, for seven (7) total hatches. One (1) additional hatch shall be installed inboard of the generators to facilitate removal of other engine room equipment. Smaller machinery removal hatches shall also be provided for removal of pumps and other equipment from the Switchboard Room and Voids. Machinery access hatch details shall generally be as shown on Reference (6J). Machinery hatches shall be rated for the same loading as the center section of the main deck.

625 WINDOWS AND FIXED LIGHTS

Windows shall be installed as shown on References (6A) and (6G). All exterior windows shall be of the clamp-in type. All exterior windows shall be properly sealed to prevent any leakage. Window mounting frames shall be stainless steel construction for marine duty.

The Pilot House windows shall utilize single-pane, clear, tempered glass. As shown on Reference (6G), four windows adjacent the Pilot House consoles shall be (sliding/openable). All other Pilot House windows shall be fixed. Exterior passenger lounge windows shall be tinted to reduce heating from thermal transfer.

The forward and aft Pilot House windows shall each be fitted with a pantograph wiper. Wipers shall be suited to the shape of the window they serve and shall provide as much of a clear visible area as practicable.

Exterior windows in crew lounge and passenger lounge shall utilize tinted dual pane insulating glass units with a Low-E coating. Glass units shall have a solar heat gain coefficient (SHGC) of less than 0.45.

Windows in the EOS bulkheads shall be A60 fire rated windows with steel frames. EOS windows shall have a noise transmission rating of STC 43 or greater. Particular attention shall be paid to these windows during development of the noise analysis in order to maintain noise levels below the limits outlined in Section 073.

Watershed bars of 1" × 1/4" flat bar shall be installed above all windows which are not protected by overhangs.

631 SURFACE PREPARATION AND PAINTING

631.1 General

Unless otherwise noted all surface coatings shall be supplied by the same manufacturer. The coating manufacturer shall have extensive successful marine experience.

The Contractor shall propose a Paint Schedule utilizing this section as guidance. The Paint Schedule shall be reviewed and approved by the coating manufacturer before it is submitted to the Owner for approval. The Paint Schedule shall include information pertaining to paint formulation, surface preparation and cleaning, environmental constraints, and application techniques and tolerances. Paint performance, including, but not limited to, anti-fouling performance, shall be fully warranted by the Contractor.

The Contractor shall have a local paint manufacturer's representative approve surface preparation and paint application methodology for hull and deck painting.

Coatings used shall be acceptable for use in the state and local regulatory jurisdictions where the vessel is constructed. The coatings and application methods shall meet requirements of all applicable regulatory bodies, including the EPA.

Paint colors and textures shall be selected by NCDOT.

All steel, stainless steel, and exposed aluminum surfaces shall be painted, except as specifically excluded by these technical specifications. Steel surfaces, not otherwise lined, shall be provided with finish coats in accordance with the paint schedule described herein.

631.2 Use of Preconstruction Primer

Prior to fabrication, ALL structural steel used for the construction of the vessel shall be wheelabrated and primed with inorganic zinc preconstruction primer immediately after blasting. Blasting, priming, and coating welded assemblies after weld out will not be accepted by the NCDOT Representative.

Plates and shapes used in construction shall be abrasive blasted to completely remove scale, rust, and other surface contaminants to a near white surface profile in accordance with SSPC SP-10. The abrasive chosen shall produce a uniform anchor pattern with a 2.5 mil maximum profile height. If steel shot is used, a suitable proportion of iron grit shall be mixed with the shot to remove rust, scale, or other impurities peened into the surface by the shot and to produce a sharp, jagged profile. The owner’s representative shall have access to the vendor’s facility to witness surface preparation. He shall inform the Contractor of any non-compliance to the required surface preparation as noted in this section.

The Contractor or its steel supplier shall apply primer coats with inorganic zinc pre-construction primer to clean metal surfaces per the manufacturer's specifications. All plates and shapes shall receive one (1) coat, 1.0-1.5 mils dry film thickness (DFT), of pre-construction primer. Primer shall be uniform, free of pinholes and holidays, and compatible with specified coating systems.

631.3 Surface Preparation

All surface preparation shall be in accordance with the Steel Structures Painting Council's (SSPC) Steel Structures Painting Manual. In application of these standards, regardless of surface preparation method, the coating manufacturer's recommended surface profiles shall be explicitly followed.

The prepared surfaces shall be inspected by the NCDOT Representative and the Coating Manufacturer's Representative for residual dust and other surface contamination and to ensure that the minimum or higher surface preparation was achieved. The Contractor shall give as much advance notice as is possible of the time the surface will be ready for inspection. The minimum time notice of an upcoming inspection is 24 hours.

When high pressure water washing, the nozzles must be kept close enough to the surface being cleaned to work properly. In the case of hand held nozzles the maximum effective distance is approximately 6 inches. The high-pressure water washing units must be of sufficient size and pressure to properly clean the surfaces. The wetting of a surface with a high-pressure water gun does not constitute high pressure washing; it must be done correctly. If oil or grease is present, then a proper de-greaser must be used when high-pressure washing.

The quality of the surface preparation specified is the minimum quality that is acceptable on the metal's surface at the time of the paint application. Previously accepted surfaces may be rejected if excess metal turning occurs prior to the completion of painting.

Where wire brushing of steel surfaces prior to coating is specified, the use of a power wire-brush or the equivalent is intended to remove all mill scale and rust.

Dry Abrasive Grit Blasting

Abrasive grit blasting shall be done using clean, oil-free, after-cooled compressed air. The compressed air used for blasting shall be dried with properly sized, working air filters and drying units, located just prior to the blast machines. The air pressure and air volume shall be sufficient to ensure at least 90 psi air pressure at all nozzles during the normal blasting operations. Care is to be taken to blast only those areas that can be coated within a short time. This must be determined in advance and agreed upon by the Contractor, the Coating Manufacturer's Representative, and the NCDOT Representative based on atmospheric conditions at the time.

The grit used for blasting work shall be dry, oil free, clean, and essentially free of harmful contamination such as chloride and sulfate. The conductivity of the grit shall not exceed 300 micro-siemens when equal volumes of grit and distilled water are mixed together (per ASTM-D4940 testing). The grit stored at the site shall be kept in properly closed and clean storage containers. The grit size used shall consist of a mix of fine and coarse grit particles to ensure thorough surface cleaning.

Grind off all weld slag and weld splatter prior to abrasive blasting. Fill weld undercuts and weld pinholes with weld material. Areas where temporary erection structure has been removed shall be ground smooth and gouges shall be filled with weld and ground smooth. Prior to abrasive blast cleaning of steel, remove oil, grease, weld smoke, and other contamination with a suitable

detergent or SSPC-SP 1 solvent cleaning, followed by a thorough high-pressure, fresh water wash down.

The Contractor shall seal off valves, machinery, equipment, exterior aerials, and all openings in way of abrasive blast operations to prevent damage from grit and paint. Engine room intakes, exhaust ports, ventilation louvers, and all other louvers and screens must be sealed during blasting and painting in order to prevent internal spaces from being contaminated.

Surface Preparation Standards

All steel surfaces shall be blasted to SSPC SP-10, "Near White" metal prior to fabrication as indicated in Section 631.2.

The Contractor's paint schedule shall include a statement of the degree of surface preparation to be utilized for each coating system selected. Unless otherwise approved by the coating manufacturer and the NCDOT Representative, surface preparation for coating after fabrication shall be as described below.

Exterior Surface Preparation

Prior to coating, exterior surfaces shall be prepared as follows:

- Remove all weld splatter, smooth all weld seams and sharp edges.
- Remove oil and grease, dirt, etc. by detergent wash/solvent clean.
- High-pressure wash with 2,500 to 5,000 psi
- Abrasive blast hull surfaces up to 12 inches above the design load waterline to SSPC SP-10
- Abrasive blast all welds and disturbed areas 12 inches above the waterline and above (including superstructure) to SSPC SP-10.
- Sand sweep to SSPC SP-7 to remove contaminants and zinc salt
- Blow down with clean air

Hull Interior Surface Preparation

Prior to coating, hull interior surfaces shall be prepared as follows:

- Remove all weld splatter, smooth all weld seams and sharp edges
- Clean by suitable means such as pressure wash or scrubbing and solvent wipe at the discretion of the Contractor and to the satisfaction of the NCDOT Representative
- Prepare all welds and disrupted areas by abrasive blasting to SSPC SP-10
- Sand sweep to SSPC SP-7 to remove contaminants and zinc salt
- Blow down with clean air

Oil Tank Interior Surface Preparation

Interior surfaces of oil tanks shall be prepared as follows:

- Remove all weld splatter, smooth all weld seams and sharp edges
- Abrasive blast interior of tank to SSPC SP-6
- Clean and vacuum to remove all dust, grit, and contaminants
- Immediately after preparation, wipe down or spray tanks with a suitable oil to protect surfaces from rust bloom.

Superstructure Interior Surface Preparation

Interior spaces in the superstructure shall be prepared as follows prior to coating:

- Remove all weld splatter, smooth all weld seams and sharp edges
- Clean by suitable means such as scrubbing and solvent wipe at the discretion of the Contractor and to the satisfaction of the NCDOT Representative
- Prepare all welds and disrupted areas by abrasive blasting to SSPC SP-10. Where abrasive blasting is not prudent or feasible, welds may be prepared by mechanical means to SSPC SP-3
- Blow down with clean air

631.4 Coating Application

All hardware, windows, light fixtures, placards and signs, nameplates, gages, thermometers, and adjacent equipment and structure shall be properly masked off when the surrounding areas are being painted. Masking tape shall be removed within 24 hours from when it was applied. Items and surfaces to be protected may be removed, moved, or otherwise protected, at the preference of the Contractor, but shall be restored to their pre-removal form, appearance, and function at completion of the paintwork.

The Contractor shall mask hoses, gauges, and bright work prior to painting. Painted hoses shall be replaced, even if only partially painted.

Unless otherwise specified, or approved of by the manufacturer, paint and other coating materials are not to be thinned with solvent or altered in any manner by the Contractor.

