

## PURCHASE DESCRIPTION

### BOAT, BRIDGE ERECTION (BEB)

UNCLASSIFIED: Distribution Statement A: Approved for public release.

#### 1. **Scope.**

##### 1.1 **Scope.**

This Purchase Description (PD) covers the performance requirements for the Boat, Bridge Erection (BEB). The purpose of the BEB is to support tactical float bridging and rafting operations.

##### 1.2 **Required/Desired.**

Within this procuring document, the requirement refers to the minimum threshold that will be expected or accepted (required). Desired refers to the Army's objective that it would like to achieve. Required is also referred to as Threshold, and Desired is also referred to as Objective.

##### 1.3 **Design.**

The design of the BEB shall be in accordance with the performance standards invoked in this PD. Unless otherwise specified, the design, materials and manufacturing processes selected are the prerogative of the contractor so long as the final product conforms to the requirements set forth in this performance based PD.

##### 1.4 **Regulations.**

The BEB shall conform to all Federal Laws and regulations governing safety, noise levels, reduction of Ozone Depleting Substances (ODS), and heavy metals, which are in effect on the date of contract, or publicly known to be scheduled for implementation during the performance of the contract, for a commercial craft. All systems and components shall be designed to prevent environmental hazards and inadvertent product discharge or leakage during operation, storage, maintenance, and disposal. The BEB shall incorporate commercial design features, while ensuring the design considers mission requirements and combat capability as primary considerations.

##### 1.5 **Order of Precedence.**

Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 2. Applicable Documents.

### 2.1 Government Documents.

#### 2.1.1 Specifications and Standards.

The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the revisions of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and in effect on the date of Request for Proposal (RFP).

#### 2.1.2 Federal.

FED-STD-595/34094	Green 383 Camo
A-A-50271	Plate, Identification
A-A-52624	Antifreeze, Multi Engine

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

#### 2.1.3 Military.

MIL-DTL-53072	CARC System Application Procedures and Quality Control Inspection.
MIL-DTL-83133	Turbine Fuel, Aviation, Kerosene Type JP-8 (NATO F-34, NATO F-35).
MIL-HDBK-237	Electromagnetic Environmental Effects and Spectrum Supportability Guidance for the Acquisition Process
MIL-HDBK-1791	Designing for Internal Aerial Delivery in Fixed Wing Aircraft
MIL-PRF-680	Degreasing Solvent
MIL-PRF-2104	Lubricating Oil, Internal Combustion Engine, Combat and Tactical Service/Tactical Services
MIL-PRF-10924	Grease, Automotive and Artillery
MIL-PRF-21260	Lubricating Oil, Internal Combustion Engine, Preservative Break-in
MIL-PRF-32073	Hydraulic Fluid, Biobased
MIL-PRF-46167	Lubricating Oil, Internal Combustion Engine, Arctic
MIL-S-53021	Stabilizer Additive, Diesel Fuel
MIL-STD-130	Standard Practice Identification Marking of U.S. Military Property
MIL-STD-209	Interface Standard for Lifting and Tie down Provisions for Military Equipment
MIL-STD-464	Electromagnetic Environmental Effects Requirements for Systems

MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-913	Requirements for the Certification of Externally Transported Military Equipment by Department of Defense Rotary Wing Aircraft
MIL-STD-1310	Standard Practice for Shipboard Bonding, Grounding, for Electromagnetic Compatibility and Safety
MIL-STD-1366	Interface Standard for Transportability Criteria
MIL-STD-1472	Human Factors Engineering
MIL-STD-1474	Noise Limits
MIL-STD-1605(Ships)	Procedures for Conducting a Shipboard Electromagnetic Interference (EMI) Survey (Surface Ships)
MIL-V-81940/1B	Valve, Sampling And Bleed, Hydraulic, Type II Systems

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

Available from the Defense Technical Information Center (DTIC) [www.dtic.mil/dtic/](http://www.dtic.mil/dtic/):

- DoD Instruction 6055.11: Protection of DoD Personnel from Exposure to Radio Frequency Radiation

Available from Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology (OASA(ALT)) [www.alt.army.mil](http://www.alt.army.mil):

- AAE Policy on ODS: Eliminating the Dependency on Ozone-Depleting Substances (ODS) Memorandum 16 June 2004

#### 2.1.4 Other Government documents drawings, and publications.

CBT/BAP/HEMTT – TM 9-2320-279-10

IBC –TM 5-5420-277-14&P

IRB – TM 5-5420-278-10

TACOM Corrosion Rating System

TACOM Drawing 13229E8016 – Bracket, Rifle Stowage

#### 2.1.5 Department Of Labor (DOL).

29 CFR 1910

Occupational Safety and Health Standards (OSHA)

33 CFR 86.05

Navigation and Navigable Waters

46 CFR (Parts 24, 25, 26)

Shipping

(Copies of these documents are available from [www.gpoaccess.gov/cfr/index.html](http://www.gpoaccess.gov/cfr/index.html) or U.S. Government Printing Office, P.O. Box 979050, St. Louis, MO 63197-9000.)

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### 2.1.6 Department Of Transportation (DOT).

DOT Regulations Part 325 Compliance With Interstate Motor Carrier Noise Emission Standards

(Copies of these documents are available from [www.gpoaccess.gov/cfr/index.html](http://www.gpoaccess.gov/cfr/index.html) or U.S. Government Printing Office, P.O. Box 979050, St. Louis, MO 63197-9000.)

72 COLREGS International Regulations for Preventing Collisions at Sea, 1972

(Copies of these documents are available online at [www.imo.org](http://www.imo.org) or from the International Maritime Organization, Publishing Service, 4 Albert Embankment, London SE1 7SR, United Kingdom.)

### 2.1.7 Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA).

SDDCTEA PAMPHLET 70-1 – Transportability for Better Deployability  
SDDCTEA Pamphlet 55-19

(Copies of these documents are available from [dppubsemail@sddc.army.mil](mailto:dppubsemail@sddc.army.mil) or [http://www.tea.army.mil/pubs/pubs\\_order.htm](http://www.tea.army.mil/pubs/pubs_order.htm) or from Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA), 709 Ward Drive, Bldg. 1990, Scott AFB, IL 62225.)

## 2.2 Other Publications.

The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

### 2.2.1 American Welding Society. (AWS).

AWS D1.1 – Structural Welding Code – Steel  
AWS D1.2 – Structural Welding Code – Aluminum  
AWS D3.7 – Guide For Aluminum Hull Welding

(Copies of these documents are available from [www.aws.org](http://www.aws.org) or American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.)

### 2.2.2 Association Of American Railroads (AAR).

General Rules Governing the Loading of Commodities on Open-Top Cars and Trailers

(Copies of this document are available from [www.aar.org](http://www.aar.org) or AAR, 50 F Street NW, Washington, DC 20001-1564.)

### 2.2.3 International Organization For Standardization (ISO).

ISO 10012	Equipment, Quality Assurance Requirements For Measuring - Part 1: Metrological Confirmation System For Measuring Equipment
ISO 11591	Small Craft, Engine-Driven -- Field Of Vision From Helm Position
ISO 12215-5	Small Craft - Hull Construction And Scantlings - Part 5 : Design Pressures For Monohulls, Design Stresses, Scantlings Determination
ISO 12215-6	Small Craft - Hull Construction And Scantlings - Part 6 : Structural Arrangements And Details
ISO 12216	Small craft - Windows, portlights, hatches, deadlights and doors - Strength and watertightness requirements
ISO 12217-1	Small craft – Stability and Buoyancy Assessment and Categorization – Part 1: Non-sailing Boats of Hull Length greater than or equal to 6m
ISO 2631-1	Mechanical Vibration And Shock -- Evaluation Of Human Exposure To Whole-Body Vibration -- Part 1: General Requirements

(Copies of this document are available from [www.iso.org](http://www.iso.org) or [www.ansi.org](http://www.ansi.org) or American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.)

