

STATEMENT OF WORK  
FOR  
PRELIMINARY AND CONTRACT DESIGN  
MARITIME SECURITY CUTTER MEDIUM (WMSM)  
OFFSHORE PATROL CUTTER (OPC)

DRAFT

PREPARED BY  
U.S. COAST GUARD  
OFFSHORE PATROL CUTTER PROJECT

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## STATEMENT OF WORK FOR PRELIMINARY DESIGN AND CONTRACT DESIGN (PD&amp;CD)

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## STATEMENT OF WORK FOR PRELIMINARY AND CONTRACT DESIGN (P&amp;CD)

**1.0 SCOPE**

- 1.1. This Statement of Work (SOW) is for Preliminary Design (PD) and Contract Design (CD) of the U.S. Coast Guard's (USCG) Offshore Patrol Cutter (OPC). This SOW supplements the OPC General SOW, which is in Section C of the contract.
- 1.2. The objectives of Preliminary Design are to:
- 1.2.1 Develop, mature and achieve a balanced OPC ship which meets all contract requirements with internally consistent and convergent design characteristics of the Principal Dimensions, Arrangements, Area/Volume, Structures, Weight, Stability, Seakeeping, Propulsion Power and Electric Power representing an engineering description with minimal risk of subsequent changes.
  - 1.2.2 Begin integration of Government Furnished Information (GFI) and Government Furnished Equipment (GFE) into the OPC design. This effort shall include identification of system interfaces.
  - 1.2.3 Verify that the ship system and its subsystems meet the OPC System Specification.
  - 1.2.4 Develop concepts for enhancing human performance, workload and safety.
  - 1.2.5 Demonstrate technical feasibility and capability of meeting the requirements with identified risk.
- 1.3. The objectives of Contract Design are to:
- 1.3.1 Mature the design to a level suitable for transition to Detail Design (DD) through increased levels of systems/subsystem definition.
  - 1.3.2 Mature the integration of Government Furnished Information (GFI) and Government Furnished Equipment (GFE) into the OPC design. This effort shall include refinement of system interfaces.
  - 1.3.3 Refine the design for human performance, workload and safety.
  - 1.3.4 Verify that the design meets the contract requirements.
  - 1.3.5 Identify technical and schedule risks and implement risk mitigation.
  - 1.3.6 Ensure that the results of model testing verify the applicable performance requirements.

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**2.0 REFERENCES AND DEFINITION**

- 2.1 Refer to Attachment J-X for references.
- 2.2 Refer to Attachment J-Y for definitions.

**3.0 REQUIREMENTS**

- 3.1 General. The Contractor shall develop Preliminary and Contract Designs meeting the contract requirements.

**040 Project Management**

- 040.1 Management Plan. The Contractor shall provide a Management Plan (MP). [040-01-1001]

- 040.1.1 During the Contract Design period the Contractor shall update the MP to include detail design and Lead OPC Construction.

- 040.2 Integrated Master Schedule. The Contractor shall provide an Integrated Master Schedule (IMS). [040-01-2288]

- 040.2.1 The Contractor shall reflect the following meeting schedule in the IMS:

040.2.2

	Post Award Conf.	TMs	PMCs 1 and 3	PDR (PMC 2)	KDR (PMC 4)
Weeks after Award	8	14, 20, 32, 44, 50, 56, 68	26, 62	38	74

- 040.2.3 During the Contract Design period the Contractor shall update the IMS to include Detail Design and Lead OPC Construction.

- 040.2.4 Subsidiary plans and schedules required herein shall be integrated with the MP and IMS.

- 040.3 Program Management Review Documentation. The Contractor shall provide Program Management Review Plans, evidence of meeting the entrance and exit criteria, presentations, and action reporting. Meetings shall cover the following topics as a minimum: [040-01-1009]

- 040.3.1 Program Management Conference #1 (PMC #1). The Contractor shall include the following items in the Agenda for PMC #1:

- 040.3.1.1 Phase I IMS Review.

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- 040.3.1.2 Engineering Descriptions of the ship and sub-systems and associated architectures, including the following topics:
  - 040.3.1.2.1 Arrangements.
  - 040.3.1.2.2 Topside Design.
  - 040.3.1.2.3 Weights and Stability
  - 040.3.1.2.4 Hull Form and Resistance (including seakeeping, endurance, speed, model test status).
  - 040.3.1.2.5 Structures.
  - 040.3.1.2.6 Propulsion.
  - 040.3.1.2.7 Electrical.
  - 040.3.1.2.8 Electronic Systems.
  - 040.3.1.2.9 Auxiliaries.
  - 040.3.1.2.10 Outfitting.
  - 040.3.1.2.11 Weapons.
- 040.3.1.3 Design Margin Status.
- 040.3.1.4 ILS Strategy.
- 040.3.1.5 Human Systems Interfaces (HFI) and Human Factors Engineering (HFE).
- 040.3.1.6 Risk assessment that includes descriptions of the top ten most critical identified risks, including details and status of the proposed risk mitigation actions.
- 040.3.1.7 Verification Planning, including:
  - 040.3.1.7.1 Requirements Traceability Status, including requirements trace through the system level.
  - 040.3.1.7.2 Modeling and Simulation Support Efforts.
  - 040.3.1.7.3 Test and Integration Approach and Facility Planning.
  - 040.3.1.7.4 Road to PMC #2 (PDR), including plans, issue identification and proposed resolutions.
  - 040.3.1.7.5 Requests for Action (RFA).
- 040.3.2 Program Management Conference #2 (PMC #2); Preliminary Design Review (PDR). The Contractor shall host a formal PDR.
  - 040.3.2.1 Prior to conducting the PDR, the Contractor shall satisfy the following entrance criteria:
    - 040.3.2.1.1 The Preliminary Design demonstrates compliance with the OPC System Specification.

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- 040.3.2.1.2 Preliminary Design deliverables have been accepted.
- 040.3.2.1.3 The design is defined to the system level, physical and functional interfaces have been defined, and supporting analyses have been completed.
- 040.3.2.1.4 Government Furnished Material (GFE) and Space and Weight items have been incorporated into the design.
- 040.3.2.2 During the PDR the Contractor shall demonstrate that:
- 040.3.2.2.1 The Preliminary Design is technically feasible and consistent with a product that can meet the OPC System Specification in its entirety.
- 040.3.2.2.2 The Preliminary design is balanced with internally consistent and convergent design characteristics of the Principal Dimensions, Arrangements, Area/Volume, Structures, Weight, Stability, Seakeeping, Propulsion Power and Electric Power from a common design baseline with minimal risk of subsequent changes.
- 040.3.2.2.3 The Preliminary Design is capable of incorporating and integrating the GFE and Space and Weight items.
- 040.3.2.2.4 The Contractor has control and management of the interfaces defined in the OPC System Specification and the GFI.
- 040.3.2.2.5 Engineering descriptions of the ship system and subsystems and associated architecture, including the following:
- 040.3.2.2.5.1 Arrangements.
- 040.3.2.2.5.2 Topside Design Analysis.
- 040.3.2.2.5.3 Weights and Stability.
- 040.3.2.2.5.4 Hull Form and Resistance (including speed, endurance, seakeeping and model test status).
- 040.3.2.2.5.5 Structures.
- 040.3.2.2.5.6 Propulsion.
- 040.3.2.2.5.7 Electrical.
- 040.3.2.2.5.8 Electronic Systems, including:
- 040.3.2.2.5.8.1 C4ISR systems / subsystems interfaces and integration requirements allocations.
- 040.3.2.2.5.8.2 Software / middleware development strategy.
- 040.3.2.2.5.8.3 IBS and Navigation Systems.

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- 040.3.2.2.5.8.4 Notional description of planned Machinery plant Control and Monitoring System (MPCMS) system design and architecture.
- 040.3.2.2.5.9 Auxiliaries.
- 040.3.2.2.5.10 Outfitting.
- 040.3.2.2.5.11 Weapons.
- 040.3.2.2.6 Design Margin Status.
- 040.3.2.2.7 The Preliminary Design is supportive of ABS classification and third party certifications.
- 040.3.2.2.8 The Preliminary Design is producible.
- 040.3.2.2.9 The ILS strategy development is in progress.
- 040.3.2.2.10 Human Systems Interfaces (HSI) and Human Factors Engineering (HFE) analyses, including the Top-Down Function Analysis (TDFA), are in progress, demonstrating human performance, workload and safety requirements have been integrated into the design.
- 040.3.2.2.11 Risk assessment that includes descriptions of the top ten most critical identified risks, including details and status of the proposed risk mitigation actions.
- 040.3.2.2.12 Verification Planning including:
- 040.3.2.2.12.1 Requirements Traceability Status.
- 040.3.2.2.12.2 Modeling and Simulation Support efforts.
- 040.3.2.2.12.3 Test and Integration Approach and Facility Planning
- 040.3.2.2.13 The Design Approach, Management Plan, and IMS for Contract Design are achievable.
- 040.3.2.2.14 Design tools are available and are sufficient to support Contract Design and Detail Design.
- 040.3.2.2.15 Road to PMC #3, including plans, issue identification and proposed resolutions.
- 040.3.2.2.16 Prior RFAs, Action Items, and deficiencies documented from prior reviews have been addressed.
- 040.3.2.3 The Preliminary Design Review shall have the following exit criteria:
- 040.3.2.3.1 The Contractor has demonstrated that the Preliminary Design is converged, balanced, technically feasible, and consistent with a product that can meet the OPC System Specification in its entirety.

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- 040.3.2.3.2 The Contractor's approach for Contract Design has been accepted.
- 040.3.2.3.3 Critical technical risks have been identified and they are acceptable or mitigation plans are in place and being executed.
- 040.3.2.3.4 GFE/GFI integration management is sufficient to proceed to Contract Design.
- 040.3.2.3.5 Government identified Requests for Action (RFA) from the Preliminary Design Review have been assigned.
- 040.3.3 Program Management Conference #3 (PMC #3). The Contractor shall include the following items in the Agenda for PMC #3;
- 040.3.3.1 Review of prior RFAs, Action Items, and deficiencies documented from prior reviews.
- 040.3.3.2 Phase I IMS Review.
- 040.3.3.3 Preliminary Phase II IMS Presentation.
- 040.3.3.4 Requirements Trace through the sub-system level status update.
- 040.3.3.5 Engineering descriptions of the ship and sub-systems and associated architectures, including the following:
- 040.3.3.5.1 Arrangements.
- 040.3.3.5.2 Topside Design Analysis.
- 040.3.3.5.3 Weights and Stability.
- 040.3.3.5.4 Hull Form and Resistance (including speed, endurance, seakeeping, and model test status).
- 040.3.3.5.5 Structures.
- 040.3.3.5.6 Propulsion.
- 040.3.3.5.7 Electrical.
- 040.3.3.5.8 Electronic Systems, including:
- 040.3.3.5.8.1 C4ISR systems/subsystems interface and integration requirements allocation.
- 040.3.3.5.8.2 Software/Middleware Development update.
- 040.3.3.5.8.3 IBS and Navigation Systems.
- 040.3.3.5.8.4 Notional description of the planned Machinery Plant Control and Monitoring System (MPCMS) system design and architecture.
- 040.3.3.5.9 Auxiliaries.

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- 040.3.3.5.10 Outfitting.
- 040.3.3.5.11 Weapons.
- 040.3.3.6 Design Margin Status.
- 040.3.3.7 Status of ILS planning.
- 040.3.3.8 Initial Build Strategy Approach.
- 040.3.3.9 Human Systems Interfaces (HSI) and Human Factors Engineering (HFE).
- 040.3.3.10 Risk assessment that includes descriptions of the top ten most critical identified risks, including details and status of the proposed risk mitigation actions.
- 040.3.3.11 Verification Planning, including:
  - 040.3.3.11.1 Requirements Traceability Status, including requirements trace through the subsystem level.
  - 040.3.3.11.2 Modeling and Simulation Support Efforts.
  - 040.3.3.11.3 Test and Integration Approach and Facility Planning.
- 040.3.3.12 Road to PMC #4 including plans, issue identification and proposed resolutions.
- 040.3.3.13 Requests for Action (RFA)
- 040.3.4 Program Management Conference #4 (PMC #4); Contract Design Review (KDR). The Contractor shall host a formal KDR.
  - 040.3.4.1 Prior to conducting the KDR the Contractor shall satisfy the following entrance criteria:
    - 040.3.4.1.1 The Contract Design configuration to the sub-system level has been defined, is converged, integrated, and internally consistent and has been verified to satisfy the OPC System Specification requirements, as demonstrated by Phase I deliverables.
    - 040.3.4.1.2 Phase I deliverables have been accepted and verify that the OPC System Specification requirements are satisfied.
    - 040.3.4.1.3 The design has been defined to the subsystem level, including system architectures, interfaces, and interface standards, both physical and functional.
    - 040.3.4.1.4 Technical risks are documented in the Risk Database. Risk mitigation plans are documented and executable. The mitigation steps scheduled for completion prior to the Contract Design Review have been completed.

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- 040.3.4.1.5 Phase II Design Margins and the required Service Life Allowances are fully accounted for in the Contract Design.
- 040.3.4.1.6 Human System interfaces have been defined to determine that the design can be operated and maintained by the specified crew size and skill levels.
- 040.3.4.2 During the Contract Design Review the Contractor shall demonstrate:
- 040.3.4.2.1 The Contract Design is a complete engineering description of the OPC design that meets the OPC System Specification in its entirety, showing the configuration, operational capability, functional relationships, acquisition cost.
- 040.3.4.2.2 Engineering descriptions of the ship and subsystems and associated architecture, including the following:
- 040.3.4.2.2.1 Arrangements.
- 040.3.4.2.2.2 Topside Design.
- 040.3.4.2.2.3 Weights and Stability.
- 040.3.4.2.2.4 Hull Form and Resistance (including speed, endurance, seakeeping and model test status and results).
- 040.3.4.2.2.5 Structures.
- 040.3.4.2.2.6 Propulsion.
- 040.3.4.2.2.7 Electrical.
- 040.3.4.2.2.8 Electronic Systems, including:
- 040.3.4.2.2.8.1 Integration of IBS, C4ISR, and Combat Weapons Systems into the overall ship design, including interface requirements.
- 040.3.4.2.2.8.2 C4ISR CFE Selections, Material Sources, and integration planning.
- 040.3.4.2.2.8.3 C4ISR Space and Weight items.
- 040.3.4.2.2.8.4 Software / middleware development strategy.
- 040.3.4.2.2.8.5 IBS and Navigation Systems
- 040.3.4.2.2.8.6 Machinery plant Control and Monitoring System (MPCMS) development approach, architecture, and software requirements, including interfaces and signal count.
- 040.3.4.2.2.9 Auxiliaries.
- 040.3.4.2.2.10 Outfitting.
- 040.3.4.2.2.11 Weapons.
- 040.3.4.2.3 Design Margin Status.

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- 040.3.4.2.4 The Contract Design is supportive of ABS classification and third party certifications.
- 040.3.4.2.5 The Contract Design is producible per the Contractor's build strategy.
- 040.3.4.2.6 ILS strategy update.
- 040.3.4.2.7 Human Systems Interfaces (HSI) and Human Factors Engineering (HFE) analyses, including the TDFA, are complete for Phase I, demonstrating human performance, manpower, workload, and safety requirements have been integrated into the design.
- 040.3.4.2.8 The Phase I Risk Assessment summary that includes presentation of the latest version of the Risk Rating Matrix and the Risk Register Database from the Contractor's Risk Management Plan. Also includes descriptions of the top ten most critical identified risks, including details and status of the proposed risk mitigation actions.
- 040.3.4.2.9 Verification Planning, including:
- 040.3.4.2.9.1 Requirements traceability, through the sub-system level, is verifiable and traceable to the OPC System Specification with supporting analyses.
- 040.3.4.2.9.2 Modeling and Simulation Support Efforts.
- 040.3.4.2.9.3 Test and Integration Approach and Facility Planning.
- 040.3.4.2.10 The acquisition cost estimate is mature and associated risks and uncertainty have been identified and characterized.
- 040.3.4.2.11 The life cycle cost estimate and design features that reduce life cycle support requirements (e.g. access to equipment for maintenance and repair, obsolescence, commonality) have been identified and characterized.
- 040.3.4.2.12 Phase II Detail Design and Construction design approach Management Plan, and Integrated Master Schedule (IMS) are achievable and the Contractor proposed Schedule A, and C delivery dates and Schedule B requirements are feasible.
- 040.3.4.2.13 GFE requirements have been integrated into the ship design, including interface requirements.
- 040.3.4.2.14 The Contractor can evolve the Contract Design into a Detail Design that is technically feasible and producible at the Contractor's facility, and that design tools are available and sufficient.

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- 040.3.4.2.15 The Contract Design will permit evaluation of the ability to establish an Allocated Baseline at the start of Detail design.
- 040.3.4.3 The Contract Design Review shall have the following exit criteria:
- 040.3.4.3.1 The Contractor has demonstrated that the Contract Design is converged, balanced, technically feasible, and meets the OPD System Specification in its entirety.
- 040.3.4.3.2 Critical technical risks have been identified and they are acceptable or mitigation plans that are within the scope of the program are in place and can be executed during Phase II.
- 040.3.4.3.3 GFE has been incorporated in the Contract Design.
- 040.3.4.3.4 The Detail Design and Construction cost estimates are documented in sufficient detail to support Government cost estimates.
- 040.3.4.3.5 The Contract Design is supportive of ABS classification and system certification as described in Attachment J-Q.
- 040.3.4.3.6 Government identified Requests for Action (RFA) from the Contract Design Review have been closed.
- 040.4 Meetings
- 040.4.1 The Contractor shall prepare meeting agendas, presentation materials, action lists and track action. [040-01-1029]
- 040.5 Technical Meetings
- 040.5.1 The Contractor shall solicit agenda items from USCG and provide agendas, presentation material and action reporting and tracking for the Technical Meetings (TM). [040-01-1029]

**041 Configuration Management**

- 041.1 Configuration Management Plan. The Contractor shall provide a Contractor's Draft Configuration Management Plan. [041-01-1013]

**042 General Administrative Requirements**

- 042.1 Contract Work Breakdown Structure. The Contractor shall provide a Contract Work Breakdown Structure (CWBS) and CWBS Dictionary. [041-01-1004]

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- 042.2 Earned Value Management System Plan. The Contractor shall provide an Earned Value Management System Plan. [042-01-2343]
- 042.3 Data Management Plan. The Contractor shall provide a Data Management Plan. [042-01-1268]
- 042.4 Build Strategy.
- 042.4.1 The Contractor shall develop a build strategy, assess the producibility of their design at their shipyard and provide an OPC Build Strategy and Producibility Report. [042-01-1023]
- 042.4.2 In developing the Build Strategy, the Contractor shall plan for and review and assess the impacts of Schedules A, B, and C.
- 042.4.2.1 The Contractor shall review Schedule A, Government Furnished Equipment (GFE), (Attachment J-4) and develop Phase II GFE required delivery dates in terms of Months Before (Ship's) Delivery (MBDs) during the Preliminary Design Review. During the PDR GFE presentation, the Contractor shall present the Schedule A delivery dates in the context of the Contractor's overall projected Phase II Detail Design and Construction Integrated Master Schedule (IMS). The Contractor shall demonstrate the dependency of GFE delivery dates by GFE system to IMS successor schedule events in order to provide the latest GFE system delivery date that does not impact the overall Phase II critical path.
- 042.4.2.2 The Contractor shall review Schedule B, Technical Support Services, (Attachment J XX), evaluate the level of GFE/GFI labor support documented therein for each GFE/GFI line item and shall develop changes in required labor support during the PKDR. The Contractor shall provide an estimate for the number of Man Days/per ship of Government Support Services for technical assistance required to support contractor installation, integration and testing for each Schedule B Line Item. The Contractor's estimate shall take the form of Schedule B Line Item that breaks down labor support budgets by the same Schedule B functional area such as the man days associated with test and integration support, and shipboard installation and testing. Each of these categories shall be further differentiated by Hardware or Software support.
- 042.4.2.3 The Contractor shall review Schedule C Phase II GFI deliveries and shall develop GFI required delivery dates for each Schedule C line item in terms of Months After Phase II Option Exercise (MAOE) during the PDR. The Contractor shall present the Schedule C delivery dates in the context of the Contractor's projected overall Phase II Detail Design and Construction IMS. The Contractor shall demonstrate the

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dependency of GFI delivery dates to IMS successor schedule events in order to provide the latest GFI delivery date to support either Detail Design engineering events or testing events that does not impact the overall Phase II critical path.

042.5 Risk Management.

042.5.1 The Contractor shall provide and execute the Contractor's Risk Management Plan and Database (CRMP). [068-01-1083]

042.5.2 The Contractor shall:

042.5.2.1 Identify cost, schedule and performance risks.

042.5.2.2 Analyze each risk as follows:

042.5.2.2.1 Develop the probability of occurrence.

042.5.2.2.2 Develop the consequences in terms of performance, cost and schedule.

042.5.2.2.3 Based on the probability of occurrence and consequence, assign a risk severity.

042.5.2.3 The Contractor shall develop risk mitigation plans that eliminate or control, transfer or accept risks for the moderate or high risks.

042.5.2.3.1 Mitigation actions for high risk items shall address cost, schedule, performance and identify technical products impacted.

042.5.3 The Contractor shall develop, maintain and provide a Risk Database that documents each risk, the assessment results, recommended risk severity, the risk mitigation plans, and the progress against the mitigation plans.

042.6 Software Development.

042.6.1 For any software to be developed, the Contractor shall follow the OPC System Specification (NVR 4-1-12).

042.6.1.1 The Contractor shall establish management/engineering processes consistent with IEEE/EIA Standard 12207.

042.6.2 The Contractor shall develop the system architectural design as described in IEEE 12207, and shall identify the hardware and computer software configuration items.

042.6.3 The Contractor shall provide a Software Development Plan (SDP). [042-01-1550]

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- 042.6.4 The SDP shall cover the Contractor's plans to acquire vendor-supplied data for COTS and other NDI Software, and plans to acquire required licenses, including site licenses for computer software.
- 042.6.5 In constructing the SDP, the Contractor shall plan for the conduct of the following reviews that will occur in Phase II:
- 042.6.5.1 Software Specification Review.
- 042.6.5.2 Human-Machine-Interface Design Review.
- 042.6.5.3 Software Preliminary Design Review.
- 042.6.5.4 Software Critical Design Review.
- 042.6.5.5 Processing Hardware Preliminary Design Review.
- 042.6.5.6 Processing Hardware Critical Design Review.
- 042.6.5.7 Test Readiness Review(s).
- 042.6.5.8 Physical Configuration Audit(s).
- 042.6.6 The Contractor shall provide the following software technical documents as defined in the OPC System Specification (NVR 4-1-12):
- 042.6.6.1 System/Subsystem Requirements Specification. [042-01-1420]
- 042.6.6.2 Software Requirements Specification (SRS). [042-01-1420]
- 042.6.6.3 Software Requirements Traceability Matrix & Verification Plan. [068-01-1081]
- 042.6.6.4 Software Architecture Document (SAD). [042-01-1424]
- 042.6.6.5 Interface Requirements Specifications. [042-01-1420]
- 042.6.6.6 Display Screen Designs/Layouts, Button Actions, and Operator Actions for Console & Work Stations. [042-01-2347]

**068 Integration and Engineering**

- 068.1 Plans, procedures, design criteria, calculations, analyses, drawings, diagrams and reports required herein for Phase I design development shall be in accordance with the OPC System Specification (NVR as modified by Addendum I).
- 068.2 Systems Engineering.
- 068.2.1 The Contractor shall prepare, maintain and execute a Systems Engineering Management Plan (SEMP) that provides the core

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processes for managing the engineering effort, to ensure, through all design, development, integration, test, production, and support activities, that the ship is an integrated system. The SEMP shall also describe metrics (production and process) collection. [068-01-2285]

- 068.2.2 The contractor shall develop, implement and maintain a Requirements Traceability and Verification Matrix to ensure contract requirements are integrated into the design. [068-01-1081]
- 068.3 Preliminary Design Report. The Contractor shall provide an OPC Preliminary Design Report. [068-01-1055]
- 068.4 Contract Design Report. The Contractor shall provide an OPC Contract Design Report. [068-01-1055]
- 068.5 C4ISR Integration Plan. The Contractor shall provide a C4ISR Integration Plan (CIP). [068-01-2317]
- 068.6 Master Equipment List. The Contractor shall identify and determine characteristics for equipment and define them in the Master Equipment List (MEL). [068-01-2106]
- 068.6.1 The equipment characteristics shall be based on one of the following:
- 068.6.1.1 Existing, available equipment with a make and model.
- 068.6.1.2 A composite of existing, available equipment with an explanation of the composite and the make and model the composite was based on in the Notes section of the MEL.
- 068.6.1.3 An estimate of equipment with an explanation of the estimation method in the Notes section of the MEL.

**070 General Requirements for Design and Construction**

- 070.1 General Arrangements. The Contractor shall provide a General Arrangements Design Compliance Report that encompasses the tasks below: [070-01-1102]
- 070.1.1 Develop ship general arrangements by assigning space for required functions and equipment, and by coordinating operability, adjacency and access.
- 070.1.2 Provide rationale for and impact of compromises made in developing the arrangements design.
- 070.1.3 Develop the design and arrangements philosophy established and utilized to ensure the incorporation of OPC requirements into

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an optimum arrangement solution. The design philosophy shall, at a minimum, account for operational effectiveness, cost, habitability, survivability, and future growth. The Contractor shall decompose these basic principles into specific general arrangement requirements for deck areas, volumes, locations, access, tightness, clearances and adjacencies.

- 070.1.4 Define the basis for providing the compartment area/volume and location requirement, and any peculiar or unusual requirements, and describe how the requirements will be met.
- 070.1.5 Conduct an Access Study that includes personnel egress, maintenance and equipment access/removal.
- 070.1.6 Conduct a Food Service Study that demonstrates through sketches and description how requirements for food service will be met, including personnel flow paths and queues.
- 070.1.7 Conduct a Protected Spaces Study that demonstrates through sketches and description how the requirements for equivalent ballistic protection will be met for the Operations Center, Engineering Control Center, Damage Control Center, and Damage Control Repair Stations.
- 070.1.8 Conduct a Stores Arrangement and Flow Study that includes stores spaces and access routes/methods including general stores, cargo, provisions, solid waste, engineer / electrical / electronic stores, and aviation stores.
- 070.1.9 Conduct a Fire Zone Boundary Study.
- 070.1.10 Conduct a Vital Space Study that provides a listing of the vital spaces on the ship and rationale for this designation.
- 070.1.11 Develop a Damage Control Plan that demonstrates through sketches and description how requirements for damage control are met with respect to the arrangement.
- 070.1.12 Conduct a Chemical, Biological and Radiological (CBR) Spaces & Systems Study that demonstrates through sketches and description stowed locations of CBR protective equipment and the decontamination facility.
- 070.1.13 Complete the following arrangement sketches in both PD and CD: For each, outfitting, equipment, access, structure and subdivision shall be depicted and labeled in order to clearly demonstrate the function and suitability of the space. Plan and Profile views shall be included as necessary.
- 070.1.13.1 Berthing and Sanitary Spaces; At a minimum one representative space for an Officer, Chief Petty Officer, and Enlisted berthing compartment, including sanitary space.

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- 070.1.13.2 Lounges and Training Rooms.
  - 070.1.13.3 Office Spaces.
  - 070.1.13.4 Galley and Scullery.
  - 070.1.13.5 Officer, CPO, Enlisted Messrooms.
  - 070.1.13.6 Physical Fitness Space.
  - 070.1.13.7 Medical Space.
  - 070.1.13.8 Ship's Store.
  - 070.1.13.9 Laundry Facilities.
  - 070.1.13.10 Workshops.
  - 070.1.13.11 Law Enforcement Locker.
  - 070.1.13.12 Armory(s).
  - 070.1.13.13 Stowage Spaces.
  - 070.1.13.14 Damage Control Repair Stations.
  - 070.1.13.15 Solid Waste and Hazardous Material Spaces.
  - 070.1.13.16 Damage Control Central.
  - 070.1.13.17 Engineering Control Center.
  - 070.1.13.18 Pilot House.
  - 070.1.13.19 Helo Control Center.
  - 070.1.13.20 Operations Center.
  - 070.1.13.21 Network Room.
  - 070.1.13.22 SCIF.
  - 070.1.13.23 Radio and Top Secret Room.
  - 070.1.13.24 Sensors Compartment.
- 070.2 General Arrangements Drawings. The Contractor shall provide General Arrangements Drawings. [070-01-1105]
- 070.2.1 The Contractor shall define the major components, in sufficient detail to justify the basic configurations and space allocations reflected in the design. The Contractor shall assign space for required functions and equipment properly coordinated for operability, adjacency and access.
- 070.2.2 The Contractor shall develop the complete subdivision of the hull and superstructure into compartmentation, passages, vestibules, joiner bulkheads, trunks, tanks, cofferdams, shaft

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alleys, intakes, uptakes, voids, built-in lockers, and functional areas shall be shown and designated by name.

- 070.2.3 The Contractor shall develop the location of major pieces of equipment, fire zones, important structural components, and appendages.
- 070.2.4 The Contractor shall develop Plan Views for each deck, platform, flat, tank top, hold, innerbottom and superstructure level; Inboard Profile, Outboard Profile, Topside Configuration, and Bow and Stern Views.
- 070.3 Area / Volume Report. The Contractor shall provide an Area / Volume Report in accordance with NAVSEA T9070-AB-PRO-010. [070-01-1100]
- 070.4 Tank Arrangements and Capacities Booklet. The Contractor shall develop a Tank Arrangements and Capacities Booklet. [070-01-1108]
- 070.5 Integrated Topside Design. The Contractor shall develop an Integrated Topside Design (ITD) that is effective, safe, and interoperable, perform an Integrated Topside Design Analysis and provide an Integrated Topside Design Analysis Report addressing the following topics. [070-01-1956]
- 070.5.1 The Contractor shall develop and implement an ITD Process, using the "Integrated Topside Design and Certification Process for New Construction Ships", NAVSEA 05D, as a guide.
- 070.5.2 The Contractor shall consider ship missions and operations, physical and electromagnetic environmental conditions, human factors engineering, as well as equipment and material configurations and limitations.
- 070.5.3 The Contractor shall develop descriptive evidence that the ship's topside design is safe, interoperable, meets the OPC System Specification requirements.
- 070.5.4 During Preliminary Design the Contractor shall:
- 070.5.4.1 Prepare a Topside Ship and Systems Requirements Summary by reviewing, collecting, and arranging the contractual requirements that apply to the ITD in such a manner that the various competing requirements are available for conducting a complete analysis.
- 070.5.4.2 Conduct Topside Trade Studies, to determine initial parameters and arrangement constraints such as equipment combinations related to minimum topside stack-up length, EMC, HM&E compatibilities, and aviation equipment compatibilities.
- 070.5.4.3 Develop Topside Configuration Arrangement Descriptions and Sketches to illustrate that topside equipment proximity issues

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resulting from interference, vibration, structure loading, green water loading, stack gas exhaust, are resolved, separation distances maintained, and where practical, equipment is optimally placed to perform its mission.