Where minimum dry film thickness (MDFT) requirements are specified they shall have precedence over the number of coats specified. The readings shall be made with a magnetic coating thickness gauge in accordance with the manufacturer's instructions.

All topcoats shall be from the same lot, applied in continuous fashion. The finished surface shall be free of curtains, holidays, and shadows. If discoloration or fading of the topcoat is evident at the completion of construction, the topcoat shall be reapplied.

Stainless steel doors, hinges, handles and other stainless steel used on the exterior of the vessel shall not be painted.

631.5 Baseline Coating System

The coating system described below represents a system as supplied by one (1) manufacturer with extensive successful marine experience. Other coating systems provided by other manufacturers may be considered, if they have equivalent successful marine experience and if the coating system equal to the type specified. The NCDOT Representative shall make the sole determination of whether the alternative system is satisfactory.

Primers

Prime coat aluminum, galvanized, and stainless steel with a full coat of a compatible two-component, moisture-curing low zinc (ethyl) silicate prefabrication primer to 1.0 to .15 mils DFT.

Keel to Deep Load Line

Apply two coats of two-component, multi-purpose phenalkamine epoxy followed by three coats of a one-component, high-performance, self-polishing antifouling paint as follows:

- First Coat: Epoxy, 6 mils DFT
- Second Coat: Epoxy, 4 mils DFT
- Third Coat: : Antifouling, black, 4 mils DFT
- Fourth Coat: Antifouling, red, 4 mils DFT
- Fifth Coat: Antifouling, red, 4 mils DFT

Hull from Deep Load Line, and External Superstructure

Apply two coats of two-component, multi-purpose phenalkamine epoxy followed by one top coat a high gloss, Two-component, engineered polysiloxane coating

- First Coat: Epoxy, 6 mils DFT
- Second Coat: Epoxy, 4 mils DFT
- Finish Coat: Polysiloxane, 5 mils DFT

Exposed Weather Deck (except vehicle deck)

Apply two coats of two-component, multi-purpose phenalkamine epoxy followed by one top coat a high gloss, Two-component, engineered polysiloxane coating with non-skid in traffic areas.

- First Coat: Epoxy, 6 mils DFT
- Second Coat: Epoxy, 4 mils DFT
- Finish Coat: Polysiloxane, 5 mils DFT with non-skid

Vehicle Deck

Apply two coats of two-component, multi-purpose phenalkamine epoxy followed by one top coat a high gloss, two-component, engineered polysiloxane coating

- First Coat: Epoxy, 6 mils DFT

- Second Coat: Epoxy, 4 mils DFT
- Finish Coat: Polysiloxane, 5 mils DFT with non-skid

Paint six-inch wide yellow lane stripes on the Main Deck as directed by the Owner.

Passenger and Crew Areas (Interior Bulkheads and Overhead)

Apply two coats of compatible alkyd primer followed by two coats of gloss alkyd enamel as follows:

- First Coat: Alkyd primer, 2 mils DFT
- Second Coat: Alkyd primer, 2 mils DFT
- Third Coat: Alkyd enamel, 1.5 mils DFT
- Fourth Coat: Alkyd enamel, 1.5 mils DFT

Passenger and Crew Areas Under Deck Coverings or Behind Insulation

Apply two coasts of compatible alkyd primer as follows:

- First Coat: Alkyd primer, 2 mils DFT
- Second Coat: Alkyd primer, 2 mils DFT

The Contractor shall choose primers or coatings compatible with underlayment and flooring materials that will be applied over.

Engine Room, Void, and Thruster Room Bilges

Apply four coats of two-component multi-purpose phenalkamine epoxy as follows:

- First Coat: 4 mils DFT
- Second Coat: Stripe coat
- Third Coat: Strip coat
- Fourth Coat: 4 mils DFT

Hold Level Flats, Overheads, and Sides

Apply two coats of compatible alkyd primer followed by one coat of gloss alkyd enamel as follows:

- First Coat: Alkyd primer, 2 mils DFT
- Second Coat: Alkyd primer, 2 mils DFT
- Third Coat: Alkyd enamel, 1.5 mils DFT

Ballast Tanks and Waste Oil Tanks

The ballast tanks shall receive five coasts of two-component, multi-purpose phenalkamine epoxy formulated for seawater ballast tanks, as follows:

- First Coat: 5 mils DFT

- Second Coat: Stripe coat
- Third Coat: Strip coat
- Fourth Coat: 5 mils DFT
- Fifth Coat: 5 mils DFT

Each coat shall be a different color.

Potable Water Tank

The potable water tank shall receive three coats of NSF Approved Solvent Free Cycloaliphatic Amine Tank Lining as follows:

- First Coat: 4 mils DFT
- Second Coat: Stripe coat
- Third Coat: 10 mils DFT

Voids

Voids and interior surfaces within the hull not covered by any other portion of this section shall receive two coats of two-component multi-purpose phenalkamine epoxy to an MDFT of 8-10 mils.

Fuel Oil Tanks

All fuel oil tanks shall be treated frequently after construction with sufficient fuel oil to prevent the formation of any rust.

Oil Tanks

All other oil tanks, unless otherwise specified, shall be treated frequently after construction with appropriate preservative oil in order to prevent the formation of any rust.

Miscellaneous Spaces

Miscellaneous spaces shall be coated as follows:

- Vent ducts when made of other than sheet metal shall be coated the same as void.
- Aluminum deck plates shall not be coated.
- Fan rooms shall receive inorganic zinc silicate throughout, including the same overcoat system as the superstructure exterior in plenums and where not insulated. Where insulated, coat the same as other insulated spaces.
- Miscellaneous trunks shall be coated the same as voids.
- Cleaning gear and other lockers shall be coated the same as water ballast, oily water, sludge, and waste oil tanks.
- Prime unlagged pipe to suit material. Overcoat primer and lagged pipe with materials to match surroundings.

- Any other space or item not described herein shall be coated as appropriate for similar spaces, in accordance with the manufacturer, and as approved by the NCDOT Representative.

631.6 Coating - Piping, Machinery, and Electrical

Piping

In general, coat piping with a glossy finish in accordance with the paint requirements for the area through which the piping passes or is installed. All fire main system piping shall be painted red. Paint rigid pipe insulation as described herein for piping. Do not paint insulation blankets.

Do not paint flexible hoses, hose sleeves, and flexible connections. Mask all electrical cable to prevent coating and overspray. Flexible hoses, hose sleeves, and flexible connections with paint or overspray shall be rejected and require replacement.

Machinery

New machinery and equipment in non-weather spaces shall retain the coating supplied by the factory, provided the coat is a finish coat, and shall not be further coated to match the above paint schemes. Where machinery coating is damaged during construction, carefully feather the edges and paint to match factory coating.

Equipment that is delivered with only a factory-applied primer coat shall be coated with two coats of a high performance, self-priming surface tolerant epoxy. Color to be selected by Owner.

- First coat: 6 mils DFT
- Second coat: 4 mils DFT

Paint deck machinery and equipment installed in the weather or in public spaces in accordance with color schemes approved by the Owner' Representative.

Electrical

Do not paint electrical cable. Mask all electrical cable to prevent coating and overspray. Any painted electrical cable shall be replaced, even if only partially painted.

Electrical components such as power distribution panels, motor control enclosures, junction boxes, etc., shall retain the color and coating as supplied from the factory provided the coating is a finish coat.

Equipment that is delivered with only a factory-applied primer coat shall be coated with two coats of a high performance, self-priming surface tolerant epoxy.

- First coat: 6 mils DFT
- Second coat: 4 mils DFT

Protect and mask off factory lenses, switches, pushbuttons, label plates, etc. from damage by the coating.

Repair of Damaged Coatings

Where any coating has been damaged by welding, burning, or any other cause, the damaged area shall be repaired by abrasive blasting or power tool cleaning, degreased and cleaned as needed, and a full coating system applied in way of the damage. Care shall be exercised that the edges are feathered and that no sanding swirls or other marks will remain after the final coat is applied. Colors shall match the adjacent pre-existing coatings.

633 CATHODIC PROTECTION

The Contractor shall provide and install sacrificial anodes on the submerged portions of the hull including the sea chests and ballast tanks. An anode shall be fitted in every sea chest. The Contractor shall perform calculations to determine the required number of anodes and submit along with an anode plan for NCDOT Representative review and approval.

Anodes shall be high purity zinc meeting MIL-DTL-18001K specification or approved aluminum meeting MIL-DTL-24779B, as approved by the NCDOT Representative. Anodes shall be 22 lb. weld strap type zinc using NCDOT standard anode mounting frame. NCDOT Ferry Div. (Owner) shall provide a drawing detail of mounting frame.

Anodes shall be fitted on each azimuth thruster in accordance with manufacturer specifications.

634 DECK COVERINGS

634.1 General

Deck covering shall be laid under furniture except where the furniture is built-in to the vessel structure. Cove base shall be installed around boundaries, including built-in furniture.

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

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

634.2 Underlayment

Before flooring is installed, the deck shall be faired with underlayment to provide a smooth and even appearance, and eliminate irregularities in the deck surface. Underlayment shall be applied only to the minimum thickness required.

634.3 Deck Covering Schedule

Deck	Location	Floor Covering
Pilot House Top		Non-Skid Paint (Section 631)

Deck	Location	Floor Covering
Bridge Deck	Pilot House	Raised Floor, Raised Dot Rubber Tile (Black)
	Exterior Walkways	Non-skid paint (Section 631)
01 Deck	Crew Lounge	Raised Dot Rubber Tile (Black)
	Head	Poured Epoxy Floor
	Exterior Walkways	Non-skid paint (Section 631)
Main Deck	Vehicle Deck	Non-skid paint (Section 631)
	Exterior Walkways	Non-skid paint (Section 631)
	Passenger Lounge	Raised Dot Rubber Tile
	Restrooms	Poured Epoxy Floor
	Emergency Generator Room	Paint (Section 631)
	Cleaning Gear Locker	Paint (Section 631)
Hold	Engine Room, Voids, Thruster Rooms, Switchboard Room	Paint or Grating
	EOS	Raised Floor, Raised Dot Rubber Tile (Black)
All	Inclined Ladders	See Section 634.5
	Exterior Doors	See Section 634.5

Raised Floor

The Pilot House and EOS shall be fitted with a modular raised floor system, with the finished floor approximately six inches above the steel deck level. The floor system shall have removable panels, approximately 24 inches square to allow convenient access to the area below the raised floor.