### 2.2.4 North Atlantic Treaty Organization (NATO) Standardization Agreement (STANAG).

NATO STANAG 4074	Auxiliary Power Unit Connections for Starting Tactical Land Vehicles
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(Copies of these documents are available from <http://nsa.nato.int> or from NATO Standardization Agency (NSA), North Atlantic Treaty Organization, HQ, 1110 Brussels, Belgium.)

### 2.2.5 American Boat And Yacht Council Standards.

P-1	Installation of Exhaust Systems for Propulsion and Auxiliary Engines
P-4	Marine Inboard Engine and Transmissions

(Copies of these documents are available from <http://www.abycinc.org> or American Boat and Yacht Council, 613 Third Street, Suite 10, Annapolis, MD 21403.)

### 2.2.6 American Society for Testing and Materials (ASTM).

- ASTM F1166 Standard Practice for Human Engineering Design for Marine Systems, Equipment and Facilities
- ASTM B928 Standard Specification for High Magnesium Aluminum-Alloy Sheet and Plate for Marine Service and Similar Environments
- ASTM D975 Oils, Diesel Fuel

(Copies of these documents are available from [www.astm.org](http://www.astm.org) or ASTM International, P.O. Box C700, West Conshohocken, PA 19428-2959.)

### 2.2.7 European Commission.

- EU 94/25/EC EU harmonized requirements for recreational craft

(Copies of this document are available from [www.ihs.com](http://www.ihs.com) or [http://ec.europa.eu/enterprise/sectors/maritime/documents/recreational-craft/index\\_en.htm](http://ec.europa.eu/enterprise/sectors/maritime/documents/recreational-craft/index_en.htm).)

- RSG Guidelines 2008 for the Recreational Craft Directive 94/25/EC as amended by Directive 2003/44/EC

(Copies of this document are available from <http://www.rsg.be>.)

### 2.2.8 Society of Automotive Engineers International (SAE).

- SAE J514 Hydraulic Tube Fittings
- SAE J1176 External Leakage Classifications for Hydraulic Systems
- SAE J1708 Serial Data Communications Between Microcomputer Systems in Heavy-Duty Vehicle Applications
- SAE J1939 Recommended Practice for Truck and Bus Control and Communications Network.
- SAE J1939/13 Off-Board Diagnostic Connector
- SAE J2360 Lubricating Oil, Gear Multipurpose (Metric) Military Use (previously MIL-PRF-2105).

(Copies of these documents are available from [www.sae.org](http://www.sae.org) or SAE Customer Service, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

### 2.2.9 Aluminum Association.

AA ADM-1 Aluminum Design Manual, 2010

(Copies of this document are available from [www.aluminum.org](http://www.aluminum.org) or The Aluminum Association, Inc., Publications Dept., P.O. Box 753, Waldorf, MD 20604.)

### 2.2.10 American National Standards Institute.

ANSI/NCSL Z540.3 Calibration Laboratories and Measuring and Test equipment –  
General Requirements  
IEEE-STD-45 Recommended Practice for Electrical Installations on  
Shipboard

(Copies of these documents are available from [www.ansi.org](http://www.ansi.org) or ANSI Customer Service Department, 25 W. 43rd Street, 4th Floor, New York, NY 10036.)

## 3. Requirements.

### 3.1 Description.

The BEB shall be a twin engine, water jet (including pump jet) propelled boat, and shall accomplish the mission requirements as set forth in this document. Engines shall meet all requirements using Jet Propellant (JP)-8 and Ultra Low Sulfur Diesel (ULSD) fuel. The primary function of the BEB is to provide propulsion and maneuvering thrust to the ribbon bridge bays to support tactical float bridge and rafting operations of the Multi-Role Bridge Company (MRBC) worldwide. The MRBC consists of Common Bridge Transporters (CBT), M1076 Palletized Loading System Trailers (PLST), Legacy BEBs, Improved Boat Cradles (IBC), Improved Ribbon Bridges (IRB), Bridge Adapter Pallets (BAP), Dry Support Bridge (DSB), DSB Launcher, and M1077 Flatrack. The Line Of Communication Bridge (LOCB), which consists of both dry span and wet gap bridging, will be inducted to the MRBC upon Type Classification/Full Material Release in 2015. Secondary missions require the BEB to support diving missions, transport troops, and tow another BEB. All functions shall be performed by no more than the two-person crew.

#### 3.1.1 BEB System.

Throughout this document, BEB System is defined as BEB alone, or BEB with IBC if used, or BEB with BAP if used.

#### 3.1.2 Operating Environments.

The BEB shall operate in high particulate matter environments, such as sand in the air, and silt in fresh, brackish, and sea water.

#### 3.1.3 Operating Hours.

Peacetime normal operation consists of 200 hours with 25 launches and 25 retrievals per year.

#### 3.1.4 **Operating Duration.**

The BEB components and attachments shall be designed for a 20-year life (except where noted).

### 3.2 **General Design Requirements.**

#### 3.2.1 **EU 94/25/EC.**

The BEB and its construction shall be in compliance with the Essential Requirements and associated Harmonized (ISO) Standards (Annex I) of Directive EU 94/25/EC, as a category C (inshore) vessel, except as otherwise stated. The BEB is considered:

- Twin engine
- Over six meters in length
- Planing Hull
- Hydraulic steering
- Non-habitable
- Diesel fueled
- Inboard engines
- Motorcraft or Motorboat
- Non-sailing boat
- Welded aluminum construction
- Design Category C – Inshore, riverine, estuary
- Category B for Resistance to waves criteria
- Flotation after flooding (objective requirement)
- Craft without permanent cabin or other superstructure aft of the main cabin (ref: ISO 11591)

If the visibility from the helm requirement per ISO 11591 cannot be met due to the location of essential equipment, PCO approval must be obtained.

The following Directive EU 94/25/EC requirements (EU Annex I reference section) are not required:

- Craft Identification (2.1) (see PD 3.11.1)
- Builder's Plate (2.2) (see PD 3.11.1)
- Protection from Falling Overboard and Means of Reboarding (2.3) (see PD 3.4.1.15)
- Owner's Manual (2.5)
- Liferaft stowage (3.7)
- Fire Fighting Equipment (engine space only) (5.6.2) (see PD 3.4.2.4.6)
- Discharge prevention and installation facilitation the delivery ashore of waste (5.8) (see PD 3.4.2.5.1)
- Engine emissions (Annex I.B) (see PD 3.4.2.4.4.2)



### **3.2.2 ISO Structural Requirements.**

The structure shall be designed in accordance with ISO 12215-5. The following minimum design, or greater, applies:

- Deck design pressure of 1.78 psi
- Super structure design pressure of 1.0 psi
- Vertical design acceleration of 3 g

The BEB shall meet the requirements of Small Craft – Hull Construction and Scantlings, ISO 12215-6 for the conditions given above. Recommendations and “Good Practice” or the given equivalents and alternatives of ISO 12215-6 are mandatory.

### **3.2.3 Code of Federal Regulations.**

The BEB and its construction shall be in compliance with the requirements of Code of Federal Regulations (CFR) Title 46 Shipping, Chapter I Coast Guard, Subchapter C Uninspected Vessels (Parts 24, 25, 26) as a motorboat vessel.

### **3.2.4 American Boat and Yacht Council Standards.**

The BEB shall meet the following American Boat and Yacht Council (ABYC) standards: P-1 Installation of Exhaust Systems for Propulsion and Auxiliary Engines  
P-4 Marine Inboard Engine and Transmissions (excluding Electrical systems and Diesel Fuel Systems requirements).