- 070.5.4.4 Develop Topside Equipment lists (CFE and GFE).
- 070.5.4.5 Conduct a Navigation and Signal Light Location Study.
- 070.5.4.6 Prepare Topside Design Histories.
- 070.5.4.7 Perform a Line of Sight (Visibility) Study.
- 070.5.4.8 Perform a Weapons Coverage Study.
- 070.5.4.9 Develop detailed description and rationale to demonstrate the topside design is safe, interoperable, and meets the requirements of the OPC System Specification.
- 070.5.5 During Contract Design the Contractor shall also:
  - 070.5.5.1 Finalize selection from among the technical alternatives considered and complete selection of topside systems and equipment.
  - 070.5.5.2 Develop a 3D model of the Topside design.
  - 070.5.5.3 The Contractor shall determine the required number and location of AS-141 Direction Finding antennas.
  - 070.5.5.4 Analyze Radiation Hazards (RADHAZ) including Hazards of Electromagnetic Radiation to Ordnance (HERO), Hazards of Electromagnetic Radiation to Personnel (HERP) and Hazards of Electromagnetic Radiation to Fuel (HERF).
  - 070.5.5.5 Analyze blockage.
  - 070.5.5.6 Analyze Electromagnetic Environmental Interference (EMI).
  - 070.5.5.7 Analyze the effects of physical and electromagnetic environmental conditions on topside operations, systems and equipment.
  - 070.5.5.8 Perform Human Factors Engineering.
  - 070.5.5.9 Assess the effects of equipment and material configurations and limitations.
  - 070.5.5.10 Develop a Computational Fluid Dynamics (CFD) model and perform Stack Gas Dispersion Analysis of exhaust gas plumes to confirm that gases do not contaminate air intakes, interfere with operating crew (including flight operations), exceed temperature limits of exposed equipment (including antennas), or create a fire hazard.
  - 070.5.5.11 Develop the final stack design.

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- 070.5.5.12 Determine the placement of CBR sensors based on topside airflow analysis.
- 070.5.5.13 Analyze Countermeasure Washdown coverage.
- 070.5.5.14 Determine and assess final Navigation and Signal Light Locations.
- 070.5.6 During Contract Design the Contactor shall complete the selection of topside systems and equipment, resolve outstanding technical alternatives and update the Topside Arrangements.
- 070.5.7 The Contractor shall provide an OPC topside arrangement drawing depicting an optimal topside design configuration and provide Topside Arrangements. [070-01-1091]
- 070.6 Limiting Displacement / Draft Report. The Contractor shall provide a Limiting Displacement / Draft Report(s). [070-01-1197]
- 070.6.1 The Limiting Displacement / Draft shall be determined by analytical calculations and geometric limitations based on the requirement for the OPC.
- 070.6.2 The Contractor shall identify the key factors governing the displacement / draft limit.
- 070.6.3 The Contactor shall develop an outboard profile drawing of the OPC depicting the location of the limiting draft marks.

**071 Access**

- 071.1 Shipboard Access Study. During the Contract Design period the Contractor shall provide a Shipboard Access Study that includes access, egress, escape and evacuation, personnel flow, queuing lines, stores and weapon handling. [071-01-1124]
- 071.2 Equipment Removal and Maintenance Access Arrangement Drawing. During the Contract Design period the Contractor shall provide an Equipment Removal and Maintenance Access Arrangement Drawing that includes equipment maintenance, removal, and handling paths. [071-01-2109]

**073 Noise and Vibration**

- 073.1 Airborne Noise Category Assignment List. During the Contract Design period the Contractor shall assign noise categories to compartments and provide an Airborne Noise Category Assignment List. [073-01-2079]

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- 073.2 Airborne Noise Control/Design History Booklet. During the Contract Design period the Contractor shall analyze ship and equipment noise, develop and analyze noise control features and provide the Airborne Noise Control/Design History Booklet. [073-01-2081]
- 073.2.1 The Contractor shall document efforts for meeting the airborne noise requirements.
- 073.2.2 The Contractor shall conduct noise engineering analysis to verify that ship compartments and topside areas noise requirements are met. The analyses shall demonstrate that noise control measures necessary to meet the airborne noise acceptance levels have been identified and incorporated into the ship design.
- 073.2.3 The Contractor shall identify the machinery and equipment that will be procured with noise level performance limits.
- 073.2.4 The Contractor shall develop a color coded arrangement drawing identifying the assigned airborne noise category for compartment.
- 073.2.5 The Contractor shall identify for each compartment (except lockers, storerooms, and passages), the noise sources, including HVAC systems, equipment noise source levels and transmission paths, and the noise attenuation properties of noise control measures, as well as the noise attenuation properties of measures required for other purposes such as vibration and thermal control treatments. Airborne noise source levels used in predictions shall also be identified. Where measured source levels are not available, estimated levels shall be used. The basis for the source levels shall also be included.
- 073.2.6 The Contractor shall determine the worse case machinery line-up for each compartment and provide a noise prediction. The noise level predictions shall include the effects of noise sources located within each space and those located in adjacent and other nearby spaces. Both airborne and structureborne sound transmission paths shall be included in the calculations. Where noise measurements locations are known, both reverberant and direct field effects shall also be included in the calculations of compartment noise levels. Spreadsheet calculations with assumptions shall be developed.
- 073.2.7 The Contractor shall prepare a description of where noise control features, in addition to those specified in the OPC System Specification, shall be incorporated into the design to meet compartment airborne noise criteria.

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- 073.3 Propulsion System Vibration Analysis. During the Contract Design Period the Contractor shall provide the Propulsion System Vibration Analysis. [073-01-1139]
- 073.3.1 The Contractor shall conduct a complete mathematical analysis of the lateral, torsional, and longitudinal vibration of the propulsion system.
- 073.3.2 This analysis shall be in accordance with ANSI S2.27.
- 073.4 Hull Vibration, Superstructure, Mast, and Foundation Vibration Analysis and Report. During the Contract Design Period the Contractor shall provide a Hull Vibration, Superstructure, Mast, and Foundation Vibration Analysis and Report. [073-01-1142]

**074 Welding and Fabrication**

- 074.1 Welding and Fabrication Procedures and Sequences Documents. The Contractor shall provide Welding and Fabrication Procedures and Sequences documents. [074-03-1378]
- 074.2 Qualification testing. The Contractor shall notify the PRO 24 hours prior to any welder qualification testing.

**076 Reliability, Maintainability and Availability**

- 076.1 RM&A Program Plan. The Contractor shall provide and implement an RM&A Program Plan to ensure and verify that the ship satisfies the operational availability (A0) requirements. [076-01-1155]
- 076.2 Methods to allocate the operational availability requirements. The Contractor shall define the methods to allocate the operational availability requirements to subsystems and equipment and verify that the requirements have been met in accordance OPC System Specification and ANSI/GEIA-STD-0009 Reliability Program Standard for Systems Design, Development, and Manufacturing Section 4.5.1 and SAE JA1010 Maintainability Program Standard Sections "4. Program Requirements", and "5. Program Elements".
- 076.2.1 The Contractor shall designate a single key person for RM&A. The RM&A key person shall have a bachelor's in an engineering field from an accredited college or university. In addition, the key person shall hold a current certification as a reliability engineer (CRE) from American Society for Quality or as a Certified Maintenance & Reliability Professional (CMRP) from the Society of Maintenance and Reliability Professionals.

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- 076.2.2 The maintainability development shall be coordinated with the Human Engineering Program to determine Mean Maintenance Time (MMT).
- 076.3 RM&A Assessments. The Contractor shall provide RM&A Assessments in accordance with ANSI/GEIA-STD-0009 Reliability Program Standard for Systems Design, Development, and Manufacturing and SAE JA1010 Maintainability Program, section 4. [076-01-1152]
- 076.3.1 The contractor may utilize manufacturer supplied Mean Time Between Failure (MTBF), Mean Time Between Maintenance (MTBM), and MMT data for Non-Developmental items and Commercial, Off-the-Shelf (COTS) equipment until the RM&A modeling is complete or testing and evaluation identifies more accurate values for the first RM&A assessment submission.
- 076.3.2 The contractor shall provide a recommended Critical Item List (CIL) for the "ship systems" and "mission systems" designated in specification section 076. The contractor shall identify the RM&A modeling method or shall use the Handbook of Reliability Prediction Procedures for Mechanical Equipment, CARDEROCKDIV, NSWC-10, Jan 2010 to calculate contractor developed mechanical systems and subsystems and components.
- 076.3.3 The Contractor shall provide a Failure Modes, Effects & Criticality Analysis (FMECA) to include recommended improvements on all components on the CIL. The Contractor shall identify any failure modes that are expected to occur over the life cycle of the OPC and shall be conducted in accordance with MIL-STD-3034, RCM Phases I through V.

**077 System Safety**

- 077.1 System Safety Program Plan. The Contractor shall provide and implement a System Safety Program Plan (SSPP). [077-01-1170]
- 077.2 Functional Hazard Analysis. The Contractor shall conduct a Functional Hazard Analysis (FHA) on the propulsion system and provide a report. [077-01-2047]
- 077.2.1 The Contractor shall utilize the propulsion system functions identified in the Top-Down Function Analysis and maintain traceability to the Critical Task Analysis Report.
- 077.2.2 The Contractor shall identify existing safety criteria in the OPC System Specification that mitigates the hazard. Where the specification contains no mitigation requirements, the Contractor shall continue the assessment.

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- 077.2.3 The Contractor shall assess the mishap severity associated with the failure or malfunction of each function.
- 077.2.4 Based on the assessed mishap severity, the Contractor shall designate functions or associated hardware or software items as Safety Critical Functions (SCF), Safety Critical Items (SCI), Safety Significant Functions (SSF), and Safety Significant Items (SSI).

**079 Hull Form and Hydrodynamics**

- 079.1 Ship hull form and appendage design. The Contractor shall develop the ship hull form and appendage design.
- 079.1.1 The Contractor shall develop a 3D model of the hull.
- 079.1.2 The Contractor shall provide Lines, Offsets and Hull Appendage Drawings, which shall be consistent with the Hull Form Development Report. The lines shall be completely faired and depict the entire hull. [079-01-1193]
- 079.2 Hydrodynamic analyses. The Contractor shall conduct hydrodynamic analyses of the ship hull form and appendages and shall provide the Hull Form Design Report that documents the analysis. The hull form development approach shall consider hydrodynamic performance, machinery fit, stability and longitudinal strength. [079-01-1190]
- 079.2.1 The Contractor shall prepare a description of the hull form development.
- 079.2.1.1 The Contractor shall provide details of the selection and description of any hull used as a baseline.
- 079.2.2 The Contractor shall provide the factors that led to specific hull form features, requirements which drove hull form decisions and any other description pertinent to the hull form development philosophy and approach employed for the ship.
- 079.2.3 The Contractor shall prepare a hull form description and model that shall qualitatively and quantitatively express and illustrate the features of the ship's hull form through text description, figures, sketches and tables. The Contractor shall prepare rationale for sizing and location of hull form control surfaces, bulbs, and appendages.
- 079.2.4 The Contractor shall conduct the Resistance and Powering Analysis. The Contractor shall:
- 079.2.4.1 Calculate hull resistance from the hull form dimensions and coefficients using methods appropriate to the ship type, and/or ship data if available.

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- 079.2.4.1.1 These methods shall be one or more of the following systematic series: Taylor, Series 64, or National Physical Laboratory, UK (NPL).
- 079.2.4.1.2 Propulsive efficiencies used in the analysis shall be explained and justified.
- 079.2.4.1.3 Provide an estimate of bare-hull and appendage drag.
- 079.2.4.1.4 Perform the analyses for every speed increment from zero knots to the speed at maximum continuous engine rating, for dual-shaft and for trail-shaft operation.
- 079.2.4.1.5 Establish the relationship between speed and shaft power.
- 079.2.4.1.6 Determine the required installed power.
- 079.2.5 The Contractor shall conduct Maneuvering Analyses.
- 079.2.5.1 The Contractor shall prepare estimates of Directional Stability, Turning Performance (including tactical diameter, maximum advance and head reach, zig-zag), and Operational Performance (including docking/mooring, zero-speed rotation, restrained rotation, and thruster performance).
- 079.2.5.2 The Contractor shall perform the rudder sizing analysis and assessment of the hull form and rudder maneuvering performance.
- 079.2.5.3 The Contractor shall perform the thruster sizing analysis and parametric assessment of the hull form and thruster maneuvering performance.
- 079.2.5.4 The Contractor shall use analytical simulation tools that have been validated against full-scale data or other accreditation for evaluating maneuvering characteristics and provide validation data.
- 079.2.6 The Contractor shall conduct Seakeeping Analyses.
- 079.2.6.1 The Contractor shall quantify seakeeping characteristics and analytically verify the ship's capability to comply with the limiting criteria for each case required by the OPC System Specification.
- 079.2.6.2 The Contractor shall utilize a frequency domain, linear strip theory seakeeping analysis program that has been validated against full scale data.
- 079.2.6.3 The Contractor shall model hull form control surfaces consistent with the sizing and location of the "Lines, Offsets, and Hull Appendage Drawing."

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- 079.2.6.4 Use vendor performance data for specific systems when available.
- 079.2.6.5 The Contractor shall perform a Roll Stabilization Analysis to estimate and quantify the effect of anti-roll stabilization methods (if provided).
- 079.2.6.5.1 The Contractor shall provide objective evidence justifying magnitude of roll dampening through simulation data, model or full scale testing, vendor data, or some combination of these.
- 079.2.6.6 The Contractor shall update the analysis to reflect results of physical model tests after model test completion.
- 079.2.7 During the Contract Design period the Contractor shall update the hydrodynamic analyses to include design changes and correlation with model test results.
- 079.3 Model Testing. The Contractor shall plan the model test program and provide a Preliminary and Contract Design Model Test Plan that includes planning and test readiness review for hydrodynamic model testing for the design. [079-01-1196]
- 079.3.1 The Contractor shall plan the details and the supporting rationale for the proposed model tests of the ship. The Contractor shall develop specific information and direction to the model test facility for the costing and the execution of the program and for providing data and reports. The Contractor shall develop detailed requirements for model construction, model tests, data analyses, photography, video recording, and associated report preparation to be carried out by the model test facility.
- 079.3.2 The Contractor shall select a test facility and conduct the planned model tests to verify the design satisfies the speed, seakeeping, endurance and maneuvering requirements.
- 079.3.3 The Contractor shall conduct the following tests during Phase I:
- 079.3.3.1 Bare Hull Effective Horsepower (EHP) Resistance Tests.
- 079.3.3.2 Appended EHP Resistance Tests.
- 079.3.3.3 Appendage Stripping Tests.
- 079.3.3.4 Wake Survey.
- 079.3.3.5 Flow Visualization.
- 079.3.3.6 Bilge Keel Alignment Test (if applicable).
- 079.3.3.7 Shaft Strut Alignment Test.

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- 079.3.3.8 Self Propulsion Shaft Horsepower (SHP) Test (with Stock Propeller).
- 079.3.3.9 Added Resistance in Waves.
- 079.3.3.10 Seakeeping Tests.
- 079.3.3.11 Maneuvering Tests.
- 079.3.3.12 Roll Decay Tests.
- 079.3.4 Contractor shall conduct resistance tests for a range of speeds from 4 to 26 knots at 2 knot increments. At a minimum, resistance tests shall be performed at Full Load Displacement, 110% of Full Load Displacement, and 90% of Full Load Displacement for each speed.
- 079.3.4.1 The Contractor shall conduct self propulsion tests at the self propulsion point and at also for 5% of the thrust over the self propulsion point. Rudder zero-angle shall be determined for the tests.
- 079.3.4.2 The Contractor shall conduct seakeeping tests in NATO Sea States 4, 5 and 6, at wave headings (000 = head seas) 000, 015, 030, 045, 060, 075, 090, 135, and 180 degrees for speeds of 0 to 25 knots (full scale) at 5 knot increments. Seakeeping tests in Sea State 7, same sea directions, shall be completed from steerageway to 20 knots (ship scale) in 5-knot speed increments. The seakeeping tests shall simulate the Bretschneider wave spectrum. The seakeeping test model shall be fully appended, and equipped with stock propellers. Motion control systems, if present on the ship full-scale, shall be modeled in seakeeping tests. The model shall be built up to at least the main deck level and shall include a simplified superstructure for decks that will be watertight on the full-scale ship. The waterlines and stations shall be marked on the shell. The ship KG, GM, longitudinal, vertical, and transverse radii of gyration shall be modeled. The seakeeping model shall be ballasted to Full Load displacement.
- 079.3.4.3 The Contractor shall conduct a capsize test, using the seakeeping model, in NATO Sea State 8, in bow quartering, beam and following seas, model moving at speed representing minimum steerageway.
- 079.3.4.4 The Contractor shall conduct roll decay tests in calm water at speeds zero through maximum speed at 5 knot speed increments.
- 079.3.4.5 The Contractor shall notify the Government 45 days prior to the model tests so the Government may witness the tests.

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- 079.3.5 The Contractor shall provide Hull Form and Hydrodynamic Model Test Reports documenting the results of the model tests. [079-01-2220]
- 079.3.6 During the Contract Design period the Contractor shall provide a Detail Design Model Test Plan. The Contractor shall plan the following testing:
- 079.3.6.1 Open Water Design Propeller Test.
- 079.3.6.2 Self Propulsion Shaft Horsepower (SHP) Test (with Design Propeller).
- 079.3.6.3 Design Propeller Cavitation Test.
- 079.4 Stability and Buoyancy.
- 079.4.1 The Contractor shall analyze the ship's stability and buoyancy and provide the following reports:
- 079.4.1.1 Intact and Damage Stability Analyses. [079-01-1202]
- 079.4.1.2 Flooding Water Levels (V-Lines) Analysis. [079-01-1201]

**080 Integrated Logistics Support**

- 080.1 Integrated Logistics Support Plan. The Contractor shall provide the Integrated Logistics Support Plan (ILSP) that defines the Contractor's approach to provide data to support the USCG's OPC logistics program. [080-01-2211]
- 080.2 Data and material. The ILSP shall establish the Contractor's strategy for providing data and material to the USCG for Integrated Logistics Support (ILS). It shall document specific Contractor processes for Logistic Support Analysis (LSA) and for the ILS elements of: Support and Test Equipment (S&TE); Packaging, Handling, Storage and Transportation; Facilities; and Personnel and Training. In addition, specific Contractor processes for Access Control, Supply Support, technical documentation, and Diminishing Manufacturing Sources and Material Shortages (DMSMS) management shall be included.

**085 Drawings**

- 085.1 System Diagram. Piping and HVAC systems shall have a diagram depicting the interconnections of the components in the system within the plan views of the ship structure. Components that provide functional effect on the system shall be depicted.

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- 085.1.1 Piping and Mechanical Diagrams shall include components, such as valves and piping connections, which can be disconnected in the course of normal servicing. Permanent joints such as threaded, welded or soldered pipe connections need not be depicted. Components and their interconnections shall be located as required for clarity in comprehending the functionality of the system and shall not be to scale in the diagram.
- 085.1.2 Components shall be depicted as symbols and all diagrams shall include a symbol list including all symbols used.
- 085.1.2.1 Symbols shall be in accordance with ASTM F1000-95 unless otherwise specified.
- 085.1.3 Hose and pipe shall be distinguished from each other.
- 085.1.4 Diagrams shall include tables with major component characteristics such as material types and specifications, flow rates, pressure settings, sizing information, etc. Where appropriate, flow quantities, pressures, directions and nominal pipe sizes shall be shown as text near or leader to the line depicted.
- 085.2 Machinery Arrangement Drawings. Machinery arrangement drawings shall be developed for showing the major components, in sufficient detail, to justify the basic configurations and space allocations reflected in the design.
- 085.2.1 Drawings shall indicate required access clearances for routine maintenance and repair but not for removal of the machinery.
- 085.2.2 The drawings shall show the locations of major components within each machinery space including, but not limited to tankage, ventilation, hull structure and closures, pumps, motors and major electrical equipment. The drawings shall identify each piece of equipment shown.
- 085.2.3 The frames and bulkheads shall be clearly shown in the machinery arrangement drawings.

**088 Human Systems Integration (HSI)**

- 088.1 Human Systems Integration Program Plan. The Contractor shall provide and implement the Human Systems Integration Program Plan (HSIPP) in accordance with ASTM F1337. [088-01-1281]
- 088.2 HSI issues. The Contractor shall document HSI issues identified by the Contractor's HSI analyses, design reviews and testing in the

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Government's HSI Issue and Decision Database as they are identified. The Contractor shall provide a report. [088-01-2292]

- 088.2.1 The Contractor shall analyze the identified issues according to the provided instructions, to assess their impact on human performance and mission success.
- 088.3 Human Factors Engineering.
- 088.3.1 The Contractor shall provide a Human Engineering Program Plan (HEPP) to reflect the current state of the design. [088-01-1282]
- 088.3.1.1 The Contractor shall develop the HEPP in accordance with ASTM F1337 and MIL-STD-46855 for Phase I and II.
- 088.3.1.2 The Contractor shall conduct the activities identified in the HEPP.
- 088.3.1.3 The Contractor shall itemize Shipboard Spaces and identify:
- 088.3.1.3.1 Whether or not each space is normally manned,
- 088.3.1.3.2 The types of human/machine interfaces and watchstations located within, and
- 088.3.1.3.3 The type of human engineering analyses to be performed against that space.
- 088.3.1.4 The Contractor shall include planning details and methodologies for the following minimum activities in the HEPP:
- 088.3.1.4.1 Top-Down Function Analysis (TDFA).
- 088.3.1.4.2 Human Factors Issue Tracking and Analysis.
- 088.3.1.4.3 Human Engineering Design Approach Document - Operator (HEDAD-O).
- 088.3.1.4.4 Human Engineering Design Approach Document - Maintainer (HEDAD-M).
- 088.3.1.4.5 Link Analysis using the Spatial Analysis and Link Tool (SALT) on the following layouts:
- 088.3.1.4.5.1 Bridge.
- 088.3.1.4.5.2 Operations Center.
- 088.3.1.4.5.3 Helicopter Control Station.
- 088.3.1.4.5.4 Galley.
- 088.3.1.4.5.5 Engineering Control Room.
- 088.3.1.4.5.6 Damage Control Central.

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- 088.3.1.4.6 Modeling and Simulation Testing and Demonstration, coordinated with the activities identified in Section 098.
- 088.3.1.4.7 Support for Equipment Selection (trade studies).
- 088.3.1.4.8 The Contractor shall include planning details for the following minimum Phase II activities in the HEPP:
- 088.3.1.4.8.1 Human Factors Issues Tracking and Analysis.
- 088.3.1.4.8.2 Human Engineering Design Approach Document - Operator (HEDAD-O).
- 088.3.1.4.8.3 Human Engineering Design Approach Document - Maintainer (HEDAD-M).
- 088.3.1.4.8.4 Modeling and Simulation Testing and Demonstration, coordinated with the activities identified in Section 098.
- 088.3.1.4.9 Valve Criticality Analysis.
- 088.3.1.4.10 Engineering Design Drawing Reviews.
- 088.3.1.4.11 Support for Equipment Selection (trade studies).
- 088.3.1.4.12 Human Performance Testing.
- 088.3.1.4.13 Usability Testing.
- 088.3.2 The Contractor shall use the Critical Task Analysis Report and task analysis data as the basis for bounding Contractor human factors analyses.
- 088.3.3 The Contractor shall perform a Top-Down Function Analysis (TDFA) to define each subsystem function as part of the overall Systems Engineering effort. [088-01-1287]
- 088.3.3.1 The Contractor shall use these function definitions as the basis for the function allocation between human and machine, in accordance with ASTM F1337 section 7.4.
- 088.3.3.2 The Contractor shall decompose and allocate functions to identify procedural steps for operator and maintainer tasks.
- 088.3.3.3 The Contractor shall provide and maintain traceability of GFI Critical Task Analysis data to the further decomposed Contractor task data.
- 088.3.4 The Contractor shall provide a Human Engineering Systems Analysis Report (HESAR). [088-01-1283]
- 088.3.4.1 The Contractor shall provide evidence in the HESAR that the TDFA results are reflected in the proposed design.
- 088.3.5 The Contractor shall provide a Human Engineering Test Plan (HETP) that describes planned testing and verification of human

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performance aspects of the ship design identified in the HEPP.  
[088-01-1284]

- 088.3.5.1 The Contractor shall describe how dedicated and integrated human performance verification testing will be conducted.
- 088.3.5.2 The Contractor shall include plans and methodologies for human engineering integrated system testing of the projected ship systems and subsystems in the HETP. This includes planning details and methodologies for the following Phase II activities identified in the HEPP:
  - 088.3.5.2.1 Human Performance Testing.
  - 088.3.5.2.2 Usability Testing.
  - 088.3.5.2.3 Any additional activities identified in the Contractor's HEPP for Phase II.
- 088.3.6 The Contractor shall provide a Human Engineering Design Approach Document-Operator (HEDAD-O). [088-01-1291]
  - 088.3.6.1 The Contractor shall include identified crew station and operator-related information for each of the content areas.
  - 088.3.6.2 The Contractor shall provide placeholders for notional equipment, drawings, crew stations, procedures, tasks, and other content that have not been identified during this phase.
- 088.3.7 The Contractor shall provide a Human Engineering Design Approach Document-Maintainer (HEDAD-M). [088-01-1290]
  - 088.3.7.1 The Contractor shall include identified information pertaining to maintenance actions performed at the organizational level for each of the content areas.
  - 088.3.7.2 The Contractor shall provide placeholders for notional equipment, drawings, descriptions, layouts/arrangements, designs, installation procedures, rationale, special tools/equipment/aids, analyses, depictions, and other content that have not been identified during this phase.
- 088.3.8 Manpower and Personnel.
  - 088.3.8.1 The Contractor shall conduct a Manpower Mix analysis and provide a report. [088-01-1285]
  - 088.3.8.2 The Manpower Mix Analysis Report and updates shall be prepared in accordance with the COMDTINST 5312.11, and the Manpower Estimate Report for the Maritime Security Cutter Medium (WMSM) dated 18 March 2011 and the Legend Class (WMSL 750) Interim Manpower Requirements Analysis dated 30 September 2011.

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- 088.3.8.3 The Contractor shall identify the constraints and assumptions required to operate, maintain, support, and train given the proposed ship design.
- 088.3.8.4 The Contractor shall trace the manning concept to the operator and maintainer tasks identified in the TDFA.
- 088.3.8.5 The Contractor shall conduct a Manpower Mix analysis for the operational crew based on the following watches and evolutions for Condition I, General emergency; Condition III and Condition IV levels of readiness:
- 088.3.8.5.1 Bridge watch.
  - 088.3.8.5.2 Engineering Control Center Operation.
  - 088.3.8.5.3 Damage Control Operations.
  - 088.3.8.5.4 Operations Center Operations.
  - 088.3.8.5.5 Galley Operations.
  - 088.3.8.5.6 Flight Operations (including landing, recovery, traversing, Helicopter In-Flight Refueling).
  - 088.3.8.5.7 Boat Operations (including launch, recovery, man overboard recovery, rescue and assistance, boarding operations, etc.).
  - 088.3.8.5.8 At Sea Replenishment.
  - 088.3.8.5.9 Migrant Operations.
  - 088.3.8.5.10 Mooring and Unmooring.
  - 088.3.8.5.11 Anchoring.
  - 088.3.8.5.12 Main Space Fire.
  - 088.3.8.5.13 Setting of General Quarters.
  - 088.3.8.5.14 In-port watch standing and maintenance.
- 088.3.8.6 The Contractor shall conduct a Manpower Mix analysis for the ashore personnel based on the following functions for both in-port and at sea operations:
- 088.3.8.6.1 Maintenance.
  - 088.3.8.6.2 Support.
  - 088.3.8.6.3 Training.

**090 Quality Assurance**

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- 090.1 Quality Assurance Plan. The Contractor shall provide a Quality Assurance Plan. [090-01-1319]

**096 Mass Properties**

- 096.1 Preliminary Weight Control Plan. The Contractor shall provide a Preliminary Weight Control Plan that defines the Contractor's approach to controlling weight growth throughout the detail design and construction phases. [096-01-1351]
- 096.2 Mass properties. The Contractor shall provide and control the mass properties of the ship in accordance with the guidelines set in the Society of Allied Weight Engineers, Recommended Practices No. 12.
- 096.3 Rationale. The Contractor shall determine, define the rationale for, and provide a report of weight and KG margins for PD, CD, DD and Construction and the post-delivery Service Life Allowances. [096-01-2142]
- 096.4 Weight Estimate Reports. The Contractor shall provide the PD, CD Weight Estimate Reports [096-01-2141] and the Preliminary Allocated Baseline Weight Estimate Report [096-01-1347]. The reports shall also include:
- 096.4.1 The weight and KG margins for each phase.
- 096.4.2 The Longitudinal Weight Distribution for the load cases discussed in NVR Part 0, Chapter 5, Section 8, and in 1-3-3/3.3.2. The weight and LCG for 22 weight segments shall be provided for each load case.
- 096.4.3 The Contractor shall provide the Weight Moment of Inertia Report. [096-01-1353]

**098 Modeling, and Simulation**

- 098.1 Modeling and Simulation Plan. The Contractor shall provide a Modeling and Simulation Plan defining the scope and use of virtual mock-ups and simulations and the plan for use of physical mock-ups. [098-01-2103]
- 098.1.1 Modeling and Simulation shall be conducted under realistic conditions with representative operators to verify that the system will meet requirements.
- 098.2 Models. The Contractor shall develop the following models in a 3D CAD system and shall demonstrate them during PMC#3:
- 098.2.1 Pilot House.

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- 098.2.2 Galley and mess deck.
- 098.2.3 Main Machinery Room.
- 098.2.4 Auxiliary Machinery Room.
- 098.2.5 Aviation Facility.
- 098.2.6 Small Boat Handling and Operations.
- 098.2.7 Weapons loading and firing.
- 098.2.8 Operations Center (OPCEN).
- 098.2.9 Forecastle (Anchoring).
- 098.3 3D CAD mockups. 3D CAD mockups shall include the structure, machinery, equipment and outfitting consistent with design concepts for areas to be modeled.
- 098.4 Accessibility. The 3D CAD mockups shall be capable of demonstrating accessibility using an anthropomorphic model that can simulate a 5th percentile female through a 95th percentile male with and without firefighting protective clothing and equipment.
- 098.5 Results and findings. The Contractor shall document the results and findings from modeling and simulation activities and analyses specified in the Modeling and Simulation Plan in a Models, Mockups and Simulation Report. [098-01-2102]

**100 SHIP Structure**

- 100.1 Analysis. The Contractor shall design and analyze the ship hull and superstructure, mast, major foundations and appendages. At the end of the Contract Design Period, the structural design shall be documented as satisfying the requirements.
- 100.2 Finite element models. Finite element models shall be created and analyzed using FEMAP, NASTRAN, ANSYS or ABAQUS. MAESTRO may be used for full ship coarse mesh models.
- 100.3 Design loading criteria. The Contractor shall develop and document the design loading criteria including details concerning the specific loads applicable to the design. The Design Load Criteria Summary shall be developed during the Preliminary Design Period and updated during the Contract Design period. [100-01-1348]
- 100.4 Strength Studies, Calculations and Analyses. The Contractor shall develop and provide Strength Studies, Calculations and Analyses. [100-01-1380]

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- 100.5 Longitudinal Strength Report and Drawing. The Contractor shall analyze Hull girder longitudinal bending strength and provide the results. [100-01-1389]
- 100.5.1 For Preliminary Design, the longitudinal strength analysis shall be based on the design load and initial weight distribution.
- 100.5.2 For Contract Design, the longitudinal strength analysis shall be based on a complete set of calculations in accordance with the requirements.
- 100.6 Structural Opening Reinforcement Report. The Contractor shall develop an assessment methodology and engineering approach to maintain the structural integrity of openings in plating and beam members. [100-01-1377]
- 100.6.1 For the Preliminary Design, the assessment shall include structure in way of openings greater than 15 square feet.
- 100.6.2 For the Contract Design, the assessment shall include structure in way of openings down to 2 square feet.
- 100.7 Fatigue Analysis. The Contractor shall perform the Hull structural fatigue calculations and demonstrate the fatigue life meets the requirement. [100-01-1379]
- 100.7.1 For Preliminary Design, the fatigue life shall be evaluated for the midships section arrangement and scantlings with proposed details and SPECTRA developed hull bending moment histogram.
- 100.7.2 For Contract Design, a complete set of calculations shall be provided in accordance with the requirements. The fatigue loading shall be assessed at 10 stations equally spaced along the length of the ship. The Course Mesh FEM shall be used to validate stress levels and identify stress concentrations and areas where fine mesh modeling is needed to determine the fatigue stress range. Fine mesh modeling or alternate methods shall be used to evaluate the stress concentrations identified.
- 100.8 Structural Design Report. the Contractor shall provide a Structural Design Report that documents: [100-01-1387]
- 100.8.1 Calculations that demonstrate the selected scantlings satisfy the design requirements for the identified loads. For the Preliminary Design Period, the calculations shall cover at least the midship section scantlings. For the Contract Design, calculations shall be provided for the scantlings depicted in the system level structural drawings.
- 100.8.2 Ultimate Strength of the Hull Girder shall be calculated and demonstrated to satisfy the design criteria. For the

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Preliminary Design period, the scantlings at midships shall be evaluated. For the Contract Design, the Hull girder ultimate strength along the length shall be demonstrated to be greater than the extreme lifetime bending moment as calculated using SPECTRA in accordance with the design requirements.