Raised Dot Rubber Tile

Provide and install commercial grade, wear, and slip resistant, synthetic rubber tile with a uniform raised dot pattern. Tiles shall be homogenous with a solid color throughout. Color and texture shall be selected by NCDOT.

Poured Epoxy Flooring

Provide and install USCG approved poured epoxy floor with integrated cove base. Flooring shall be continuous throughout the installed space. Color and texture shall be selected by NCDOT.

634.4 Switchboard and Fatigue Matting

Provide 36-inch-wide matting in front of the main propulsion, ship service, and emergency switchboards for their full length as approved by the NCDOT Representative. Matting shall meet the requirements of ASTM D-178 and Mil Spec M-15562F.

Provide and install anti fatigue mats on the deck in each Pilot House as approved by NCDOT.

Provide and install anti fatigue mats on the deck in the EOS as approved by NCDOT.

634.5 Safety Treads

Fit each step of inclined ladders with safety treads. Safety treads shall be extruded aluminum with ribbed aluminum oxide non-slip filler. Treads abrasive shall be safety yellow at nose of tread, remaining abrasive shall be black. Safety treads shall be attached by stainless steel, flat head countersunk machine screws. Aluminum shall be insulated from steel by 1/8" thick, rubber gasket material.

Safety yellow adhesive-backed, silicon carbide safety treads shall be installed at the head and foot of all interior inclined and vertical ladders, on interior sides of exterior doors, and in other locations where it is necessary to ensure safe footing. The safety treads shall be 6 inches wide and safety yellow. Adhesive treads shall not be applied to surfaces that have non-skid coatings applied, nor within tanks.

A 6-inch wide safety yellow stripe shall be painted at the head and foot of all exterior ladders and at exterior side of exterior doors. The painted strip shall be non-skid matching the surrounding surface.

635 INSULATION AND LININGS

635.1 General

Surfaces to which insulation is applied shall be prepared in accordance with Section 631.

Insulation materials shall be USCG-approved and certified for the intended use and shall be free of asbestos containing materials. Provide documented proof of USCG certification to the NCDOT Representative prior to installation of insulation materials.

Provide a vapor barrier wherever insulation contacts weather or exterior surfaces.

Install mineral wool batts or blankets tight to the surface being protected. Contour insulation around angles and tees to ensure that there is no reduction in cross section, and that there is minimal loss of contact with the structure.

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

20 GA perforated aluminum steel sheet metal sheathing shall be installed over all bulkhead and deck head insulation in the Engine Room, Switchboard Room, EOS, Thruster Rooms, and uptakes.

In way of bolted access plates, tonnage openings, and other openings insulation shall be installed in such a manner as to permit the use of the opening or access without the necessity of removing or damaging the insulation and sheathing.

635.2 Structural Fire Protection

Provide and install structural fire protection insulation as required by USCG, generally as shown in Reference (6C). Structural fire insulation shall be a faced mineral wool product approved by the USCG.

The uptakes will be lined with A60 and A15 structural fire protection and 20 GA perforated aluminum sheet metal as shown in Reference (6C).

635.3 Thermal Insulation

Where structural fire protection insulation is not required, thermal insulation shall be provided on all weather boundaries of passenger and crew spaces, except for the Engine Room. The underside of the deck in way of the Passenger Cabin shall receive thermal insulation where not otherwise covered by structural fire protection. The switchboard room bulkheads at frames 8 and 16, and the side shell above the waterline in the switchboard room shall be also insulated. The overhead of the thruster rooms shall be insulated with rock wool. Rock wool is the preferred type insulation to be used throughout the vessel to help reduce noise.

The effective overall heat transfer coefficient of bulkheads and decks requiring thermal insulation shall be U=0.12 BTU/Hr/SF/°F or lower. This corresponds to 2" of insulation + 1" stiffener wrap behind furred sheet metal linings or 3" insulation + 1" stiffener wrap over unlined bulkheads or decks.

635.4 Acoustic Insulation

The Contractor shall install acoustic insulation system in order to meet the noise requirements detailed in Section 073. Acoustic insulation shall be applied to the overhead of the engine room below the passenger space, the engine room facing EOS bulkheads, and around the interior of the uptakes as required to meet these requirements.

These areas shall utilize a single insulation system that meets both structural fire protection and acoustic requirements.

635.5 Machinery and Piping Insulation

Refer to Sections 259 and 505.6 for machinery and piping insulation requirements.

637 LININGS AND CEILINGS

Bulkheads, whether flat side or stiffener side, and overheads in the following spaces shall be sheathed with vinyl-covered aluminum:

- Pilot House
- Crew lounge
- Crew Head
- Passenger Lounge
- Passenger Restrooms

The lower 48" of toilet space bulkheads and boxing around windows shall be 18 gauge stainless steel. The stainless steel plate shall be installed using stainless steel screw fasteners with finish type washers.

Colors and finishes shall be selected by NCDOT.

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

Where necessary for inspection or operation, provide hinged access panels. Panels shall be labeled appropriately.

All exposed metal including but not limited to doors, frames, etc., shall be painted to the satisfaction of the Owner.

640 OUTFITTING

Furniture and furnishings shall be provided as shown on Reference (6A) and shall be of good marine quality, installed to present a complete and pleasing package to the satisfaction of NCDOT.

Spaces and lockers not specifically mentioned herein, but which normally require shelving, etc. shall be suitably equipped in keeping with the requirements for similar spaces. Provide stainless steel racks, rods, hooks, etc., as necessary for proper stowage of gear and supplies in accordance with the requirements of vessel operation in normal service.

All shelving shall be adequately braced and supported and shall be fitted with removable sea rails. Final outfit items selected for the spaces below shall be approved by the NCDOT Representative.

640.1 General

Outfitting of all spaces shall be in accordance with the fire load restrictions applicable to their space designation.

All passenger spaces shall comply with ADA requirements in ADAAG July 2013.

Contractor shall measure the space available so that furniture and furnishings fit smartly with efficient use of space. All furniture shall be of commercial grade with non-combustible frames with tamper resistant or durable finishes.

Furniture and fabric colors, themes, and patterns shall be selected or approved by NCDOT.

In no case shall equipment, furnishings, or outfitting be attached to structure by drilling holes in bulkheads. When fixing smaller items to bulkheads, reusable weld studs or weld-on threaded fittings shall be used. Larger items shall be attached to welded foundations as described in Section 180.

640.2 Furnishings

Pilot House

Furnish the Pilot House generally as shown on Reference (6A). The Pilot House shall be furnished with the following items:

- Two (2) Pilot House consoles, see Section 640.3.
- Two (2) pilot seats, with 6" adjustable swivel and 36" floor slide
- Coffee counter
- Coffee maker
- 4.4 ft^3 under counter refrigerator
- Desk with locking drawers and bookcase
- Office chair
- Anti-fatigue mats

Fit all windows with roll-up polyester film windows shades with smoke tint and reflective coating. Provide metal clips at bottom of windows for shade restraint.

Crew Lounge

The crew lounge shall be arranged generally as shown on Reference (6A). The crew lounge shall be furnished with the following items:

- Galley counter and cupboards
- Galley sink, stainless steel two (2) compartment
- Fixed stainless steel table with seating for six as shown on plans
- Microwave, stainless steel finish
- Coffee maker with metal coffee decanters
- Refrigerator 20 cu. Ft. minimum with separate freezer compartment
- Bulletin board, 36” x 48”, with hinged glass cover and lock
- White board, 36” x 48”, with metal frame mounted on the wall
- Electronics enclosure with standard 19-inch rack for equipment
- Waste basket, medium size galvanized metal with lid
- Cabinets shall be stainless steel with door latches to prevent accidental opening in rough seas

- Paper towel holder mounted near sink

Crew Head

The crew head shall be furnished with the following items:

- One (1) vitreous china toilet, deck mounted, with flush valve, 1.2 gpf
- One (1) stainless steel sink cabinet and lavatory
- Mirror, 16” wide x 24” high
- Air hand dryer
- Waste receptacle, galvanized metal with lid, similar to one in Crew Galley
- Soap dispenser, liquid soap type
- Commercial grade toilet paper (roll) holder (OWNER FURNISHED)
- Coat hook, (mounted on door)

Passenger Lounge

Provide and install fixed seating for 29 people generally shown on Reference (6A).

Seats shall be cushioned type passenger seating with high backs and arm rest. Upholstery shall be transit grade flame retardant vinyl and foam. Seat coverings finish and color shall be selected by NCDOT.

Seating shall be completely open from seat to floor for ease of cleaning underneath and security screening considerations.

Seats shall be mounted to maintain 36" clear pathway in front of tonnage openings and through the passenger lounge.

Seats shall be secured to deck with stainless steel studs welded to deck and secured with stainless steel nylock (plastic insert) nuts. Mounting details shall meet seat manufacturer recommendations and be approved by the NCDOT Representative.

Provide and install one (1) bottled water machine approved by the owner.

Provide a securely framed bulkhead in-way of refreshment machines. This includes adequate structure for restraining the machines without having to drill holes in vendor machines.