### **3.2.5 MRBC Interface.**

If the IBC or BAP is used as the interface between the BEB and the CBT/PLST, any modification to the IBC or BAP shall be installed or removed using only BEB Basic Issue Items (BII). Any required modification to the CBT or PLST shall be installed or removed using BEB BII. The contractor shall provide all components required to prepare the CBT, PLST, IBC or BAP for interface with the BEB as a kit. Permanent changes to the CBT, PLST, IBC or BAP are not permitted.

## **3.3 Performance.**

### **3.3.1 Launch, Retrieve Performance.**

The BEB shall be launched or retrieved from the CBT within 5 minutes (threshold), 3 minutes (objective). Time commences after the BEB is prepared for launch or retrieval and the CBT is in position to launch or retrieve with the water level at the middle of the rear wheel hub. For launch, time ceases when the BEB is completely free and clear. For retrieval, time commences when the first part of the BEB hull is over the CBT, IBC or BAP structure and ceases when the BEB is secured and the CBT begins movement out of the water. The BEB shall be able to be launched and retrieved from the CBT within the launch site requirements: up to 20% (11 degrees) slope, 8% (5 degrees) side-to-side slope, water depth of at least 48-inches where the boat enters the water, current of up to 5 fps. Any water taken onboard during launch or retrieval shall be drained from operator's spaces (no standing water), but not into machinery spaces.

### **3.3.2 Launch, Retrieve Personnel.**

Launching and Retrieving the BEB from the CBT shall not require more than two people in the BEB.

### **3.3.3 Temporary Bridge Anchoring.**

The BEBs shall provide temporary bridge anchoring, while up to (Military Load Class) MLC 100 wheeled and up to MLC 85 tracked vehicles are crossing with a spacing of one vehicle per 18 bays. Thrust shall be provided by one BEB per six bays, in a water depth of 6 feet and greater, at water velocities of 6 fps (threshold), 8 fps (objective).

### **3.3.4 Rafting.**

Two BEBs shall be able to push a 7-bay raft (2 ramps and 5 interior) with up to MLC 140 (two MLC-70 ton tracked vehicles or equivalent) for both conventional (see 6.4.3) and longitudinal rafting (see 6.4.4), in a water depth of 6 feet and greater, at a relative water speed of 6 fps (threshold), 8 fps (objective). For longitudinal rafting, the use of IRB rafting brackets is required unless the BEB is equipped with appurtenances which function as rafting brackets.

### **3.3.5 Navigational Draft.**

The BEB shall have a navigational draft at Full Load condition of no more than 30-inches (threshold), 24-inches (objective) in fresh water.

### **3.3.6 Shallow Water Operation.**

The BEB shall operate in 4 feet of water with a soft bottom at a relative water velocity of 6 feet per second, while at full power for 30 minutes without overheating.

### **3.3.7 Out of Water Operation.**

The engines, without any configuration changes, shall operate with the BEB clear of the water, at idle speed, in neutral gear, without external water hookup, for at least 10 minutes without overheating.

### 3.3.8 Ambient Conditions.

Normal operating and storage condition for the BEB shall be as follows:

Condition	Air Temp	Water Temp	Solar Load (Radiation)	Relative Humidity
Engine start Note 1	-25°F to 0°F	n/a	Negligible	Tending toward saturation
BEB Operation Includes engine starts	0°F to 120°F	20°F to 95°F	Up to 104 W/ft <sup>2</sup> (1120 W/m <sup>2</sup> )	95% or above
Storage	-50°F to 160°F	n/a	Up to 104 W/ft <sup>2</sup>	95% or above

Note 1. Engine starting out of the water, without ether or similar starting aids (plug-in accessories are acceptable, i.e. block heater, dipstick heater, engine blanket(s) etc.).

### 3.3.9 Top Speed.

The BEB shall be able to back safely at 4 knots without water flooding the craft in calm water and Full Load condition. The BEB shall achieve a forward steady state speed over water of at least 8 knots with Full Load in a water depth greater than 23 feet (threshold). The BEB shall achieve a forward steady state speed over water of at least 24 knots with Full Load in a water depth greater than 23 feet (objective).

### 3.3.10 Unloaded Bay Maneuverability.

The BEB shall assemble rafts and bridges by maneuvering 1 to 4 bay-combinations of ramp and interior bays forward, reverse, and sideways in current speeds up to 6 fps.

### 3.3.11 Reliability.

The BEB shall achieve reliability of 275 hours Mean Time Between Hardware System Abort (MTBHSA) and 143 hours Mean Time Between Hardware Essential Function Failures (MTBEFF) as defined in the Failure Definition and Scoring Criteria (FDSC).

### 3.3.12 Maintenance Ratio.

The BEB shall operate continuously without maintenance for a minimum of 9 hours. The Maintenance Man Hour per Operating Hour (MMH/OH) ratio shall not exceed 0.136, allocated as MMH/OH ratio of 0.10 for field-level maintenance and MMH/OH ratio of 0.036 for sustainment-level maintenance.

### 3.4 **Physical Characteristics.**

#### 3.4.1 **Hull.**

Hull integrity (including all appendages) shall be maintained (no hull rupture/penetration or broken welds) during all operations without ice in the water including ground contact against a hard mud bottom at 8 knots. Any part of the BEB that contacts the ground during beaching, loading, unloading, launching, and recovery operations shall be protected or reinforced as required to withstand the contact. In accordance with ISO 12215-6, no stiffeners shall terminate on shell plate, and doubler plates are not allowed for structural applications. Doubler plates for wear applications must be approved by the PCO. All installed equipment shall be adequately secured.

##### 3.4.1.1 **Ground Supported.**

The BEB shall remain stable and level when placed on the ground. If stabilizing equipment is required, the stabilizing equipment shall be integral to the BEB.

##### 3.4.1.2 **Hull Material.**

Aluminum plating shall be 5083-H116 or 5086-H116 series marine alloy meeting the requirements of ASTM B928. Extruded shapes shall be 5083-H111, 5086-H111 or 6061-T6 aluminum alloy. Alternate aluminum alloys or tempers may be proposed, but shall be approved by the PCO prior to use. Mechanical properties for alloys and tempers not found in Table F.1 and F.2 of ISO 12215-5 shall be taken from the Aluminum Association publication "Aluminum Design Manual", Section V, Table 1 or 1M (metric) where unwelded properties are required, and Table 2 or 2M (metric) where welded properties are required.

##### 3.4.1.3 **Hull Drainage.**

The BEB shall have means to drain/remove water entrapped in the hull when the BEB is in level transport mode and when stored on level ground. Plugs, if used, shall be attached with a permanent tether/lanyard.

##### 3.4.1.4 **Buoyancy. (Objective)**

The BEB in Full Load condition shall be positively buoyant after flooding in accordance with Directive EU 94/25/EC. Flotation material shall be protected from damage during BEB operation and maintenance.

##### 3.4.1.5 **Intact Stability.**

The BEB shall meet the intact stability requirements of ISO 12217-1 as invoked by 3.2.1 at Full Load with payload as specified in 3.4.1.6.

##### 3.4.1.6 **Payload.**

The BEB shall have the capability to transport 1000 lbs of payload in addition to the Full Load while maintaining safety and stability. The payload shall be assumed to have a center of gravity 24 inches above the surface of the payload area. The payload area shall be a single area of 3.5 feet by 3.5 feet or larger. Multiple tie-down points shall be provided to secure various sized payloads in the payload area. The payload area shall not

be located on engine hatches or in areas that may require emergency access. Storage space for two IRB rafting brackets shall be provided on the BEB. The two IRB rafting brackets may be stored in the payload area or in a separate location.