- 100.9 Structural Foundations Report. During the Contract Design Period, the contractor shall develop and provide structural calculations identifying the integration of major equipment foundations into the hull structure. Where major equipment is not yet specified, notional equipment shall be included. Foundations shall be developed for the following items: [180-01-1401]
- 100.9.1 Main Propulsion Prime Movers.
- 100.9.2 Diesel Generator sets.
- 100.9.3 Shafting Reduction Gears and Thrust Bearing.
- 100.9.4 Cranes and Davits.
- 100.9.5 Rudder Support Structure.
- 100.10 Shaft Strut Design and Analysis. For the Contract Design, the Contractor shall provide calculations and arrangements. [161-01-1397]
- 100.11 Mast Analysis. The Contractor shall perform a Mast Analysis for the Contract Design. The Contractor shall provide a Mast Structural Analysis report demonstrating the mast structure and arrangements satisfy the stress and stiffness design requirements. [170-01-2104]
- 100.12 Finite Element Analysis Report and Model. A Finite Element Model of the hull girder shall be developed and completed during the Contract Design period in order to validate that the structural design meets the requirements. [100-01-1386]
- 100.12.1 A course mesh Finite Element Hull Model shall be provided in accordance with the requirements.
- 100.12.2 Fine mesh modeling shall be accomplished to determine stress concentration factors for strength and fatigue evaluations.
- 100.13 System Level Structural Drawings. The Contractor shall develop a set of System Level Structural Drawings. These shall depict the structural design that is demonstrated by the calculations to meet the design requirements.
- 100.13.1 For Preliminary Design, the following shall be provided:
- 100.13.1.1 Midship Section Drawing. [100-01-1376]
- 100.13.1.2 Standard Structural Details. [100-01-1395]

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- 100.13.1.3 Scantling Drawings. [100-01-1382]
- 100.13.2 For Contract Design the following shall be provided:
- 100.13.2.1 Scantling Drawings. [100-01-1382]

**184 Combat System Alignment**

- 184.1 Combat System Alignment Plan. The contractor shall provide a Combat System Alignment Plan which defines the C4ISR and weapons systems requirements for alignment to the ship's defined reference planes. [184-01-2330]
- 184.1.1 The Combat System Alignment Plan shall be in accordance with the NAVSEA Combat System Alignment Manual, Alignment Theory SW225-AO-MMA-010/OP762.

**200 Propulsion System**

- 200.1 Propulsion Systems Analysis. The Contractor shall develop and analyze the propulsion system.
- 200.2 Trade-Off Study. During Preliminary Design the Contractor shall conduct a Propulsion System Trade-Off Study and provide a report. [200-01-2227]
  - 200.2.1 The Contractor shall develop selection criteria, analyze alternatives, select a propulsion plant configuration and develop rationale. The Contractor shall integrate the trade-off analysis with the electric plant design development.
  - 200.2.2 The Contractor shall develop, for each option:
    - 200.2.2.1 Propulsion support auxiliary equipment descriptions.
    - 200.2.2.2 An equipment list.
    - 200.2.2.3 Arrangements.
    - 200.2.2.4 Weight estimates.
    - 200.2.2.5 Sustained speed estimate.
    - 200.2.2.6 Continuous speed range for each operating mode.
    - 200.2.2.7 Endurance fuel load.
    - 200.2.2.8 Propulsion redundancy assessment.

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- 200.2.2.9 Intake and uptake design and arrangement.
- 200.2.2.10 The following operating and support considerations:
  - 200.2.2.10.1 Fuel oil consumption.
  - 200.2.2.10.2 Lube oil consumption and commonality with machinery plant.
  - 200.2.2.10.3 Maintenance and overhaul including Time Between Overhaul (TBO) for propulsion diesel engines.
  - 200.2.2.11 Operating modes.
  - 200.2.2.12 Reliability, Maintainability and Availability (RM&A) assessment.
  - 200.2.2.13 High programmatic or technical risk assessment.
- 200.2.3 The Contractor shall support the trade-off study with a market survey for major equipment selection.
- 200.2.4 For electric propulsion systems, the contractor shall also develop:
  - 200.2.4.1 Electric plant design.
  - 200.2.4.2 Electric Plant Load Analysis (EPLA)
  - 200.2.4.3 TBO of each generator set.
- 200.2.5 If an Integrated Diesel Electric (IDE) Propulsion Drive design is included in the design, the Contractor shall include risk mitigation strategies in the Propulsion System Trade-Off Study to demonstrate that the following areas of concern have been addressed:
  - 200.2.5.1 Electric Plant Survivability.
  - 200.2.5.2 Power Quality.
  - 200.2.5.3 Machinery Arrangements.
  - 200.2.5.4 Electric Plant Requirements relative to OPC System Specification.
  - 200.2.5.5 Operating Range.
  - 200.2.5.6 Interoperability.
  - 200.2.5.7 Operational Sustainment and Workforce Allocation.
  - 200.2.5.8 Reliability/Maintainability/Availability.
  - 200.2.5.9 Training.
  - 200.2.5.10 Life Cycle Costs.
- 200.3 Propulsion System Report. During Contract Design the Contractor shall refine the selected propulsion plant design, verify its performance and update the Propulsion System Report. [200-01-2115]
  - 200.3.1 The Contractor shall develop:

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- 200.3.1.1 Propulsion support auxiliary equipment descriptions.
- 200.3.1.2 Sustained speed estimate.
- 200.3.1.3 The speed-power relationship for twin screw and trail shaft operation.
- 200.3.1.4 Operating modes.
- 200.3.1.5 TBO for propulsion diesel engines.
- 200.3.2 The Contractor shall update the market survey to include technical data for candidate equipment for the selected propulsion plant including diesel engines, reduction gears, bearings, clutches, couplings, seals, exhaust silencers.
- 200.3.3 The Contractor shall determine the propulsion system equipment and its performance characteristics and estimate the equipment configuration characteristics.
- 200.3.4 For each operating mode the Contractor shall:
  - 200.3.4.1 Determine the minimum and maximum continuous speeds.
  - 200.3.4.2 Determine the fuel consumption - speed relationship.
  - 200.3.4.3 Determine the range - speed relationship.
- 200.3.5 The Contractor shall determine the acceptable fuel types.
- 200.3.6 The Contractor shall determine the required lubricating oils and identify adverse effects on performance of alternative lubrication oils.
- 200.3.7 The Contractor shall determine how emissions requirements are met.
- 200.4 Ship Endurance Fuel Requirements. During Contract Design the Contractor shall provide the Calculation of Surface Ship Endurance Fuel Requirements. [200-01-1412]
- 200.5 Propulsion Redundancy Computations and Analysis Report. During Contract Design the Contractor shall verify, in accordance with the OPC System Specification (NVR 2-6-1), that the propulsion redundancy requirements are met and provide the Propulsion Redundancy Computations and Analysis Report. [200-01-1408]
- 200.6 Propulsion System Dynamic Analysis Report. The Contractor shall analyze the performance of the propulsion system during anticipated steady state and transient maneuvers, as well as dead shaft pickup sequences and transitioning between operating modes and provide a Propulsion System Dynamic Analysis Report. [200-01-1433]

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**202 Machinery Control System**

- 202.1 Engineering Design. The Contractor shall be responsible for the overall engineering design of:
- 202.1.1 Propulsion Engines, associated clutches and couplings and associated Propulsion Control System (PCS).
  - 202.1.2 Reduction Gears, Shafting and Bearings, Propulsors and Pitch Controls.
  - 202.1.3 Auxiliary Propulsion Motors, Propulsion Motor Controllers, and interconnecting cabling.
  - 202.1.4 Diesel Generators.
  - 202.1.5 Power Generation and Electrical Distribution System and associated Electrical Plant Control System (EPCS).
  - 202.1.6 Machinery Plant Control and Monitoring system (MPCMS).
  - 202.1.7 Auxiliary Systems.
  - 202.1.8 Damage Control Systems.
- 202.2 HM&E Machinery Controls Development Integrated Master Plan. The Contractor shall provide the HM&E Machinery Controls Development Integrated Master Plan (IMP). [202-01-2048]
- 202.2.1 The Contractor shall plan and schedule the integration of the design, vendor interface, testing, validation, documentation, and performance of the MPCMS, EPCS, PCS and the MPCMS Local Area Network (LAN) and its interfaces to the Propulsion Plant and Electric Plant LANs, as well as other subsystem interfaces and responsibilities listed in the OPC System Specification.
  - 202.2.2 The Contractor's planning shall include the machinery controls hardware and software development, signal lists, networking, machinery integration and the required machinery controls data products.
  - 202.2.3 The Contractor shall plan HMI development and review schedules, Factory Acceptance Testing (FAT) for MPMCS, EPCS, PCS, and integration testing for the control systems.
- 202.3 Functional Block and Schematic Block Diagrams. The Contractor shall provide Functional Block Diagrams (FBDs) and Schematic Block Diagrams (SBDs). [202-01-2054]
- 202.3.1 The FBDs shall allocate the OPC System Specification requirements to functions of MPCMS, PCS, EPCS, and respective subsystems. The SBDs shall show data flow between functions.
- 202.4 During Contract Design the Contractor shall provide the following:

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- 202.4.1 Machinery Control Development Environment to identify MPCMS, PCS and EPCS programmable devices -including Programmable Logic Controllers (PLCs), PCs, and network equipment as well as their respective programming and operating software. [202-01-2218]
- 202.4.2 The contractor shall provide an Interface Design Description (IDD) and Diagram of the MPCMS, PCS, EPCS and their respective subsystems -to supplement the integration of machinery control, including remote control. [202-01-2061]
- 202.4.3 The Contractor shall provide a preliminary signal list for MPCMS, PCS, EPCS, and local controlled machinery. [202-01-1421]
- 202.4.4 The Contractor shall provide a Machinery System Integration Plan for the MPCMS, PCS, EPCS, and the Machinery Plant including Hardware Configuration Items (HWCIs), Computer Software Configuration Items (CSCIs) and manual operations. [202-01-1427]
- 202.4.5 The Contractor shall provide a Network Architecture Report that defines the architecture of the machinery controls system networks which includes network design, physical and network security, and interconnects within and between MPCMS, PCS and EPCS. [202-01-2052]
- 202.4.6 The Contractor shall provide a Human-Machine Interface (HMI) Style Guide which describes and illustrates the guidelines of the machinery controls HMI designs. [202-01-2050]
- 202.4.7 The Contractor shall document and deliver MPCMS, PCS, and EPCS Design Data and Analysis for ship responses, maneuvering, simulations, system response times, scan times, safety, security, failure detection and system reconfiguration, system startup/shutdown times, system load analysis, and network transmission times. [202-01-2049]

**235 Electric Drive Propulsion System**

- 235.1 One Line Diagram. During Contract Design the Contractor shall provide the Electric-Drive Propulsion System One Line Diagram (if an Electric Propulsion System or IDE is provided). [235-01-2219]

**243 Propulsion Shafting**

- 243.1 Design and analysis. The Contractor shall design and analyze the propulsion shafting.

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- 243.2 Drawings. During Contract Design the Contractor shall provide the Main Propulsion Shafting Arrangement and Details Drawing. [243-01-1437]
- 243.3 Analysis. During Contract Design the Contractor shall provide the Propulsion Shafting Alignment Analysis and Propulsion Shafting Stress Analysis. [243-01-2232]

**244 Propulsion Shaft Bearings and Seals**

- 244.1 Design and analysis. The Contractor shall design and analyze the propulsion shaft bearings and seals.
- 244.2 Drawings. During Contract Design the Contractor shall provide Line Shaft Bearing Drawings, Stern Tube and Strut Bearing Drawings, and Thrust Bearing Drawings limited to elevation and plan views of the completely assembled line shaft bearings, stern tube bearings, strut bearings, and thrust bearings. [244-01-2091]
- 244.3 Analysis. During Contract Design the Contractor shall provide the Line Shaft Bearing Location and Radial Loads Calculations, Stern Tube and Strut Bearing Location and Radial Loads Calculations, and Thrust Bearing Location and Thrust and Radial Loads Calculations. [244-01-2092]
- 244.3.1 In addition to thrust bearing location and thrust and radial load calculations, thrust bearing stiffness calculations shall also be provided.

**256 Propulsion Machinery Seawater Cooling**

- 256.1 Design and analysis. The Contractor shall design and analyze the Machinery Seawater Cooling System.
- 256.2 Diagrams. The Contractor shall provide Machinery Seawater Cooling diagrams. [501-01-2029]
- 256.3 Analysis. The Contractor shall perform Machinery Seawater Cooling System calculations and provide a report. [501-01-2034]
- 256.3.1 Computer flow analysis models of frequently operating seawater piping shall be provided. The computer models shall be based on the system diagrams.
- 256.3.2 The associated system diagram shall be submitted concurrently.
- 256.3.3 Computer models shall demonstrate that design flow rates and design pressures will be met and are within the component

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manufacturer's recommendations under worst-case conditions and that pipe velocities are within required limits under all worst-case conditions.

- 256.3.4 Calculations shall demonstrate the efficiency of the system and power consumption.
- 256.3.5 Flows, pressures and temperatures associated with each mode of system operation shall be included, such as shore, anchor, cruise, and functional (such as battle and UNREP) operating conditions. In generating the individual load cases for the various operating conditions (summer and winter conditions, etc.), consideration must be given to reduced system cooling demand caused by equipment isolation, reduced heat load, and variations in ambient seawater temperature.
- 256.3.6 For each operating condition and mode, calculations shall determine pressures, flow velocities, and flow rates at seawater service pump discharges; at pump discharge connections to seawater mains; in the seawater service main; in branches supplying more than one load; at branch connections upstream and downstream of reducing stations and orifices; in supply and return lines for each cooling load; and through heat exchanger inlet flanges and heat exchanger tubes. Normal operation is with the minimum number of pumps and heat exchangers on-line to satisfy each condition. Abnormal operation is with at least one extra pump on-line; or selected heat exchangers throttled or secured; or pumps operating at extreme ends of the main to cause maximum flow through the mains; or heat exchanger combinations causing maximum flow through branch lines serving more than one load. As a minimum, the following modes shall be analyzed:
- 256.3.6.1 Mode A - Normal. Minimum required number of pumps and heat exchangers operating with a well distributed load. Manual throttle valves are fully open.
- 256.3.6.2 Mode B - Abnormal. One more pump than minimally required is on-line. This pump may be located anywhere in system configuration and any normally secured pump may be selected. Manual throttle valves are fully open.
- 256.3.6.3 Mode C - Abnormal Same as Mode B except that pumps and heat exchangers are selected to cause maximum flow in the seawater system main.
- 256.3.6.4 Mode D - Abnormal. Pumps same as Mode A. Seawater demands are adjusted consistent with a seawater temperature of 28°F.

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**259 Combustion Air Exhaust System**

- 259.1 Design and analysis. During Contract Design the Contractor shall design and analyze the combustion air intake and exhaust systems.
- 259.2 Analysis Report. The contractor shall provide a Combustion Air Intake and Exhaust Systems Analysis Report. [259-01-1465]
- 259.2.1 The Contractor shall perform air flow modeling throughout a range of attitudes and wind directions to verify adequate intake and exhaust air flow under most expected operating conditions.
- 259.2.2 The Contractor shall perform pressure drop and backpressure calculations in accordance with the OPC System Specification.

**264 Lube Oil Fill, Transfer and Purification**

- 264.1 Design and analysis. The Contractor shall design and analyze the Lube Oil Fill, Transfer and Purification Systems.
- 264.2 Diagrams. The Contractor shall provide Lube oil system diagrams. [501-01-2029]
- 264.3 Analysis. During Contract Design the Contractor shall perform lube oil system calculations and provide a report. [501-01-2034]

**300 Electric Plant**

- 300.1 Electric Plant design. The Contractor shall develop the Electric Plant design and perform verification analyses.
- 300.2 Documentation. During Preliminary Design the Contractor shall provide:
- 300.2.1 Electric Plant Design Report. [300-01-1472]
- 300.2.2 Electrical One Line Diagram. [300-01-1473]
- 300.2.3 Electric Plant Load Analysis. [300-01-1474]
- 300.2.4 Electric Plant Control System (EPCS) Report. [300-01-1476]
- 300.3 Trade-off study. During Preliminary Design the Contractor shall conduct a trade-off study for providing and controlling the export power interface. The Contractor's study shall include system safety, particularly protection of the ship's electrical power distribution system, and safety of establishing and energizing the

## STATEMENT OF WORK FOR PRELIMINARY AND CONTRACT DESIGN (P&amp;CD)

interface. Based on the results, the Contractor shall provide the Export Power Design Report. [320-01-1537]

- 300.4 Documentation. During Contract Design the Contractor shall provide the following:
- 300.4.1 The updated Electric Plant Design Report. [300-01-1472]
  - 300.4.2 The updated Electrical One Line Diagram. [300-01-1473]
  - 300.4.3 The updated Electric Plant Load Analysis. [300-01-1474]
  - 300.4.4 The updated Electric Plant Control System (EPCS) Report and Description. [300-01-1476]
  - 300.4.5 The updated Export Power Design Report. [320-01-1537]
  - 300.4.6 Electrical System Survivability Analysis. [300-01-1485]
  - 300.4.7 Dead Ship Recovery Concept of Operations. [320-01-2263]
  - 300.4.8 General lighting, normal and alternate One Line diagrams. [331-01-1627]
  - 300.4.9 List of Essential Service Loads. [320-01-2253]
  - 300.4.10 HIL (Hardware-In-the-Loop) Sim/Stim Test Plan. [324-01-2273]
  - 300.4.11 System Control and Power Block Diagrams for the following systems: [300-01-1484]
    - 300.4.11.1 Hydraulics.
    - 300.4.11.2 Weapons.
    - 300.4.11.3 Sewage.
    - 300.4.11.4 Steering Gear.
    - 300.4.11.5 HVAC.
    - 300.4.11.6 Chilled Water.
    - 300.4.11.7 Deck Machinery.
    - 300.4.11.8 Potable Water.
    - 300.4.11.9 Fuel.
    - 300.4.11.10 Propulsion.
    - 300.4.11.11 Boat Davit.
    - 300.4.11.12 Fire Fighting.
    - 300.4.11.13 Hoist.
    - 300.4.11.14 Crane.
    - 300.4.11.15 Generator Set.

## STATEMENT OF WORK FOR PRELIMINARY AND CONTRACT DESIGN (P&amp;CD)

**400 Electronic Systems**

- 400.1 Designs and plans. The Contractor shall prepare designs and plans for the C4ISR system.
- 400.2 Configuration. The Contractor shall utilize Figure 400-1, as a point of departure for Phase I efforts to develop configuration and interface hardware/software documents.
- 400.3 As-Designed Allocated Baseline Configuration. The Contractor shall prepare and present evolved FBDs at each PMC with the KDR FBD submittal representing the Contractor's C4ISR As-Designed Allocated Baseline Configuration.
- 400.4 Documentation. For each of the C4ISR subsystems, and the meteorological system the Contractor shall provide:
- 400.4.1 Functional Block Diagrams. [400-01-2310]
- 400.4.2 C4ISR Interfaces. The Contractor shall design and develop a system of hardware/software/middleware to meet the C4ISR interface requirements.

STATEMENT OF WORK FOR PRELIMINARY AND CONTRACT DESIGN (P&CD)

**Notional OPC C4ISR Configuration**

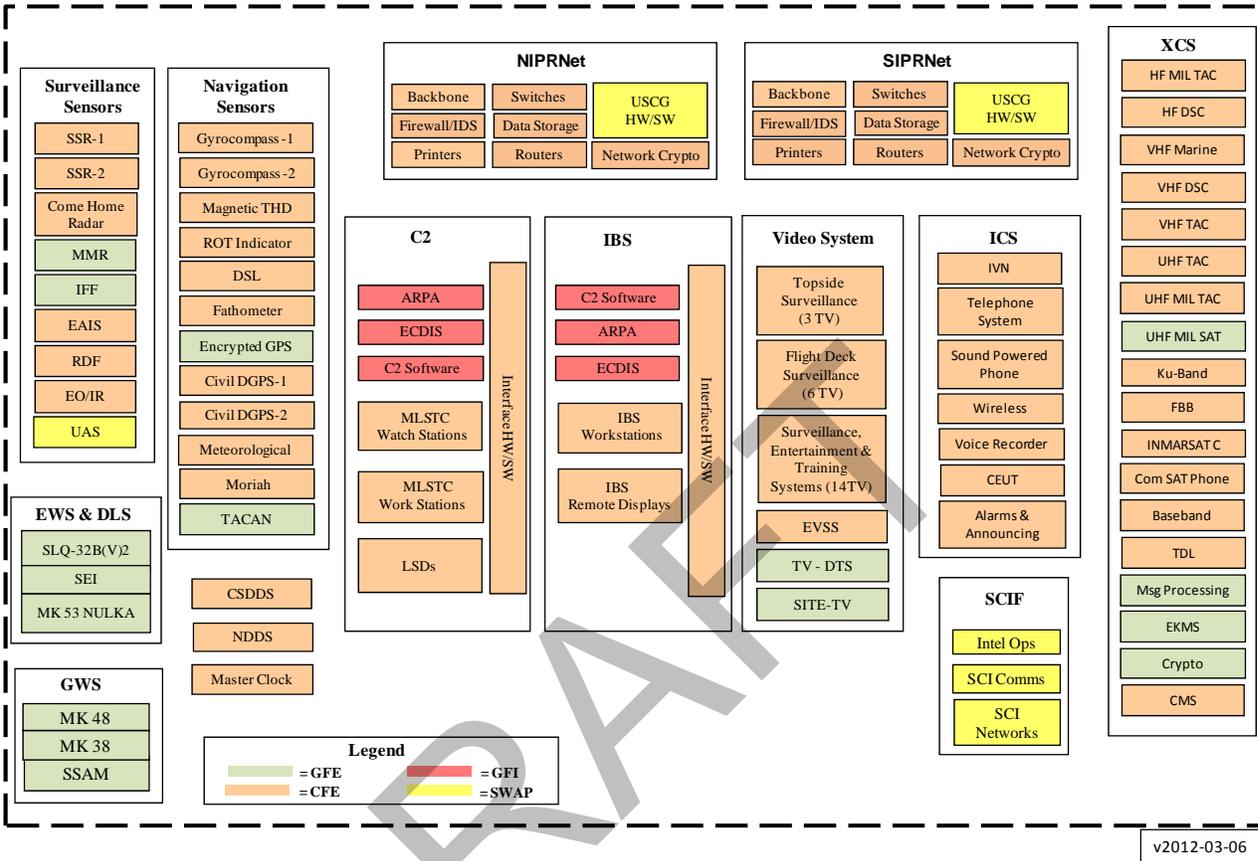


Figure 400-1:

**402 Secure Electronic Information Processing Systems**

402.1 Information Assurance. The Contractor shall provide an Information Assurance (IA) Plan in accordance with the OPC System Specification. [402-01-2344]

402.1.1 For both classified and unclassified systems, the Contractor shall include a Security Technical Implementation Guide (STIG) for the system design, including an Open for Functionality (OFF) document detailing the vulnerabilities which will be left open and mitigating controls that will be put into place to reduce the risk without affecting system functionality.

## STATEMENT OF WORK FOR PRELIMINARY AND CONTRACT DESIGN (P&amp;CD)

**404 C4ISR Radio Frequency (RF) Transmission Lines**

- 404.1 Routing. The Contractor shall identify suitable routes for waveguides that satisfy the Multi-Mode Radar waveguide design constraints.
- 404.1.1 The Contractor shall utilize NAVSEA 0967-LP-000-0110 for designing the routes.
- 404.2 Drawings. The Contractor shall provide the Waveguide Routing Reservation Drawing & Waveguide Routing Drawing. [404-01-1641]

**405 Antenna Systems Arrangements**

- 405.1 Drawings. The Contractor shall develop the Topside Antenna Systems Arrangement Drawing in accordance with the OPC System Specification. [405-01-1090]
- 405.2 Topside Design and General Arrangement Exterior Configuration drawings. The antenna arrangement drawings depicting the location of each antenna shall be incorporated into the Topside Design and General Arrangement Exterior Configuration drawings (Plan and profile).

**407 Electromagnetic Environmental Effects (E3) and Bonding and Grounding**

- 407.1 E3 Compatibility Plan. During the Contract Design period the Contractor shall provide an E3 Compatibility Plan. [407-01-1657]
- 407.2 TEMPEST. During the Contract design period the Contractor shall provide a Telecommunications Electronics Material Protected from Emanating Spurious Transmissions (TEMPEST) Control Plan. [407-01-1638]

**415 Computing Network System (CNS)**

- 415.1 Network Architecture Report. The contractor shall provide a Network Architecture Report for the OPC Computing Network System (CNS). [415-01-2333]
- 415.1.1 The Contractor shall tailor the report on the outline in the OPC System Specification (NVR 4-1-13 and 4-1-14).

## STATEMENT OF WORK FOR PRELIMINARY AND CONTRACT DESIGN (P&amp;CD)

**420 Navigation Systems**

- 420.1 Reports. The Contractor shall provide navigation systems reports for Navigation Systems including Integrated Bridge, design, operational description, identification of features monitored and alarms that will be displayed. [400-01-2122]

**430 Interior Communication (IC) Systems**

- 430.1 Report. The Contractor shall provide an Internal Communication (IC) Systems Report that includes: [430-01-1673]
- 430.1.1 Shoretie Communication System (Section 431).
- 430.1.2 Telephone (Section 432).
- 430.1.3 Amplified Voice Communications Systems (Section 433).
- 430.1.4 Surveillance, Training and Entertainment Systems (Section 434).
- 430.1.5 Electrical Alarm, Safety and Warning Systems (Section 436).
- 430.1.6 Video Systems (Section 439).

**443 Visual and Audible Systems**

- 443.1 Whistle Operating System Functional Block Diagram. During the Contract Design period the Contractor shall provide the Whistle Operating System Functional Block Diagram. [443-01-2171]

**501 Auxiliary Systems**

- 501.1 Design. The Contractor shall design and analyze the Auxiliary Systems.
- 501.2 Drawings. During the Contract Design, the Contractor shall provide Main and Auxiliary Machinery Arrangements Drawings. [501-01-2028]
- 501.3 Diagrams. The Contractor shall provide Auxiliary System Diagrams as applicable to the design. [501-01-2029]
- 501.4 Analysis. The Contractor shall perform Auxiliary System Calculations and provide reports. [501-01-2034]
- 501.4.1 The Contractor shall determine and prepare technical rationale for the worst-case conditions for each calculation.

## STATEMENT OF WORK FOR PRELIMINARY AND CONTRACT DESIGN (P&amp;CD)

- 501.4.2 The Contractor shall verify that design flow rates and design pressures are met and are within the component manufacturer's recommendations under normal and worst-case conditions and that pipe velocities are within required limits. The Contractor shall determine flows, pressures and temperatures associated with system operation.
- 501.4.3 The Contractor shall, where applicable to the system, size the pumps, compressors, flasks, reservoirs, sumps, tanks, plants, manifolds, strainers, and valves.
- 501.4.4 The Contractor shall, for systems which require vents and ducts instead of pipes, size the vents and ducts based on a nominal round duct size.
- 501.4.5 The Contractor shall determine the efficiency of the system and power consumption.
- 501.5 Miscellaneous Tank Drawing. During Contract Design the Contractor shall design and analyze non-integral tanks and provide a Miscellaneous Tank Drawing. The Contractor shall determine: [501-01-2032]
- 501.5.1 The principal dimensions of each tank.
- 501.5.2 The total volume and usable volume of each tank.
- 501.5.3 The size, type and location of each connection.
- 501.5.4 The maintenance and repair accessibility of each tank.

**512 HVAC and Refrigeration**

- 512.1 Design and Analysis. The Contractor shall design and analyze the HVAC system and air conditioning plant.
- 512.2 Diagram. The Contractor shall provide an HVAC system diagram. [501-01-2029]
- 512.3 HVAC Equipment List. During the Contract Design, the Contractor shall determine the HVAC system equipment and provide an HVAC Equipment List. [512-01-1718]
- 512.4 Design Criteria Manual. The Contractor shall provide a Heating, Ventilation and Air Conditioning Design Criteria Manual. [512-01-2101]
- 512.5 Heating and Cooling Load Calculations. The Contractor shall perform HVAC Heating and Cooling Load Calculations and provide a report. [512-01-1719]

## STATEMENT OF WORK FOR PRELIMINARY AND CONTRACT DESIGN (P&amp;CD)

- 512.6 Calculations. During the Contract Design, the Contractor shall perform Refrigeration System Sizing Calculations. [516-01-1732]
- 512.7 Refrigeration System Design Report. During the Contract Design, the Contractor shall provide a Refrigeration System Design Report. [516-01-2275]

**549 Lubricants**

- 549.1 Lubricants and hydraulic fluids list. The Contractor shall provide a List of Lubricants and hydraulic fluids for machinery, equipment and components. [549-01-1788]

**555 Firefighting Systems**

- 555.1 Calculations. During the Contract Design the Contractor shall provide Type Approved and Packaged Fixed Fire Fighting System Calculations. [555-01-2040]

**556 Hydraulic Power Transmission System**

- 556.1 Hydraulic System diagrams. The Contractor shall provide Hydraulic System diagrams. [501-01-2029]
- 556.2 Calculations. During Contract Design the Contractor shall perform Hydraulic Power Transmission Systems Calculations and provide a report. [556-01-1805]

**562 Maneuvering Systems**

- 562.1 Calculations. During Contract Design the Contractor shall provide Rudder and Rudder Stock Design Calculations. [562-01-1820]

**568 Bow Thrusters**

- 568.1 Calculations. During Contract Design the Contractor shall develop and analyze the bow thruster design and provide the Thruster Design Calculations and Analysis. [568-01-1828]

## STATEMENT OF WORK FOR PRELIMINARY AND CONTRACT DESIGN (P&amp;CD)

- 568.1.1 The Contractor shall estimate the thrust, power and efficiency required to satisfy the OPC System Specification at full load displacement, 110% full load displacement and at the minimum operating condition.
- 568.2 Drawings. During Contract Design the Contractor shall provide Thruster Arrangement Drawings. [568-01-1827]

**572 Stores Handling Systems**

- 572.1 Design. The Contractor shall develop a preliminary design of the Stores Elevator Systems including hoisting machinery, car, trunk, rails, and accesses at each deck level and provide Stores Elevator Preliminary Arrangements Drawings. [572-01-2266]

**580 Weight Handling Systems**

- 580.1 Design and Analysis. The Contractor shall design and analyze the weight handling systems to support the OPC System Specification. The Contractor shall coordinate and integrate the weight handling systems and ship arrangement to minimize the required equipment. The Contractor shall provide the Integrated Weight Handling Report. [580-01-2265]
- 580.2 Boat Davit Analysis. The Contractor shall analyze the boat davit system to verify the feasibility that the system's structural interface, power train and rigging can satisfy strength requirements when subjected to the required ship motions while in operation and when stowed. [583-01-1901]
- 580.3 Stores Crane Analysis. The Contractor shall analyze the stores crane system(s) to verify the feasibility that the system's structural interface, power train and rigging can satisfy strength requirements when subjected to the required ship motions while in operation and when stowed. [589-01-1933]

**582 Mooring and Towing Systems**

- 582.1 Design. The Contractor shall design the Mooring and Towing Systems and provide a report. [582-01-2267]
- 582.1.1 The Contractor shall select the mooring hawsers and determine the mooring systems line loads.