Passenger Restrooms

The vessel shall have two (2) unisex passenger restrooms, both of which shall be ADA compliant. Each passenger head will be furnished with the following items:

- One (1) ADA compliant vitreous china toilet, deck mounted, with flush valve, 1.2 gpf.
- One (1) bulkhead mounted ADA compliant stainless steel countertop and lavatory
- Mirror
- Air hand dryer
- Waste receptacle, galvanized metal can with lid

- Soap dispenser for liquid soap
- Commercial grade toilet paper (roll) holder (OWNER FURNISHED)
- Coat hook, mounted on door
- Stainless steel ADA grab rails on two sides
- Folding, wall mounted baby changing station

Cleaning Gear Locker

Provide and install the following furnishings in the cleaning gear locker:

- Floor mounted service sink of fiberglass construction with stainless steel faucets
- Bulkhead mounted service faucet with hose-bib fitting
- Two (2) stainless steel shelves mounted above floor sink
- Mop and broom rack, stainless steel
- Six (6) bulkhead mounted stainless steel hooks
- Hose valve and 50 ft. rubber hose with rack

EOS

The EOS shall be furnished with the following items:

- Stainless steel EOS console, see Section 640.4
- Storage cabinet (for books and ring binders, three (3) shelves floor mounted)
- Two (2) bulkhead mounted stainless steel coat hooks
- Waste bin, galvanized metal can with lid
- 4.4 ft^3 cubic foot refrigerator
- Anti-fatigue mats and electrical mat in-way of all switchgear see Section 634.4

640.3 Pilot House Consoles

Provide and install two (2) identical Pilot House consoles in the Pilot House. Develop the console configuration in compliance with the recommendations of ABS Guidance Notes on Ergonomic Design of Navigation Bridge. Mount controls and instruments indicated on the Drawings and as described elsewhere in this Technical Specification on the consoles. Final arrangements are subject to approval by the NCDOT Representative.

The consoles shall be constructed of lightweight steel. Instruments shall be installed in modular fashion, with instruments mounted in removable square or rectangular steel panels attached to the console body with removable fasteners. The console shall have a durable, flat black epoxy or powder coat finish.

Fit hinged doors to permit convenient access to all internal components. Provide adequate power ventilation in console to maintain required environmental conditions for operation of equipment housed in the console. Provide sufficient lighting and electrical outlets under the console for maintenance and electrical equipment. Lights shall be LED, switched inside, and convenient to access doors.

Install a minimum of four (4) multi-cable transits (MCTs) in the Pilot House deck, two (2) under each Pilot House console. One (1) MCT shall be for power cables and one (1) for control and signal cables, at least 50% of the available capacity shall remain unused. Install one (1) unused 120 VAC duplex receptacle on each side of the console, and two (2) unused 120 VAC duplex receptacles inside the console.

The Contractor shall develop a full-scale mockup of a console for NCDOT approval prior to final console fabrication. The mockup will include accurate representations of the instruments and controls positioned on the console.

640.4 EOS Console

Provide and install one (1) control console in the EOS. Develop the console configuration in accordance with the recommendations of ABS Guidance Notes for the Application of Ergonomics to Marine Systems and ASTM F1166 Standard Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities as applicable. Final arrangements are subject to approval by the NCDOT Representative.

The consoles shall be constructed of lightweight steel. Instruments shall be installed in modular fashion, with instruments mounted in removable square or rectangular steel panels attached to the console body with removable fasteners. The console shall have a durable epoxy or powder coat finish. The EOS Console shall be painted gray to match other electrical cabinets located in the EOS. Color shall be approved by NCDOT.

Fit hinged doors to permit convenient access to all internal components. Provide adequate ventilation in console to maintain required environmental conditions for operation of equipment housed in the console. Provide sufficient lighting and electrical outlets under the console for maintenance and electrical equipment. Lights shall be LED, switched inside, and convenient to access doors.

The Contractor shall develop a full-scale mockup of the console for NCDOT approval prior to final console fabrication. The mockup will include accurate representations of the instruments and controls positioned on the console.

640.5 Machinery Space Outfit

The Contractor shall provide and install one (1) workbench the Engine Room as shown on Reference (6E). A heavy duty work vice shall be mounted on the workbench.

Provide a FO/LO filter drain basin near the work bench for draining filters.

The Contractor shall provide and install four (4) heavy duty storage cabinets in the Engine Room as shown on Reference (6E).

Provide and install an eyewash station and first aid kit where shown on Reference (6E).

Provide and install a storage cabinet sized to hold four (4) 5-gallon cans of premixed engine coolant. Locate storage cabinet where shown on Reference (6E).

The Contractor shall provide and install padeyes throughout the Engine Room, Voids, and Thruster Rooms for maintenance of all major equipment, including but not limited to: Generators, azimuth thrusters, pumps, and motors. Size and arrange padeyes to suit lifting arrangements and capacity of equipment installed.

Twenty-eight (28) padeyes shall be installed at the major equipment access hatches, one padeye at each corner of each hatch. Each of these padeyes shall be constructed of 1-inch plate, shall have a safe lifting capacity of at least 3 metric tons, and shall be painted bright yellow. Additionally, the Contractor shall provide and install twenty (20) additional padeyes in convenient locations throughout the Engine Room, Voids, and Thruster Rooms for handling of machinery. Final locations for all padeyes shall be approved by NDCOT prior to installation.

644 SANITARY FIXTURES

The Contractor shall select, provide, and install sanitary fixtures and equipment as shown on Reference (6A) and as described in this Specification. All fixtures shall be approved by NCDOT. Trim and exposed metal fixtures and accessories shall be satin finished stainless steel.

Plumbing fixtures, fittings, and accessories shall be suitable for marine service. Where not specified, they shall be finished with stainless steel or chrome plated cast brass trim and accessories.

Furnish lavatory fixtures complete with valves, faucets, stops, drain fittings, vents, and hangers. Traps shall be adjustable, chrome plated cast brass, with cleanout plugs.

Install toilets over finish deck coverings for removal ease and maintenance. Provide and install manufacturer recommended closet flanges for steel deck applications.

680 EMERGENCY AND FIREFIGHTING EQUIPMENT OUTFIT

680.1 General

Emergency equipment shall be installed generally as shown on References (6A) and (6B), as required by all applicable regulations, and as required by NCDOT. The type, quantity, location and installation of life saving appliances are subject to final approval of cognizant Officer in Charge, Marine Inspection (OCMI).

The locations of all firefighting and emergency equipment shall be verified and approved by the Owner.

680.2 Portable and Semi-Portable Fire Extinguishers

The Contractor shall provide and install hand portable fire extinguishers as required to meet all applicable USCG regulations, including 46 CFR 76.50. The following list provides the minimum acceptable quantity, rating, and location for fire extinguishers to be installed. The final quantity, location and size shall be provided as determined by USCG inspection and approval but not less than shown in this list.

Location	Qty	Rating
• Pilot House	1	3A:40-B:C
• Crew Lounge	1	2-A
• Passenger Lounge Interior	1	2-A
• Emergency Generator Room	1	40-B:C
• Engine Room, Near Generators	2	10-B:C (20 lb CO2)
• Main Deck	6	40-B
• EOS	1	3A:40-B:C
• EOS	1	10-B:C (20 lb CO2)
• Engine Room	2	40-B:C
• Switchboard Room	1	40-B:C
• Voids	2	40-B:C
• Thruster Rooms	4	40-B:C
• Spare	1	2-A
• Spare	1	40-B:C
• Spare	1	10-B:C (20 lb. C02)

Install extinguishers on manufacturer-matched and recommended brackets for stored pressure and cartridge activated extinguishers. Extinguisher brackets shall be USCG-approved. Spares shall be mounted in like manner and stowed in the A-End void with final location as directed by the Inspector.

In addition, the contractor shall provide and install one (1) 120-B rated semi-portable extinguisher in the engine room as required by USCG regulation. Mount where directed by the Owner.

680.3 Fire Axes

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

680.4 Rescue Equipment

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

- One medevac litter with flotation kit and litter hoisting sling
- One rescue strop

Contractor shall provide and install one gear storage locker, of approximate overall dimensions of 71 inches by 22 inches by 24 inches. Locker shall be installed on the 01 Deck as directed by the NCDOT.

Contractor shall fabricate or provide two (2) aluminum rescue ladders constructed of 2" × 2" × 1/8" wall square tube rails spaced 18 inches apart and 2" × 2" tube rungs capped with 1/4" × 2" aluminum tread plate steps spaced 12 inches apart. Ladder shall be arranged to lock into Main Deck sockets at approximately Frame 41 starboard, on both ends of the vessel. Ladder shall have hand grabs extending 18 inches above the Main Deck and shall be at minimum 9 feet long inclusive of the hand grabs. Provide secure storage for the ladder on the starboard curtain plate as directed by the Owner.

680.5 Defibrillator

Contractor shall provide and stow one (1) automatic external defibrillator. Unit shall be bulkhead mounted in the Pilot House with final location as directed by NCDOT.

681 LIFESAVING SYSTEMS

The locations of all lifesaving equipment shall be verified and approved by the Owner.

681.1 Rescue Boat and Davit

Provide and install one (1) USCG approved rescue boat. The rescue boat shall have a fiberglass reinforced polyester hull, soft-foam fenders, and 25 HP 4-stroke outboard motor. The rescue boat shall be stowed on the 01 Deck as shown on Reference (6A) within a cradle with suitable quick release retaining mechanism. The cradle shall be vendor supplied, or detailed and installed to the requirements of the rescue boat vendor. The rescue boat shall be identical to those currently on NCDOT's other ferries. A step ladder shall be fitted for access to rescue boat per Owner, fabricated from stainless steel pipe.

Operation of the rescue boat shall be as shown in Reference (6B). Operating instructions shall be displayed adjacent to rescue boat. The instruction plaque shall be laminated for weather proofing.

Provide and install one USCG approved, free standing, deck mounted davit with electric slew and hoist. The rescue boat davit and winch shall be rated for lowering and hoisting the rescue boat with six (6) occupants.

681.2 Life Jackets (PFDs) and Stowage

Provide and install life jackets in accordance with USCG requirements. Label life jacket lockers as to contents per USCG requirements.