#### **3.4.1.7 Anodes.**

Sacrificial anodes shall be provided to deter corrosion on the hull and underwater portions of the BEB machinery. Anodes shall be replaceable with common tools.

#### **3.4.1.8 Rub Rail(s).**

Replaceable rub rail(s) shall be mounted around the entire hull on the outer-most projection. The rub rail shall be rubber or synthetic rubber material, commercially available marine grade. The rub rail shall be replaceable using tools available in a general mechanic's tool kit. The rub rail shall not tear or detach when impacting a pier or floating bay(s) from any angle at 3 knots.

#### **3.4.1.9 Dive Platform.**

A dive platform which supports the two Soldier crew shall be provided and shall extend farther aft than any other appendages of the BEB when deployed. Means shall be provided for boarding of personnel. The platform may be stowable if required to reduce rear overhang during transport. Stowing shall be accomplished without tools.

#### **3.4.1.10 Push Knees.**

The bow shall be fitted with push knees which interface with IRB bays for maneuvering operations. The push knee interface surface shall be covered with marine grade rubber or synthetic rubber material. The surface shall be replaceable with common hand tools. The push knees shall withstand the force of a fully loaded BEB impacting stationary bays at 3 knots with all push knees contacting simultaneously. The push knees shall also withstand a 45-degree impact with stationary floating bays at 2 knots.

#### **3.4.1.11 Tie-Offs.**

The BEB shall have at least six tie-offs, three located on each side: forward, approximately amidships, and aft. Each tie-off and its mounting structure shall withstand the greater of three times the static bollard capacity of the BEB or three times the maximum calculated load from bay handling and towing. Tie-off locations shall facilitate line attachment to support conventional and longitudinal rafting. Tie-offs shall be sized to accept lines up to 1.25 inch in diameter.

#### **3.4.1.12 Capstan.**

The BEB shall be equipped with a minimum of one capstan located near the stern to provide for snugging and pulling in lines. All capstans shall have a drum diameter of at least six inches with a rated capacity of at least the BEB's forward bollard pull. The ultimate strength of all capstan foundations shall be at least three times the BEB's forward bollard pull. All capstans shall be self-tailing or captive reel capstans and shall handle the lines provided for steering and towing. At least one of the capstans provided shall have the ability to be operated by hand. Hand powered capstans shall be multi-speed and have a removable locking handle.

#### 3.4.1.13 **Line Take Up Device(s) (Objective).**

The BEB shall provide a line take up device(s) to secure single IRB bays conventionally to the BEB during construction. The line tensioning device(s) shall have a powered means of handling one port and one starboard lines individually, be controlled by the operator at the crew station, and shall have a system to prevent over-tightening of lines. The line take up device shall pay out and take in sufficient line to secure the BEB to single IRB bays during bridge and raft construction.

#### 3.4.1.14 **Anchor Fairlead.**

Fairleads (e.g. open chock) or other means shall be provided for guiding the anchor line off the bow near the centerline.

#### 3.4.1.15 **Personnel Safety Aids.**

Grabrails, handholds, footholds or other means shall be provided to allow safe personnel movement during all operations, including moving between BEBs and bays.

#### 3.4.1.16 **Crew Station.**

The crew station shall provide all-around visibility and space for two Soldiers. All BEB controls shall be located in the crew station and designed for a single operator. Front and sides of the crew station structure shall be designed to accept flat appliqué panels per 3.7.1. The crew station shall be designed to prevent operators from getting wet during routine operations (routine operations include operating at all boat speeds ranging from idle speed up to the maximum speed of the BEB in wind speeds of 10 knots and below in calm water). If required to keep the operator dry, windshield(s) may be provided. If a windshield is provided as part of the crew station, it shall be made of automotive-style (tempered) safety glass, shall include powered windshield wipers and washers, and shall be removable or hinged with a hold open device. Removal or opening of a hinged windshield shall be performed without the use of tools. If the windshield is removable, storage space shall be provided on the BEB. If the windshield is stowable, it shall not interfere with bridging operations when stowed.

#### 3.4.1.17 **Operator's Seat.**

One vertically adjustable padded seat shall be provided in the crew station. The seat shall be stowable or removable and storable within the crew station to facilitate operation while standing. The seat shall be designed to support an operator weighing 300 pounds including gear and Individual Body Armor (IBA).

#### 3.4.1.18 **Heater.**

The crew station shall contain a marine heater with blower with an output of 10,000 BTU/hour when the ambient air temperature is 28°F and the engines are at normal operating temperature. One permanent heater vent shall be directed at the operator. If a windshield is provided, an additional permanent heater vent shall be directed at the windshield for removing frost. A means shall be provided to direct a heater outlet onto the crew station enclosure for removing frost.

#### 3.4.1.19 **Mast(s).**

Mast(s) shall be provided as required to facilitate navigation and communication. The mast(s) shall be stowable. The mast(s) in the stowed position shall not interfere with BEB operations and maintenance. Stowing shall be accomplished without tools. All wires and cables running to the mast shall have a quick disconnect near the base of the mast to facilitate removal of the mast from the BEB.

#### 3.4.1.20 **Crew Station Top.**

A removable crew station top shall be provided to protect the two person crew from overhead sun and rain. The top shall be installed and removed without tools and shall integrate with the windshield (if provided). Removal of top shall not diminish BEB capabilities. If installed top interferes with transportation, storage space shall be allocated on the BEB during transport. The top shall withstand a wind load of the BEB's maximum speed heading into a 25 knot wind for a minimum duration of 2 hours. The top shall be designed for at least a 4-year life.

#### 3.4.1.21 **Crew Station Enclosure.**

A removable, lightweight, collapsible marine-grade crew station enclosure shall be provided from the crew station top down to the operator's station or deck. The enclosure shall be installed and removed without tools. The enclosure shall be designed to provide maximum field of view with transparencies. The enclosure may be combined with or attached to the crew station top. The enclosure shall be designed for at least a 4-year life. The use of hook and loop fasteners is not permitted on the crew station enclosure. Storage space for the crew station enclosure shall be allocated on the BEB (objective). If a windshield was provided as part of the crew station, the enclosure must integrate with the windshield without degrading capabilities.

#### 3.4.1.22 **Weapon Brackets.**

Weapon brackets (TACOM Drawing 13229E8016 or similar) shall be provided near the crew station for at least two weapons. The mounts shall hold weapons of up to 37 inches in length. The weapons shall be pointed up and away from the operator's station and secure against loss, including if the boat capsizes.

#### 3.4.1.23 **Storage Compartments.**

Storage compartments shall be weather protected, be permanently mounted and have covers which are latching and lockable with a padlock of 3/8-inch shank. Covers shall incorporate a weather tight seal in accordance with ISO 12216 watertightness 4, and have a positive locking hold-open device (threshold). In addition to the space required for storage of BII, two cubic feet of weather tight storage space shall be provided in the operator's station (objective).

#### 3.4.1.24 **Basic Issue Items.**

The following is the minimum basic issue items (BII) to be provided with each BEB. All BII shall be adequately stowed. The contractor shall propose items beyond this listing if required.

#### **3.4.1.24.1 Personal Flotation Device.**

Three self-inflating, USCG or 46 CFR 160.076 approved Type V-Special Use Inflatable Personal Flotation Devices (PFDs) shall be provided. When not inflated the PFDs shall be Army green, camouflage, or black in color. The PFDs shall be compatible with IBA and Modular Lightweight Load-Carrying Equipment (MOLLE).