## STATEMENT OF WORK FOR PRELIMINARY AND CONTRACT DESIGN (P&amp;CD)

- 582.1.2 The Contractor shall select the primary and secondary towing hawsers and determine the towing system line loads.

**593 Environmental Pollution Control Systems**

- 593.1 Environmental Pollution Control Systems Report. The Contractor shall provide the Environmental Pollution Control Systems Report that includes waste stream diagrams, system and stowage concepts. The report shall address: [593-01-1938]
- 593.1.1 Grey water / sewage collection, storage and treatment system including the VCHT system.
- 593.1.2 Bilge water / oily waste collection, storage and treatment.
- 593.1.3 Solid waste collection, storage and treatment, including the incinerator.
- 593.1.4 Ballast water treatment system (shown with the ballast system).
- 593.1.5 Hazardous Materials (HAZMAT) collection, stowage and removal.

**630 Coatings and Corrosion Control**

- 630.1 Corrosion Prevention and Control Plan. The Contractor shall provide a Corrosion Prevention and Control Plan. [630-01-1981]

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

**CONTRACT DATA REQUIREMENTS****General**

This Attachment includes the Data Item requirements for Phase I and Phase II. Phase I and Phase II form DD 1423 templates are provided as enclosures (1) and (2).

The definitions for Block 10 and Block 12 acronyms are in Tables 1 and 2.

Data Item Numbers: Data items are identified using the following 3-part approach:

- XXX: SWBS identifier for the item
- YY: Indicates the following Program Periods:
  - 01 - Phase I Preliminary and Contract Design
  - 03 - Phase II Detail Design
  - 04 - Phase II Construction
  - 05 - Life Cycle Engineering
- ZZZZ: Unique Sequence Number - Identifies a submittal.

There are no data delivery requirements associated with the General Statement of Work.

There is a separate group of submittals for each Program Period. Where submittals associated with different Program Periods have identical Sequence Numbers, the data requirements for later submittals are the same as for earlier submittals, except where noted. Where the Form DD 1423 does not provide specific additional data requirements for each submittal, the Contractor shall provide an update of the previous submittal.

Example:

A Phase I Preliminary and Contract Design submittal has a Data Item Number of 562-01-1820.

A Phase II Detail Design submittal has a Data Item Number of 562-03-1820.

The base data requirements for the Phase II Detail Design submittal are as specified in the Phase I Preliminary and Contract Design version of the 1423 with any additional requirements specified.

**DD 1423 Block information:**

Block 1 Data Item No.: See attached forms DD 1423.

Block 2 Title of Data Item: See attached forms DD 1423.

Block 3 Subtitle: Not used.

Block 4 Authority: See attached forms DD 1423.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

Block 5 Contract Reference: Not used. The Data Item Number provides the contract cross reference to the applicable section(s) of the SOW.

Block 6 Requiring Office: Not used.

Block 7 DD 250 Req: See Section C.

Block 8 Approval Code: During Phase I, deliverables are for Acceptance only. During Phase II, deliverables are for Acceptance, Approval, or Information as indicated in the 1423. These are defined as follows:

Acceptance: The USCG will provide a response that indicates acceptance, comments identifying non-compliance, or rejection.

Approval: The USCG will provide a response that indicates approval, comments identifying non-compliance, or disapproval. Where an item is required to be submitted for approval, it is intended that work shall not proceed until notification of approval is received. In the event the subject item is not approved, rationale will be provided and subject effort shall not proceed until such time as a satisfactory and mutually agreeable resolution has been resubmitted and approved.

Information: The USCG may provide comments.

Block 9 Distribution Statement: Not used.

Block 10 Frequency: See attached forms DD 1423. See Table 1.

Block 11 As of Date: Not used.

Block 12 Date of initial Submission: See attached forms DD 1423. See Table 2.

Block 13 Date of Subsequent Submission: See attached forms DD 1423. See Table 2.

Block 14 Distribution: Not used.

Block 15 Total: Not used.

Block 16: Remarks: See attached forms DD 1423.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

Table 1	Submittal Codes: Frequency
Blank	In BLK 10, there are no periodic (e.g., monthly, quarterly, annually) submittals.
WKLY	Weekly
BI-WKLY	Bi-weekly (every other week)
MTHLY	Monthly
BI-MTHLY	Bi-monthly (every other month)
QTRLY	Quarterly
SEMI-ANNLY	Every six months
ANNLY	Annually
ASREQ	As required

Table 2	Submittal Codes: Initial / Subsequent Submittal
YYYY/MM/DD	Specific Year/Month/Day
RAR	ReSubmit As Required (use only for Phase II Approval CDRLs)
DAC	Days After Contract Award; i.e., 15 DAC (include the space)
DAOE	Days After Option Exercised
DAPAC	Days after Post Award Conference.
DARP	Days After Reporting Period
DPPMC1	Days Prior to Program Management Conference #1
DPPDR	Days Prior to Preliminary Design Review
DAPDR	Days After Preliminary Design Review
DPPMC3	Days Prior to Program Management Conference #3
DPKDR	Days Prior to Contract Design Review
DPKOM	Days Prior to Kick-off Meeting
DPIBR	Days Prior to IBR
DPICDR	Days Prior to Initial Critical Design Review
DAICDR	Days After Initial Critical Design Review
DPFCDR	Days Prior to Final Critical Design Review
DPPRR	Days Prior to Production Readiness Review
DAPRR	Days After Production Readiness Review
DPT	Days Prior to Test
DATC	Days After Test Complete
DPL/D	Days Prior to Launching / Docking
DPBT	Days Prior to Builders Trials
DPAT	Days Prior to Acceptance Trials
DAAT	Days After Acceptance Trials
DPD	Days Prior to Delivery

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

DAD	Days After Delivery
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During Phase I, the Contractor shall incorporate responses to USCG comments in the next submittal of the deliverable, unless otherwise specified in the USCG response. During Phase II, the Contractor shall respond to USCG comments and resubmit deliverables updated in response to the comments within 30 days of receipt of the comments.

In subsequent submittals of a deliverable, the Contractor shall indicate on the cover page the version being submitted and include a change page that indicates changes to the paragraph level.

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 041-01-1004

BLK02-TITLE OF DATA ITEM: Contract Work Breakdown Structure

BLK04-AUTHORITY: DID Number: DI-MGMT-81334  
DID Title: Contract Work Breakdown Structure

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DAC

BLK 13-DATE OF SUBS SUBM: See BLK 16

BLK16-REMARKS:

BLK04: The CWBS shall be provided to the 3 digit SWBS level.  
BLK 13: Subsequent submittals shall be included as a part of the EVMS Plan.

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 041-01-1013

BLK02-TITLE OF DATA ITEM: Contractor's Draft Configuration Management Plan

BLK04-AUTHORITY:

DID Number:

DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM:

90 DPPDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

BLK04: Organize the plan according to Table A-3, Contractor CM Plan Content, in MIL-HDBK-61A. The plan shall also include C4ISR, GFE, and GFI.

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 040-01-2288

BLK02-TITLE OF DATA ITEM: Integrated Master Schedule

BLK04-AUTHORITY: DID Number: DI-MGMT-81650  
DID Title: Integrated Master  
Schedule (IMS)

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 10 DPPAC

BLK 13-DATE OF SUBS SUBM: 30 DPKDR

BLK16-REMARKS:

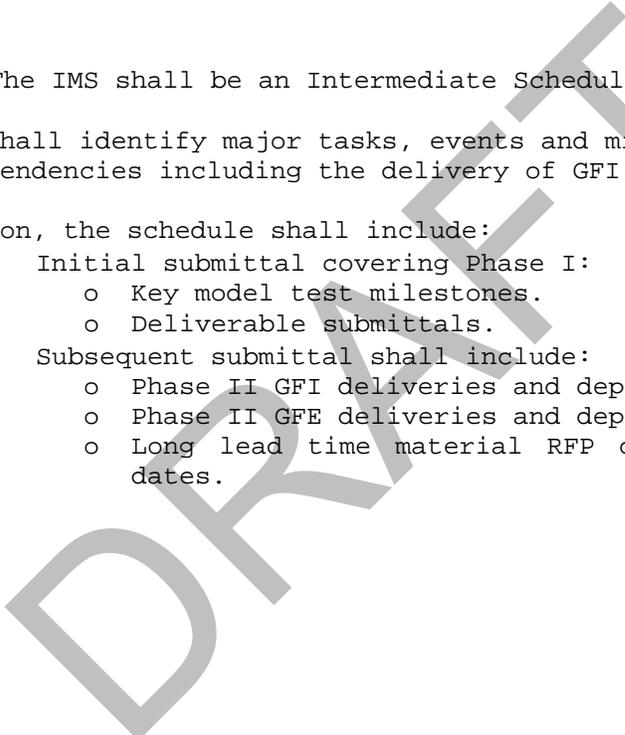
BLK04: The IMS shall be an Intermediate Schedule.

The IMS shall identify major tasks, events and milestones along with their dependencies including the delivery of GFI and GFE.

In addition, the schedule shall include:

- Initial submittal covering Phase I:
  - o Key model test milestones.
  - o Deliverable submittals.
- Subsequent submittal shall include:
  - o Phase II GFI deliveries and dependencies.
  - o Phase II GFE deliveries and dependencies.
  - o Long lead time material RFP dates and in-yard-need-dates.

041.2



## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 040-01-1001

BLK02-TITLE OF DATA ITEM: Management Plan

BLK04-AUTHORITY: DID Number: DI-MGMT-80004  
DID Title: Management Plan

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DAC

BLK 13-DATE OF SUBS SUBM: 90 DPKDR

BLK16-REMARKS:

BLK04: Modify DI-MGMT-80004 as follows:

- Requirements 2.c.: Delete and replace with: The plan shall be formatted to be printed on standard size paper, 8 ½ x 11 inches. The pages shall be sequentially numbered. As necessary, graphic material may be formatted as one-way fold-outs. All attachments shall be identified and referenced in the text. Each section and paragraph shall be numbered.
- Requirements 3.2: Delete the list of subjects and replace with:
  - o Design management
  - o PMC/ TM management
  - o Deliverable management
  - o Configuration management
  - o Model test management
  - o C4ISR management and integration

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 040-01-1009

BLK02-TITLE OF DATA ITEM: Program Management Milestone Design Reivew Plans and Presentations.

BLK04-AUTHORITY: DID Number: SEE BLK16  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: SEE BLK16

BLK 13-DATE OF SUBS SUBM: SEE BLK16

BLK16-REMARKS:

- BLK04: Milestone Design Review Plan: The plan shall include:
- Introduction with Purpose, Scope, Overview and Appliable Documents
  - Plan with Organizational Responsibilities, Team Responsibilities, Government Participation, Top Level Inputs, Review Process, Review Schedule, Process for resolving Requests for Action (RFA)
  - Metrics with Entrance and Exit Criteria a check list supporting each criterion.
  - Meeting announcement template
  - Meeting agenda templates
  - Meeting presentation template
  - Request for Action (RFA) template

Milestone Design Review Presentations: This shall consist of the presentation material, including speaker's notes for each slide, videos and hard copy material not available electronically.

- BLK12: The Contractor shall provide the following initial submittal:
- Initial PDR Plan: 30 DAC

- BLK13: The Contractor shall provide the following subsequent submittals:
- Final PDR Plan: 30 DPPDR
  - Initial PDR Presentations: 14 DPPDR
  - Final PDR Presentations: 14 DAPDR
  - Initial KDR Plan: 30 DAPDR
  - Final KDR Plan: 30 DPKDR
  - Initial KDR Presentations: 14 DPKDR
  - Final KDR Presentations: 14 DAKDR

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 042-01-1023

BLK02-TITLE OF DATA ITEM: Build Strategy and Producibility Report

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
 DID Title: Scientific and  
 Technical Reports System

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: SEE BLK 16

BLK 13-DATE OF SUBS SUBM: SEE BLK 16

BLK16-REMARKS:

Preliminary Submission: 120 DAC shall include:

1. The level of fabrication, assembly, outfitting and integration at various stages of the construction process.
2. How their OPC Build Strategy supports the USCG's OPC delivery schedule.
3. Long Lead Time Materials (LLTM), Contractor Furnished Material (CFM) and Government Furnished Material (GFM).
4. Design aspects driven or dependent on the build strategy
5. Producibility concerns such as industrial base capabilities and limitations
6. Description of current & planned shipyard facilities
7. Description of current and planned C4ISR development and production facilities

041.3

2<sup>nd</sup> Submission:

- 30 DPPDR shall include updates to the above and include:
1. Items categorized as any one or combination of the following attributes: high cost, high risk, or long-lead time. The Contractor shall provide details of how the production, delivery and integration of these items will be completed.
  2. A timeline for ordering LLTM with supporting vendor/supplier/Gov data.
  3. The Contractor shall define the following producibility items:
    - a. How the layout of the shipyard depicting the material, fabrication, outfitting and assembly process and flow has sufficient fabrication, assembly, and launch capacity to support construction.
    - b. The key personnel who will be overseeing the ship's design, construction and testing. The Contractor shall provide resumes, which shall include relevant experience.
    - c. The established work instructions and processes supporting the OPC Build Strategy.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

- d. Demonstration of sufficient engineering, fabrication, outfitting, assembly, integration and testing capability to include details of similarly sized ships that the Contractor has previously constructed.
  - e. The major equipment to be used in the ship's construction. If major equipment is needed but is not currently available at the Contractor's facility, the Contractor shall verify the necessary equipment is being purchased.
4. The Contractor shall demonstrate that the Contractor's facilities are adequate to execute their OPC Build Strategy, including but not limited to the following:
- a. Maximum Lift Capacity.
  - b. Plate Handling/Bending/Rolling Limitations.
  - c. Unit/Assembly Size Limitations.
  - d. Blast & Paint Facility.
  - e. Burning Machines.
  - f. Pipe Bending Machines.
  - g. Robotic Equipment.
  - h. Launch Capability.
  - i. Shore power capacity and quality
  - j. All other major pieces of equipment that will aid the Shipyard in construction.

3<sup>rd</sup> Submission:

30 DPKDR shall update the above to include Contract Design activities and resolve Government comments.

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 040-01-1029

BLK02-TITLE OF DATA ITEM: Conference Meeting Agenda, Presentation  
Material, Actions, Action TrackingBLK04-AUTHORITY: DID Number: SEE BLK16  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: SEE BLK16

BLK 13-DATE OF SUBS SUBM: SEE BLK16

BLK16-REMARKS:

BLK04: The Conference Meeting Agenda shall include the following:

- Program Name
- Program Element Name from Program Plan
- Conference Title / Subject
- Conference date, time and location
- Contractor POC / e-mail / phone
- Agenda topics

Presentation Material shall include:

- Slides
- Videos
- Hardcopy material not available electronically

Actions and Action Tracking shall include:

- Identification number
- Action short title
- Action description
- Name of person responsible for responding to the item
- Name of person authorized to close the item
- Due date for action response
- Outlook date
- Actual Response Date
- Date Closed
- Status / Closure comments

BLK12: The Contractor shall submit the initial Conference Meeting  
Agenda 14 days prior to the meeting.The Contractor shall submit initial presentation material 7  
days prior to the meeting.

The Contractor shall submit Actions 14 days after the meeting.

BLK13: The Contractor shall submit the final Conference Meeting Agenda  
at the meeting.The Contractor shall submit final presentation material 14 days  
after the meeting.

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

The Contractor shall submit Actions 14 days after the meeting.

The Contractor shall provide Action Tracking quarterly after the Actions have been submitted until the Actions have been closed by the person authorized to close the action.

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 042-01-1268

BLK02-TITLE OF DATA ITEM: Data Management Plan (DMP)

BLK04-AUTHORITY: DID Number: Contractor Format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DAPAC

BLK 13-DATE OF SUBS SUBM: 60DPICDR

BLK16-REMARKS: This plan shall address the generation and management of data associated with the OPC Program. This data includes, but is not limited to, administrative, engineering, configuration management, financial, logistics, quality, safety, manufacturing and procurement, subcontract and technical data and includes the administration of:

- Contract Recordkeeping Requirements
- Contract Data Requirements
- Data Duplication Control
- Quality Control
- Acquisition
- Administration of Subcontractors
- Storage and Retrieval Systems
- Identification and Handling of Data
- Maintenance and Control of Contractor-Developed Information
- Government Furnished Information
- Handling of Classified Information
- Financial Data
- Plans and Schedules
- Requests For Proposal
- Implementation of Data Requirements such as:
  - o Preparation
  - o Publication
  - o Control
  - o Distribution

- Retention  
- Retrieval  
- Disposition of Data

This plan establishes and describes the methodologies, procedures, program controls, and associated tasks necessary for implementing a Data Management System that complements the data products housed in the Integrated Data Environment (IDE).

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 042-01-1420

BLK02-TITLE OF DATA ITEM: System / Sub-system Requirements Specifications  
(RS)BLK04-AUTHORITY-: DID Number: DI-IPSC-81433  
DID Title: Software  
Requirements Specifications

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30DPPDR

BLK 13-DATE OF SUBS SUBM: See Block 16

BLK16-REMARKS:

BLK02 Applies to:

- System/Subsystem Requirements Specification (SSRS)
- Interface Requirements Specification (IRS)
- Software Requirements Specification (SRS)

## 041.4 Tailoring for DID Rev A

1. For all applications, provide information in accordance with (IAW) DID paragraph 4. , sub-paragraphs a. - g.
2. For the System/Subsystem Requirements Specifications, provide information IAW example paragraphs 3.2, 3.2.x, 3.9, 3.10, 3.10.1, 3.10.2, and 3.10.3
3. For Interface Requirements Specifications, provide information IAW example paragraphs 3.3 and 3.3.1
4. For Software Requirements Specification, provide information IAW example paragraphs 3.2, 3.2.x, 3.3.x, 3.4, 3.5, 3.6, 3.7, 3.11, 3.12

BLK 13: Updates shall be provided 30DPPMC3, and 30DPKDR.

BLK16: Separate packages shall be provided for C4ISR and Machinery Control Systems (MPCMS, PCS, EPCS).

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 042-01-1424

BLK02-TITLE OF DATA ITEM: Software Architecture Document (SAD)

BLK04-AUTHORITY-: DID Number: DI-MGMT-81644  
DID Title: DoD Architecture  
Framework Documentation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The applicable architecture products listed in Table 1 of DI-MGMT-81644A shall include:

AV-1 Overview and Summary Information.

OV-1 High-Level Operational Concept Graphic:

- Provide the Contractor's understanding of the OPC Operations.

SV-1 SYSTEMS INTERFACE DESCRIPTION

- Include the systems (logical elements) that interact with the subject system in the diagram(s).
- Include the systems nodes (physical elements/localities) that interact with the subject system node in the diagram(s).
- Represent the significant subsystems (belonging to the subject system) and their internal and external interactions.
- Include at least one interface class for each system-to-system node "pair".
- For each system-to-system node pair, "move" or allocate the operations to the corresponding interface class.
- For each system-to-system node pair, draw appropriate relationships to the applicable interface class

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 042-01-1550

BLK02-TITLE OF DATA ITEM: Software Development Plan

BLK04-AUTHORITY: DID Number: DI-IPSC-81427  
DID Title: Software Development  
Plan

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60DPPMC3

BLK 13-DATE OF SUBS SUBM: 90DPKDR

BLK16-REMARKS:

This plan shall include open architecture standards to be followed in the development of the software for all systems (C4ISR, HM&E, etc.) and interfaces; identification of the coding standards and development processes to be followed; project schedules and resources, reviews (internal/external) to be conducted; processes for test, verification, and problem resolution. The plan shall describe the methodology for developing software including the standards to be followed, the build processes to be used, configuration management approach, the verification methods to be followed, and load-out/delivery processes. The test strategy shall be contained in this SDP or in a related system test plan.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 042-01-2343

BLK02-TITLE OF DATA ITEM: Earned Value Management System Plan (EVMS)

BLK04-AUTHORITY: DID Number: Contractor Format (DI-  
MGMT-80004 for guidance)  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60DPPMC3

BLK13-DATE OF SUBS SUBM:

BLK16-REMARKS:

BLK04: The EVMS plan shall describe the implementation of EVMS to the contract which meets the all contract requirements. The plan shall provide documentation which verifies the EVMS system to be in compliance with ANSI/EIA-748 by a cognizant federal agency. The plan shall identify the major subcontractors, or major subcontracted effort if major subcontractors have not been selected, planned for application of the guidelines. The Contractor and the USCG will agree to sub-contractors selected for application of the EVMS criteria.

The plan shall include:

- EVMS overview
- Contractor's EVMS management structure and controls
- Contractual thresholds for reporting variances
- Methods for estimating Estimates at Complete (EAC) and EAC bottoms up review process and periodicity
- Methods and rules for establishing and maintaining the time phased Performance Measurement Baseline (PMB) throughout the contract period of performance (including baseline changes)
- Methods for assessing actual and earned value and criteria applicable to the type of costs incurred Subcontract earned value management
- CPR development process and content
- EVMS tools and systems for managing and processing EVM data
- Surveillance Reviews
- EVMS Training
- Integrated Baseline Review/s
- EV formulae
- EV definitions
- Contract Work Breakdown Structure (CWBS)
- Organizational Breakdown Structure (OBS)
- CWBS Dictionary
- Acronyms and abbreviations

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 042-01-2347

BLK02-TITLE OF DATA ITEM: Display Screen Designs/Layouts, Button Actions,  
and Operator Actions for Console & Work  
Stations

BLK04-AUTHORITY: DID Number: Contractor Format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30DPPMC3

BLK 13-DATE OF SUBS SUBM: 30DPKDR

BLK16-REMARKS:

Storyboards shall include the entire C4ISR system.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 068-01-1055

BLK02-TITLE OF DATA ITEM: Preliminary and Contract Design Reports

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports- Elements,  
Organization, and Design

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 14 DPPDR

BLK 13-DATE OF SUBS SUBM: 14 DPKDR

BLK16-REMARKS:

The Preliminary Design report shall include the following:

An assessment of the ship performance against the OPC System Specification performance requirements.  
A summary of the content of the individual Preliminary Design reports and description of the design integration efforts, including:  
Principal Characteristics Summary.  
Hullform and Performance.  
Weights and Stability.  
General Arrangements.  
Topside Design.  
Structures.  
Propulsion Plant.  
Electrical Plant.  
C4ISR.  
Auxiliary and Distributive Systems.  
Boat, Boat Handling, and Deck Systems.  
Aviation Facilities and Flight Deck.  
Outfitting.  
Weapons Systems.  
Survivability and Damage Control.  
HSI and Crewing.  
Results of Trade-Off Studies to document any trade-off analyses that support decisions that have significant impacts on acquisition cost, life-cycle cost, design or production schedule, cutter safety, integrity, or performance.  
Summary of Active and Retired Risks.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

A summary of the Design and Construction Margins and Service Life Allowances required and included in the ship design. This includes any margins or allowances required by the Specification as well as any additional margins specified by the Contractor. Design Margin usage shall be identified and justified.  
Cost Studies.

The Contract Design Report shall include:

An assessment of the Ship performance against the OPC System Specification performance requirements.

A summary of the content of the individual Contract Design reports and a description of design integration efforts, including:

Principal Characteristics Summary.

Hullform and Performance.

Weights and Stability.

General Arrangements.

Topside Design.

Structures.

Propulsion Plant.

Electrical Plant.

C4ISR.

Auxiliary and Distributive Systems.

Boat, Boat Handling, and Deck Systems.

Aviation Facilities and Flight Deck.

Outfitting.

Weapons Systems.

Survivability and Damage Control.

HSI and Crewing.

Results of Trade-Off Studies to document any trade-off analyses that support decisions that have significant impacts on acquisition cost, life-cycle cost, design or production schedule, cutter safety, integrity, or performance.

Diminishing Manufacturing Sources/Material Shortages

Summary of Active and Retired Risks.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

A summary of the Design and Construction Margins and Service Life Allowances required and included in the ship design. This includes any margins or allowances required by the OPC System Specification as well as any additional margins specified by the Contractor. Design Margin usage shall be identified and justified.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 068-01-1081

BLK02-TITLE OF DATA ITEM: Requirements Traceability and Verification Matrix

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and Technical Reports - Preparation, Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPPDR

BLK 13-DATE OF SUBS SUBM: 75 DPKDR

BLK16-REMARKS:

The Requirements Traceability and Verification Matrix shall include a discrete verification identification number to each requirement in the contract. The number shall be comprised of the ESWBS number that specifies the item or system being verified followed by an additional five digit number assigned sequentially for tracking purpose.

The matrix shall include the following for each requirement or decomposed requirement:

- Higher level requirement identification number (if decomposed)
- Requirement text
- Requirement type (performance, detail)
- For Preliminary Design:
  - Verification methods (Inspection, Analysis, Demonstration, Test)
  - Reference to requirements for verification method
  - Reference to verification document.
  - Verification Result (S-Verified to meet requirement; U - Verification failed)
- For Contract Design:
  - Verification methods (Inspection, Analysis, Demonstration, Test)
  - Reference to requirements for verification method
  - Reference to verification document.
  - Verification Result (S-Verified to meet requirement; U - Verification failed)

BLK01-SEQUENCE NO.: 068-01-1083

BLK02-TITLE OF DATA ITEM: Contractor's Risk Management Plan (CRMP) and Databse

BLK04-AUTHORITY: DID Number: DI-MGMT-81808  
DID Title: Contractor's Risk Management Plan

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK10-FREQUENCY: QTRLY  
 BLK12-DATE OF 1ST SUBM: 90 DAC  
 BLK 13-DATE OF SUBS SUBM:  
 BLK16-REMARKS:

The following definitions shall be used to assess and rate risk events:

Probability of Occurrence

Level			Normal approaches and processes
Remote	Very Low (<10%)	1	Will effectively avoid or mitigate this risk based on standard practices
Unlikely	Low (11-35%)	2	Have usually mitigated this type of risk with minimal oversight in similar cases
Likely	Medium (36-65%)	3	May mitigate this risk, but workarounds will be required
Highly Likely	High (66-90%)	4	Cannot mitigate this risk, but a different approach might mitigate this risk
Near Certain	Very High (>90%)	5	Cannot mitigate this type of risk, no known processes or workarounds are available

Severity of Consequence

Level		Cost	Schedule	Technical	Programmatic	Support
Minimal Impact	1	Minimal deviation from planned budget	Minimal schedule impact	Similar system in field currently meets all requirements	Issues that have minimal impact	Similar system currently being supported with established logistics
Marginal	2	<10% deviation from planned budget	Meet schedule with additional project resources or additional activities	Meets objective requirement but margin is low	Issues that can be mitigated by the Contractor alone	Support plan not fully resourced but multiple alternatives exist in the current market
Significant	3	10-15%	Slip less	Meets	Issues that	Support plan

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

		deviation from planned budget	than 4 months in key milestones	threshold with adequate margin	may require Government support	not fully resourced but one alternative exists in the current market
Critical	4	15-20% deviation from planned budget	More slip (over 4 months) in key milestones	Meets threshold with low or no margin	Issues that require extensive Government support	Support plan not fully resources but alternatives will be available in the near future
Unacceptable	5	>20% deviation from planned budget	Cannot meet key milestones	Does not meet threshold	Issue cannot be resolved	Support requirement exceeds resource capabilities

Risk Rating Matrix

Severity of Consequence	5	Unacceptable	5	10	15	20	25
	4	Critical	4	8	12	16	20
	3	Significant	3	6	9	12	15
	2	Marginal	2	4	6	8	10
	1	Minimal or no impact	1	2	3	4	5
			Remote	Unlikely	Likely	Highly Likely	Near Certainty
			1	2	3	4	5
Probability of Occurrence							

Risk Rating	Definition
High Risk	Unacceptable. Major disruption likely. Priority management attention required
Moderate Risk	Some disruption. Additional management attention required.
Low Risk	Minimal impact. Normal oversight needed to ensure risk remains low.

BLK04: The following definitions shall be used for the headings in Section 2.3 of the DID:

- a. Introduction: This section addresses the purpose and objective of the plan, and provide a brief summary of the program, to include the approach being used to manage the program, and the acquisition strategy.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

b. Scope: This section describes the extent that the CRMP covers all possible risks that may occur during design and construction. This section also lists assumptions that have gone into creating the CRMP.

c. Program Summary: This section contains a high level description of the Contractor's Risk Management program and how it supports the acquisition strategy.

d. Risk Management Strategy and Process: Provide an overview of the risk management approach, to include the status of the risk management effort to date, and a description of the program risk management strategy.

e. Responsible /Executing Organizational Component. Describe the risk management organization and list the responsibilities of each of the risk management participants.

f. Risk Management Process and Procedures: Describe the program risk management process to be employed; i.e., risk planning, assessment, handling, monitoring and documentation, and a basic explanation of these components. Also provide application guidance for each of the risk management functions in the process. It shall address how the information associated with each element of the risk management process will be documented and made available to all participants in the process, and how risks will be tracked, to include the identification of specific metrics if possible.

g. Risk Identification: This section describes the risk planning process and provides guidance on how it will be accomplished, and the relationship between continuous risk planning and this CRMP. Guidance on updates of the CRMP and the approval process to be followed shall also be included.

h. Risk Analysis: This section of the plan describes the assessment process and procedures for examining the critical risk areas and processes to identify and document the associated risks. It also summarizes the analyses process for each of the risk areas leading to the determination of a risk rating. This rating is a reflection of the potential impact of the risk in terms of its variance from known Best Practices or probability of occurrence, its consequence/impact on schedule, acquisition costs, and life cycle costs, and its relationship to other risk areas or processes. This section shall include:

- Overview and scope of the assessment process;
- Sources of information;
- Information to be reported and formats;
- Description of how risk information is documented; and
- Assessment techniques and tools

i. Risk Mitigation Planning: This section describes the procedures used to determine and evaluate various risk handling options.

j. Risk Mitigation Implementation:, This section identifies tools that can assist in implementing the risk handling process. It also provides guidance on the use of the various handling options for specific risks.

k. Risk Tracking: This section provides the procedure to document risks throughout the design and construction process. It also provides the procedure to identify how risks have been mitigated throughout the design and construction process.

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

Add subparagraph m to Section 2.3 as follows:

m. Definitions: Definitions used by the Contractor shall be consistent with DHS definitions for ease of understanding and consistency.

The Risk Database shall be included as an appendix. The risk database shall also include Cross-reference risk events to applicable sections of the OPC System Specification.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 068-01-2106

BLK02-TITLE OF DATA ITEM: Master Equipment List (MEL)

BLK04-AUTHORITY: DID Number: Contractor Format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPPDR

BLK 13-DATE OF SUBS SUBM: 60 DPKDR

BLK16-REMARKS:

BLK04: The MEL shall be in Microsoft Office Excel spreadsheet format.  
The MEL shall include:

- ESWBS: The appropriate 3-digit code selected from the ESWBS list.
- Equipment Name
- Equipment Location: The compartments that the equipment is located in.
- Quantity: The quantity of equipment to be installed in the compartment.
- Equipment Performance Characteristics
- Equipment Configuration Data
  - o Dimensions in inches, dimensions with maintenance and operational envelopes in inches
  - o Dry Weight: The weight of the equipment without operating fluids in pounds.
  - o Wet Weight: The total weight of the equipment including operating fluids in pounds.
  - o Electrical Power: The connected power required by the equipment in kW.
  - o Electric Phase: The electric phase of the equipment.
  - o Electrical Frequency: The electrical frequency of the equipment in Hz.
  - o Voltage: The voltage required by the equipment in volts.
- Potential Vendor(s)
- Model Number: Each potential manufacturer's part number, if available.
- Long Lead Time: Identifies if the equipment has long lead time.
- Critical: Identifies if the equipment is designated as critical equipment.
- Notes: Details describing the basis for the equipment characteristics.
- Date: The date the record was established/updated in the MEL.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 068-01-2285

BLK02-TITLE OF DATA ITEM: Systems Engineering Management Plan (SEMP)

BLK04-AUTHORITY: DID Number: DI-SESS-81785  
 DID Title: Systems  
 Engineering Management Plan  
 (SEMP)

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 140 DAC

BLK 13-DATE OF SUBS SUBM: 30 DPPDR, 30 DPKDR

BLK16-REMARKS:

The SEMP shall include a C4ISR Development Integrated Master Plan and a Machinery Plant Control and Monitoring System (MPCMS) Development Integrated Master Plan.