Lifejackets shall be stowed in lockers as shown on References (6A) and (6B). The Contractor shall provide and install suitable weathertight fiberglass lockers for life jacket storage where shown on the References (6A) and (6B). Provide a wood grating in each locker; finish shall be natural with varnish sealant. Adult and children's life preservers shall be separated by a divider. Divider shall be 1/8” aluminum plate with 3-inch radius corners, sized to suit. Locker hinges

shall be 316 stainless steel. Lockers shall be securely mounted on 3" high foundation angles. Provide a laminated instruction plaque near each life jacket box.

681.3 Life Rings

A total of eight (8) 30-in diameter, USCG-approved life rings shall be provided, labeled, and stowed in stainless steel brackets. The installation of all life rings shall meet the requirements set forth in 46 CFR 199. Four (4) rings shall have rope and light, two (2) with rope as shown in Reference (6B).

681.4 Inflatable Buoyant Apparatus (IBA)

The Contractor shall provide and install five (5) 50-person, passenger-vessel-type USCG-approved IBAs. Install as shown in Reference (6B). IBAs shall be stowed with a float free configuration that includes a painter, weak link, and hydrostatic release. Handrails shall have chained sections to provide easy access to launch IBAs.

The manufacturer shall be approved by Owner to match units used on other vessels in their fleet.

Install a laminated instruction plaque at raft location. The Contractor shall use raft vendor supplied instructions.

800 INTEGRATION ENGINEERING

800.1 References

Reference ID	Number	Title
(8A)	18026-200-101-1	Profiles and Deck Arrangements
(8B)	18026-200-833-1	Weight Estimate
(8C)	18026-200-835-1	Tonnage Assessment
(8D)	18026-200-843-5	Stability Assessment

810 Engineering and Working Drawings, Calculations, Review

The Contractor shall provide all engineering services necessary for the work in accordance with this Contract Specification. Services shall include technical calculations, surveys, material selection, preparation of diagrams, sketches, schedules, data, and preparation of all working drawings and as-built drawings.

Drawings shall be complete in all detail, serve to gain regulatory approval, and facilitate future use by the NCDOT for maintenance and repair activity. All drawings shall identify make and model of equipment utilized to complete the construction of the vessel. Where an EBDG Contract or Contract Guidance Drawing has been developed for this project, the Contractor may utilize it for further development as needed. Any such revisions shall be clearly and explicitly identified with a revision note and revision mark at the revision. The EBDG title block shall remain on all drawings utilized by the Contractor.

All drawings shall be produced using Computer Aided Design (CAD) in AutoCAD 2018 or most current format. Provide the data files electronically in AutoCAD and PDF as applicable and as 11 inch × 17 inch paper format. The Contractor shall provide full scale printed drawings larger than 11 inch ×17 inch upon request of the NCDOT Representative. All delivered PDF files shall be searchable.

The Contractor shall submit a full sample-drawing format showing a typical sheet one and sheet two, including title block, reference, general notes, and revision table format to the NCDOT Representative for approval.

The NCDOT Representative will review the Contractor's detailed design to determine compliance with the Drawings, Contract Specifications, and Contract. The Owner Representative's review will not relieve the Contractor of responsibility for deviations from this Contract Specification unless the Contractor has provided written notification of any deviation at the time of drawing submittal. Approval of a drawing does not constitute approval of a deviation, mistake, or omission.

The Owner Representative's approval of a deviation from this Contract Specification will not relieve the Contractor of the responsibility for satisfactory operation of the system or equipment.

Work performed by the Contractor prior to the Owner Representative's review and approval, or any required regulatory approval, of the Contractor's drawings will be at the Contractor's own risk.

Booklets of details and calculations may be on sheets 11 inch × 17 inch or 8 1/2 inch × 11 inch.

Symbols on drawings shall conform to recognized marine commercial standards.

Complete bills of materials shall be shown on drawings. Materials on drawings shall have item numbers and be identified in a material list by material specifications, ASTM, ANSI, NEMA, etc., as appropriate.

Valves and equipment on drawings shall have an identifying number, matching the number inscribed on the label or nameplate for that item.

Each drawing shall contain a view showing the entire system covered by the drawing. All drawings shall be initialed in the title block by the drafter and the engineer responsible for the design prior to submittal to the NCDOT Representative.

Each drawing shall be checked and finished before submitting. Drawings without appropriate signatures and drawings that are not complete or contain excessive errors will not be reviewed by the NCDOT Representative and will be returned to the Contractor for completion. Returned drawing submittals do not count towards fulfilling the Contractor's obligations with regard for scheduling, i.e., all returned drawings must be resubmitted complete within the scheduled time.

Furnish a copy of all written or email correspondence sent to and from regulatory agencies, including vendor submissions, to the NCDOT Representative at the time they are sent. A consolidated list of comments shall be maintained by the Contractor and provided to the NCDOT Representative.

The Contractor shall submit drawings and engineering calculations, including vendor system drawings and calculations, to the NCDOT Representative in a timely fashion according to the approved Master Construction Schedule and the Plan Schedule. When submitting system design drawing, such as piping diagrams and wiring diagrams, include the calculations by which the component were sized. NCDOT will not review these drawings without supporting calculations, equipment drawings and cut sheets. The NCDOT Representative will respond to submittals normally not later than ten (10) working days after receipt with "approved", "conditionally approved subject to comments", or "returned for revision and resubmittal". Review responses shall be via email.

The Contractor shall furnish one (1) electronic file copy of each drawing, document, or calculation when submitted to the NCDOT Representative for approval. The Contractor shall use a transmittal form for each submittal giving the drawing number, revision letter, title, date submitted, and spaces for the NCDOT Representative to enter the return date, approval action, comments, reviewer's name, and the signature of the NCDOT Representative. Drawings for submittal shall be complete in all respects with all material and equipment shown and shall be accompanied by supporting calculations.

The Contractor shall provide one (1) D-Size copy and one (1) electronic PDF copy of all approved, USCG stamped plans.

810.1 As-Built Drawings

Update all working drawings to conform to an as-built condition and stamp "AS-BUILT FINAL" in the title block. The final drawings shall reflect systems and arrangements of each vessel as finally completed and reviewed.

Prior to delivery of the vessel to NCDOT, the Contractor shall deliver: one (1) full size; one (1) 22 inch × 34 inch (ANSI D) drawing set, and one (1) electronic copy of the AS-BUILT FINAL drawing set. Drawing shall be printed on white bond paper. The electronic files shall be in AutoCAD 2018 (or current version) .dwg format and in PDF format. PDF files shall be searchable.

Vendor drawings shall also be printed and shall meet the same requirements as Contractor provided as-built drawings.

810.2 Vendor System Diagrams

All vendor-supplied systems are to include system diagrams (piping and electrical) providing ship specific system configurations. Wiring and cabling diagrams shall include the cable type and unique designations for each cable. As-built versions of these diagrams shall be provided by the Contractor prior to sea trials for review by the Owner.

The Contractor shall provide one (1) D size copy and one (1) electronic PDF copy of all vendor plans.

810.3 Display Drawings for Mounting Onboard

The Contractor shall develop and provide the following reduced size, non-fading positive prints of drawings to be mounted in the locations noted on board the vessel. These drawings shall be mounted prior to delivery of the vessel to NCDOT. Mount all drawings in anodized aluminum, or stainless steel frames with clear plastic covers.

The set of prints shall include two (2) Fire and Safety Plans to be developed by the Owner's Naval Architect. Contractor shall mount plans as directed by NCDOT once approved and stamped by local OCMI in NC

Additionally, the Contractor shall provide and place onboard all plans and documents required by the USCG including documents listed in Section 602. The final locations of all mounted plans shall be subject to approval by NCDOT's Representative.

810.4 Docking Plan

The Contractor shall provide a docking plan that incorporates the Owner’s docking plan at its shipyard in Manns Harbor, NC as described in Section 603.

810.5 FCC Certificate

The FCC Certificate will be provided by NCDOT.

833 WEIGHT ESTIMATE

The Contractor shall prepare a detailed weight estimate for the vessel and submit it to the NCDOT Representative within forty-five (45) calendar days of award of contract. The Contractor shall weigh all items furnished for the vessel and shall update the weight estimate and submit it to the NCDOT Representative on a biweekly basis. The weight estimate shall include a summary page with the current light ship weight estimate, longitudinal center of gravity and vertical center of gravity.

835 TONNAGE ADMEASUREMENT

The Vessel has been designed to admeasure less than 400 GRT. Within 30 days of Notice to Proceed, the Contractor shall obtain an independent validation of the tonnage scheme, based upon the Contract Guidance Drawings. The independent validation of the tonnage scheme shall be performed by a qualified, Owner approved agent and completed prior to commencing fabrication.

The Contractor shall contract with a USCG approved Classification Society (i.e. ABS, DNV-GL, etc.) for determination and assignment of the Vessel's gross and net tonnage under the U. S. (Regulatory) Tonnage Convention systems, as required by law.

The Contractor shall advise when the Vessel is ready for inspection and verification of dimensions. After such verification and upon receipt of the Vessel's tonnage and official number assignments, the Contractor shall mark them on the Vessel as required. All costs associated with determination and assignment of the Vessel's Regulatory tonnage, including all fees, shall be to Contractor’s account, and shall be included in the price of the Vessel.

843 DEADWEIGHT SURVEY

The Contractor shall prepare and submit to the USCG for approval a deadweight survey procedure to determine the weight, longitudinal center of gravity, and transverse center of gravity of the vessel. The vessel shall be essentially complete and afloat at the Contractor's dock and the "weights to go on/off list" shall be within the tolerance permitted by the USCG. The data gained from this survey shall be used to prepare the stability submittal to the USCG to obtain a stability letter. The Contractor shall supply a copy of the stability model and calculations in electronic format.

851 TRAINING

Introductory training shall be provided to the NCDOT operators. The training shall provide an overview of the entire propulsion system, including controls and monitoring. The training shall include start up procedures, operating procedures and shutdown procedures. The training shall include personnel safety procedures. The training shall also include basic maintenance procures and good practice. The training shall be provided at the NCDOT's Manns Harbor facility immediately prior to delivery of the vessel. It shall be conducted for up to fifteen (15) NCDOT employees.