#### **3.4.1.24.2 Throwable Flotation.**

A USCG approved Type IV personal flotation device (ring or horseshoe buoy) per 46 CFR 160.050 shall be provided. Storage space or mounting provisions shall be provided and allow deployment within 10 seconds.

#### **3.4.1.24.3 Anchor and Line.**

The BEB shall be provided with an anchor and at least 100 feet of line which shall hold the BEB stationary in a current of 8 fps with up to 25 knot winds in hard sand.

#### **3.4.1.24.4 Mooring, Towing, and Steering Lines.**

Sufficient lines shall be provided to support all bridging operations. Lines shall be double-braided polyester, stretch resistant, and have a minimum 12" diameter eye splice on one end. A minimum of two mooring lines shall be provided which are 5/8" in diameter and a minimum of 50' long. A minimum of four lines to be used for steering and towing shall be provided and shall be no larger than 1.25" in diameter and of sufficient length to accommodate all tie-off configurations required for bridging and rafting operations. The minimum line breaking strength for steering and towing lines shall be at least three times the forward static bollard pull or three times the maximum static load required in service, whichever is greater.

#### **3.4.1.24.5 Hand Tools.**

The contractor shall provide all tools required for Preventative Maintenance Checks and Services (PMCS). A tool bag shall be provided to hold the hand tools. Weather protected storage space shall be provided for the tool bag.

#### **3.4.1.24.6 First Aid Kit.**

A First Aid Kit, General Purpose NSN 6545-00-922-1200 shall be provided. Weather protected storage shall be provided for the first aid kit in the operator's station.

#### **3.4.1.24.7 Line Cutting Device.**

The BEB shall be provided with a manual hand-held device for cutting through the mooring, towing, and steering lines in emergency conditions. Mounts shall be provided to stow the device safely and securely, while allowing access by hand without tools within 10 seconds.

#### **3.4.1.24.8 Document Pouch.**

The BEB shall have a waterproof and UV-resistant document pouch which shall hold a standard 8-1/2 x 11 x 1-inch three-ring binder and Operator's manual. Weather protected storage shall be provided for the document pouch.



#### 3.4.1.24.9 **Mat(s).**

Anti-fatigue, self-draining, easily removable, marine quality mat(s) shall be provided in the crew station. The mat shall be removed without tools.

#### 3.4.1.24.10 **Headsets.**

Weather protected storage space shall be provided in the crew station for 2 lightweight headsets (NSN 5820-99-280-7276).

#### 3.4.1.24.11 **Digital Range Finder.**

One battery powered, digital, eye-safe laser range finder shall be provided for determining the straight-line distance between the operator and the shore at a range between 40 feet and 2000 feet. Weather protected storage space shall be provided for the digital range finder.

#### 3.4.1.24.12 **Hand Portable Fire Extinguisher.**

One type B size I hand portable fire extinguisher shall be installed for immediate access from the crew station.

#### 3.4.1.24.13 **Boat Hook**

An 8 foot long non-telescoping boat hook shall be provided. Storage space for the boat hook shall be provided.

### 3.4.2 **Mechanical Systems.**

The propulsion systems shall operate independently of and in tandem with each other, and shall allow for independent forward/reverse/neutral operating.

#### 3.4.2.1 **Lubricants and Fluids.**

All fluids and lubricants shall be compatible with the following unless approved by the PCO:

- Engine Oils: MIL-PRF-2104 (OE/HDO), MIL-PRF-46167 (OEA-30)
- Automotive Engine/Preservation Oils: MIL-PRF-21260 (PE)
- Antifreezes and Test Kit: A-A-52624
- Gear Lubricants: SAE J2360 (GO)
- Biodegradable Hydraulic Fluid (BHF): MIL-PRF-32073, on the Qualified Products List (QPL)
- Multi-purpose Grease: MIL-PRF-10924 (GAA)
- Fuel Biocide/Stabilizer Additive: MIL-S-53021
- Degreasing Solvents: MIL-PRF-680

#### 3.4.2.2 **Lubrication Fittings.**

Means shall be provided for lubricating all moving parts that require lubrication. Fittings shall be located in a protected location and accessible by a grease gun with a 10-inch flexible extension. Fittings shall be accessible without removing or adjusting accessories or parts. Remote or extended lubrication fittings may be used.

#### 3.4.2.3 **Petroleum, Oils, and Lubricants Leakage.**

The degree of petroleum, oils, and lubricants (POL) external leakage allowable on components such as engine, gearboxes, and pump drive shall not exceed class 2 of SAE J1176 for dust free conditions and class 2D of SAE J1176 for dusty conditions. No evidence of fluid leakage shall be permitted in fuel, hydraulic, or cooling systems.

#### **3.4.2.4 Propulsion.**

The propulsion system shall provide the thrust required to meet performance requirements without exceeding the component manufacturer's recommended installation requirements, durability, or horsepower rating.

##### **3.4.2.4.1 Oil Change System.**

Each engine shall employ an oil change system which permits removal of oil from the engines into a portable container using only common mechanics hand tools. This effort shall be accomplished with the BEB either in or out of the water. Storage space for the oil change system shall be provided on the BEB.

##### **3.4.2.4.2 Oil Filters.**

Oil filters shall be changeable with common mechanics hand tools without having to remove or disconnect any other equipment.

##### **3.4.2.4.3 Oil Sampling Valves.**

An engine oil sampling valve shall be provided on each engine, which allows an in-stream sample to be taken before the engine oil filter. The valve shall be manually operated and shall close automatically when released. It shall be made of material resistant to corrosion such that it will not contaminate the sample. The discharge port of the valve shall be covered with a captive chain cap conforming to MIL-V-81940/1B and SAE J514.

#### **3.4.2.4.4 Engine Configuration and Performance.**

##### **3.4.2.4.4.1 Fuel.**

The engines shall meet all performance requirements while operating on ULSD (ASTM D975) and JP-8 (MIL-DTL-83133) fuel. The engine shall not require any modifications (beyond normal maintenance items) when switching between fuels. Fuel lubricity filters are permitted; all other fuel lubricity additive devices and fuel lubricity additives that have to be manually administered are not acceptable (threshold); operate without lubricity additives (objective).

##### **3.4.2.4.4.2 Emissions Technologies.**

Pollution control technologies that are impacted by the sulfur level of the JP-8 fuel (up to 3000 ppm sulfur) either in effectiveness, maintenance or life expectancy shall not be used, e.g. Exhaust Gas Recirculation (EGR), Oxides of Nitrogen (NOx) traps, catalytic converters.

##### **3.4.2.4.4.3 Ignition.**

The engines shall use keyless ignition at the operator's station.

#### 3.4.2.4.4.4 **Shut Down.**

The engines shall have both primary and emergency shutdown methods. The emergency method shall be a manually operated control that stops the supply of either air or fuel to the engine.

##### 3.4.2.4.4.4.1 **Automatic Engine Shut Down Override.**

If the engines incorporate an automatic shut down feature, an alarm and engine shut down override control shall be provided at the operator's station to allow the operator to restart the engine.

##### 3.4.2.4.4.5 **Hour Meter.**

Each engine shall have an accessible and readable hour meter attached.

##### 3.4.2.4.4.6 **Exhaust System.**

Each engine shall have an independent exhaust system. The exhaust outlet shall be located to minimize noise and fume impact on the crew station. After shut down water shall drain from the exhaust system to the outside of the BEB to prevent damage from freezing.

##### 3.4.2.4.4.7 **Engine Cooling.**

Each engine shall have an independent cooling system. If the engine is liquid cooled, it shall be a closed-loop coolant system.