The SEMP shall identify the HM&E control system integrator that will execute the HM&E Machinery Controls Development Integrated Master Plan.

The SEMP shall include development and testing of the interface of the HM&E control and C4ISR systems.

The MPCMS portion of the SEMP shall include the Contractor's strategy for establishing a Land Based Test Facility.

The C4ISR portion of the SEMP shall include the Contractor's strategy for establishing a C4ISR Test and Integration Facility (TIF)

BLK04: Tailor DI-SESS-81785 as follows:

Paragraph 3: Delete the last sentence.

Paragraph 4: Delete and replace with: The SEMP topics shall address:

Scope: Describe the scope of the Systems Engineering (SE) effort.

Organization and Management:

- Describe the Contractor's SE organization and responsibilities.
- Include an organization chart
- Describe the responsibilities of each organizational element.
- Describe the relationships between the Contractor SE organization and the subcontractor organizations for managing the Machinery Control System and the C4ISR System and their interfaces.
- Describe the SE organization for cross functional areas: Human Systems Integration (HSI), System Safety, Electromagnetic Environmental Effects (E3), Reliability, Maintainability and Availability (RMA), Topside Integration, Integrated Logistics Support (ILS)
- Describe integration with the Contractor's Configuration Management and Risk Management processes.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

- Describe how the integration of efforts conducted under subsidiary development or integration plans, such as Software Development Plans will be managed.

SE Reviews: Provide a detailed schedule and agendas for each review (Preliminary Design Review (PDR) and Contract Design Review (KDR)) showing how focused technical reviews build to the formal SE Review and scheduling the submittal of read-ahead material. Provide a table for each review that links the Contractor's products to the entrance criteria. Provide templates for documenting the meeting results.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 068-01-2317

BLK02-TITLE OF DATA ITEM: C4ISR Integration Plan (CIP)

BLK04-AUTHORITY: DID Number: DI-MGMT-80033  
DID Title: Site Preparation  
Requirements and Installation  
Plan

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60DPPDR

BLK 13-DATE OF SUBS SUBM: 90DPKDR.

BLK16-REMARKS:

The CIP shall include:

- The contractor's strategy for the integration of CFE, GFE, Design Budget, and associated software into an operational C4ISR capability that meets the OPC System Specifications.
- The Contractor's strategy for establishing a C4ISR Test and Integration Facility (TIF) for C4ISR design, development, integration and testing.
- Contractor's strategy for establishing a C4ISR Production Facility (PF) for C4ISR assembly and interface check-out.
- Contractor's strategy for migrating the verified systems out of the PF and into the ship.
- Arrival and staging of equipment.
- Load-out processes for GFE/CFE software.
- Installation and checkout of C4ISR systems onboard the ship.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 070-01-1091

BLK02-TITLE OF DATA ITEM: Topside Design Arrangement Drawing

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product Drawings Models  
and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30DPPMC1

BLK 13-DATE OF SUBS SUBM: 30DPPMC3, 30DPKDR

BLK16-REMARKS:

The Topside Design Drawing shall depict all elements of the cutter's topside in order to provide descriptive evidence that the cutter's topside design is safe, interoperable, and meets all requirements of the USCG OPC Systems Specification.

The Drawing shall show Port and Stbd Outboard Profiles, Topside Plan, Bow and Stern views.

The Drawing shall show the design waterline, and shall show hull and appendages below the waterline for completeness.

The Drawing shall show and label all major HM &E equipment and features, including but not limited to mooring and towing gear, flight deck and markings, safety nets, exterior doors, bulwarks, stanchions, cranes, boats and davits, windows and portlights, deck hatches and scuttles, lifesaving devices, stacks and macks, vertical and inclined ladders, RAS/FAS equipment, navigation and other lights, shore connections and VERTREP zones.

The Drawing shall show mast(s) and antenna systems iaw the Topside Antenna Systems Arrangements drawing, however only major antennas shall be labeled in order to avoid unnecessary drawing clutter.

The Drawing shall show and label all weapons and decoy systems in their deployed configuration.

The Drawing shall include the following lists in tabular format:  
Lights, Weapons and Decoys, Boats and Boat Handling Systems.

In each subsequent design phase, additional detail shall be added to the Topside Design Drawing, further defining the topside, reducing risk and uncertainty.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 070-01-1100

BLK02-TITLE OF DATA ITEM: Area / Volume Report

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
 DID Title: Scientific and  
 Technical Reports - Elements,  
 Organization, and Design

BLK10-FREQUENCY: See BLK 16

BLK12-DATE OF 1ST SUBM: See BLK 16

BLK 13-DATE OF SUBS SUBM: See BLK 16

BLK16-REMARKS:

The Area and Volume Report shall be delivered with each issue of the General Arrangements.

Appendix C of MIL-HDBK-2150 shall not apply.

Areas shall be reported in feet squared, and Volumes shall be reported in feet cubed.

The Report shall be a MS Excel spreadsheet with the following tabs:

Title Page  
 Summary  
 SSCS  
 Compartment  
 Deck

The following is additional detail describing required content of each MS Excel spreadsheet tab:

Summary tab: Shall include the total molded volume of the hull and total molded volume of the superstructure. Shall include a summary of Area and Volume by SSCS Groups 1 through 5, and a total sum of Groups 1 through 5.

SSCS, Compartment and Deck tabs: Each tab shall include the following columns SSCS Code, Compartment Name, Area (ft<sup>2</sup>), Deck Height (ft), Volume (ft<sup>3</sup>), Deck, Frame, P/S/CL, Remarks.

The SSCS tab shall be sorted by SSCS number. The Compartment tab shall be sorted alphabetically by compartment name. The Deck tab shall be sorted by deck, from highest superstructure deck to lowest hull deck (from forward to aft on each deck).

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 070-01-1102

BLK02-TITLE OF DATA ITEM: General Arrangement Design Compliance Report

BLK04-AUTHORITY:

DID Number: ANSI-Z39.18

DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30 DPPDR

BLK 13-DATE OF SUBS SUBM: 30 DPKDR

BLK16-REMARKS:

The General Arrangements Design Compliance Report shall include the following:

Design and Arrangements Philosophy  
Compartment Summary  
Access Study  
Food Service Study  
Protected Spaces Study  
Stores Arrangement and Flow Study;  
Fire Zone Boundary Study  
Vital Space Study;  
Damage Control Plan  
Chemical, Biological and Radiological (CBR) Spaces & Systems Study

The Report shall include arrangement sketches in the GA DCR in PD and CD. For each, all outfitting, equipment, access, structure and subdivision shall be depicted and labeled in order to clearly demonstrate the function and suitability of the space. Plan and Profile views shall be included as necessary.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 070-01-1105

BLK02-TITLE OF DATA ITEM: General Arrangement Drawings

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product Drawings  
Models and Associated Lists

BLK10-FREQUENCY: QTRLY

BLK12-DATE OF 1ST SUBM: 45 DPPDR

BLK 13-DATE OF SUBS SUBM: 45 DPKDR

BLK16-REMARKS:

Information and formatting to be included in the General Arrangement Drawings shall conform to those specified in NAVSEA T9070-AB-PRO-010 (NAVSEA Design Practices and Criteria Manual for General Arrangements Design Chapter 070), excluding Table 4 - Area Margins. Level of detail to be shown on the arrangement drawings shall include those specified in Table 6 of NAVSEA T9070-AB-PRO-010, with the following additions:

- Officer and Crew Berthing - In PD, drawing shall indicate number of personnel berthed in each space. In CD, the drawing shall also show outline of berths, lockers, and other furniture.
- Messing - In PD, drawing shall indicate number of personnel that can be seated in each space. In CD, the drawing shall also show outline of all tables, service bars and other furniture and outfitting.
- Lounges, Training Areas, Recreation Spaces - In PD, drawing shall indicate number of personnel that can be accommodated in each space. In CD, the drawing shall also show outline of all tables, and other furniture and outfitting.
- Equipment Removal Plates (BERPS and WERPS) - Drawing shall depict and label in PD and CD.
- Passing windows - Drawing shall depict and label in PD and CD.
- Portlights - Drawing shall depict and label in PD and CD.
- Sheer & Camber (extent and type) - Drawing shall depict and label in PD and CD.
- Stanchions - Drawing shall depict and label in PD and CD.
- Trolley/Boom System Locations and Arrangements - Drawing shall depict and label in PD and CD.
- Anchor System Arrangements - Drawing shall depict and label in PD and CD.
- Mooring and Towing Systems Arrangements - Drawing shall depict and label in PD and CD.
- Boat Handling Systems Arrangements - Drawing shall depict and label in PD and CD.
- Aviation Facilities Arrangements including flight deck and hangar - Drawing shall depict and label in PD and CD.
- Weapons Systems and Magazine Locations/Arrangements - Drawing shall depict and label in PD and CD.
- Stores Crane Location and Operating Ranges - Drawing shall depict and label in PD and CD.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

- Replenishment at-Sea Systems - Alongside and astern - Drawing shall depict and label in PD and CD.
- Liferaft Locations - Drawing shall depict and label in PD and CD.

The molded height of decks and superstructure levels above the baseline shall be indicated on the inboard profile. Design Waterline (DWL) and Full Load Waterline (FWL) shall be depicted on the inboard and outboard profiles.

45 days prior to Preliminary and Contract Design Reviews, drawings and supporting documentation shall be submitted.

Any subsequent submissions to be provided in response to comments will be due 15 days after receipt of comments.

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 070-01-1108

BLK02-TITLE OF DATA ITEM: Tank Arrangement and Capacity Booklet

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DPPDR

BLK 13-DATE OF SUBS SUBM: 14 DARC

BLK16-REMARKS:

The Tank Arrangement and Capacity Booklet shall depict structural and non-structural tanks on the cutter. The booklet shall exclude tanks, sumps, and reservoirs that come as an integral part of a piece of machinery or equipment. The booklet shall depict tank capacities in tabular form in 5% increments from empty to full, and at 98% full. For each increment, the table shall provide percent full, sounding in feet, volume in cubic feet and gallons, capacity in Long Tons, free surface moment, and the longitudinal, vertical, and transverse centers of gravity. The tank capacity calculations shall assume a 98% tank permeability, unless calculations of structure or piping volumes are presented showing otherwise. The value of the liquid density shall be included with each tank table.

The booklet shall be in Microsoft Excel format.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 079-01-1193

BLK02-TITLE OF DATA ITEM: Lines, Offsets and Hull Appendage Drawings

BLK04-AUTHORITY: DID Number: DI-SESS-81002  
 DID Title: Developmental Design  
 Drawings/Models and Associated  
 Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 120 DAC

BLK 13-DATE OF SUBS SUBM: 45 DPPDR  
 45 DPKDR

BLK16-REMARKS:

The Lines, Offsets and Hull Appendage Drawing shall include Hull Lines, Rudder and Appendages, Table of Offsets, and Principal Characteristics. The lines shall be completely faired and depict the entire hull. The Drawing shall show faired lines at 20 equally spaced stations, plus half, quarter, and other stations as necessary to adequately delineate the hullform at the bow and stern. The number of stations shall not exceed 40. Station 0 shall be at the Forward Perpendicular, and increase going aft. Waterlines shall be depicted from the baseline to top of the hull in 2 foot increments. The Drawing baseline shall depict the cutter's molded baseline. The design waterline shall be depicted. Buttocks shall be depicted at no greater than 4 foot increments. The bow shall be depicted on the right side of the drawing. Lines of contours, decks, chines and knuckles shall be shown. The lines shall be drawn in as large a scale as practical, but not less than ¼ inch to the foot. All stations, frames, waterlines, buttocks and any other reference lines are to be clearly identified. Deck camber shall be identified and defined. All control surfaces and appendages (including but not limited to struts, rudders, propeller disk, shaft angles, skegs, fins, thruster tunnels, bilge keels) shall be depicted showing sizes and locations.

The Table of Offsets shall contain dimensions for half-breadths, and heights defining the shape of every station, profile, chine, deck edge and knuckle.

The Principal Characteristicstable shall include at least the following: Length Overall, Length Between Perpendiculars, Beam Overall, Beam at Design Waterline, Design Draft, Design Displacement (in Saltwater), Hull Volume, Hull Wetted Surface, Vertical Center of Buoyancy, Longitudinal Center of Buoyancy, KMT, KML, Longitudinal Center of Flotation, Block Coefficient, Prismatic Coefficient, Sectional Area Coefficient.

The Lines, Offsets and Hull Appendage Drawing shall be delivered in a format compatible with AutoCAD. Reservation notes indicating design development reservations, with items lined out as reservations are resolved shall be included in the Drawing.

Mathematical signs and symbols shall be in accordance with ANSI Y10.20 and Y10.20a.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 070-01-1197

BLK02-TITLE OF DATA ITEM: Limiting Displacement/Draft Report

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30 DPPDR

BLK13-DATE OF SUBS SUBM: 30 DPKDR

BLK16-REMARKS:

The report shall document the analysis, calculation and determination of the OPC Limiting Displacement(s)/Draft(s) in accordance with ABS NVR, Part 0, Chapter 5, Section 3, sub-sections 1.1 Limiting Drafts and 1.2 Reserve Buoyancy/Subdivision Limiting Drafts, except that analyses and/or calculations provided via other deliverables may be included by reference.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 070-01-1956

BLK02-TITLE OF DATA ITEM: Integrated Topside Design Analysis Report

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports- Elements,  
Organization, and Design

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DPPDR

BLK 13-DATE OF SUBS SUBM: 45 DPKDR

BLK16-REMARKS:

Stack gas dispersion analysis shall include stack exit area(s) and diameter, total temperature at stack exhaust exit, mass flow rate at the stack exit, wind dynamics analyzed, and required flight operations wind envelopes. The analysis shall simulate the diesel exhaust flows at several power levels (including full power) under a full range of headings, for a full range of relative wind conditions.

The 3D Topside Model shall be developed according to the following guidelines:

**Part (Component) Construction**

- Parts shall be constructed so that the positive direction of the X-axis is fore to aft of the part.
- Parts shall be constructed so that the positive direction of the Z-axis is bottom-side to top-side as related to placement on the ship.
- Solid modeling shall be used.
- All parts when completed shall be free of any 3D CAD errors.

**Ship Assembly Model Construction**

- Assemblies shall be constructed so that the positive direction of the X-axis is fore to aft of the assembly.
- Assemblies shall be constructed so that the positive direction of the Z-axis is bottom-side to top-side.
- Hull assembly origin (0,0,0) shall be placed on the hull baseline, centerline, and at Frame 0.
- Adjacent part features shall be constrained. Parts and assemblies shall be placed in the model with precision.
- Both ship structure and antenna coordinates shall be accurate to a minimum of one inch.
- Antennas shall be modeled either as a single part or as an assembly of several parts.
- If an antenna consists of a radome, it shall be a separate part/component from the antenna's internal parts/components for ease of removal or suppression.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

- Mechanical components, such as bolts, brackets, hatchways, and access plates, are not generally required for EM modeling. These items, if included in the assembly model, shall be assembled as individual components for ease of removal or suppression.

**Ship Equipment and Structures**

- All Equipment and Structures shall be fully constrained.
- All dimensional data shall be present in model.
- The completed ship assembly shall be developed from sub-assemblies:
  - Hull Assembly: The hull assembly shall consist of the hull structure along with all of the associated equipment installed on the hull and weather deck(s) of the ship.
  - Superstructure Assembly: This assembly shall consist of the superstructure and all related equipment landed on the superstructure. This assembly can be broken down into further sub-assemblies, such as pilothouse, hangar section, stack(s) section, etc.
  - Mast(s) Assembly: This assembly shall consist of mast structure and related equipment. This assembly can be broken down into further sub-assemblies, such as Upper Yardarm, Lower Yardarm, Stub mast, Platform 91ft0in, Radar Platform, etc. If multiple masts exist, then a separate assembly shall be made for each.
- Assemblies shall contain associated equipment including, but not limited to: railings, lights, weapons, antennas, flag poles and hoists, fueling stations, lifeboats, anchors, horns, whistles, doors, hatches, storage boxes, and ladders.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 071-01-1124

BLK02-TITLE OF DATA ITEM: Shipboard Access Study

BLK04-AUTHORITY: DID Number: DI-DRPR-81000  
DID Title: Product Drawings  
and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The Shipboard Access Study Drawing shall include general quarters, personnel emergency escape routes, material strikedown paths, stores and weapons replenishment paths, weapon and ammo handling and flow, messing queues, clean and dirty paths in mess areas, activity areas, processed waste flow paths, and medical evacuation routes for the medical treatment room and battle dressing station, to include stretcher paths. Each path or area indicated shall be drawn with a different linetype, and a key labeling each path will distinguish between them.

Any subsequent submission to be provided in response to comments during Contract Design Review will be due 15 days after completion of review.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 071-01-2109

BLK02-TITLE OF DATA ITEM: Equipment Removal and Maintenance Access  
Arrangement DrawingsBLK04-AUTHORITY: DID Number: DI-DRPR-81000  
DID Title: Product Drawings  
and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The Equipment Removal and Maintenance Access Arrangement Drawings shall include equipment maintenance, removal, and handling paths. Each path or area indicated shall be drawn with a different line type, and a key labeling each path will distinguish between them.

Drawings shall list pieces of machinery and equipment, including propeller shaft(s), to be handled through the indicated openings, giving the size and weight of each. Route of handling shall be shown and clearances for principal pieces of machinery and equipment indicated. Openings, such as hatches and doors, shall be shown. Details of special closure plates shall be shown.

Any subsequent submission to be provided in response to comments during Contract Design Review will be due 15 days after completion of review.

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 073-01-1139

BLK02-TITLE OF DATA ITEM: Propulsion System Vibration Analysis

BLK04-AUTHORITY: DID Number: DI-GDRQ-80650  
DID Title: Design Data and  
Calculations

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 073-01-1142

BLK02-TITLE OF DATA ITEM: Hull Vibration, Superstructure, Mast, and  
Foundations Vibration Analysis and ReportBLK04-AUTHORITY: DID Number: DI-MISC-80296  
DID Title: Design Data and  
Calculations

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

Identify vibration limitations and include analyses and information that will permit an understanding of the verified requirements. Identify the natural frequency of the hull girder, masts, stack, machinery foundations and superstructure. Identify the vibration excitation frequencies caused by the environment, internal excitation of equipment and excitation associated with reciprocating machinery and the components of the propulsion system. Include data which identifies the fundamental frequencies percentage above the excitation frequencies or data which confirms that foundations are isolated from the excitation source.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 073-01-2079

BLK02-TITLE OF DATA ITEM: Airborne Noise Category Assignment List

BLK04-AUTHORITY: DID Number: Contractor format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 180 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

- BLK04: The Airborne Noise Category Assignment List shall be in Microsoft Word. For each space provide the following:
- a.) assigned name and number
  - b.) a brief description of the space
  - c.) airborne noise category assigned to the space
  - d.) a brief justification for the selection of the airborne noise category

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 073-01-2081

BLK02-TITLE OF DATA ITEM: Airborne Noise Control/Design History Booklet

BLK04-AUTHORITY: DID Number: Contractor Format  
or ANSI Z.39.18  
DID Title: Scientific and  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 076 -01-1152

BLK02-TITLE OF DATA ITEM: Reliability, Maintainability & Availability  
(RM&A) Assessment Report

BLK04-AUTHORITY: 4-033] DID Number: ANSI-Z39.18 [AI

DID Title: Scientific and Technical Reports  
- Preparation, Presentation, and  
Preservation

DID Number: DI-SESS-81613  
DID Title: Reliability & Maintainability (R  
& M) Program Plan

DID Number: DI-ILSS-80498  
DID Title: Critical Item Recommendation

DID Number: DI-GDRQ-81223  
DID Title: Schematic Block Diagrams

DID Number: DI-ILSS-81495  
DID Title: Failure Modes, Effects &  
Criticality (FMECA) Report

DID Number: DI-RELI-81496  
DID Title: Reliability Block Diagrams and  
Mathematical Models Report

DID Number: DI-RELI-81497  
DID Title: Reliability Prediction &  
Documentation of Supporting Data

DID Number: DI-RELI-80255  
DID Title: Failure Summary & Analysis Report

DID Number: DI-SESS-81315  
DID Title: Failure Analysis and Corrective  
Action Report

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPPDR

BLK 13-DATE OF SUBS SUBM: 90 DPKDR

BLK16-REMARKS:

BLK 04:

RMA Assessment report and all attachments shall be delivered in a  
Microsoft Office format as specified.

1st submission will consist of:

1. Critical Item List (CIL) recommendation.
- 1.1. Modify DI-ILSS-80498 Paragraph 10. 1 to read as  
follows:

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

"10.1 Format and Content. The CIL shall contain the following data in Microsoft Excel format:

- a. ESWBS based HSC
- b. Item Nomenclature
- c. Reference Number
- d. OEM CAGE Code, if available
- e. NSN, if available
- f. Essentiality Code
- g. Next Higher Assembly HSC
- h. Next Higher Assembly Nomenclature"

1.2. The CIL may be satisfied by including the data elements as part of the MEL submittal, or as a part of the Configuration Status Report after the Allocated Baseline is established.

2. Those analyses and reports to accomplish Objective 1 of GEIA-STD-0009 and section 4.1 of SAE JA1010, The assessment will demonstrate progress and accomplishment of those analyses that support Preliminary Design Review (PDR) as part of Objective 2 of GEIA-STD-0009 and section 4.2 of SA JA1010. The assessment shall be completed for all items identified in the Critical Item List (CIL).

3. The report shall include the Failure Modes, Effects & Criticality Analysis (FMECA) to include recommended improvements on all components on the CIL. This section shall include any failure modes that are expected to occur over the life cycle of the OPC and shall be conducted in accordance with MIL-STD-3034, RCM Phases I through V. The data shall be delivered in GEIA-STD-0007A format.

2nd submission shall consist of:

1. Updated CIL
2. Update to the previous submissions based on design changes, model & simulation analyses, and an RM&A Assessment that demonstrate progress and accomplishment of those analyses that support Preliminary Design Review of Objective 2 of GEIA-STD-0009, section 4.2 of SAE JA1010,
3. A Reliability Block Diagram (RBD). Verify operational availability (Ao) values can be satisfied.
4. An update to the Maintainability Analysis to identify design features that incorporated maintainability as part of the systems design process.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 076-01-1155

BLK02-TITLE OF DATA ITEM: RM&amp;A Program Plan

BLK04-AUTHORITY:

DID Number: DI-MGMT-80004

DID Title: Management Plan

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM:

90 DPPDR

BLK 13-DATE OF SUBS SUBM:

90 DPKDR

BLK16-REMARKS:

BLK 04: The RM&A program plan definition of resources shall include a listing of key personnel under which all RM&A activities are supervised. The RPP Engineering Processes (4) and (5) referenced in ANSI/GEIA-STD-0009-2008, paragraph 4.5.1 and the Maintainability Program elements listed in SAE JA1010 5.b.4, 5.c.1, & 5.c.2 shall integrate with the configuration management requirements for engineering changes to ensure all RM&A analyses are based on the latest functional, allocated, and product configurations.

The report and all attachments shall be delivered in a Microsoft Word format.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 077-01-1170

BLK02-TITLE OF DATA ITEM: System Safety Program Plan (SSPP)

BLK04-AUTHORITY: DID Number: DI-SAFT-81626  
DID Title: System Safety Program  
Plan (SSPP)

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DAC

BLK13-DATE OF SUBS SUBM: 30 DPPDR

BLK16-REMARKS:

The SSPP shall be prepared in accordance with DI-SAFT-81626 and include the requirements for format and content contained therein.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 077-01-2047

BLK02-TITLE OF DATA ITEM: Functional Hazard Analysis (FHA) Report

BLK04-AUTHORITY: DID Number: Contractor format.  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30 DPKDR

BLK13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The Functional Hazard Analysis (FHA) is a systematic, comprehensive examination of functions to identify and classify failure conditions of those functions according to their severity and consequences. The analysis shall classify the consequences in terms of severity for the purpose of identifying the Safety-Critical Functions (SCF), Safety-Critical Items (SCI), Safety-Significant Functions (SSF), and Safety-Significant Items (SSI) of the system.

The FHA shall be a high-level qualitative assessment of the basic functions of the OPC system as defined during Phase 1. The FHA shall identify and classify the failure conditions associated with the system and subsystem-level functions. The classification of these failure conditions establishes the safety requirements that the OPC system must meet. The subsystem level FHA is also a qualitative assessment which is iterative in nature and becomes more defined and fixed as the system evolves, considering a failure or combination of system failures that affect the OPC function. The output of the top-level and/or subsystem-level FHA is the starting point for the generation and allocation of safety requirements.

The FHA shall provide the following information:

- a. A brief summary of objectives and conclusions of the FHA;
- b. A description of the analytical approach used to create the FHA;
- c. A description of the OPC's functional capabilities and various modes of operation. There shall be sufficient detail to provide a good understanding of functions and system interfaces. Descriptions of interfaces shall include crew warnings and indications; controls, settings, and input/output signals;
- d. References to relevant technical drawings and documents (may include functional block diagrams, power distribution diagrams, and schematics); a description of the safety philosophy or any failure alleviation devices; and a description or diagram of where the equipment will be located on the OPC.
- e. Analyses including, but not limited to, the following:
  - (1) OPC system-level FHA
  - (2) OPC Fault Tree Analysis (FTA)
  - (3) Subsystem-level FHAs; and
  - (4) Common Cause Analyses
- f. A discussion section listing and describing the most serious failure conditions and methods that may be utilized during the design phase to meet the safety requirements.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

041.5

The FHA shall provide the following information relative to each top-level function and combination of functions:

- a. Identification of related failure conditions;
- b. Identification of the effects of failure conditions;
- c. Classification of each failure condition based on the identified effects using the risk severity categories defined in the Contractor's System Safety Program Plan. The severity of failure conditions shall be evaluated according to the following:

041.6

- (1) Effects on the crew, such as increases above their normal workload that would affect their ability to cope with adverse operational or environmental conditions or subsequent failures;
- (2) Effects on the OPC, such as;
  - (a) Reduction in safety margins;
  - (b) Degradation in performance
  - (c) Loss of capability to conduct certain operations;
  - (d) Reduction in environmental protection, or
  - (e) Potential or consequential effects on structural integrity;
- d. Identification of the required system development assurance levels; and
- e. A statement outlining what was considered and what assumptions were made when evaluating each failure condition (e.g., factors that might alleviate or intensify the direct effects of the initial failure condition; phase of operation).

The FHA analysis document shall incorporate consideration of the effects of

- a. Multiple failures and undetected failures;
- b. Reasonably anticipated crew errors after the occurrence of a failure or failure condition; and
- c. Crew alerting cues, corrective action(s) required, and the capability of detecting faults.

BLK01-SEQUENCE NO.: 079-01-1190

BLK02-TITLE OF DATA ITEM: Hull Form Design Report

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
 DID Title: Scientific and  
 Technical Reports - Elements,  
 Organization, and Design

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 120 DAC

BLK 13-DATE OF SUBS SUBM: See BLK16, 30 DPPDR

BLK16-REMARKS:

Submittals:

- 1<sup>st</sup> Submittal shall be a "Preliminary" issue of report.
- 2<sup>nd</sup> submittal shall be 30 DPPDR

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

3<sup>rd</sup> submittal shall be after completion of hydrodynamic model testing and incorporation of any results/changes.

The Hullform Development Report shall contain at least the following sections:

- Development Approach
- Hullform Description and Model (Including Appendages)
- Resistance and Powering Analysis
- Maneuvering Performance Analysis
- Seakeeping Analysis
- Roll Stabilization Analysis (if provided)

The Hullform Development Report shall be delivered with all input data, output data, and models (3D hull model, Seakeeping Analysis model, etc.) as appendices or attachments to the Report.

The report shall include all assumptions, analytical approach, input and output data, polar plots and data summary. Where assumptions (in control surface sizing, performance, or any other aspect of the hullform) are necessary due to normal design immaturity, those assumptions shall be described in detail, and conform with typical naval architecture practice.

The Resistance and Powering Analysis shall at a minimum include estimates of residual resistance, frictional resistance, total bare hull resistance, appendage resistance, total effective horsepower (EHP), total shaft horsepower (SHP), total delivered horsepower (DHP), and shaft rpm as a function of ship speed in both tabular and graphic formats. Speed shall be in increments no greater than 2 kts.

The Seakeeping Analysis shall include seakeeping performance indices (Mission Operability Index) in tabular and polar plot format which apply the seakeeping limits for all cases required in the specification. Tabular and polar plot data shall be for 360° in wave heading increments no greater than 15° and from minimum steerage speed to full power or highest speed for operation in increments no greater than 4 kts. Instances of deck wetness per hour shall be calculated at the transom, fantail, flight deck, boat davits, accommodation ladder, fwd gun, pilot house and forecastle and reported in tabular format. Instances of slamming shall be calculated at the keel at a location that is 15 percent of ship length aft of the Forward Perpendicular. The Analysis shall include a summary of results for all cases required in the Specification.

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 079-01-1196

BLK02-TITLE OF DATA ITEM: Preliminary and Contract Design Model Test Plan

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Elements,  
Organization, and Design

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DAC

BLK 13-DATE OF SUBS SUBM: 60 DPKDR

BLK16-REMARKS:

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 079-01-1201

BLK02-TITLE OF DATA ITEM: Flooding Water Levels (V-Lines) Analysis

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30 DPPDR

BLK13-DATE OF SUBS SUBM: 30 DPKDR

BLK16-REMARKS:

The Flooding Water Levels calculations shall be in accordance with ABS NVR, Part 0, Chapter 5, Section 3, sub-section 2, Flooding Water Levels (FWL or V-Lines). The analysis report shall include a discussion of how the V-Lines were calculated, a tabular listing of the results, and the V-Lines shall be drawn on at least three ship sections.

The Flooding Water Levels (V-Lines) report shall be delivered as either a separate report or shall be included as an appendix to the Intact and Damage Stability Analysis reports due 30 DPPDR and 30 DPKDR. The Flooding Water Levels (V-Lines) analysis shall be updated between reports.

The reports shall be in Microsoft Word or Microsoft Excel format.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 079-01-1202

BLK02-TITLE OF DATA ITEM: Intact and Damage Stability Analyses

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DAPAC

BLK13-DATE OF SUBS SUBM: 30 DPPMC1  
30 DPPDR  
30 DPPMC3  
30 DPKDR

BLK16-REMARKS:

The Intact and Damage Stability Analyses shall show compliance with the specification and present the following: assumptions/conditions and the standards on which the stability analyses are based. This shall include: the stability criteria for intact and damage, overall buoyant envelope, bulkhead deck location, margin line description, details of the load conditions analyzed, assumptions and method for inclusion of free surface effects, details and discussion of intact stability analyses and the damage stability analyses. The analyses details shall include: a discussion of any heeling moments, identification of flooded compartment combinations, liquid runoff, downflooding points, identification of critical intact conditions and cases of damage, and their governing criteria. Results shall include: a limiting KG curve over the range of operating conditions, comparison of allowable KG to the actual KG, discussion of the use and design, if any, of cross-connected tanks/spaces, and the discussion of the affect of anti-rolling tanks (if any) on intact stability and the initial and final stability after damage. The hull form and major appendages shall be included electronically and in the NAVSEA SHCP format. A complete listing of the ship compartments, and their numerical boundaries, used in the stability analysis shall be included.

The deliverable titles shall indicate the specific design period of each report (Draft Preliminary Design Intact and Damage Stability Analysis, Preliminary Intact and Damage Stability Analysis, Initial Contract Design Intact and Damage Stability Analysis, Contract Design Intact and Damage Stability Analysis).