The Contractor shall record the training sessions and provide recorded training sessions to the Owner in DVD format.

856 INSTRUCTION BOOKS, OPERATING MANUALS, AND TECHNICAL DATA SHEETS

The Contractor shall provide instruction books and/or operating manuals for all equipment and machinery on board. Before delivery of the vessel, one (1) paper copy and one (1) electronic copies shall be provided to NCDOT. The paper copy shall be stored in the EOS library as instructed by the Owner's Representative.

856.1 Software Programs

Where equipment or systems are programmed for use on this vessel such as may be used in monitoring systems, HMIs, PLCs, door locks, etc., NCDOT shall be provided with the specific program as installed on the vessel and such licensed programs to allow their viewing, modification, updating and troubleshooting. NCDOT shall be the licensed owner/registered user of all programs provided. NCDOT shall be provided with all data link cables for connection between the equipment and a PC.

900 TESTS, TRIALS, AND DELIVERY

900.1 References

Reference ID	Number	Title
(9A)	18026-200-101-1	Profiles and Deck Arrangements
(9B)	18026-200-833-1	Weight Estimate
(9C)	18026-200-835-1	Tonnage Assessment
(9D)	18026-200-843-5	Stability Assessment

982 Tests and Trials

The Contractor shall conduct a testing program to demonstrate satisfactory workmanship, proper installation of equipment and materials, compliance with the Contract Specification and Drawings, and compliance with regulatory agency requirements.

Alternate test methods from those detailed in this section will be accepted with the approval of USCG inspector, as appropriate, and the NCDOT's Representative. The USCG may require more stringent test methods than those outlined in this section; the Contractor is required to satisfy the regulatory test requirements.

The Contractor shall submit a complete schedule of tests to the NCDOT's Representative for approval not less than thirty (30) calendar days prior to commencement of testing. The Contractor shall prepare test and trial agenda. Dock trials shall be conducted in accordance with SNAME T&R Bulletin No. 3-39 "Guide for Shop and Installation Trials", 2018. Builder's trials and sea trials shall be conducted in accordance with applicable sections of SNAME T&R Bulletin No. 3-47 "Guide for Sea Trials," 2015.

The Contractor shall prepare and submit test memoranda of the test results to the NCDOT's Representative for approval. One (1) copy of completed tests and test reports shall be submitted to the NCDOT's Representative.

The Contractor shall bear all expenses, furnish the crew, fuel, water, lubricating oil, special instruments, and supplies required for all tests and for all trials.

982.1 Hull Tests

The purpose of hull tests is to demonstrate the water tightness and fairness of the structure and fittings. It is further intended that the Contractor demonstrate the satisfactory installation and operation, where applicable, of all items of outfit.

Structure

The hull, watertight bulkheads, Main Deck, superstructure, and watertight closures shall be air box or air jet tested to prove tight all exterior surfaces. All watertight tests shall be performed

prior to paint out. Structure shall be measured to ensure that plating is within the tolerances specified in Section 101.1 of this Specification.

The Contractor shall provide NDT of shell plate welding as described in Section 074.1

Doors, Scuttles, Manholes, and Closures

Doors, scuttles, manholes, and similar closures which are gasketed shall be chalk tested to prove full gasket contact. Visually inspect other doors, scuttles, manholes, and closures to demonstrate proper workmanship and operation. Superstructure doors shall be chalk tested. Watertight and exterior weathertight doors shall be chalk tested and hose tested to verify proper fit.

Hatches

Machinery removal hatches shall be hose tested prior to being silicone caulked.

Windows and Fixed Lights

Windows shall be hose tested in conjunction with the testing of the adjacent plating.

Ballast Tanks

The Ballast tanks shall be hydrostatically tested in accordance with ABS rules. The tests shall be made after air pipes, sounding tubes, and all other connections have been fitted but prior to paint out.

982.2 Machinery Tests

The Contractor shall test machinery, equipment, piping, and systems according to the following procedures:

Heating, Ventilation and Air Conditioning

Test the electrical circuits of the fans.

Test each system to assure delivery of designed air quantities. Before testing, the following conditions shall exist:

- Systems shall be clean
- Normally open closures and dampers shall be open
- Fans and motors shall run in the proper direction of rotation with correct speed

Operate each system at full capacity. Pilot House and Passenger Space HVAC shall be tested in both heating and cooling modes to ensure correct operation.

Operate all ventilation system weather closures and fire dampers to demonstrate free operation without binding.

Ensure ventilation shutdowns operate properly. Fans and dampers that are interlocked with fire suppression system release shall be tested using an acceptable method to simulate actuation of system release.

Test each Engine Room ventilation control system to ensure proper operation including maintaining Engine Room pressure at acceptable level. Ensure Engine Room temperature can be maintained at no more than ambient plus twenty degrees Fahrenheit.

Piping

Visually inspect all installed piping systems to ensure proper workmanship and completion of tasks in accordance with the Contract Specification requirements.

Piping shall be cleaned after fabrication and care shall be taken to ensure that the piping systems are kept clean during installation.

After installation and cleaning each piping system shall be tested. Equipment, such as strainers and heat exchangers, which are normally subject to the pressure of the system, shall be tested with the system. For equipment such as heat exchangers, pressure shall be applied to one system at a time to allow the unit to be checked for internal leakage.

Pressure shall be applied to each system in its entirety, unless otherwise specified. Hydrostatic pressure specified for the piping systems shall be maintained long enough to check thoroughly for leaks. The Contractor shall retest after any leaks have been repaired to prove each system tight.

The test fluid used shall be compatible with the system being tested.

Shipboard test procedures, in pounds per square in gage, shall be as follows:

System	Test Pressure	Test Fluid
Seawater cooling	50 psi	Fresh water
Freshwater cooling	50 psi	Fresh water
Bilge and ballast	55 psi	Fresh water
Fire main	150 psi	Fresh water
Exterior deck and sanitary drains	Fill system to fixture or vent	Fresh water
Vents and Overflows	Fill system to fixture or vent	Fresh water
Fuel oil fill and transfer piping	30 psi	Oil
Fuel oil service piping	15 psi	Oil
Lube oil and waste oil piping	35 psi	Oil
Potable water	100 psi	Fresh Water
Compressed Air	248 psi	Fresh Water

System	Test Pressure	Test Fluid
Hydraulic Piping	1.5 x Design Pressure	Oil

Hydraulic piping shall be hydrostatically tested in accordance with hydraulic system manufacturer and regulatory requirements.

Relief valves and pressure safety devices shall be demonstrated to operate at their set pressure or provided with current test certification. Pressure gauges shall be provided with lab calibration test and certification stickers along with certifying documents provided to the NCDOT's Representative.

Fuel and oil hose assemblies shall be hydrostatically tested and provided with metal tags attached showing their test date and pressures.

Independent Tanks

Tanks normally vented to the atmosphere shall be tested hydrostatically to 3 psig.

Diesel Generator Sets

The assembled generator sets shall be shop tested at the manufacturer’s or vendor’s facility. The shop tests shall include running at rated speed. The generator shall be tested for insulation resistance.

Each generator set shall be checked after installation for proper alignment and clearances. The generator sets shall be tested after installation as part of a complete Main Propulsion Switchboard (MPS) installation load test. The electrical load shall consist of an adjustable industrial resistor bank rated for a minimum 1200kW. The load shall be built up in 25% increments of 30 minutes each to l00%, which shall be maintained for four hours. Tests after installation shall also include functional tests of all local and remote controls, sensors, automation, diagnostic, and safety features.

Azimuth Thrusters

The azimuth thruster shall be factory tested in accordance with the manufacturer's standards and ABS requirements.

After installation is complete, the thrusters shall be tested in accordance with manufacturer recommendations and as follows:

- Conduct tests on control, lubricating and other piping systems not previously tested shop tested by the manufacturer
- Check cleanliness of hydraulic system.
- Check safety and regulating devices
- Operate azimuthing mechanism
- Check agreement between the actual azimuth angle and the local and remote azimuth indicators

- Check operation of thruster control system, including lights, indicators, switches, alarms, selectors, actuators, motor overload devices, etc.
- Check operation of all interlocking of auxiliary equipment such as ventilation fans, cooling equipment, etc.
- With the power supplied from the ship system, in the normal service condition for thruster operation, start, stop and operate the thruster through a sufficient number of cycles to determine its compatibility with the ship's electrical and other systems

Auxiliary Machinery

Each pump shall be tested with its respective system, both hydrostatically to determine tightness, and in operation. The Contractor shall confirm that pump shaft seals are rated for the test pressure. Check each item for proper installation, alignment, and rotation prior to the operating test. Data shall be recorded such that equipment performance can be evaluated and compared with the requirements of the Specification. Generally, the required data shall include the pressure change across the machine, rpm, power consumption, and, where applicable, the performance of controls and functions.

982.3 Electrical Power, Controls, and Monitoring Tests

General

Inspect the electrical installation for completeness, including tagging, labeling, and phase balancing of single-phase loads. Operate circuit breakers manually under load to demonstrate proper action. See Section 300.8 for further requirements.

Generator

The loads used in these tests shall be measured as functions of the rated full load current. The Contractor shall operate each generator for a minimum of four (4) hours between 80% and 100% of their rated load. The Contractor shall operate the generators to demonstrate remote Pilothouse and local EOS or switchboard room transfer of load. The Contractor shall demonstrate that the generators shutdowns operate as required. While testing, the Contractor shall record available parameters.

Insulation Resistance

Measure and record the insulation resistance of each circuit between conductors with branch and main circuit breakers open for all AC power circuits and for DC power circuits over 20 AT protection and elsewhere as required by USCG. Where applicable, the main neutral conductor shall be temporarily ungrounded.

Disconnect the equipment from each circuit to enable satisfactory resistance values to be obtained and to protect the equipment. This test does not apply to signal and control circuits. Provide written reports documenting the insulation resistance tests.