##### 3.4.2.4.4.8 **Raw Water Cooling.**

Raw-water cooling system, if used, shall have the capability of being flushed. Duplex strainers or self-cleaning strainers shall be used for raw-water fed to heat exchangers. Non-self-cleaning strainers shall be readily accessible without having to lift a main engine hatch. After shut down water shall drain from the raw water cooling system to the outside of the BEB to prevent damage from freezing.

##### 3.4.2.4.5 **Water Jets.**

Two water jets (pump jets allowable) with linked steering and independent reversing controls shall be provided. Reversing and neutral controls for the water jets shall be independently-power assisted. The water jets shall be able to be back flushed, or have other means to clear the water jet inlet grill. Portions of the water jets requiring inspection as part of PMCS shall be readily accessible. The water jets shall be protected from damage.

##### 3.4.2.4.6 **Fire Protection.**

A fixed fire extinguishing system shall be employed in the main engine space(s) and shall meet the following requirements for a commercial uninspected vessel in CFR Title 46, Part 25:

###### 3.4.2.4.6.1 **Actuation.**

The fire extinguishing system shall automatically discharge upon sensing a fire via temperature.

#### 3.4.2.4.6.2 **Alarm.**

An audible alarm shall indicate when the fire system senses a fire. The alarm shall be able to be muted.

#### 3.4.2.4.6.3 **Extinguishing Agent.**

The extinguishing agent shall be one the following unless approved by the PCO:

- Carbon dioxide (CO<sub>2</sub>) (CAS 124-38-9)
- Pentafluoroethane (HFC-125) (CAS 354-33-6)
- Heptafluoropropane (HFC-227ea) (a.k.a. FM-200) (CAS 43-18-90)
- Sodium bicarbonate (baking soda) (CAS 144-55-8)

If the engine's combustion air is obtained from the engine space, the extinguishing agent shall be CO<sub>2</sub>.

#### 3.4.2.5 **Fuel System.**

Each engine shall have an independent fuel system. A single common fuel tank shall be provided (multiple linked tanks that act as a single tank are allowable). The system shall allow each engine to be isolated. Shutoff valves shall be positioned to preclude excess spillage when removing components or performing service operations. A fuel-water separator shall be provided, accessible and maintainable without removal of any other equipment. Priming the empty fuel system shall be performed without use of the starter.

##### 3.4.2.5.1 **Discharge Control.**

The BEB shall be designed to minimize or control discharge of POL into the water.

##### 3.4.2.5.2 **Fuel Tank.**

The fuel system shall accommodate safe, efficient fueling operations using a refueling nozzle of minimum 2-inch diameter at a flow rate of at least 20 gallons per minute. One gloved operator on the deck shall perform all refueling operations without tools. Fuel overflow shall be contained in an area or device designed to contain at least 8 fluid ounces. The fuel tank shall not contain explosive retardant material. A means shall be provided for sounding the tank. The BEB shall have enough fuel capacity for 9 hours of operation at 50% of the maximum power absorbed by the waterjets.

#### 3.4.3 **Electrical Systems.**

The BEB shall employ a 24 volt direct current (Vdc) electrical system with isolated negative grounds and neutrals to control corrosion and prevent electrolysis. The control gauges, circuit breakers, switches, and displays shall allow for safe operation in all climatic conditions. All grounds and neutrals shall come to common busses separate from the engine using insulated conductors. Open areas in the console and unused wire terminations shall be capped to protect from exposure to weather conditions. Engine alternators, starters, sensors and electronic control modules shall not use the case of the component or the engine block as a negative return path to the batteries. Use of drive components as part of the 24 Vdc return is not permitted.

#### **3.4.3.1 Alternator.**

Each engine shall be fitted with an alternator. The alternator and pulley shall be sized so that adequate power for electrical loads is available at engine idle without over speeding the alternator when the engine is at maximum RPM. The amperage output from each alternator shall provide power to operate the BEB without restriction. The system shall be wired and sized such that either alternator can charge either bank of batteries.

#### **3.4.3.2 Batteries.**

All batteries shall be identical, deep-cycle marine grade, absorbed glass-mat (AGM) type (e.g. Optima D34M Bluetop, NSN 6140-01-475-9355). Batteries selected shall be in the federal supply system (i.e. already have NSN assigned). At least two banks of batteries, one for each engine, shall be provided. A means to temporarily parallel the engine-starting battery banks for emergency engine starting shall be provided. The cranking performance for each starting bank shall ensure engines can be started at -25°F without preparatory charging of the batteries. The batteries shall be easily accessible by a crewmember on the deck without the use of tools. All batteries shall be protected from water and metal objects falling from above when hatches are open.

##### **3.4.3.2.1 Battery Cables.**

Battery cables shall be furnished with reusable insulated terminal covers on the positive lead. Positive and negative cable terminals shall be identified with a red sleeve labeled “+” and a black sleeve labeled “-”, respectively. Corrosion resistant bolts and nuts shall be used. Wing nut type fasteners to connect battery cables to the battery terminals are not acceptable.

##### **3.4.3.3 Battery Disconnect Master Switch.**

A master switch, which disconnects all power from each of the battery banks with the exception of SINCGARS radio and bilge pumps, shall be provided near the battery compartment (threshold), near operator’s console (objective).

##### **3.4.3.4 Cabling and Wiring.**

All electrical systems shall utilize marine multi-conductor IEEE-STD-45 approved, USCG, and ABS accepted cable with tinned copper conductors per ASTM B-33 flexible stranding. Single conductor UL1426 wire may be used in enclosures and for jumper wires. The BEB electrical systems shall utilize multi-conductor cable to provide power to individual loads from branch circuit breakers. Any terminal or electrical interface exposed when components are not installed shall have tethered weather proof caps.

#### **3.4.3.4.1 Connectors and Labels.**

Permanent markings (e.g. cable tags, colors, numbers) shall be utilized to identify individual cables and cable connectors. The minimum size hook-up wire used to make interconnections inside of consoles, cabinets and connection boxes shall not be smaller than 16 American Wire Gauge (AWG) unless otherwise specified by the manufacturer of the component. Cables shall employ connectors located to facilitate maintenance actions for removal and replacement of equipment. Cable conductors shall be continuous, single strand wire without splices. Stuffing tubes, hold-backs and securing devices shall be used to minimize chafing. Wiring which is disconnected-in-use shall be marked for ease of reassembly. Multiple connectors at disconnected-in-use points shall use separate design features to prevent improper wiring cross-connections. Connectors shall be selected based upon the environment where used.

#### **3.4.3.4.2 Connection Boxes.**

Connection boxes and other electrical enclosures shall be water tight, including cable entry sealing devices into each connection box.

#### **3.4.3.4.3 NATO Slave Receptacle.**

A receptacle in accordance with NATO STANAG 4074, Type I shall be provided to allow for starting of each engine and charging of the batteries from an external power source. The receptacle shall also provide a back feed power source from the BEB electrical system for charging and slaving other 24 Vdc equipment. The receptacle shall be installed near the battery enclosure and shall be accessible without tools to personnel standing on the deck. The NATO receptacle shall be isolated from the hull to prevent the receptacle from inadvertently using the hull as a negative return path to batteries. The receptacle shall be labeled "SLAVE 24 VOLTS DC" with one-inch black lettering. The receptacle shall have a disconnect switch to isolate the receptacle when not in use.

#### **3.4.3.5 24 Vdc to 12 Vdc Converter.**

If required to power onboard equipment, 12 Vdc supply shall be via a 24 Vdc to 12 Vdc converter as opposed to drawing power from a single battery. The converter shall use an isolated ground to prevent a negative polarity return path through the hull.