The reports shall be in Microsoft Word or Microsoft Excel format.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 079-01-2220

BLK02-TITLE OF DATA ITEM: Hullform and Hydrodynamic Model Test Reports

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Elements,  
Organization, and Design

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: See BLK 16

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

Model Test Report shall be delivered 45 days after completion of testing. If testing program is segmented into multiple phases (resistance, seakeeping, maneuvering, etc.) the Report shall be delivered in phases, no later than 45 days after completion of each testing phase.

The Report shall include standard ship and model data presentations (including ship dimensions and coefficients) applicable to the hull form.

The Report shall include photographs of the fully-appended model out of the water, and photographs of the model during all tests at all speeds.

The Report shall provide all resistance data expanded to full scale using ITTC friction coefficients and a correlation allowance of 0.0005. There will be no form factor, and self-propulsion data shall be provided at the self-propulsion point and also for 5% of thrust over the self propulsion point.

The Report shall provide tabulation of the predicted full scale EHP and SHP values as appropriate, at 2 knot speed intervals for each displacement tested developed from the completed tests. The tabulation shall be as a function of full scale ship speed, speed-length ratio, and Froude Number (Fn). In addition to any model test facility standard data presentations, the Report shall include: total resistance coefficient, frictional resistance coefficient, residual resistance coefficient, EHP and SHP (in British horsepower) and resistance coefficients for the model and the ship.

The Report shall provide stock propeller open water characteristics, a drawing and tabulation of propeller geometry, and for CRP propellers this data shall be provided for each P/D tested.

The Reports shall include plots of bow and stern rise and sinkage versus speed as well as trim as a function of ship speed; Fn and speed-length ratio for each displacement.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 080-01-2211

BLK02-TITLE OF DATA ITEM: Integrated Logistics Support Plan (ILSP)

BLK04-AUTHORITY: DID Number: DI-ILSS-80095  
DID Title: Integrated Logistics Support Plan

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPPDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

BLK04: The ILSP shall describe the contractor's plans for the management, control, execution, interface and integration of all aspects of the ILS Program in accordance with GEIA-STD-0007A, & GEIA-HB-0007. The Contractor may utilize MIL-STD-1388-1A as guidance. The contractor shall identify how logistics support analyses shall comply the GEIA-STD-0007A and what logistics data management software they intend to use to generate LSAR and may use DI-ILSS-80531 Logistic Support Analysis Plan as guidance. In addition, the ILSP shall include a Diminishing Manufacturing Sources and Material Shortages (DMSMS) management plan which describes the contractor's approach to managing the loss, or impending loss of manufacturers or suppliers of parts and/or material. The plan shall:

- a. Identify the key participants in the contractor's DMSMS Program and the organizational structure associated with the Program.
- b. Identify the major components of the contractor's DMSMS Program.
- c. Identify the contractor's DMSMS Program objectives.
- d. Identify milestones and scheduling of key events associated with the DMSMS Program.
- e. Describe how the components, organizational structure and efforts of the participants are integrated to achieve the contractor's DMSMS Program objectives.
- f. Identify the scope of the DMSMS Program.

Change the following in DI-ILSS-80095:

- a. All references to "DoD" or "Department of Defense" shall be changed to "U.S. Coast Guard" unless specifically directed otherwise.
- b. All references to "Reliability, Availability, Maintainability" or "RAM" shall be synonymous with the OPC RFP's of "RM&A", "Reliability, Maintainability, and Availability."
- c. The contractor shall provide a reference or hyperlink to specific documentation requirements or lists that are required in other Statement of Work Contract Deliverable Requirement. For example, paragraph 10.9.7 "Chapter 7, Configuration Management". This requirement is part of another analysis and management plan. The contractor shall reference the report or list by title, latest version and approval date, and CDRL data

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- identification number instead of reproducing the entire text of the report, list or analysis in the ILSP.
- d. Para 7.2 of change reference from "DOD-STD-1702(NS)" to "GEIA-STD-0007A, GEIA-HB-0007".
  - e. Delete paragraph 10.9.1.2.1
  - f. Delete paragraphs 10.9.2.2.1 through 10.9.2.2.4
  - g. Delete paragraphs 10.9.2.3 through 10.9.2.7.1
  - h. Delete section 10.9.8 Chapter 8, Installation and Facilities.
  - i. Delete section 10.9.10 Chapter 10, Funding
  - j. Delete section 10.10. Annex A, Instructions for Developing Annex A of an ILS Plan.
  - k. Delete section 10.11 Annex B.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 088-01-1281

BLK02-TITLE OF DATA ITEM: Human Systems Integration Program Plan (HSIPP)

BLK04-AUTHORITY: DID Number: DI-HFAC-81743  
DID Title: Human Systems  
Integration Program Plan

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DAC

BLK13-DATE OF SUBS SUBM: 45 DPKDR

BLK16-REMARKS:

Tailoring: DI-HFAC-81743 paragraph 4.n., section head shall be, "Human Systems Integration in System Safety and Occupational Health (SSOH)".

For any section whose content is substantially covered in another document (such as the Human Engineering Program Plan), the Contractor shall provide a summary of the content in the HSIPP and a reference to the document section(s) that contain the content.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 088-01-1282

BLK02-TITLE OF DATA ITEM: Human Engineering Program Plan (HEPP)

BLK04-AUTHORITY: DID Number: DI-HFAC-81742  
DID Title: Human Engineering  
Program Plan

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DAC

BLK13-DATE OF SUBS SUBM: 45 DPKDR

BLK16-REMARKS:

DI-HFAC-81742 Section 3b, Tailoring. The HEPP shall also comply with the following:

- All activities in Phase I and II shall be included in the plan.
- The HEPP shall include a table of shipboard spaces in an Appendix indicating whether or not each space is normally manned, the types of human/machine interfaces and watchstations located within, and the type of human engineering analyses to be performed against that space.

For the analyses and activities the contractor may use MIL-HDBK-46855A for general guidance and instruction on conducting HFE tasks.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 088-01-1283

BLK02-TITLE OF DATA ITEM: Human Engineering Systems Analysis Report  
(HESAR)BLK04-AUTHORITY: DID Number: Contractor Format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30 DPPDR

BLK13-DATE OF SUBS SUBM: 30 DPKDR

BLK16-REMARKS:

1. Content. The Human Engineering Systems Analysis Report shall contain the following information
  - a. Systems objective(s). In accordance with the Contractor's Top-Down Function Analysis (TDFA), the system objective(s) shall be described. If the objective(s) are to be met by the system operating in conjunction with other systems not within the scope of the contracts, the following shall also be described:
    - (1) The overall (or higher level) objective(s) to be met through combined operation of systems.
    - (2) The sub-objective(s) to be met by the system being developed under the contract.
    - (3) Interactions required between systems to meet the objective(s).
  - b. System mission(s). The Contractor shall describe the mission analysis performed and the system mission(s) shall be described. The mission description(s) shall describe the operational and physical environmental context(s) within which the system will meet its objective(s) (e.g., fixed installation versus mobile system operations, geography, mission time constraints, weather, day/night, humidity, sea state, terrain roughness, vegetation density, enemy force concentration, enemy weapons/countermeasures capabilities, enemy order of battle, presence or absence of other cooperating systems). Include the organizational structure of the system and required communication with other operators or support personnel. This may also include the various system or operational modes and associated environments. For legacy systems, any changes between the current and future mission environment should be identified and described. Any special requirements or considerations due to environmental factors or equipment (i.e., arctic mittens, etc.) should be identified.
  - c. System functions. Based on the Contractor's TDFA, the system functions (that must be performed to meet the system objective(s) within the mission context(s) shall be described.
  - d. Allocation of system functions. Allocation of system functions shall be described. Specifically, the following analyses and the results of these analyses shall be presented:
    - (1) Information flow and processing.

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- (2) Estimates of potential operator/maintainer processing capabilities.
- (3) Allocation of functions to the system and to the operator.
- e. Equipment identification. In accordance with information provided by the procuring activity and/or based on contractor studies conducted to identify equipment, the selected design configuration shall be described. Provide hardware and software component descriptions including remote or external elements.
- f. Subsystems. Identify any subsystems defined during the system analysis and design process.
- g. Internal Interfaces. Describe the interfaces between internal system elements.
- h. External Interfaces. Describe the interfaces to external elements.
- i. User, operator, and support elements. Provide a brief statement identifying the user, operator, and support elements. This can also serve as a section heading for subsections and does not require a text description.
  - 1. Operator Descriptions. Identify the numbers and types of users and operators of the system. This can include the minimum number of operators required to operate and/or maintain the system in any given shift. Identify the number of operators per console, if applicable (e.g., operators share terminal on an as needed basis or one operator monitors/operates system using three consoles, each console providing separate functions). Include any special requirements for the job (e.g., must have 20/20 vision or cannot be colorblind). Identify any assumptions that are made about the system or the users that influence the design of the system. Identify any derived requirements that are a result of analysis that influence design decisions or that are critical to system performance.
  - 2. Roles. Identify the specific roles in the system such as supervisor, operator (type), maintenance, technician, etc. Identify the specific function(s) performed for each role. Identify and clarify any assumptions made about the user roles that affect or influence design decisions. Identify any assumptions made about the roles or the users completing these roles.
  - 3. Profiles and Skills. Identify and describe the people who fulfill the system roles. Includes prerequisites such as rank, and years of experience. Special knowledge areas or pertinent experience (lack of experience - e.g., novice computer users) can be included. Also describe the required skill sets of the users and operators of the system. This can include education, reading level, technical prerequisites and occupational specialties. If applicable, identify the skills for each of the roles. Identify any assumptions made about the system users.
- j. Scenarios. Provide a brief statement identifying the system scenarios. This can also serve as a Section heading for sub-sections and does not require a text description.
  - 1. Mission Use Scenarios. Mission scenarios describe the high-level system functionality. Define the mission capabilities expressed as end to end threads. Each thread includes all system components that contribute to the execution of the operation described. For instance, aircraft systems may operate in different geographic theaters with different tactics and strategies. Other systems may operate in a mobile platform (in a car) as well as a fixed platform/location (office).

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2. Operational Use Scenarios. Operational use scenarios describe the individual operations that are used to fulfill the mission scenarios. These can be used individually or in sequence to complete the mission scenarios. Define operational scenarios representative of actual system use. These are the sequence of actions taken by the operator and performed by the system for different system operations. The Operational Use scenarios may include high level scenarios as well. Such scenarios consist of the operations of the system as part of a larger system or transactions and interactions with other systems, etc.
  - a. Startup. Describe how the system is started up.
  - b. Setup. Describe any setup operations.
  - c. Normal Operations. Describe operations under normal working conditions.
  - d. Failure Modes. Describe operations when failure conditions occur.
  - e. Emergencies. Describe operations under emergency situations.
  - f. Shutdown. Describe any shutdown operations.
3. Support. Provide a brief statement identifying system support. This can also serve as a section heading for subsections and does not require a text description.
  - a. Provisioning. List the provisioning requirements and operations to fulfill those requirements.
  - b. Maintenance. List the maintenance requirements and maintenance operations that need to be performed on the various parts of the system. Identify any special maintenance needs, tools, or equipment. Document all assumptions - who will complete the maintenance and where the maintenance will be performed.
  - c. Training. Identify the training that needs to be developed to educate personnel on the use and operations of the system. Identify the training type, duration, and format required. Identify any additional, specialized training or prerequisites required for system, operations.
  - d. Deployment. Identify when and where the system is to be deployed and in what configuration.
  - e. Upgrade Methodology. Describe how the hardware and/or software are to be upgraded over the lifecycle of the program.
- Security. Provide a description of the physical / information security requirements of the system. This should include the security requirements for the operational and non-operational environment (e.g., trusted systems, multi-level security schemes, or multi-tiered physical security levels). Identify the concepts for addressing the security issues in the system. Identify in the form of scenarios where security requirements are addressed and met (e.g., when log-on and passwords are required and performed).
- Appendices.
  - a. Link Analysis on the following layouts:
    - a. Bridge
    - b. Combat Information Center (CIC)
    - c. Helicopter Control Station
    - d. Galley
    - e. Main Engineering Control Room
    - f. Damage Control Central
  - b. Summary of human factors inputs to equipment selection and outcomes of trade studies
  - c. Any additional analysis activities identified in the HEPP for Phase I not otherwise delivered as CDRL items.
  - d. Additional appendices may be used as needed.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 088-01-1284

BLK02-TITLE OF DATA ITEM: Human Engineering Test Plan (HETP)

BLK04-AUTHORITY: DID Number: DI-HFAC-80743  
DID Title: Human Engineering  
Test Plan

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30 DPKDR

BLK13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The HETP shall include planning details and methodologies for the following Phase II test activities identified in the HEPP:

- Human Performance Testing
- Usability Testing
- Any additional test activities identified in the Contractor's HEPP for Phase II.

Planned data collection tools such as checklists or questionnaires shall be provided as appendices.

Evidence of compliance with COMDTINST M6500.1 (May 2011) shall be provided in the HETP.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 088-01-1285

BLK02-TITLE OF DATA ITEM: Manpower Mix Analysis Report

BLK04-AUTHORITY: DID Number: Contractor format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 180 DAC

BLK13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The contractor shall include two sections titled: Operational Crew and Ashore Support.

The Operational Crew Section shall include only the operations/procedures while cutter is underway and in port. The operational crew section shall include a description of the manning and design concept required to complete all watches, evolutions and tasks.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 088-01-1287

BLK02-TITLE OF DATA ITEM: Top-Down Function Analysis (TDFA)

BLK04-AUTHORITY: DID Number: DI-GDRQ-81224  
DID Title: Functional Flow  
Diagrams

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPPDR

BLK13-DATE OF SUBS SUBM: 45 DPKDR

BLK16-REMARKS:

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 088-01-1290

BLK02-TITLE OF DATA ITEM: Human Engineering Design Approach Document-Maintainer (HEDAD-M)

BLK04-AUTHORITY: DID Number: DI-HFAC-80747  
DID Title: Human Engineering Design Approach Document-Maintainer

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK13-DATE OF SUBS SUBM:

BLK16-REMARKS:

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 088-01-1291

BLK02-TITLE OF DATA ITEM: Human Engineering Design Approach Document-  
Operator (HEDAD-O)

BLK04-AUTHORITY: DID Number: DI-HFAC-80746  
DID Title: Human Engineering  
Design Approach Document-Operator  
(HEDAD-O)

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK13-DATE OF SUBS SUBM:

BLK16-REMARKS:

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 088-01-2292

BLK02-TITLE OF DATA ITEM: HSI Issue and Decision Database Report

BLK04-AUTHORITY: DID Number: Contractor Format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DAC

BLK13-DATE OF SUBS SUBM: 30 DPKDR

BLK16-REMARKS:

Contractor shall provide snapshot of HSI Issue and Decision Database. In contractor format, the report shall include:

- 1) List of all HSI issues, sorted by domain. List shall include the control number, title, short description of the issue, primary domain, secondary domain (if applicable), and all data in the database columns.
- 2) Summary of issue status by domain: Numbers of issues currently open, closed, pending, etc.
- 3) Number of issues being tracked by the web based Hazard Tracking System.
- 4) Number of issues elevated to Risk Management Program.
- 5) Since last submittal: number of issues opened, closed, moved to Hazard Tracking System, elevated to Risk management Program.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 090-01-1319

BLK02-TITLE OF DATA ITEM: Quality Assurance Plan

BLK04-AUTHORITY: DID Number: Contractor Format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

BLK 04:

The Quality Assurance Plan shall include

- 1) The Contractor's planned Phase II Structure and Organization Chart depicting how the QA organization interacts with all Phase II activities of Detail Design and Construction
- 2) The Contractor's Current QA Certifications

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 096-01-1347

BLK02-TITLE OF DATA ITEM: Preliminary Allocated Baseline Weight Estimate  
Report (PABWE)BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30 DPKDR

BLK13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The PABWE shall be in accordance with the Society of Allied Weight Engineers, Recommended Practice No.12.

A Longitudinal Weight Distribution Report, Government Furnished Material Summary, and Contract Modification Summary Report shall be included with the PABWE.

The reports shall be in Microsoft Word or Microsoft Excel.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 096-01-1351

BLK02-TITLE OF DATA ITEM: Preliminary Weight Control Plan

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DPKDR

BLK13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The Preliminary Weight Control Plan shall be in accordance with the Society of Allied Weight Engineers, Recommended Practice No.12.

The reports shall be in Microsoft Word or Microsoft Excel.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 096-01-1353

BLK02-TITLE OF DATA ITEM: Weight Moment of Inertia Report

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30 DPPDR

BLK13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The Weight Moment of Inertia Report shall be in accordance with the Society of Allied Weight Engineers, Recommended Practice No.12.

The reports shall be in Microsoft Word, Microsoft Excel, or a compatible format. The reports shall be in electronic format with the ability to search/find and copy/export text or tabular data to another Microsoft Word or Excel file.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 096-01-2141

BLK02-TITLE OF DATA ITEM: Weight Estimate Report(s), for Preliminary and Contract Design

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and Technical Reports - Preparation, Presentation, and Preservation

BLK10-FREQUENCY: QTRLY

BLK12-DATE OF 1ST SUBM: QTRLY

BLK13-DATE OF SUBS SUBM: QTRLY (with one 30 DPPDR and one 30 DPKDR)

## BLK16-REMARKS:

Weight Reports for Preliminary and Contract Design shall be in accordance with the Society of Allied Weight Engineers, Recommended Practice No.12.

A Longitudinal Weight Distribution Report shall be included in each weight report.

Analysis shall be quarterly which will create multiple deliverables. Of these, one shall be delivered 30 DPPDR and one 30 DPKDR. The deliverable titles shall indicate the specific design period of the report (i.e. Preliminary Design Weight Report, or Contract Design Weight Report).

The reports shall be in Microsoft Word, Microsoft Excel, or a compatible format. The reports shall be in electronic format with the ability to search/find and copy/export text or tabular data to another Microsoft Word or Excel file.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 096-01-2142

BLK02-TITLE OF DATA ITEM: Design Margins and Service Life Allowance Plan  
for Weight and KGBLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DAC

BLK13-DATE OF SUBS SUBM: 90 DPKDR

BLK16-REMARKS:

The Design Margins Plan for Weight and KG shall be in accordance with ABS NVR 0-10-1/1.2 and 0-10-2/1.4 and the instructions of the Society of Allied Weight Engineers, Recommended Practices No.12, No.13 and No.14.

The reports shall be in Microsoft Word or Microsoft Excel.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 098-01-2102

BLK02-TITLE OF DATA ITEM: Models, Mockups and Simulation Report

BLK04-AUTHORITY:  
Format.

DID Number: Contractor

DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM:

45 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The Models, Mockups and Simulation Report shall document the results and findings from modeling and simulation activities and analyses specified in the Modeling and Simulation Plan.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 098-01-2103

BLK02-TITLE OF DATA ITEM: Modeling and Simulation Plan

BLK04-AUTHORITY:  
format.

DID Number: Contractor

DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM:

90 DAC

BLK 13-DATE OF SUBS SUBM:

60 DPKDR

BLK16-REMARKS:

The Modeling and Simulation Plan shall define the use of Modeling and Simulation in the design process. The Plan shall include schedules for development, tools to be used and expected results. The Plan shall include the M&S efforts to support HSI objectives and include the use of 3D Zone reviews to support maintenance and access.

The subsequent submission shall include Phase II planning. The plan shall address certification of Phase II tools and describe the formal Verification, Validation, and Accreditation (VV&A) process in accordance with DoD 5000.59 series instruction.]

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 100-01-1348

BLK02-TITLE OF DATA ITEM: Design Load Criteria Summary

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
DID Title: Scientific and  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPPDR

BLK 13-DATE OF SUBS SUBM: 45DPKDR

BLK16-REMARKS:

Design Loading Criteria Summary shall provide details concerning the specific loads applicable to the design. Unique load cases and load applications that deviate from the requirements of these Rules shall be specifically noted and justified. Reference shall be made to specific load requirements. The Design Loading Criteria Summary shall include specifics on supported equipment and cargo, such as vehicle or aircraft dimensions, wheel load, tire imprint data, and tie-down arrangements.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 100-01-1376

BLK02-TITLE OF DATA ITEM: Midship Section Drawing

BLK04-AUTHORITY: DID Number: DI-SESS-81002  
DID Title: Developmental Drawings  
Models and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPPDR

BLK 13-DATE OF SUBS SUBM: 45DPKDR

BLK16-REMARKS:

Midship Section Drawing shall identify materials and dimensions for plate and framing members for the typical structure of the hull and superstructure in the midship area. In addition to any NVR documentation requirements, the drawing shall include section views indicating typical framing and a typical transverse bulkhead, and any special details associated with these views. A table of the cutter's principal dimensions and design information shall be provided and shall include but is not limited to length (LBP, LOA), beam, depth, scantling draft, design draft, design displacement and equipment numeral. The drawing shall be dimensioned and include typical frame spacing information. The strength deck and damage control decks shall be identified.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 100-01-1377

BLK02-TITLE OF DATA ITEM: Structural Opening Reinforcement Report

BLK04-AUTHORITY:  
format.

DID Number: Contractor

DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM:

45 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

For Preliminary Design, the engineering approach for determining stress concentrations and compensation or reinforcement of structural openings shall be provided and identify large openings greater than 15 square feet.

For Contract Design the report shall include reinforcement for large openings greater than 15 square feet including openings for; machinery casings, ventilation ducting, ladderway hatches or stairwells and identify structure in way of openings down to 2 square feet.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 100-01-1379

BLK02-TITLE OF DATA ITEM: Hull Structural Fatigue Calculations

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
DID Title: Scientific and  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPPDR

BLK 13-DATE OF SUBS SUBM: 45DPKDR

BLK16-REMARKS:

The report shall document the fatigue analysis and assessment. The report shall include structural details to be used, associated S-N curves, impact of hull openings, Spectra input and output, hull girder bending moment histogram, identification of critical details and associated stress histograms.

The analysis shall utilize the General Procedure as identified in NVR 1-3-A5, Figure 6. The report shall:

- 1) Identify input to SPECTRA in accordance with the OPC system specification.
- 2) Document the SPECTRA output hull girder vertical bending moment histogram for the required fatigue life period.
- 3) Document the stress range histograms for locations of interest based on the hull girder bending moment histograms for:
  - a. Bottom shell structure
  - b. Strength deck structure
  - c. Key details
  - d. Locations with stress concentrations (associated with hull girder openings, deckhouse endings, structural discontinuity, etc.)
  - e. And other locations where scantling / detail selection may lead to a more critical stress range histogram for the given SPECTRA hull girder bending moments
- 4) Identify appropriate SN curves and categorization for Fatigue Details for the proposed structural details using the AASHTO categories noted in NVR 1-3-A5.
- 5) Assess cumulative damage using Miner's Rule
- 6) Identify the critical detail(s) and/or categories of details
- 7) Address any adjustment to scantlings and hull section modulus as necessary
- 8) Verify the required fatigue life (damage for the critical detail is less than or equal to 1 for a 40 year time frame)

The fatigue assessment for Preliminary Design shall be based on the midship section and proposed structural details.

The Contract Design Fatigue Assessment report shall include all of the above and additional information as follows:

- 1) Assessment for 10 stations along the length of the cutter using bending moment histograms from SPECTRA
- 2) Identification of fatigue life for hot spots and stress concentrations throughout the length of the cutter

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

The Contract Design Fatigue Assessment report shall also include a narrative section on how the course mesh Finite Element Model has validated fatigue life assessments and assumptions relative to stress range at critical locations and identify any details / features that may be more critical or need to be addressed. Where necessary, stress concentrations shall be accounted for in the Fatigue Analysis, as per NVR 1-3-A5 page 13, "Stress Concentrations".

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 100-01-1380

BLK02-TITLE OF DATA ITEM: Strength Studies, Calculations and Analyses

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
DID Title: Scientific and  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPPDR

BLK 13-DATE OF SUBS SUBM: 45DPKDR

BLK16-REMARKS:

Scantling calculations shall demonstrate structural adequacy with load requirements as outlined in Design Load Criteria Summary (100-01-830-1348). Calculations shall verify that the structure meets the applicable rules and that the structure under the design loads meets the design criteria.

Preliminary Design calculations shall include:

Scantling strength and buckling evaluations, at minimum for midship section  
Extreme Wave load (bending moment) determination

Ultimate Hull Girder Strength Assessment

Tolerance of Plate Thicknesses and Associated Structural Calculations for  
Deviation from Nominal

Intermediate Lateral Support Study for Stiffener Sections other than T's (as  
required)

Contract Design calculations shall include:

Scantling strength and buckling evaluations for all scantlings identified on  
scantling drawings

Extreme Wave load (bending moment) determination

Ultimate Hull Girder Strength Assessment

Helicopter Deck Structural Analysis

Wheeled Vehicle Deck design assessment

Reinforcements of major openings

Intermediate Lateral Support Study for Stiffener Sections other than T's (as  
required)

Tolerance of Plate Thicknesses and Associated Structural Calculations for  
Deviation from Nominal

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 100-01-1382

BLK02-TITLE OF DATA ITEM: Scantling Drawings

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product Drawings Models  
and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPPDR

BLK 13-DATE OF SUBS SUBM: 45DPKDR

BLK16-REMARKS:

Structural Scantling Drawings shall identify materials and dimensions for plate and framing for all decks, flats, casings, bulkheads, girders, stringers and stanchions throughout the hull and superstructure. Provide as structural drawings to fully depict the hull, superstructure and decks scantling and framing arrangements.

Preliminary Design Scantling Drawings shall include:  
Decks and Platforms (including Inner Bottom)  
Typical Transverse Watertight and Tank Bulkheads  
Superstructure and Deckhouses  
Shell Expansion and Framing

Contract Design Scantling Drawings shall include:  
Decks and Platforms  
Inner Bottom Plating  
Hull Sections and Transverse Bulkheads  
Superstructure and Deckhouses  
Longitudinal Bulkheads and Girders  
Miscellaneous Structural Bulkheads  
Shell Expansion and Framing  
Shaft Struts  
Mast  
Seachests and Transducer Wells

NVR 1-3-1/6 i)

System level structural drawings (decks, platforms, superstructure, longitudinal bulkheads, shell expansion, structural profile, transverse bulkheads, and transverse web frames) shall show typical scantlings, local reinforcement, application of standard structural details, integral protective plating, major foundations and openings with area greater than 2.0 ft<sup>2</sup>.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 100-01-1386

BLK02-TITLE OF DATA ITEM: Finite Element Analysis Report and Model

BLK04-AUTHORITY: DID Number: Contractor Format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DPPDR

BLK 13-DATE OF SUBS SUBM: 30 DAPDR  
90 DPKDR

BLK16-REMARKS:

## Preliminary Design:

The initial report shall outline the technical approach for global finite element analysis including analysis approach, software to be used, boundary conditions and loading conditions.

## Contract Design:

The full ship model including loads shall be submitted for review prior to proceeding with the analysis.

The structural adequacy of the hull shall be validated by the finite element method using a three dimensional (3-D) coarse mesh model representing the hull girder structure and finer mesh models for local structure. The report shall document the global coarse mesh finite element analysis including analysis method, software used, model description, boundary conditions, applied loading and loading conditions and detailed description of results including calculated deflections and stresses. The report shall also document finite element analyses that are performed for local ship structure.

The coarse mesh and fine mesh finite element model(s) shall be submitted with the report.

Results shall be evaluated to assess strength, buckling capacity and fatigue performance with respect to the requirements.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 100-01-1387

BLK02-TITLE OF DATA ITEM: Structural Design Report

BLK04-AUTHORITY: DID Number: Contractor  
format.

DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPPDR

BLK 13-DATE OF SUBS SUBM: 45DPKDR

BLK16-REMARKS:

The Structural Design Report shall include the structural design criteria and requirements, design loading criteria, structural material selection, strength studies, trade-off studies, summary of calculations and analyses. References for design data shall be noted. Calculations shall verify that the structure meets the applicable rules and that the structure under the design loads meets the design criteria.

The Structural Design Report shall be updated for Contract Design phase to reflect design development.

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 100-01-1389

BLK02-TITLE OF DATA ITEM: Longitudinal Strength Report and Drawing

BLK04-AUTHORITY: DID Number: CGDI-GDRQ-90001  
DID Title: Calculations and Stress  
Diagrams

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPPDR

BLK 13-DATE OF SUBS SUBM: 45DPKDR

BLK16-REMARKS:

Hull girder loading and section property calculations shall be provided for the longitudinal strength analysis. Longitudinal weight, shear, bending moment and stress distributions shall be provided for lightship, min-op, full load and full load EOSL in still water, hogging and sagging bending moments.

Preliminary Design deliverable shall include still water and wave bending moment calculations at 10 stations along length of hull and section property calculations at midship.

Contract design deliverables shall include the full set of required calculations per OPC System Specification (NVR 1-3-1/6).

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 100-01-1395

BLK02-TITLE OF DATA ITEM: Standard Structural Details

BLK04-AUTHORITY:  
format.

DID Number: Contractor

DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM:

45DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

In accordance with NVR 1-3-5/14.1. Deliverable to be in drawing or booklet format.

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 161-01-1397

BLK02-TITLE OF DATA ITEM: Shaft Strut Design and Analysis

BLK04-AUTHORITY:  
format.

DID Number: Contractor

DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM:

45 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

Calculation and design sketches shall be developed and provided in accordance with NVR Addendum 1-3-5/11.3. Shaft struts shall be sized in accordance with the requirements and sketches shall show integration of struts into hull support structure.

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 170-01-2104

BLK02-TITLE OF DATA ITEM: Mast Analysis

BLK04-AUTHORITY:  
format.

DID Number: Contractor

DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM:

45DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

. Mast Structural Analysis Report shall document the complete analysis from loads development, analysis and assumptions, compliance with limiting stress and deflections. The report shall document the requirements, type of analysis being performed, system of units, coordinate axis system, description of the computer program or FEA and other models, plots of the full FEA model and local details. When finite element analysis is used for determining the stresses, the mesh size shall be commensurate to the details in question and to the area of the applicable stress components. A discussion of the modeling results and acceptance criteria, load assessment, strength resistance assessment, accuracy assessment and overall assessment shall be included and a reference list provided.

Any finite element models shall be submitted with the report.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 180-01-1401

BLK02-TITLE OF DATA ITEM: Structural Foundations Report

BLK04-AUTHORITY: DID Number: Contractor  
format.

DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

For contract design deliverable, report shall include major equipment foundation design calculations. Foundation calculations shall evaluate stress and stiffness vs requirements. Provide structural arrangement sketches depicting the incorporation of major foundations.

Report shall document the analysis from loads development, analysis and assumptions, compliance with limiting stress and deflections. Report shall document the requirements, type of analysis being performed, system of units, coordinate axis system, description of the computer analysis or FEA and other models, plots of the full FEA model and local details. Report shall include all relevant finite element plots with the scales and all accompanying information given or referred to in the legend, element types and degrees of freedom per node, material properties, element properties, finite element loads and boundary conditions, all stress components (primary, secondary and tertiary), where applicable, shall be taken into consideration. When finite element analysis is used for determining the stresses, the mesh size shall be commensurate to the detail in question and to the area of the applicable stress components. Discussion of the modeling results and acceptance criteria, load assessment, strength resistance assessment, accuracy assessment and overall assessment shall be included. Provide list of references.