Harmonic Content

Under operational conditions, record and analyze the AC waveform at the propulsion bus, propulsion motors, ship service bus, and/or other locations identified by the propulsion system integrator,

NCDOT Representative, or regulatory bodies. Verify that total harmonic distortion does not exceed regulatory limits.

Operational Tests

Check all switches, control devices, etc., for proper function. Calibrate and check automatic thermal control devices, alarm and indicator devices. Record the date, any deficiencies and corrections, and the date of satisfactory completion of each test.

Test all alarm circuits by simulating the faults monitored and record performance observed. Monitoring and alarm circuits shall be demonstrated to not alarm under normal transient conditions, when equipment is being started or shut down, or during operator command changes such as rapid RPM reduction of the main propulsion system.

Check electronic equipment under the supervision of the equipment manufacturer's representative. The electronic system shall not be considered complete until the FCC inspection and certification has been accomplished, and the equipment operation has been demonstrated to the satisfaction of NCDOT.

Test all motor driven appliances under normal operating load conditions. Record operating volts and amps for each motor for each phase. Check all operating pushbuttons, selector switches, pilot lights, remote pushbuttons, pressure switches and control devices to assure their proper operation. Check overload-tripping devices for the proper size heater element and freedom of operation.

Test the function of all automation, including the Power Management System. Verify that generator sets start and stop, that load is matched to generation capacity, all indicators and alarms function properly, and that generators properly synchronize and parallel.

982.4 Vital System Automation Documentation and Testing

The Contractor shall develop procedures for and perform Design Verification Test Procedures (DVTP) and Periodic Safety Test Procedures (PSTP) as required by the Regulatory Bodies for all automated vital systems including, but not limited to:

1. Main generators
2. Diesel electric propulsion plant
3. Azimuth thruster controls
4. Navigation light switching
5. Vessel IMACS
6. Fire detection and alarm system
7. Emergency generator
8. Emergency generator switching
9. Loud hailer and talk back system
10. Ballast control system
11. Remote controls and emergency shutdowns

The Contractor shall develop all required documentation for submittal to the NCDOT Representative and USCG. These include but are not limited to: A Failure Modes and Effects Analysis (FMEA), a Periodic Safety Test Procedure (PSTP), and Design Verification Test Procedure (DVTP).

Prior to developing the procedures, the Contractor shall develop an outline procedure delineating the equipment and systems to be included and submit to USCG and the NCDOT Representative for Review.

The FMEA, DVTP and PSTP shall comply with 46 CFR Parts 61.40 and 62.20 as applicable. The FMEA, PSTP and DVTP shall be submitted to the USCG and the NCDOT Representative for review and approval.

The Contractor shall engage the engine, azimuth thruster, control system, electric propulsion system integrator and other equipment suppliers as required to complete the FMEA, DVTP and PSTP. The equipment suppliers shall be responsible for providing all data and engineering assistance necessary for completion of these documents in cooperation with interfacing equipment suppliers and the PSI.

The Procedures shall be reviewed with local USCG inspector, then submitted to USCG MSC for formal approval.

After receiving Regulatory and NCDOT Representative approval, the Contractor shall perform the DVTP and PSTP using the approved plans and procedures. This testing shall be performed with the guidance of the on-site technical representatives for the generators, azimuth thrusters, electric propulsion system, and alarm/monitoring system. The NCDOT Representative and a local USCG inspector shall be present during testing for final review and acceptance.

The Contractor shall provide one (1) printed set and one (1) electronic copy in Microsoft Word or Excel format so Owner can modify procedures in the future as may become necessary.

982.5 Rescue Boat Tests

The Contractor shall demonstrate the launching and recovery of each rescue boat utilizing the installed davits. Once afloat, the rescue boats shall be tested to demonstrate satisfactory operation. The Owner's crew shall test Rescue Boat and Davit to the satisfaction of the NC USCG local inspectors prior to vessel acceptance in Manns Harbor, NC.

982.6 Dock and Builders Trials

Dock trials shall be conducted to demonstrate proper functioning of propulsion systems, controls, auxiliary equipment, and safety equipment. At least fourteen (14) working days prior to dock trials the, Contractor will present an agenda to the Owner for review and comment.

Initial start-up and application of load to the generators will be performed by the Contractor in conjunction with the generator, propulsion system integrator, and azimuth thruster representatives. The manufacturer's representatives will review and approve the installation of the generators, azimuth thrusters, and ancillary equipment including alignments prior to startup.

Proper function of the propulsion and ship service switchboards will be verified by the switchboard manufacturer.

All auxiliary systems shall be tested at the dock and shown to be operational and ready for sea trials.

Following completion of all preliminary testing, the generators shall be operated at the dock for a period of four (4) hours. The proper operation of the azimuth thruster controls shall be verified during dock trials for propellers.

Upon satisfactory completion of the dock trial, the Contractor shall conduct a Builder's trial to demonstrate that the vessel will satisfactorily perform all requirements.

The NCDOT's Representatives and Owner's crew may attend all dock, Builder's, and sea trials.

982.7 Sea Trials

Upon satisfactory completion of the dock and Builder's trial, the vessel shall be taken on sea trials. The sea trials shall be conducted in open water in less than two (2) foot seas and less than 25 knots of wind for a sufficient length of time to accomplish the following tests and trials.

For sea trials, the vessel shall be ballasted to simulate the weight of the approved passenger and vehicle load, with full fuel and water tanks and the sewage tank empty. All outfit shall be onboard and in its permanent location. Safety and lifesaving equipment shall be complete and operational.

Sea trials shall be conducted in deep water per the guidelines of SNAME T&R No. 3-47. At least fourteen 14 days prior to sea trials, the Contractor will present an agenda to the Owner and equipment manufacturers for review and comment.

Any test failure that occurs prior to completion shall be repeated in its entirety.

At minimum, the trial shall consist of:

A. An endurance run of four (4) uninterrupted hours at full engine rpm of both propulsion engines. Operating data shall be taken and recorded for all vessel systems at 15-minute intervals.

B. Progressive speed trial consisting of reciprocal runs of at least five (5) minutes at four different speed: 30%, 60%, 90%, and full power. Vessel shall reach steady state speed and speed, horsepower, and engine rpm shall be recorded for each run.

C. Emergency crash stop from full speed ahead. Stopping distance shall be recorded.

D. Emergency steering and maneuvering.

E. Steering and maneuvering, including:

    a. Turning circles at full speed

b. Ahead steering at full speed

c. Zigzag maneuver at full speed

F. Ensure proper function of all helm controls and stations including proper operation of proportional joystick controls.

982.8 Test and Trial Instruments

The Contractor shall furnish instruments for operational tests to provide sufficient data to analyze the performance of systems, machinery, and equipment.

Ship's gauges and instruments may be used for tests of the systems they serve. The Contractor shall furnish test instruments and means of connection, as necessary, for additional readings required to test machinery and systems.

Instruments shall be checked against standards at the beginning and end of the test program. If readings taken during a test appear unreasonable, NCDOT shall require the Contractor to check all the instruments, gauges, and thermometers used on the test in question. If testing equipment is found to be out of calibration the Contractor shall repeat the test.

Following completion of sea trials, the Contractor shall coordinate with a local oil test laboratory to perform diagnostic analysis on all lubricants. The tests shall include the standard diagnostics recommended by the engine manufacturer, including tests for water and fuel contamination.

Tests shall include a sample of fresh oil of each type, prior to filling machinery, and an operating sample. The operating oil sample shall be drawn from a machine operating at normal temperatures. Samples shall not be drawn from stagnant points in the equipment system.

A spectrographic analysis shall be conducted for trace metals, employing an emission spectrometer for the following elements:

- Iron
- Lead
- Copper
- Chromium
- Silicon
- Molybdenum
- Aluminum
- Nickel
- Silver
- Tin
- Magnesium

The following machinery shall be sampled:

- Azimuth thrusters

- Generator engines

983 DELIVERY

Upon completion of construction, operational tests, sea trials, and after all known defects have been corrected, and the vessel is ready and able to be put into passenger service, the Contractor shall safely deliver the vessel afloat at NCDOT's shipyard located in Manns Harbor, NC. Plans for the delivery voyage shall be approved by the NCDOT Representative. During transit, the vessel shall remain within twenty (20) miles of a port of safe refuge at all times.

The delivery voyage shall not use supplemental fuel tanks or bladders. The NCDOT Representative shall attend the delivery voyage as observer, but shall be given right to stop the voyage in the event of poor weather. Regardless, the voyage shall not proceed if significant wave height exceeds 4'. The Owner may have two (2) representatives on board vessel during delivery voyage.

Prior to the delivery voyage, the Contractor shall obtain a provisional Certificate of Inspection (COI) with the only outstanding requirement being the required USCG testing with the vessel's crew.

At the completion of the delivery voyage and prior to the Owner taking delivery (acceptance) of the vessel, the Contractor shall repeat the sea trials in Pamlico Sound to the satisfaction of the Owner and the final COI shall be obtained. All sea trial agenda shall indicate all systems working properly.

After completion of these trials, the vessel shall be dry docked at NCDOT's expense. The underwater hull surfaces shall be thoroughly inspected and any damage found, including that to coatings, plate, equipment, and hull fittings, shall be repaired prior to acceptance at the Contractor's expense.

NCDOT will provide afloat berthing at the Manns Harbor facility from arrival until acceptance for a maximum of two months.

The vessel shall be in first class condition throughout. The vessel shall be thoroughly cleared of all dunnage, staging, debris, spatters, and dirt and shall be washed down, painted out and left clean. Special care shall be taken to see that all surfaces in bilges, tanks and voids, piping, wireways, machinery, floor plates, and gratings are clean and free from any foreign substances.

The vessel's engines and equipment shall be filled with lubricating oil. Diesel oil remaining on the vessel at delivery will be purchased by NCDOT at the certified cost to the Contractor.

996 LAUNCHING AND DRY DOCKING

The Contractor shall be responsible for the satisfactory launching of the vessel at a time to be mutually agreed upon by all parties concerned. Arrangements for the sponsor will be made by NCDOT. Expenses connected with the launching shall be borne by the Contractor.