#### **3.4.3.6 Circuit Breaker Panel.**

The electrical devices and cables in each circuit shall be protected by appropriately sized circuit breakers. Each circuit breaker shall comply with the design, performance, and installation requirements of IEEE-STD 45. Circuit breakers shall be marine grade. Separate panels shall be used if both 24Vdc and 12Vdc components are used. Three spare 20 amp breakers shall be provided on the 24 Vdc panel. Spare circuits shall be labeled with individual label-plates as "Spare". Fuses shall not be used unless integral with the component.

#### 3.4.3.7 **Searchlight.**

A marine grade service 24 Vdc searchlight (Hella Marine 8502 (NSN 6220-12-304-6240) or equivalent) shall be supplied. The searchlight shall have the capability of elevation and depression adjustment with a rotation of 360 degrees. The searchlight shall be placed in such a location that it may be turned forward or aft for navigational purposes. The searchlight shall be equipped with a one-hand control operable from either the operator's position or the deckhand's position within the cab (threshold), from both the operator's and deckhand's position within the cab using multiple mounting locations (objective). The searchlight shall have the capability of being removed from the mounting and moved to shine hand-held over the side of the BEB. A dedicated 24 Vdc searchlight electrical receptacle, which accepts the mating plug on the searchlight power cord, shall be installed on the operator's console.

#### 3.4.3.8 **Inspection Light.**

A removable hand-held inspection 24 Vdc light(s) shall be provided to allow inspection of the battery, engine, transmission and propulsion unit compartments. Dedicated 24 Vdc electrical receptacle(s) and/or the cord length shall be provided such that the light can be moved to illuminate the compartments as well as the BEB's entire waterline.

#### 3.4.3.9 **Lighting.**

A variable-lighted operator's control console and instrument panel(s) shall be provided, controlled from the operator's console by an electronic dimmer switch. The range of intensity shall be variable from full-off to full-on intensity.

#### 3.4.3.10 **Instrument Panel(s).**

The instrument panel(s) shall be located in and viewable from the operator's station. All lights, displays, and gauges on the instrument panel shall be readable in full sun.

##### 3.4.3.10.1 **Fuel Level Gauge.**

The fuel tank shall have a graduated tank-level indicator on the operator's console.

##### 3.4.3.10.2 **Gauges.**

The following analog-style gauges shall be provided and readable both day and night for each engine:

- Engine oil pressure
- Engine coolant temperature
- Engine RPM Tachometer
- Battery voltmeter
- Transmission oil pressure
- Transmission oil temperature
- Steering position indicator

All gauges shall be visible at all times during operation. All gauges shall be labeled (threshold). Gauges shall include red/yellow/green color-markings for operating limits as applicable (objective).

#### 3.4.3.10.3 **Malfunction Indicators.**

An audible alarm with a mute function, as well as visual indicator(s) shall be provided which indicates these adverse conditions:

- Engine low oil pressure
- Engine high coolant temperature
- Fuel level below 10%
- Flooding (bilge pump automatic activation)
- Fire sensing or system discharge
- Loss of exhaust water cooling supply, if applicable
- Low hydraulic fluid level

All malfunction indicator lights shall be visible to the operator when operating the BEB. All audible alarms shall be audible to the operator when the engines are operating at maximum RPM.

#### 3.4.3.11 **Horn.**

A horn shall be provided with a minimum sound pressure level of 112 dB.

#### 3.4.3.12 **Navigation Lights.**

The BEB shall have marine-grade long-life LED navigation light system with the mast erected, as required by COLREGS 72 for International and Inland Navigation rules for power-driven vessels when pushing.

#### 3.4.4 **Communications-Electronics Complement.**

The items below shall be located in and viewable from within the operator's station. The sensors and displays may be combined.

##### 3.4.4.1 **SINCGARS Radio Capability.**

The BEB shall have the capability to accommodate one AN/VRC-90 SINCGARS radio system. The BEB shall have:

- 24 Vdc NATO power source
- One two-shelf rack using Mounting Base MT-6352/MT-6353
- Vehicle Adapter Assembly (VAA) AM-7239
- 50 watt Power Amplifier (PA)(AM-7238)
- SINCGARS antenna base
- Two-piece fiberglass antenna (AS-3900) with attaching wrench
- Speaker (LS-671)

All mounting, wire harnesses, antenna and transducers necessary for the equipment to be fully operational shall be installed and ready to accept the hardware control boxes.

SINCGARS operation shall not be affected when the battery disconnect switch is turned off.

##### 3.4.4.2 **Global Positioning System.**

The BEB shall be equipped with a marine grade Global Positioning System (GPS) chart plotter. The GPS shall be wired to the BEB batteries and shall display the position of the BEB in real time, the speed of the BEB over ground, and record the track of the BEB.

The GPS shall be loaded with world maps.



#### **3.4.4.3 Infrared Strobe.**

The BEB shall have an LED Infrared (IR) strobe light system at the uppermost point on the BEB. If the IR strobe light is battery powered it shall be attached and removed from the mast without tools. If the IR strobe light is wired to the BEB batteries it shall be permanently mounted to the top of the mast, and an on/off switch shall be provided on the operator's station.

#### **3.4.4.4 Depth Sounder.**

A depth sounder shall be provided. The depth sounder shall display the water depth below the keel in real time to a minimum 1-foot depth. The depth sounder shall display speed over water. The sensor shall not be damaged during BEB operations or transport.

#### **3.4.5 Bilge Drainage System.**

A minimum of three fixed, powered bilge pumps which discharge at least 10 gallons per minute each as installed shall be provided. The pumps shall be actuated both automatically and manually. At least two pumps shall be located in each bilge compartment. Control (automatic and on) and an operation indicator for each pump shall be located on the operator's console. The bilge drainage system shall not entrap water which could freeze and cause damage. Bilge pump operation shall not be affected when the battery disconnect switch is turned off. A separate, covered breaker shall be provided for the bilge pumps. The cover for the breaker switch shall allow the operator to see the position of the bilge pump breaker switch without moving the cover.

### **3.5 Transportation.**

The BEB System shall be transportable worldwide by rail, marine, highway and air modes. Guidance on transportability criteria including load distribution and maximum dimensions is provided in MIL-STD-1366, MIL-HDBK-1791, and SDDCTEA Pamphlet 70-1.

#### **3.5.1 Reconfiguration for Transport.**

If reconfiguration of the BEB System is required to meet any of the transportation requirements, the BEB System shall be disassembled at origin and reassembled at destination by two Soldiers using no more than BEB System BII. Total time for disassembly at origin and reassembly at destination combined shall be no more than 30 minutes. Time required for lashing and strapping is not included in this 30 minutes. Storage for all items removed from the BEB System shall be provided on the BEB.

#### **3.5.2 Rail Transport.**

The BEB System shall be rail transportable in the Continental United States (CONUS) and NATO countries per MIL-STD-1366. The BEB shall withstand shock loads resulting from rail impact testing in accordance with MIL-STD-810 without failure. When loaded on a 51-inch high rail car, the BEB System shall meet the dimensional requirements of the Association of American Railroads (AAR) Outline Diagram for Single Loads, Without End Overhang, on Open-Top Cars. When mounted on a 51.4-inch high railcar, the BEB System shall meet the dimensional requirements of NATO

envelope-M equipment gauge diagram. These diagrams apply to standard gauge rail lines in CONUS and NATO countries.

### **3.5.3 Marine Transport.**

The BEB System alone, loaded on a CBT, or loaded on a PLST shall be marine transportable on commercial and military watercraft per MIL-STD-1366. Marine transport of the BEB System loaded on a CBT towing a loaded PLST is not required.