Electronic FEA models (input files in compatible format) developed shall be delivered with the reports.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 184-01-2330

BLK02-TITLE OF DATA ITEM: Combat Systems Alignment Plan

BLK04-AUTHORITY:  
0101/OP762

DID Number: SW225-AO-MMA-

DID Title: Theory of Combat  
System Alignment Manual

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30DPPMC3

BLK 13-DATE OF SUBS SUBM: 30DPKDR

BLK16-REMARKS:

The Combat Systems Alignment Plan shall define the C4ISR systems requirements for alignment to the ship's defined reference planes. The plan shall specify the definition of the Ship Base Plane (SBP), the Master Reference Plane (MRP), the Ship Centerline Reference Plane (SCP) and Weapon Control Reference Plane (WCRP). The plan shall include all C4ISR systems elements, sensor equipment and navigation equipment (e.g., gun mounts, gun directors, radar sets, gyrocompasses, and stable elements) which require mechanical and electrical alignment to the ships defined reference planes. The alignment requirements, for those systems specified in the OPC Systems Specifications and the equipment's ICD, shall be listed in tabular form for inclusion in the Alignment plan. The Combat Systems Alignment Plan shall be in accordance with the NAVSEA Combat Systems Alignment Manual.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 200-01-1408

BLK02-TITLE OF DATA ITEM: Propulsion Redundancy Computations and Analysis Report

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and Technical Reports - Preparation, Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 200-01-1412

BLK02-TITLE OF DATA ITEM: Calculation of Surface Ship Endurance Fuel Requirements

BLK04-AUTHORITY: DID Number: DI-GDRQ-80650  
DID Title: Design Data and Calculations

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 200-01-1433

BLK02-TITLE OF DATA ITEM: Propulsion System Dynamic Analysis Report

BLK04-AUTHORITY: DID Number: DI-GDRQ-80650  
 DID Title: Design Data and  
 Calculations

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The Propulsion System Dynamic Analysis Report shall:

Define the operating envelope for each propulsion operating mode over a range of engine speeds, powers, and propeller pitches.  
 Provide the MPCMS schedules for pitch and speed for each operating mode.  
 Demonstrate equipment is operated within safe operating limits during all anticipated steady state and transient maneuvers.  
 Demonstrate all operating modes can pick up a dead shaft within the safe operating limits of the equipment.  
 Demonstrate any one operating mode can transition to another operating mode across all speeds achievable by both operating modes without adverse effects on ship performance or equipment.

The Propulsion System Dynamic Analysis Report shall define and provide rationale for the following design characteristics:

## Propulsion Diesel Engines:

RPM limits  
 Maximum power output  
 Non-continuous operating regions (i.e. low loading and torque limitations)

## Reduction Gears:

Torque limits - steady state and transient  
 Thrust limits - continuous thrust, maximum thrust, maximum crash ahead thrust, and maximum crash astern thrust

## Clutches:

Torque limits  
 Acceleration limits  
 Engagement speed limitations/restrictions

## Propulsion Motors (if provided):

RPM limits  
 Torque limits

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

For all analyses performed, the following parameters shall be included in the simulations:

- Ordered speed or power, each shaft
- Actual speed or power, each shaft
- Torque, each prime mover
- Power, each prime mover
- Fuel rack position, each diesel engine
- Ship reach (transient simulations only)
- Tactical diameter
- Ship speed
- Thrust, each propeller

Steady state analyses for each operating mode shall consider the ship in calm water, at design draft and trim at delivery, and over all possible propeller pitches in ten percent increments for the following conditions:

- Ship moving ahead in open water
- Ship moving astern in open water
- Maximum propeller thrust ahead in open water
- Maximum propeller thrust astern in open water

Transient analyses for each operating mode shall consider the ship in calm water and at design draft for the following conditions:

- Ship accelerating ahead from zero ship speed to maximum ahead ship speed
- Ship accelerating astern from zero ship speed to maximum astern ship speed
- Ship crash astern maneuver from maximum ahead ship speed to maximum astern ship speed
- Ship crash ahead maneuver from maximum astern ship speed to maximum ahead ship speed

Analysis of dead shaft pickup shall demonstrate the dead shaft pickup sequence procedure from zero hull speed for each operating mode without exceeding the safe operating limitations of the propulsion equipment.

Analysis of transitioning between operating modes determines the time required to transition between each operating mode, the change in ship speed from performing the transition, and the clutch engagement speed differential. The analysis shall include the following speeds for each transition:

- The minimum speed achievable by both operating modes
- The maximum speed achievable by both operating modes
- The average of these two speeds

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 200-01-2115

BLK02-TITLE OF DATA ITEM: Propulsion System Report

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 200-01-2227

BLK02-TITLE OF DATA ITEM: Propulsion System Trade-Off Study

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPPDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The study shall include a complete and detailed description of the analytical results which led to the Trade-off Study conclusions. The report shall include, but is not limited to, the following subsections:

- a. Study Approach
- b. Design Requirements
- c. Methods, Assumptions, and Procedures
- d. Description of Alternatives
- e. Plant Selection Criteria
- f. Plant Down-Select and Conclusion

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 202-01-1421

BLK02-TITLE OF DATA ITEM: Signal List

BLK04-AUTHORITY: DID Number: DI-MISC-81338  
DID Title: Master Instrument List

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The information for MPCMS, PCS, EPCS, and locally controlled machinery shall be provided in a standardized format and in separate documents.

BLK 04- Add the following to the list in Section 10.4.3.3. Data Items of the DID:

- 1) Equipment name: unique equipment name "Lube Oil System #1; Temperature RTD" for the sensor, transducer or actuator. Derived (tailored) from service attribute as well as other information.
- 2) Compartment Number: Compartment number location for the device-level equipment (such as, sensor, actuator or transducer) that the ECS interfaces, example: to 2-19-1-Q)
- 3) Compartment Level: Compartment level for the device level equipment (such as, sensor, actuator or transducer) that the ECS interfaces in instances where a compartment occupies more than one level.
- 4) Cable Block Diagram Number: Cable Block Diagram Number where the sensor, transducer, or actuator connections are identified.
- 5) System Diagram Number: System Diagram Number where the sensor, transducer, or actuator are shown.
- 6) SCID: Contractor Component ID # (AKA Instrument Number, AKA Piecepart#) of the sensor, transducer, or actuator. The purpose of the SCID is to track items between system diagram and all other artifacts such as the MEL, the ECS signal database, cable block diagrams. Example DSW-PT-001 MEL ID: unique Master Equipment List ID number for the equipment that functions as the source or destination for this signal.
- 7) Purchase Spec Number: Purchase Specification Number for the sensor, transducer, or actuator.
- 8) CN: Catalog Number for the sensor, transducer or actuator including manufacturer name, CAGE code and part number, or QPL part number
- 9) CNC: For electrical contacts, identify the Contact Normal Condition (CNC). this should be dry contact "shelf state" (open or close).
- 10) CSC: For electrical contacts, identify the Contact State Condition (CSC). this should be dry contact "actuated (true) state" (open or close)
- 11) Range: Range of engineering unit values that identifies the lowest value to the highest value that is specified for the sensor, transducer or actuator. This may also be expressed as an enumeration such as open/closed or on/off.
- 12) Units: Engineering units used in identifying the range of the sensor, transducer or actuator. (example: °F, psig, psid, feet)

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

- 13) Modes of operation: concept of operations descriptions of each subsystem that describe how the system will be used and operated. This will be provided in the form of a system description prepared in accordance with the shipbuilder procedures. This information is to enable the ECS designer to design appropriate automation algorithms to monitor and control the system.
- 14) Power Utilization: Sensor, transducer, or actuator power requirements in terms of KW, DC voltage, DC amps.
- 15) Interfaces Between Systems: Any interlocks and permissives that are necessary to coordinate the activity of two or more processes to insure that one process has reached a suitable state such that the other can proceed. Identify whether these are to be programmed in software or hardwired.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 202-01-1427

BLK02-TITLE OF DATA ITEM: Machinery System Integration Plan

BLK04-AUTHORITY: DID Number: DI-IPSC-81432  
DID Title: System/Subsystem  
Design Description (SSDD)

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90DPKDR

BLK 13-DATE OF SUBS SUBM: 90DPDR

BLK16-REMARKS:

The Documentation information for MPCMS, PCS, EPCS and any other stand alone control system shall be delivered as both separate documents for each control system and an integrated document showing plans for the installation of system interfaces.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 202-01-2048

BLK02-TITLE OF DATA ITEM: Machinery Controls Development Integrated  
Master Plan (IMP)BLK04-AUTHORITY: DID Number: DI-MGMT-81650  
DID Title: Integrated Master  
Schedule  
DID Number: DI-IPSC-81427  
DID Title: Software  
Development Plan

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPPDR

BLK 13-DATE OF SUBS SUBM: 90 DPKDR

BLK16-REMARKS:

The information for Machinery Plant Control and Monitoring System (MPCMS), PCS Propulsion Control System (PCS) and Electric Plant Control (EPCS) shall be delivered as separate documents. PCS and EPCS shall address the remote control from MPCMS and MPCMS shall address the remote control of PCS and EPCS. The plan shall provide details on hardware and software integration management, development, and interface management between system providers. The plan shall provide the development schedule for each system and subsystem for the MPCMS, EPCS and the PCS. The plan shall list the Machinery Plant subcontractors and vendors along with their respective areas of responsibility.

The plan shall describe the Integrated HM&E Machinery Controls Development approach for controlling the entire Machinery Plant Integration effort. The plan shall provide an integrated schedule for the development, testing and installation of HM&E Machinery Controls including the MPCMS, PCS, EPCS, and the respective subsystem interfaces.

The plan shall document how integration and interface requirements will be met for all machinery controls, so that a fully operational and effective MPCMS, PCS, and EPCS are delivered.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 202-01-2049

BLK02-TITLE OF DATA ITEM: Design Data and Analysis

BLK04-AUTHORITY: DID Number: DI-GDRQ-80650  
DID Title: Design Data and  
Calculations

BLK10-FREQUENCY: QTRLY

BLK12-DATE OF 1ST SUBM: 90DPKDR

BLK 13-DATE OF SUBS SUBM: 90DPCDR

BLK16-REMARKS:

The CDRL information for MPCMS, PCS, EPCS, and any stand alone control system shall be delivered as both separate documents for each control system and an integrated document showing system interfaces and connections.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 202-01-2050

BLK02-TITLE OF DATA ITEM: Human-Machine Interface (HMI) Style Guide

BLK04-AUTHORITY: DID Number: Contractor Format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90DPPDR

BLK 13-DATE OF SUBS SUBM: 90DPKDR

BLK16-REMARKS:

The data requested in this CDRL shall provide a guide for documenting the contractor's development of the HMI Graphical User Interfaces (GUIs). The Style Guide shall be developed using ANSI/HFES 200, tailored as applicable to MPCMS, EPCS, PCS, and all systems and subsystems (excluding C4ISR). Applicable sections of ANSI/HFES 200 which employ the term "should" for recommendations shall be modified to "shall" for requirements in the Human Machine Interface (HMI) Style Guide. This document shall standardize the "look and feel" and detail the requirements for common features and graphics such as: the use of symbols, the display of information, colors to be used, page navigation and menus, units, security, alarming and diagnostics, pop-ups (if used), data logging, alarm acknowledgement, and command activation. The Style Guide shall also assist in the documentation of the systems.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 202-01-2052

BLK02-TITLE OF DATA ITEM: Machinery Controls Network Architecture Report

BLK04-AUTHORITY: DID Number: DI-SESS-81001  
DID Title: Conceptual Design  
Drawings/Models

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The information for MPCMS, PCS and EPCS shall be delivered as separate documents and each document shall address its respective interfaces.

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 202-01-2054

BLK02-TITLE OF DATA ITEM: Functional Block Diagrams (FBDs) and Schematic Block Diagrams (SBDs)

BLK04-AUTHORITY:	DID Number:	DI-GDRQ-81224
	DID Title:	Functional Flow Diagrams
	DID Number:	DI-GDRQ-81223
	DID Title:	Schematic Block Diagrams

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90DPPDR

BLK 13-DATE OF SUBS SUBM: 90DPKDR

BLK16-REMARKS:

DID DI-GDRQ-81223 (SCHEMATIC BLOCK DIAGRAMS) shall be modified as follows:

The information for MPCMS, PCS, EPCS, and any stand alone control system shall be delivered as both separate documents for each control system and an integrated document showing system interfaces and connections.

The information for MPCMS, PCS and EPCS shall be delivered as separate documents.

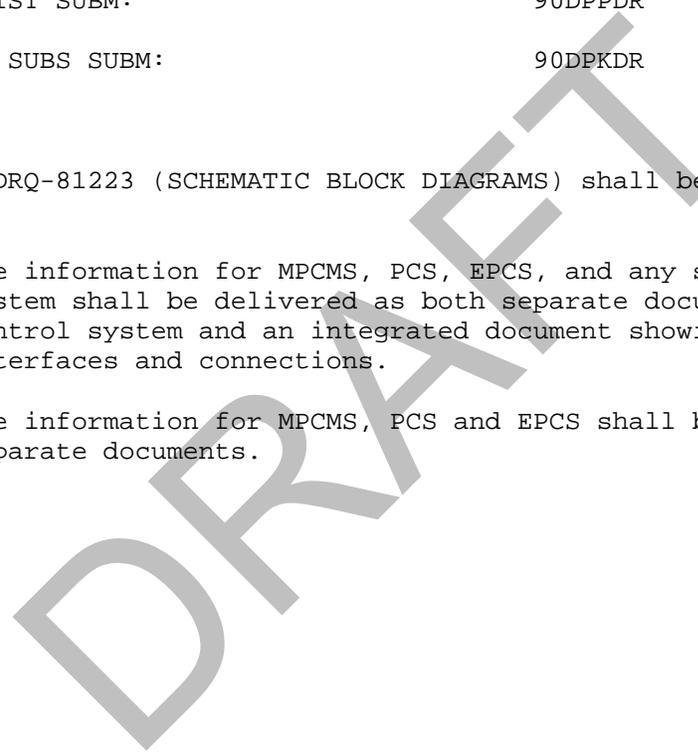


EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 202-01-2061

BLK02-TITLE OF DATA ITEM: Interface Design Description (IDD) and Diagram

BLK04-AUTHORITY: DID Number: DI-IPSC-81436  
DID Title: INTERFACE DESIGN

DESCRIPTION

DID Number: DI-IPSC- 81435  
DID Title: INTERFACE DESIGN

DESCRIPTION

DID Number: DI- GDRQ-81223  
DID Title: SCHEMATIC BLOCK

DIAGRAMS

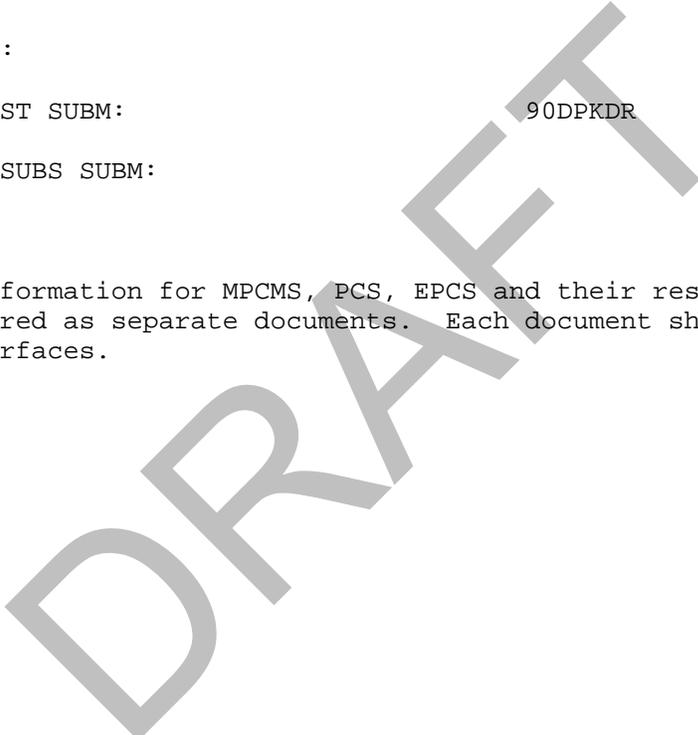
BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The document information for MPCMS, PCS, EPCS and their respective subsystems shall be delivered as separate documents. Each document shall address its respective interfaces.



## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 202-01-2218

BLK02-TITLE OF DATA ITEM: Machinery Control Development Environment  
ReportBLK04-AUTHORITY: DID Number: Contractor Format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPPDR

BLK 13-DATE OF SUBS SUBM: 90 DPKDR

BLK16-REMARKS:

The Document information shall be in contractor format and include PLC manufacturer and family, PLC programming development environment (i.e. software used to program PLCs), industrial computer manufacturer and OEM specifications, industrial computer Operating System (OS) and Application Software (i.e. HMI development software), network equipment OEM specifications and programming development environment (software used to program network devices), and data logging software.

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 235-01-2219

BLK02-TITLE OF DATA ITEM: Electric-Drive Propulsion System One Line  
Diagram

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product  
Drawings/Models and Associated  
Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 243-01-1437

BLK02-TITLE OF DATA ITEM: Main Propulsion Shafting Arrangement and  
Details Drawing

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product Drawing/Models  
and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 120 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 243-01-2232

BLK02-TITLE OF DATA ITEM: Propulsion Shafting Alignment Analysis and  
Propulsion Shafting Stress Analysis

BLK04-AUTHORITY: DID Number: DI-GDRQ-80650  
DID Title: Design Data and  
Calculations

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 120 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 244-01-2091

BLK02-TITLE OF DATA ITEM: Line Shaft Bearing Drawings, Stern Tube and  
Strut Bearing Drawings, and Thrust Bearing  
Drawings

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product Drawings/Models  
and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 244-01-2092

BLK02-TITLE OF DATA ITEM: Line Shaft Bearing Location and Radial Loads Calculations, Stern Tube, and Strut Bearing Location and Radial Loads Calculations, and Thrust Bearing Location and Thrust and Radial Loads Calculations

BLK04-AUTHORITY: DID Number: DI-GDRQ-80650  
DID Title: Design Data and Calculations

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 259-01-1465

BLK02-TITLE OF DATA ITEM: Combustion Air Intake and Exhaust Systems  
Analysis Report

BLK04-AUTHORITY: DID Number: DI-GDRQ-80650  
DID Title: Design Data and  
Calculations

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 300-01-1472

BLK02-TITLE OF DATA ITEM: Electric Plant Design Report

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
DID Title: Scientific and  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90DAC

BLK 13-DATE OF SUBS SUBM: 45DPPDR, 180DPKDR, 45DPKDR

BLK16-REMARKS:

Each subsequent submittal shall include more detail than the previous submittal.

The following shall be submitted for PD (Preliminary Design).

The report shall initially contain design approach details including number, capacity and location of generating sources, generators, switchboards, load centers and power panels .

It shall also include details about the electric plant configuration including bus tie connections, the power management system, redundancy features and how the electric plant design will meet the requirements of ABS NVR and the OPC System specification.

The report shall, at a minimum, describe the following:

- How the ship's electric power and lighting systems are designed to provide flexibility ensuring survivability and continuous service to vital power and lighting loads under normal and casualty conditions.
- The trade-offs of the current and competing designs. Document the pros and cons of each distribution system considered for the OPC.
- Describe why a particular distribution topology is preferred for OPC. Describe the power distribution topology chosen.
- How equipment control is distrusted among electrical and fire zones to enhance survivability.
- How electrical supplies are available to emergency and safety systems.
- How the electric plant control system interfaces with the machinery control and propulsion control systems.
- If electric loiter propulsion is considered, describe how both the electrical power and the control interfaces with the propulsion control system.
- Why a common or segregated bus was chosen for the electric loiter drive system(s), if proposed.
- How an electric loiter mode(s) will be incorporated into the propulsion system, if proposed.
- The cost impacts pros and cons of the electric plant design.
- How the power system design uses redundancy to address power system components that have a relatively low reliability.

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- How the electric plant will export power from the ship.
- How the electric plant plans to meet and verify the power quality requirements of the specification and ABS NVR Part 3-2-2/1.4 (MIL-STD 1399-300B). The report shall indicate if a segregated bus, filtering, active front end or other methods are required in order to isolate large electric loiter propulsion loads or non-linear load harmonics or power quality issues from ship service loads.

The report and all data or metadata shall be delivered in accordance with ANSI/NISO Z39.18.

In addition to the items above the following shall be submitted for CD (Contract Design):

- How the number and complexity of the distribution system connections crossing construction boundaries are minimized.
- How motor controls are conveniently grouped according to their function, e.g. fuel and lubrication oil services, accommodation ventilation systems, machinery ventilation systems, and domestic service systems.
- A preliminary short circuit analysis including large loads (thrusters, loiter propulsion if proposed) and sources shall be prepared for the purpose of determining the maximum expected KAIC (kilo Amp Interrupting Capacity) of circuit protection devices. This KAIC will give general size, cost and arrangement information for circuit protection devices and distribution equipment such as switchboards, load centers, distribution panels, etc.
- How the design prevents loss of lighting and circuitry for important areas, along escape routes or emergency lighting services during flooding and fire damage.
- How distribution panels will be generally arranged.
- The modes of operation for conditions and justify the preferred mode of operating the ship service generators during various missions.
- The ship service generators and distribution system design for operation in parallel and separately (split plant).
- How the design uses selective tripping or load shedding to reduce the likelihood that all circuit breakers for paralleled generators will trip as a result of a system fault.
- How localization, isolation, reconfiguration, and recovery from faults are performed automatically or manually.
- How main switchboard(s) and generators would be disabled in the event of damage, fire or flooding.
- Describe what functions of the electric plant design are local, remote, fully automatic, semi-automatic and manually operated.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 300-01-1473

BLK02-TITLE OF DATA ITEM: Electrical One Line Diagram

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product  
Drawings/Models And Associated  
Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60DPPDR

BLK 13-DATE OF SUBS SUBM: 60DPKDR

BLK16-REMARKS:

The basic function of the one line diagram is to convey information concerning the power system, including the overall scheme as well as details of each element of the plant supply and distribution system. Each subsequent submittal shall include more detail than the previous submittal. Comments, suggestions and design changes from the previous submittal review shall be incorporated into subsequent submittals. All design phases shall include, at a minimum, the following in the Electric Plant One Line Diagram or Single Line Diagram.

1. The Electrical One Line Diagram shall be prepared in accordance with OPC System specifications and NVR 3-1-4/1.1.1. The Electrical One Line Diagram shall also follow the recommendations of IEEE-STD-141 and shall substitute "should" or "recommend" with "shall".
2. The Electrical One Line Diagram shall be supported by engineering analysis.
3. Each drawing shall reference every related drawing. The Electrical One Line Diagram shall correspond to items on other system drawings such as the EPLA (Electric Plant Load Analysis), Master Equipment list, Circuit Breaker Coordination Study etc.
4. Graphic symbols for electrical and electronics diagrams shall be in accordance with IEEE-STD-315 or MIL-HDBK-290 and shall indicate type of equipment and fixtures. A table shall be provided on the drawings, which lists and provides descriptive identification for each symbol used.
5. The Electrical One Line Diagram shall show each major component in the electric plant including, generators, bus ties, switchboards, load centers, power panels, motor controller centers, LVPs and LVRs, ABTs/MBTs, Ship service transformers, and disconnect switches. The diagrammatic drawings shall present an overall view of the system including all cables that interface with other systems. The diagram shall be a continuous line with each cable represented by a single line. Identification of individual terminals of a connector or terminal board may be omitted. Cable designation and cable types shall be shown for each cable. The diagrammatic drawings shall identify the compartment where each unit in the system is located.

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6. Shall present sufficient data to plan and evaluate the electric power system.
7. Power sources: kW rating, voltage, rated current, frequency, number of phases, power factor, and characteristic impedance.
8. Source, supply and distribution voltages.
9. Protective devices, switches, circuit breakers, fuses etc. The normal operating mode for these devices shall be indicated.
10. Indicate each protective device's continuous-current rating, symmetrical interrupting current and asymmetrical momentary or closing-and-latching current rating, manufacturer, type, and model identification. Indicate tap settings on all primary transformers.
11. Nominal continuous-current ratings, interrupting or momentary closing and latching short-circuit current ratings.
12. Types of relays, circuit breakers or circuit protection, ANSI identification, location, and calibration settings for all protective devices.
13. Protective devices: rating and trip settings, emergency tripping and preferential tripping features.
14. Indicate normal operation mode of all switching, isolation, and protective devices.
15. Primary switching, fusing, other protective devices, transformer connections, ratings, system grounding, nominal loading (kilovoltamperes and amperes), and protective-device arrangement for plant and load centers.
16. Indicate bus ratings in amperes.
17. Manufacturer(s), type, model, current rating, megavoltamperes class, symmetrical interrupting current rating, and asymmetrical momentary/closing-and-latching current rating for main, tie, and feeder devices.
18. Identify major load centers and indicate general electrical configuration.
19. Identify nominal loads in kilovoltamperes and amperes on ship's service switchboards, transformers, load centers, distribution panels etc.
20. Ratings of protective devices with coordination settings.
21. Identify and show all major loads and motors, including associated transformers and all other major, significant and identifiable loads, such as motor loads on motor control centers, large press and other motor or drive loads, dedicated lighting loads, arc furnaces, induction furnaces, special purpose loads, such as data processing and computer applications, welding loads, powerhouse loads, including waste treatment, air compressor loads, etc.
22. All loads, motors including horsepower/kilowatt, revolutions per minute, and type (induction,

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

synchronous). Include chillers, compressors, etc. Indicate all solid-state/SCR-controlled variable-speed ac/dc-converter motor drives.

23. Motors: kW or hp rating, voltage and current rating.
24. Motor controllers: type (across-the-line, star-delta, vsd, etc.), disconnect devices, type of protection (LVR, LVP), and remote manual stops, as applicable.
25. Primary feeder cables and number of feeders.
26. Cable insulation and type.
27. Cable installation design (conduit, Interlocked Armored Cable [IAC] in tray, size of tray, number of cables in tray, etc.).
28. Cable nominal maximum current rating and basis.
29. Cable size and number of cables per phase.
30. Circuits: designations, type and size of cables, ampacity or each circuit, type of load (pulsed, continuous, intermittent).
31. Transformers: kVA rating, rated voltage and current, winding connection, temperature rise, taps (percent steps), In-line regulator (if separate), impedance base, kVA base, Grounding scheme (ohmic value & connections), Surge arrestors and capacitors (show switching if switched) and characteristic impedance.
32. Batteries: type, voltage, rated capacity, conductor protection.
33. Converters: type, kVA rating, input/output voltage, input/output frequency, characteristic impedances.
34. Harmonic Filters or capacitor banks: type, kVA rating, rated voltage, rated current.
35. Bus transfer Switches: type, voltage, rated current.
36. Future space considerations. Primary main switchgear. Indicate space for expansion of primary feeder overcurrent devices in switch house or available cubicles for such expansion.
37. Acronyms defined.

041.7

The following subsystems shall be submitted in accordance with the information above, at a minimum.

1. General lighting, normal and alternate one-line diagrams.
2. Navigation lights , arrangements, and details.
3. Interior communications systems power one-line diagrams (also see NVR 4-4-1/8).
4. General emergency alarm system.
5. Generator starting system.
6. Steering gear system.
7. Fire detection and alarm system.
8. Surveillance and monitoring systems.

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9. Control, Automation, and Navigation systems.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 300-01-1474

BLK02-TITLE OF DATA ITEM: Electric Plant Load Analysis (EPLA)

BLK04-AUTHORITY: DID Number: DI-SESS-81002  
DID Title: Developmental  
Design Drawings/ Models And  
Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60DPPDR

BLK 13-DATE OF SUBS SUBM: 60DPKDR

BLK16-REMARKS:

Initially the primary purpose of the EPLA is to size distribution system equipment, cables and generator set capacity. More details below will be added to the EPLA as the design progresses. These additional details reflect improvements in equipment, control (power management) and analysis methods. These details will help evaluate electric plant configurations and system comparisons to prevent an over or under sized plant. Details of the electric plant should be included in the early design process to prevent an unnecessary large electric plant from driving arrangements or ship size.

1. The EPLA (Electric Plant Load Analysis) shall be prepared in accordance with the OPC System Specifications (NVR 3-1-4/1.4) . Operating condition load requirements shall show winter and summer profiles separately. The ship service loads shall be the basic operating loads included under each ship operating condition as a minimum.
2. The EPLA shall include ship service, emergency and special frequency systems which shows operating loads under typical ship operating conditions, tabulated and summarized in such a way as to demonstrate adequacy of the power sources. This is a preliminary step in the development of a power distribution system with adequate power source capacity. This analysis shall be revised whenever noun nomenclature and individual operating loads change.
3. In addition to the requirements and recommendation above, the EPLA system load and power analysis shall be prepared in accordance with the guidance provided in DDS 310-1, "Electric System Load and Power Analysis for Surface Ships" and MIL-STD-2189-310, Electric System Load and Power Analysis For Surface Ships. This analysis shall be prepared to a detailed level for the all components of the electric plant and distribution system. In preparing the initial load analyses, typical load factors provided in DDS 310-1 and MIL-STD-2189-310 may be used; However, as the design progresses, these typical load factors shall be replaced with realistic load factors which reflect actual anticipated load under design conditions. If the operating load (kW) is determined by applying an operating load factor, the operating load factor shall be indicated; if determined by other means, the method used shall be indicated by a note. Realistic values of operating load (kW) shall be indicated for each load. For the purpose of this drawing, the operating load is defined as the

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

maximum sustained power (kW) required to operate the ship under each probable operating condition.

4. The operating load shall not include instantaneous power surges which are caused by starting large motors, or peak loads of short duration. Each electric load shall be identified as sheddable or non-sheddable. Each sheddable load shall be assigned a load shedding sequence number.
5. The EPLA may use recommendations of IEEE-STD-141 "Load Surveys" as guidance.
6. In addition to the requirements and recommendation above, the following shall be included in the EPLA:
  - a. The EPLA shall reference all related drawings. The EPLA sources and loads shall correspond to items on other system drawings such as the Electrical One Line Diagram and Master Equipment list.
  - b. The EPLA shall be supported by engineering analysis.
  - c. The EPLA shall show each generating source and load in the electric plant/electrical distribution system.
  - d. The EPLA may be created using ESA's Easypower software and exported to an AutoCAD file as long as the format meets NAVSEA S9AA0-AA-010/GEN-SPEC as stated above. This may be accomplished with ESA's SendCAD feature included with every EasyPower configuration. The Easypower source code file(s) for the EPLA shall also be delivered.
7. If the EPLA is created in a program such as Microsoft Excel or Microsoft Access, the .xls or .mdb file shall be submitted with the AutoCAD and paper version of the EPLA.
8. The System Load and Power Analysis shall be divided into groups arranged by SWBS.
9. EPLA sample below, or similar format, shall be used to tabulate the operating load on the system for each item of equipment in each SWBS group. Requirements for this tabulation are defined in more detail as follows:
  - a. Rated horsepower or kilowatt of the motor shall be indicated.
  - b. Full load kW (full load input to the motor) of each connected auxiliary shall be indicated.
  - c. The operating loads (kW) on the electric plant, obtained by the summation of individual operating loads, shall be indicated for each operating condition of the ship. From ABS NVR these are; Minimum (Anchor), Shore, Cruise, Functional, and Emergency.
  - d. Design margins and service life allowance shall be clearly identified in the EPLA. The margins shall be in accordance with the OPC System Specification (NVR 3-1-4/1.4).
  - e. Service life allowance shall be applied for sizing ship service power generation plant capacity based on the functional kW load for the worst case ship operating condition. Service life allowance is not applied for determining the emergency generator loading.
  - f. Load shed. Each electric load shall be identified as sheddable or non-sheddable. Each sheddable load shall be assigned a load shedding sequence number.

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- g. Vital, non-vital
- h. Voltage
- i. UPS hold-up time
- j. Location, compartment
- k. Power panel, load center or switchboard feed.
- l. Summary Page(s)
- m. Feeder(s)

DRAFT



## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 300-01-1476

BLK02-TITLE OF DATA ITEM: Electric Plant Control System (EPCS) Report

BLK04-AUTHORITY:

DID Number: DI-MISC-80711  
DID Title: Scientific And  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 120DAPDR

BLK 13-DATE OF SUBS SUBM: 240DAPDR

BLK16-REMARKS:

The report shall include, at a minimum, detailed information about the system, such as: Theory of operation, sequence of operation, parameters for loading and unloading the generators, logic and logic flow diagrams with decision values and criteria.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 300-01-1484

BLK02-TITLE OF DATA ITEM: System Control and Power Block Diagrams

BLK04-AUTHORITY:

DID Number: DI-SESS-81000,  
 DID Title: Product Drawings/Models  
 and Associated Lists  
 DID Number: DI-GDRQ-81223  
 DID Title: Schematic Block  
 Diagram

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS: A Controls Drawings and Schematics Booklet shall provide block diagrams for the Control Systems listed below:

Hydraulics.