While dry-docking prior to sea trials is not an absolute requirement unless the vessel has been in the water for more than twenty (20) calendar days, the Contractor is responsible for conducting

sea trials with a clean bottom and clean sea chests. Approximately four (4) calendar days prior to scheduled sea trials, the Contractor shall determine the condition of the bottom and sea chests and notify NCDOT of same. If necessary to conduct proper trials, the Contractor shall thoroughly clean the underwater surface of the hull.

If the sea trials at Manns Harbor, NC are started within one (1) week of the vessels arrival the bottom need not be cleaned beforehand. If more than one (1) week has elapsed the bottom shall be inspected and if necessary cleaned at the Contractor's expense.

The Contractor shall bear the cost of any required dry-docking prior to the vessel's arrival at NCDOT's Manns Harbor facility. NCDOT will provide dry-docking services for the vessel at the Manns Harbor facility.

LISTING OF MBE/WBE SUBCONTRACTORS			Sheet _____ of _____	
Firm Name and Address	Item No.	Item Description	* Agreed upon Unit Price	** Dollar Volume of Item
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				

***** The Dollar Volume shown in this column shall be the Actual Price Agreed Upon by the Prime Contractor and the MBE/WBE subcontractor, and these prices will be used to determine the percentage of the MBE/WBE participation in the contract.

** Dollar Volume of MBE/WBE Subcontractor Percentage of Total Contract Bid Price:
If firm is a Material Supplier Only, show Dollar Volume as 60% of Agreed Upon Amount from Letter of Intent.
If firm is a Manufacturer, show Dollar Volume as 100% of Agreed Upon Amount from Letter of Intent.

Rev 11-4-13

LISTING OF MBE/WBE SUBCONTRACTORS

Sheet _____ of _____

Firm Name and Address	Item No.	Item Description	* Agreed upon Unit Price	** Dollar Volume of Item
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				

***** The Dollar Volume shown in this column shall be the Actual Price Agreed Upon by the Prime Contractor and the MBE/WBE subcontractor, and these prices will be used to determine the percentage of the MBE/WBE participation in the contract.

**** Dollar Volume of MBE/DBE Subcontractor**
$_____

Percentage of Total Contract Bid Price
_____%

** Dollar Volume of MBE/WBE Subcontractor Percentage of Total Contract Bid Price:
If firm is a Material Supplier Only, show Dollar Volume as 60% of Agreed Upon Amount from Letter of Intent.
If firm is a Manufacturer, show Dollar Volume as 100% of Agreed Upon Amount from Letter of Intent.

FACILITY LOCATION:

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

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

_____

Physical Address

_____

City and State

LABOR AND MATERIALS SHEET

NEW CONSTRUCTION PASSENGER FERRY

INSTRUCTIONS: Contractor shall complete each item below by inserting the appropriate value for each. Please use pen for completion.

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

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

Cost Breakdown Sheet

INSTRUCTIONS: Bidders shall complete each item below by inserting the appropriate value for each. Lump Sum shall be equal to the total of individual item cost. ***Use PEN only*** *.*

Roadway Item	Roadway Item Description	Material	Labor	Total Cost (materials + labor)
1	Engineering			
2	Hull Structure and Foundations			
3	Superstructure , Bulwarks, Ladders and Handrails			
4	Ventilation - Machinery Space and HVAC			
5	Piping Systems and Pumps			
6	Electrical Switchboards, Machinery Controllers and Wiring			
7	Interior Finish, Cabinets, Consoles, Seating, Appliances			
8	Independent Tanks - Fuel, Water, Sewage, Zero Discharge and Lube Oil			
9	Exterior Doors, Interior Doors, Manholes, Hatches and Windows			
10	"Schottel" Azimuth Thrusters, Controls and Alarms			
11	Electronic, Alarm System, ADA Comm., Vessel Comm., Radios, etc,			
12	Fire Fighting, Safety Gear, Rescue Boat, Life Rafts, PFD, Fire Control			
13	Blasting, Painting, Signage, Draft Marks Labels			
14	Testing, Dock Trials, Sea Trials and Final Acceptance Trials			
15	Ship's 600 kW Gensets, Emergency Genset and AC Drive Motors			
16	Mobilization			
17	Spares (Machinery and Electrical)			
18	Delivery and Bonds			

Lump Sum Total Cost of all the above items

Please transfer the Lump Sum total cost on the above line to the itemized proposal sheet on the next page.

1. The values shall be rounded off by the bidder to contain no more than two descimal places.
2. Changes in any entry shall be made by marking through the entry in ink and making the correct entry adjacent thereto in ink. A representative of the bidder shall initial the change in ink.
3. The values used above shall match those used in the electronic Cost Breakdown version.

Aug 06, 2018 3:31 pm **ITEMIZED PROPOSAL FOR CONTRACT NO. C204243**

County : Dare

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			ROADWAY ITEMS			
0001	0005000000-N	SP	GENERIC FERRY ITEM CONSTRUCT 183'-7" X 46' X 11' PASSENGER/VEHICLE FERRY "H"	Lump Sum	L.S.	

1531/Aug06/Q1.0/D5000000/E1 **Total Amount Of Bid For Entire Project :**

ADDITIONAL FERRY VESSEL:

In the space provided below, the bidder shall enter a lump sum price for which he agrees to execute a subsequent supplemental agreement to furnish an additional ferry vessel with identical specifications, quality, performance and all other attributes as required and performed under this contract. Notice of the Department's intent to enter into such agreement, if any, will be given the successful bidder within 90 calendar days of award of this contract. The time frame for constructing the additional ferry vessel will be included in the notice of intent. Such time frame will not begin before **November 16, 2018 or after January 17, 2019** and will include a minimum of **Four Hundred Eighty-Five (485)** consecutive calendar days for construction.

The lump sum bid price submitted for the second vessel's possible supplemental agreement will not be a consideration in determining the low bidder for this contract, however, the bidder must include a lump sum amount in the following space for his bid to be considered responsive.

Lump Sum Amount to construct and furnish additional ferry vessel:

$ _____

_____
(Contractor Name)

_____
(Signature of Responsible Person for Contractor)

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

CORPORATION

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

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

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

SIGNATURE OF CONTRACTOR

_____
Full name of Corporation

_____
Address as Prequalified

Attest _____ By _____
Secretary/Assistant Secretary
Select appropriate title

President/Vice President/Assistant Vice President
Select appropriate title

_____
Print or type Signer's name

_____
Print or type Signer's name

CORPORATE SEAL

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the

_____ day of _____ 20__.

NOTARY SEAL

_____
Signature of Notary Public

of _____County

State of _____

My Commission Expires:_____

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

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

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

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

SIGNATURE OF CONTRACTOR

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

(1) _____
Name of Joint Venture

(2) _____
Name of Contractor

_____
Address as Prequalified

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

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

If Corporation, affix Corporate Seal and

(3) _____
Name of Contractor

_____
Address as Prequalified

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

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

If Corporation, affix Corporate Seal and

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

_____
Address as Prequalified

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

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

If Corporation, affix Corporate Seal

NOTARY SEAL
Affidavit must be notarized for Line (2)
Subscribed and sworn to before me this
_____day of_____ 20___
_____
Signature of Notary Public
of _____County
State of _____
My Commission Expires:_____

NOTARY SEAL
Affidavit must be notarized for Line (3)
Subscribed and sworn to before me this
_____day of _____ 20___
_____
Signature of Notary Public
of _____County
State of _____
My Commission Expires:_____

NOTARY SEAL
Affidavit must be notarized for Line (4)
Subscribed and sworn to before me this
____day of _____ 20_____
_____
Signature of Notary Public
of _____County
State of _____
My Commission Expires:_____

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

INDIVIDUAL DOING BUSINESS UNDER A FIRM NAME

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

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

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

SIGNATURE OF CONTRACTOR

Name of Contractor _____
Individual name

Trading and doing business as _____
Full name of Firm

_____
Address as Prequalified

_____ _____
Signature of Witness Signature of Contractor, Individually

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

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the

NOTARY SEAL

_____ day of _____ 20__.

_____
Signature of Notary Public

of _____County

State of _____

My Commission Expires:_____

EXECUTION OF BID

NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

INDIVIDUAL DOING BUSINESS IN HIS OWN NAME

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

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

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

SIGNATURE OF CONTRACTOR

Name of Contractor _____

Print or type Individual name

_____

Address as Prequalified

_____

Signature of Contractor, Individually

_____

Print or type Signer's Name

_____

Signature of Witness

_____

Print or type Signer's name

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the

_____ day of _____ 20__.

NOTARY SEAL

_____

Signature of Notary Public

of _____County

State of _____

My Commission Expires:_____

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

PARTNERSHIP

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

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

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

SIGNATURE OF CONTRACTOR

_____
Full Name of Partnership

_____
Address as Prequalified

_____ By _____
Signature of Witness Signature of Partner

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

AFFIDAVIT MUST BE NOTARIZED

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

_____ day of _____ 20__.

_____
Signature of Notary Public

of _____County

State of _____

My Commission Expires:_____

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

LIMITED LIABILITY COMPANY

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

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

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

SIGNATURE OF CONTRACTOR

_____
Full Name of Firm

_____
Address as Prequalified

_____ _____
Signature of Witness | Signature of Member/Manager/Authorized Agent
Select appropriate title

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

AFFIDAVIT MUST BE NOTARIZED

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

_____ day of _____ 20__.

_____
Signature of Notary Public

of _____County

State of _____

My Commission Expires:_____

1-17-12

SIGNATURE SHEET - BID ACCEPTANCE BY DEPARTMENT

Contract No. **C204243**

County: **Dare**

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

_____
Contract Officer

_____
Date

Execution of Contract and Bonds
Approved as to Form:

_____
Attorney General

DEBARMENT CERTIFICATION

Conditions for certification:

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

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

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

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

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

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

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

DEBARMENT CERTIFICATION

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

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

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

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

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

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

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

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

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