Weapons.

Sewage.

Steering Gear.

HVAC.

Chilled Water.

Deck Machinery.

Potable Water.

Fuel.

Propulsion.

Boat Davit.

Fire Fighting.

Hoist.

1. Crane.

2. Generator Set

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 300-01-1485

BLK02-TITLE OF DATA ITEM: Electrical System Survivability Analysis

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
DID Title: Scientific and  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 180DPKDR

BLK 13-DATE OF SUBS SUBM: 60DPKDR

BLK16-REMARKS:

A survivability analysis shall be in accordance with the requirements of OPC Systems Specification (NVR 3-1-4/1.5.6 and 3-2-4). Survivability relates to the ability of the power system, when damaged to support the ship's ability to continue its missions or save the ship. Since the installation of survivability improvements into existing ships has proven very expensive, focus on incorporating survivability features in the early phases of ship design will ensure an affordable balance for the ship class. Ship survivability features shall provide affordable protection at the levels specified above.

This report shall include but not limited to the following:

1. A detailed analysis and description of the survivability of the electric plant as it is subjected to equipment failure or damage.
2. A descriptive analysis of the capability of the electric plant to withstand loss of generating sources, switchboards, load centers or switchboard and load center interconnection cables and the various configurations available to circumvent the area of damage.
3. Illustrations depicting the various electric plant configurations available for all parts of the ship to continue to receive power in the event of equipment failure or damage.
4. A descriptive analysis of the power management system and associated network capability to provide redundant system control.
5. Details and descriptions that encompass electrical power for mission essential defensive systems, equipment and personnel protection features developed throughout the ship design, procurement operation and life-cycle support phases.
6. Description of how ship protection features, such as armor, arrangement, shielding, reduced fire loading, redundancy, separation of vital systems, use of damage control, firefighting techniques together with installed equipment hardened to appropriate standards, constitute a minimum baseline of survivability. These shall be implemented through the equipment specifications and the application of the principles of separation, redundancy and arrangements of critical components and systems.
7. The numerous operational environments associated with survivability.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

8. Description of trade-offs encountered in the survivability of the electric plant and the balance achieved.
9. Methodologies and perform assessments of survivability features.
10. Determination of the desirability, feasibility, benefits and impacts associated with implementing/developing survivability improvements.
- 11.
12. An assessment of cold weather and severe environmental conditions that impact the electric power system.
13. A survivability assessment section. This section shall include data that permits determination of the effectiveness of the electrical system and all existing and proposed survival enhancement techniques under a variety of conditions and also provide quantified levels of system survivability. This section shall also contain a description of the casualty conditions, a description of all the survivability enhancement techniques considered, identification of the source of all data used in the calculations, description of the methodology used, and results
14. Casualty enhancement tradeoff studies section. This section shall identify the effects of variations in each significant survivability analysis parameter (e.g. casualty, operational utilization, performance system baseline characteristics, an overall operational effectiveness and suitability, and schedule,. This section shall describe the results of trade studies.
15. Identification of the analysis methods and models used.
16. Effectiveness studies which define basic operation concepts as well as systems engineering studies which define and refine the system configuration and effectiveness due to flooding in accordance with the OPC System Specification. .
17. A determination of whether a casualty power system is required on the OPC dependent on the degree of survivability of the electric plant design when it is subjected to equipment failure or damage.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 320-01-1537

BLK02-TITLE OF DATA ITEM: Export Power Design Report

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
DID Title: Scientific and  
Technical Reports.

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 120 DAC

BLK 13-DATE OF SUBS SUBM: 60 DPPDR, 180DPKDR, 60DPKDR

BLK16-REMARKS:

Each subsequent submittal shall include more detail than the previous submittal. Comments, suggestions and design changes from the previous submittal review shall be incorporated into subsequent submittals.

The report shall include the following for PD (Preliminary Design):

1. Details of the trade-off study, including physical power routing to and from the Ships Service power and the export power control interface.
2. The report shall include descriptions of the theory of operations, proposed design, construction, and functional and safety features.
3. The capacity of the power to be exported.

The report shall include the following for CD (Contract Design):

1. Updates in the design from PD.
2. A recommendation based upon previous PD work, comments and concerns for the export power function to be implemented into the Electric Plant for OPC.

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 320-01-2253

BLK02-TITLE OF DATA ITEM: List of Essential Service Loads

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product Drawings/Models  
And Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

Provide a list of essential loads in accordance with the requirements of the OPC System Specification (NVR 3-2-3/2.1.1).

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 320-01-2263

BLK02-TITLE OF DATA ITEM: Dead Ship Recovery Concept of Operations

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
DID Title: Scientific And  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 90 DPPDR

BLK 13-DATE OF SUBS SUBM: 60 DPKDR

BLK16-REMARKS:

1. This report shall describe the process by which the requirements of OPC System Specification (NVR 3-2-2/1.3.1) are being met by the OPC's electric plant design.

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 324-01-2273

BLK02-TITLE OF DATA ITEM: Hardware-In-the-Loop (HIL) and  
Simulation/Stimulation (SIM/STIM) Test Plan

BLK04-AUTHORITY: DID Number: DI-NDTI-80809  
DID Title: Test/Inspection  
Report

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 331-03-1627

BLK02-TITLE OF DATA ITEM: General Lighting, Normal and Alternate One-Line Diagrams

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product  
Drawings/Models And Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The Lighting System One-Line Diagram shall be prepared in accordance with the OPC System Specification (ABS NVR 3-1-4/1.2). Normal and emergency lighting systems shall be included in the drawings.

The Lighting System One-Line Diagram shall show:

- Main and emergency lighting circuits: Cable type and circuit designation, load, voltage, load name and location for receptacles and lighting circuits
- Isolation transformers: kVA rating, rated voltage, current, winding connection, voltage ratio
- Lighting feeder cable: Cable type and circuit designation.
- Trip setting and rating of lighting circuit protective devices, rated load of each branch circuit.
- Lighting Load Centers, Switchboard connections, Panelboards: voltage and current rating, enclosure type, location
- Other equipment connected to lighting circuits, voltage rating, load, and location

Each diagram shall reference related drawings. Diagrams shall correspond to items on other system drawings such as the EPLA (Electric Plant Load Analysis) and Master Equipment list.

Electrical cable designations (Cable numbers) shall be identified in accordance with OPC System Specification.

Graphic symbols for diagrams shall be in accordance with IEEE-STD-315 or MIL-HDBK-290 and shall indicate type of equipment and fixtures. A table shall be provided on the drawings, which lists and provides descriptive identification for each symbol used.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 400-01-2122

BLK02-TITLE OF DATA ITEM: Navigation Systems Reports

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
DID Title: Scientific and  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30DPPDR

BLK 13-DATE OF SUBS SUBM: 30DPPMC3 and 30DPKDR

BLK16-REMARKS:

The Navigation Systems Report shall include all Navigation Systems/Subsystems, including the Integrated Bridge. The Navigation Systems Report shall include the following:

- Top level description of the design and design status
- Operational and user interface design description for primary system components
- Identification of features monitored
- Alarms that will be displayed per primary component

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 400-01-2310

BLK02-TITLE OF DATA ITEM: Functional Block Diagrams

BLK04-AUTHORITY: DID Number: DI-GDRQ-81223  
DID Title: Schematic Block  
Diagrams

BLK12-DATE OF 1ST SUBM: 30DPPMC3

BLK 13-DATE OF SUBS SUBM: 30DPKDR

BLK16-REMARKS:

The following C4ISR Functional Block Diagrams shall be developed as separate diagrams:

1. LAN (Unclassified and Classified) Architecture Block Diagram.
2. Radio, AF/RF Switching System Block Diagram.
3. IC Voice System Block Diagram.
4. Ships Video Distribution System Block Diagram.
5. IC Alarm Systems Block Diagram.
6. Indicator Systems Block Diagram.
7. Command and Control System Block Diagram.
8. Radar and IFF System Block Diagram.
9. EW System Block Diagram.
10. Weapon Systems Block Diagram.
11. CDDS System Block Diagram.
12. NDDS System Block Diagram.
13. Electrical Navigation Aids Block Diagram.
14. Electronic Navigation Systems Block Diagram.
15. Integrated Bridge System Block Diagram.
16. Chemical, Biological, Radiological (CBR) Detection Systems Block Diagram.
17. Training Systems Block Diagram.

The C4ISR Functional Block Diagrams shall include:

1. First-Level (Parent) Block Depictions - C2, Ships Video, Navigation, etc.
2. Second and subsequent Level (Child) Block depictions , down to lowest subsystem element
3. Connecting lines down from Parent to Child blocks

The Functional Diagrams shall not include system physical characteristics, messaging information, installation, or location data.

BLK 04-01:

1. The C4ISR Functional Diagrams shall be developed to the Lower-Level detail as per paragraph 10.4.b.
2. The following are portions of Paragraph 10.2 are not required:
  - "maintenance or check out aspects of the proposed design"

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

- "As system definition progresses, the schematic diagrams shall be updated to incorporate new requirements such as maintainability features, self-test capability, read-out indications, monitoring capability, critical pressures voltages, and other quantitative expressions of system performance."

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 402-01-2344

BLK02-TITLE OF DATA ITEM: Information Assurance Plan

BLK04-AUTHORITY: DID Number: DI-IPSC-81427  
DID Title: Software  
Development Plan

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30DPPDR

BLK 13-DATE OF SUBS SUBM: 30DAOE, 30DPICDR

BLK16-REMARKS

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 404-01-1641

BLK02-TITLE OF DATA ITEM: Waveguide Routing Reservation Drawing and  
Waveguide Routing Drawing

BLK04-AUTHORITY: DID Number: DI-SESS-81002  
DID Title: Developmental  
Design Drawings, Models, and  
Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

Preliminary drawings depicting the routing of the MMR waveguide .

Routing shall show the physical routing reservation of the MMR waveguide to  
the system diagram level.

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 405-01-1090

BLK02-TITLE OF DATA ITEM: Topside Antenna Systems Arrangement Drawing

BLK04-AUTHORITY: DID Number: DI-SESS-81002  
DID Title: Developmental  
Design Drawings / Models

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45DPPDR

BLK 13-DATE OF SUBS SUBM: 60DPKDR

BLK16-REMARKS:

First Submission: Notional arrangement drawing (plan and elevation views) depicting the location and number designation of all antennas topside.

Second Submission: Preliminary arrangement drawing (plan and elevation views) depicting the location of all antennas topside.

This drawing will be used to in developing the Topside Design Arrangement drawing.

The Topside Antenna System Arrangements Drawing shall depict all essential elements of the cutter's topside in order to provide graphical depiction of the incorporation of the cutter's C4ISR Sensors and Antenna suite of equipment into the topside design arrangement.

The Drawing shall show Port and Stbd Outboard Profiles, Topside Plan, Bow and Stern views.

The Drawing shall show the design waterline, and shall show hull and appendages below the waterline for completeness.

The Drawing shall show mast(s) and yardarms installed whether they are used to any of the C4ISR equipment and antenna systems placement or not. The C4ISR antennas and sensors will be identified by antenna number and listed in a table format identifying the antenna number, location (by Frame number, Height above Baseline, and distance Port, Starboard or on Centerline), Noun name or Nomenclature, associated system equipment and terminal connectivity.

The Drawing shall show and label all weapons, lights and decoy systems in their deployed configuration

The Drawing will list all antennas and sensors by antenna number as per NAVSEA Instruction 9405.1A, NUMBERING IDENTIFICATION FOR SURFACE SHIP ANTENNAS dated 3 Jan 02.

Antennas and sensors shall be identified in a List of Antennas and shall be labeled in the body of the drawing. The List of Antennas shall contain, at a minimum, columns for the following:

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

- a. Antenna No.
- b. Location by Frame number and inches aft of frame (i.e. xx + xx")
- c. Location by height above Baseline (i.e. xx' - " ABL)
- d. Location by Distance to Port (P) or to Starboard (S) from Ship's Center Line (CL) or on CL (i.e. xx'-xx" P)
- e. Antenna Nomenclature or Description
- f. Termination Equipment (Nomenclature or Description)
- g. Termination Compartment/Location
- h. Remarks (i.e. . Amplifying Information relative to the equipment, System, mounting, or operational requirements,, etc)
- i. Reference Drawing Number

Navigation and Topside Lights shall be identified in a List of Lights and shall be labeled in the body of the drawing. The List of Lights shall contain, at a minimum, columns for the following:

- a. Light No.
- b. Location by Frame number and inches aft of frame (i.e. xx + xx")
- c. Location by Height Above Baseline (i.e. xx' - " ABL)
- d. Location by Distance to Port (P) or to Starboard (S) from Ship's Center Line (CL) or on CL (i.e. xx'-xx" P)
- e. Description (i.e. FWD Masthead Light, etc)
- f. Remarks (i.e. color, etc)



## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 407-01-1657

BLK02-TITLE OF DATA ITEM: Electromagnetic Environmental Effects (E3)  
Compatibility PlanBLK04-AUTHORITY: DID Number: DI-EMCS-81528  
DID Title: Electromagnetic  
Compatibility Program Procedures

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30DPPMC3

BLK 13-DATE OF SUBS SUBM: 30DPKDR

BLK16-REMARKS:

1. The E3 Compatibility Plan shall document the Contractor's Plan for meeting the Electromagnetic Compatibility (EMC) requirements as defined in OPC Systems Specification.
2. This Plan shall include:
  - a. The milestones and actions to review potential EMC issues with the suite of Electronic and Electrical equipment installed in the OPC.
  - b. Review of the physical arrangement of equipment on the cutter to reduce Electromagnetic Interference (EMI) susceptibility from other equipment and resolution processes for resolving the problem by relocation, redesign, or other EMI mitigation techniques.
  - c. The application and effectiveness of EMI mitigation techniques such as EMI shields, EMI filters, EMI-hardened enclosures, etc. used to minimize or eliminate EMI.
  - d. Outlining other measures taken to prevent electromagnetic radiation hazards to electrical equipment, electronics, personnel, fuel and ordnance, both internal and external to the ship.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 415-01-2333

BLK02-TITLE OF DATA ITEM: C4ISR Network Architecture Report

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
DID Title: Scientific and  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30DPICDR

BLK 13-DATE OF SUBS SUBM: 30DPFCDR

BLK16-REMARKS:

The report shall cover the following topics:

- Cable Infrastructure
- Network Topology
- Testing and Verification
- Network Fault Tolerances
- Network Operational Requirements
- Environmental Requirements
- Fail-Safe/Fail-Over Processes
- Network Monitoring
- Network Disaster Recovery
- Logistics Supportability

The network design report shall document classified and unclassified data exchanges and transmissions.

For network security, the report shall address the Contractor's efforts to support the USCG in the DOD Information Technology Security Certification and Accreditation Process (DIACAP).

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 430-01-1673

BLK02-TITLE OF DATA ITEM: Internal Communication (IC) Systems Report

BLK04-AUTHORITY:

DID Number: DI-MISC-80711  
DID Title: Scientific And  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30DPPDR

BLK 13-DATE OF SUBS SUBM: 60DPKDR

BLK16-REMARKS:

The report shall provide a functional description of all of the internal communications systems developed by the Contractor (telephone, announcing, alarms, etc.), as specified in the OPC Systems Specification (NVR 4-4-1/5.1). The functional descriptions shall include a description of system/equipment functions, capabilities, and interfaces with other systems. The report shall include Functional Block Diagrams for each system.

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 443-01-2171

BLK02-TITLE OF DATA ITEM: Whistle Operating System Functional Block Diagram

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product  
Drawings/Models and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The Whistle Operating System Block Diagram shall be provided in accordance with the requirements of the the Alarm, Safety, and Warning System diagrams.

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 501-01-2028

BLK02-TITLE OF DATA ITEM: Main and Auxiliary Machinery Arrangements  
Drawings

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product Drawings  
Models and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

BLK04: Machinery Arrangement (Main and Auxiliary) Drawings shall be drawn to scales of not less than 1/4 inch to the foot.

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 501-01-2029

BLK02-TITLE OF DATA ITEM: Auxiliary Systems Diagrams

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product Drawings  
Models and Associated Lists

BLK10-FREQUENCY: See BLK 16

BLK12-DATE OF 1ST SUBM: See BLK 16

BLK 13-DATE OF SUBS SUBM: See BLK 16

BLK16-REMARKS:

BLK04: All diagrams shall be of sufficient clarity that reduced size prints (11" x 17") shall be fully legible.

The HVAC system Diagram shall depict summer and winter operating conditions concurrently.

The Hydraulic System Diagram shall be in accordance with SAE J1790, Hydraulic System Diagrams and Associated Tables for Marine Vehicles.

BLK10: Two submittals per diagram, with revisions.

BLK12: The following diagrams shall be submitted 120 DPPDR: Machinery Seawater Cooling, Combustion Air and Exhaust, HVAC, Firemain, Magazine Sprinkling, Washdown Countermeasures, Ballast, Bilge, Fresh Water, Fuel, and Fixed Fire Extinguishing.

The following diagrams shall be submitted 60 DPPDR: Lube Oil, Refrigeration System, Exterior Deck Drain, Gray Water, JP-5, Compressed Air, Hydraulic, Oily Waste, Waste Oil, Sewage, and any other system diagrams.

BLK13: The following diagrams shall be submitted 120 DPKDR: Machinery Seawater Cooling, Combustion Air and Exhaust, HVAC, Firemain, Magazine Sprinkling, Washdown Countermeasures, Ballast, Bilge, Fresh Water, Fuel, and Fixed Fire Extinguishing.

The following diagrams shall be submitted 60 DPKDR: Lube Oil, Refrigeration System, Exterior Deck Drain, Gray Water, JP-5, Compressed Air, Hydraulic, Oily Waste, Waste Oil, Sewage, and any other system diagrams.

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 501-01-2032

BLK02-TITLE OF DATA ITEM: Miscellaneous Tank Drawing

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product Drawings  
Models and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 501-01-2034

BLK02-TITLE OF DATA ITEM: Auxiliary Systems Calculations

BLK04-AUTHORITY: DID Number: CGDI-GDRQ-90001  
 DID Title: Calculations and  
 Stress Diagrams

BLK10-FREQUENCY: See BLK 16

BLK12-DATE OF 1ST SUBM: See BLK 16

BLK 13-DATE OF SUBS SUBM: See BLK 16

BLK16-REMARKS:

BLK04: Modify Calculations and Stress Diagrams DID as follows:

Add:

10.3.12 Component data/manufacturers cutsheets shall be included.

10.3.13 Calculations supporting individual equipment/component sizing, such as component process rates, performance curves, tank and sump capacities, etc, shall be clearly identified and demonstrated.

Modify:

10.2 Format: Delete and replace with "Electronic versions of the calculations shall be prepared and submitted in MS Excel™ compatible format. Calculations shall be complete enough so a reviewer can follow through the work, step by step, without difficulty."

10.3.7 Delete and replace with "All calculations shall be submitted."

BLK10: Calculations shall be submitted twice for each system, with revisions.

BLK12: The following calculations shall be submitted 90 DPPDR:  
 Machinery Seawater Cooling, Firemain, Magazine Sprinkling,  
 Washdown Countermeasures.

The following shall be submitted 45 DPPDR: Combustion Air and Exhaust, Fuel, Compressed Air.

The following calculations shall be submitted 180 DPKDR:  
 Ballast, Bilge, Fresh Water, and Fixed Fire Extinguishing.

The following calculations shall be submitted 120 DPKDR: Lube Oil, Exterior Deck Drains, Gray Water, JP-5, Hydraulic, Oily Water, Waste Oil, Sewage, and any additional systems.

BLK 13: The following calculations shall be submitted 120 DPKDR:  
 Machinery Seawater Cooling, Firemain, Magazine Sprinkling,  
 Washdown Countermeasures.

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

The following calculations shall be submitted 60 DPKDR:  
Combustion Air and Exhaust, Fuel, Compressed Air.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 512-01-1718

BLK02-TITLE OF DATA ITEM: HVAC Equipment List

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

BLK04: The standard HVAC Equipment List format shall be modified as follows;

Add an additional column to the at the to right side of the equipment list for list types 1.a through 1.h. Indicate the Navy Standard Equipment Size if not previously required. Where non-Navy standard size/commercial components are supplied, commercial manufacturer names and equipment part numbers shall be provided.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 512-01-1719

BLK02-TITLE OF DATA ITEM: HVAC Heating and Cooling Load Calculations

BLK04-AUTHORITY: DID Number: CGDI-GDRQ-90001  
DID Title: Calculations and  
Stress Diagrams

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPPDR

BLK 13-DATE OF SUBS SUBM: 120 DPKDR

BLK16-REMARKS:

BLK 04: Modify Calculation and Stress Diagram DID as follows:

Add:

10.3.12 Component data/manufacturers cutsheets shall be included.

10.3.13 Calculations supporting individual equipment/component sizing, such as component process rates, performance curves, tank and sump capacities, etc, shall be clearly identified and demonstrated.

10.3.14: Where non-Navy standard size/commercial components are supplied, commercial manufacturer names and equipment part numbers shall be provided.

Modify:

10.2 Format: Delete and replace with "Electronic versions of the calculations shall be prepared and submitted in MS Excel™ compatible format. Calculations shall be complete enough so a reviewer can follow through the work, step by step, without difficulty."

10.3.7 Delete and replace with "All calculations shall be submitted."

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 512-01-2101

BLK02-TITLE OF DATA ITEM: HVAC Design Criteria Manual

BLK04-AUTHORITY: DID Number: OT-302401  
DID Title: HVAC Design  
Criteria Manual (DCM)

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 120 DPPDR

BLK 13-DATE OF SUBS SUBM: 180 DPKDR

BLK16-REMARKS:

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 516-01-1732

BLK02-TITLE OF DATA ITEM: Refrigeration System Sizing Calculations

BLK04-AUTHORITY: DID Number: CGDI-GDRQ-90001  
DID Title: Calculations and  
Stress Diagrams

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

Electronic versions of the calculations shall be prepared and submitted in MS Excel.

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 516-01-2275

BLK02-TITLE OF DATA ITEM: Refrigeration System Design Report

BLK04-AUTHORITY: DID Number: DI-MISC-80652  
DID Title: Technical  
Information Report

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPPDR

BLK 13-DATE OF SUBS SUBM: 60 DPKDR

BLK16-REMARKS:

Electronic versions of the calculations shall be prepared and submitted in MS Word.

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 549-01-1788

BLK02-TITLE OF DATA ITEM: List of Lubricants and Hydraulic Fluids

BLK04-AUTHORITY: DID Number: Contractor Format  
DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

BLK04: The report shall provide a description of the Contractor's accomplishments to minimize the number of types of lubricants and hydraulic fluids to be used on the cutter. The report shall provide the following information in spreadsheet format for all proposed equipment on the cutter:

Lubricant (/hydraulic fluid) name  
Equipment Name (e.g., Diesel Generator)  
Applicable standard (e.g., SAE / MIL-SPEC)  
Equipment SWBS identifier (e.g., 320)  
Equipment / reservoir / HAZMINCEN / operating space nomenclature  
(name and hull designating number, e.g., SSDG No. 3, AMR 1.)

Quantity of lubricant in the equipment sumps and reservoirs, operating space stowage tank(s) or locker(s), or HAZMINCEN. The spreadsheet shall be sorted by lubricant (alphanumerically) with secondary sort by equipment SWBS identifier with the equipment / reservoir / HAZMINCEN / operating space nomenclature.

The spreadsheet shall list the estimated total quantity of each type lubricant to be on board the cutter.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 555-01-2040

BLK02-TITLE OF DATA ITEM: Type Approved and Packaged Fixed Fire Fighting System Calculations

BLK04-AUTHORITY: DID Number: CGDI-GDRQ-90001  
DID Title: Calculations and Stress Diagrams

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM: See BLK 16

BLK16-REMARKS:

The Fixed Fire Fighting System Calculations shall include equipment manufacturer supplied system engineering reports for each space which include calculations, drawings and parts lists.

BLK13: Calculations shall be resubmitted following any design changes to the fixed firefighting systems.

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 556-01-1805

BLK02-TITLE OF DATA ITEM: Hydraulic Power Transmission Systems  
CalculationsBLK04- AUTHORITY: DID Number: CGDI-GDRQ-90001  
DID Title: Calculations and  
Stress Diagrams

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

BLK04: Modify Calculations and Stress Diagrams DID as follows:

Add:

10.3.12: Component data/manufacturers cutsheets shall be included.

10.3.13: Calculations supporting individual equipment/component sizing, such as component process rates, performance curves, tank and sump capacities, etc, shall be clearly identified and demonstrated.

Modify:

10.2 Format: Delete and replace with "Electronic versions of the calculations shall be prepared and submitted in MS Excel™ compatible format. Calculations shall be complete enough so a reviewer can follow through the work, step by step, without difficulty."

10.3.7 Delete and replace with "All calculations shall be submitted."

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 562-01-1820

BLK02-TITLE OF DATA ITEM: Rudder and Rudder Stock Design Calculations

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS: Design calculations shall be in accordance with the OPC System Specification and include at least the following:

Rudder Size, Shape and Arrangement sketches  
Shear and Bending Moment Diagrams, and Bearing Reactions  
Stock size

DRAFT

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 568-01-1827

BLK02-TITLE OF DATA ITEM: Thruster Arrangement Drawings

BLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product  
Drawings/Models and Associated  
Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

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EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 568-01-1828

BLK02-TITLE OF DATA ITEM: Thruster Design Calculations and Analysis

BLK04-AUTHORITY: DID Number: DI-GDRQ-80650  
DID Title: Design Data and  
Calculations

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 572-01-2266

BLK02-TITLE OF DATA ITEM: Stores Elevator Preliminary Arrangements  
DrawingsBLK04-AUTHORITY: DID Number: DI-SESS-81000  
DID Title: Product Drawings  
Models and Associated Lists

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DPKDR

BLK 13-DATE OF SUBS SUBM: ASREQ

BLK16-REMARKS:

The drawing shall provide a conceptual plan and elevation of the trunk, showing the trunk size, deck levels, landing openings, the location of elevator machinery (block representations), elevator pit depth (below the lowest landing level) and the elevator car. The drawing shall show a typical trunk deck penetration, preliminary location of rails, and a typical set of elevator trunk doors. Provision for access to elevator machinery for maintenance shall be shown. Detail drawings of equipment are not required in this deliverable, however, the drawing shall show a viable system conceptual design which will meet the elevator code and can be loaded and unloaded with a pallet truck.

DRAFT

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 580-01-2265

BLK02-TITLE OF DATA ITEM: Integrated Weight Handling Report

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 30 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

The report shall address weight handling systems support and coordination for the following:

Bow Sea Painters.

Accommodation Ladders.

Portable Brows.

Aviation maintenance.

Ship rescue swimmers.

Ammunition and weapons transfer.

Underway replenishment.

Stores, provisions, parts, and palletized loads to and from the pier.

Strike-down and strike-up of stores, provisions, and parts.

Moving palletized cargo to temporary stowage.

Shore-tie handling.

Off loading trash and recyclables from stowage to the pier.

Recovery of floating objects and debris.

Cargo transfer to small boats.

AMIO supply transfer.

EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&CD)

BLK01-SEQUENCE NO.: 582-01-2267

BLK02-TITLE OF DATA ITEM: Mooring and Towing Systems Report

BLK04-AUTHORITY: DID Number: DI-MISC-80711  
DID Title: Scientific and  
Technical Reports

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 120 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS: Calculations for mooring systems shall be in accordance with the OPC System Specification (Addendum I 5.5.2/3.3).  
Calculations for towing systems shall be in accordance with OPC System Specification (Addendum I 5.5.2/4).

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## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 583-01-1901

BLK02-TITLE OF DATA ITEM: Davit Design Calculations

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

Calculations shall be for representative equipment to demonstrate that the equipment design concept is feasible.

In addition, the report shall include the following results:

- 1) Motion data for the structural interface for the operating sea state and the survival sea state including:
  - a) Displacements
  - b) Velocities
  - c) Accelerations
- 2) Feasibility of the davit structure and structural interface for the operating sea state and the survival sea state, including:
  - a) Major component weight
  - b) Centers of gravity
  - c) Overturning moments under load
  - d) Finite element results.
- 3) Feasibility of the strength of the power train (lift, luff, slew, deploy) for the operating sea state and the survival sea state, including:
  - a) Hydraulic and electrical load
  - b) Rigging strength
  - c) Power train strength

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 589-01-1933

BLK02-TITLE OF DATA ITEM: Stores Crane(s) Design Calculations

BLK04-AUTHORITY: DID Number: ANSI-Z39.18  
DID Title: Scientific and  
Technical Reports - Preparation,  
Presentation, and Preservation

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 60 DPKDR

BLK 13-DATE OF SUBS SUBM:

BLK16-REMARKS:

Calculations shall be for representative equipment to demonstrate that the equipment design concept is feasible.

In addition, the report shall include the following results:

- 4) Motion data for the structural interface for the operating sea state and the survival sea state including:
  - a) Displacements
  - b) Velocities
  - c) Accelerations
- 5) Feasibility of the crane structure and the structural interface for 1) operating at the pier, 2) restricted operations in the operating sea state and 3) the survival sea state, including:
  - a) Major component weight
  - b) Centers of gravity
  - c) Overturning moments under load
  - d) Finite element results.
- 6) Feasibility of the strength of the power train (lift, luff, slew, deploy) for the operating sea state and the survival sea state, including:
  - a) Hydraulic and electrical load
  - b) Rigging strength
  - c) Power train strength

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 593-01-1938

BLK02-TITLE OF DATA ITEM: Environmental Pollution Control Systems Report

BLK04-AUTHORITY: DID Number: DI-MISC-80652  
DID Title: Technical  
Information Report

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DPPDR

BLK 13-DATE OF SUBS SUBM: 45 DPKDR

BLK16-REMARKS:

BLK04: Preliminary Design: The Environmental Pollution Control Systems Report shall identify all environmental pollution control systems applicable to the design including: sewage, grey water, bilgewater/oily waste treatment system, ballast water treatment system, and solid waste, including trash compactor and incinerator. Report shall include information on management of solid/hazardous waste, including generation rates, means for disposal, and allotted storage space. Report shall include size of equipment and calculations for determining equipment size and space. Report shall also include calculations for determining the space allotted for sorting/processing and storage of solid/hazardous waste, space allocated for equipment, generation rates with supporting documentation, and the number of storage days for each type of waste generated.

Contract Design: The updated report shall additionally provide vendor information and specifications for environmental pollution control systems, applicable to the design including: sewage, grey water, bilge water/oily waste treatment system, ballast water treatment system, and solid waste, including trash compactor, and incinerator. Vendor information shall include technical specifications of equipment, which include, at a minimum, weight, power, and dimensions. System and stowage diagrams shall also be provided.

## EXHIBIT XX- PRELIMINARY AND CONTRACT DESIGN (PD&amp;CD)

BLK01-SEQUENCE NO.: 630-01-1981

BLK02-TITLE OF DATA ITEM: Corrosion Prevention and Control Plan

BLK04-AUTHORITY: DID Number: Contractor  
format. DID Title:

BLK10-FREQUENCY:

BLK12-DATE OF 1ST SUBM: 45 DPPDR

BLK 13-DATE OF SUBS SUBM: 45 DPKDR

BLK16-REMARKS:

The Corrosion Prevention Plan shall be in accordance with the OPC System Specification (COMDTINST M10360.3 and ABS NVR 8-4-21). For Preliminary Design, contractor shall submit subsections C, D, E, and L of ABS NVR 8-4-2/1. All subsections shall be submitted during Contract Design.

The Tunnel Erosion Report for the thruster shall be in accordance with OPC System Specification (Addendum I 2-5-2/1.4.3). Include data on design measures to minimize and protect the tunnel from erosion. Such data shall include identification of the propeller tip speed, design details for a wear ring in-way of propeller blade tips, and other methods as appropriate. ASTM F841 shall be used as guidance.

DRAFT