### **3.5.4 Highway Transport.**

The BEB System on the CBT or PLST shall be highway transportable per MIL-STD-1366. When prepared for transport the maximum overall height shall not exceed 157-1/2- inches (ref: NATO highway). Permits are allowable to accommodate the BEB width. The maximum weight of the BEB System shall not exceed the Load Handling System (LHS) capability of the CBT of 24,000 lbs. The BEB System shall withstand shock and vibration encountered in ground transportation without damage or degradation.

#### **3.5.4.1 MRBC Transport System.**

The CBT with the BEB System shall tow a loaded PLST (required loads include IRB/BAP, loaded CROP flatracks, and DSB/M1077 flatracks) with the draw bar in the extended position and the extended drawbar/light bar (NSN 2540-01-460-5784) installed without restricting the turning diameter of the CBT/PLST combination. The BEB System loaded on a CBT towing a PLST loaded with a BAP shall not contact the PLST or BAP while climbing the 20% grade longitudinal slope at the Aberdeen Test Center (ATC) Munson Test Area.

#### **3.5.4.2 Transload.**

The BEB System shall be transloaded (transferred) from the CBT to the PLST and from the PLST to the CBT. Permanent changes to the CBT or PLST are not permitted. Alterations to the BEB, CBT, IBC, BAP or PLST from the regular transportation mode (if required) shall be installed and removed using no more than the CBT or onboard BEB System BII and shall take the 2-person CBT crew no longer than 5 minutes for installation and removal (threshold). The BEB System shall be transloaded without alteration to any equipment (objective).

### **3.5.5 Air Transport.**

The BEB System shall be transportable on C-5 and C-17 aircraft per MIL-STD-1366. (threshold). The BEB System shall be transportable on C-130 aircraft per MIL-STD-1366 (objective). Air transport of the BEB System loaded on a CBT or PLST is not required.

### **3.5.6 Tie-Down Provisions.**

The tie-down provisions shall conform to MIL-STD-209 Interface Standard for Lifting and tie-down provisions. The BEB shall have four tie-down provisions, to permit attachment to the floor or deck of the transportation system (the tie down provisions on the IBC and BAP are not sufficient to secure the weight of the BEB). The weight to be used when calculating the required strength of the tie-down provisions shall include the

BEB System at Full Load condition. Tie-down provisions may also be used as lifting provisions when such provisions meet the requirements. All provisions shall be labeled "TIE-DOWN" or "LIFT/TIE-DOWN" as applicable in not less than 1-inch high letters.

### **3.5.7 External Air Transport.**

The BEB shall meet the requirements of MIL-STD-209 and MIL-STD-913 for external helicopter transport. The loading condition for external air transport shall be the light ship condition (see 6.3.1) plus fuel tanks at 95% of capacity and 200 lbs of personal effects. The BEB alone shall be external air transportable by the CH-47D and CH53E for a 30 nautical mile radius at 60° F and sea level. (threshold) The BEB alone shall be air transportable by the CH-47D and CH53E for a 30 nautical mile radius at 95° F and 4000 ft elevation.(objective)

### **3.5.8 Slings/Lift Provisions.**

The BEB shall have slinging provisions conforming to MIL-STD-209. The BEB System shall be single-point lifted for loading with a crane. The use of spreader bars is not permitted. Slinging provisions may also be used as tie-down provisions when such provisions meet the requirements. All provisions shall be labeled "LIFT" or "LIFT/TIE-DOWN" as applicable in not less than 1-inch high letters.

## **3.6 Environmental.**

### **3.6.1 Hazardous Materials Management.**

Asbestos, beryllium, beryllium alloys, radioactive materials, hexavalent chromium, , cadmium , cadmium alloys, lead, leaded alloys, mercury, or other Group 1 Agents classified as "carcinogenic to humans" by the International Agency for Research on Cancer (IARC) Monographs, shall not be used to manufacture, assemble, maintain or sustain the BEB, without prior approval from the PCO. Dry film lubricants (torque tension modifiers) may be used to duplicate equivalent clamp loads due to the elimination of hazardous material plating or finishing.

### **3.6.2 Airborne Concerns.**

Class I and Class II Ozone Depleting Substances (ODS) shall not be used. Volatile Organic Compounds (VOC) and Hazardous Air Pollutants (HAP) shall be minimized or eliminated.

## **3.7 Survivability.**

### **3.7.1 Appliqué Panel Support Structure.**

The BEB shall include permanent mounting provisions to accept appliqué panels. The panels shall match the configuration of the operator's station and provide 100% coverage from the crew station deck on which the operator stands up to 48-inches for the front and sides (no protection is required behind the operator). The panels on the sides shall extend a minimum of 12-inches from the rear of the operator. Appliqué panel material, weight per area, and thickness shall be one of the two options described in Annex C. A means shall be provided for removal and installation of appliqué armor panels using an overhead

hoist. The means for lifting shall have an opening of at least 2 inches in diameter. Any special tools or fittings required for the removal and installation of appliqué panels shall be included in the BEB BII.

#### **3.7.1.1 Surrogate Panels**

Each BEB shall be delivered with a set of surrogate panels installed. The surrogate panels shall match the weight and center of gravity of the appliqué armor panels. A means shall be provided for removal and installation of the surrogate panels using an overhead hoist. The means for lifting shall have an opening of at least 2 inches in diameter. Installation and removal process for the surrogate panels shall be the same as the installation and removal process for the appliqué armor panels. Any special tools or fittings required for the removal and installation of the surrogate panels shall be included in the BEB BII. Surrogate panels shall be clearly marked "Surrogate." The marking shall be engraved on the panels such that the marking cannot be painted over or removed.

#### **3.7.2 Electromagnetic Environmental Effects.**

The BEB shall be electromagnetically compatible among all subsystems, equipment within the system and with Electromagnetic Environmental Effects (E3) external to the BEB. Compliance to MIL-STD-464 to the extent delineated in the following paragraphs shall be achieved. MIL-STD-1310 shall be used to incorporate bonding and grounding installation techniques in order to reduce E3. MIL-HDBK-237 and MIL-STD-1605 are available for guidance. Non-ballistic survivability is defined as correcting all Essential Function Failures (EFF) after a HEMP or NSL event within 6 hours by re-cycling power and performing maintainer tasks (threshold), within 15 minutes by performing operator tasks (objective).

##### **3.7.2.1 Near Strike Lightning.**

The BEB shall survive a Near Strike Lightning (NSL) event at a distance of 10m with the characteristics provided in MIL-STD-464 (using TABLE 2B: Electromagnetic fields from near strike lightning [close-to-ground]). Operation through a NSL event is not required.

##### **3.7.2.2 High-Altitude Electromagnetic Pulse.**

The BEB shall survive a High-Altitude Electromagnetic Pulse (HEMP) environment in accordance with MIL-STD-464. Operation through a HEMP event is not required. The design shall conform to the requirements of MIL-STD-464, section 5.5.

##### **3.7.2.3 Electrostatic Discharge (Helicopter and Personnel).**

The BEB shall meet the requirements of Helicopter Electrostatic Discharge (HESD) and Personnel Electrostatic Discharge per MIL-STD-464, section 5.7.

##### **3.7.2.4 Radiation Hazard.**

SINCGARS antenna placement shall incorporate personnel safety standards for electromagnetic radiation hazard (RADHAZ) in accordance with MIL-STD-464 section 5.8.1, Hazards of Electromagnetic Radiation to Personnel (HERP).

### **3.7.3 Chemical, Biological, Radiological and Nuclear Contamination.**

BEB materials, particularly those used externally, shall be resistant to Chemical, Biological, Radiological and Nuclear (CBRN) agents and decontamination agents. The BEB shall be able to operate in a CBRN environment while contaminated for 72 hours. The BEB shall be decontaminated to negligible risk levels with minimum replacement of exposed components.

### **3.8 Corrosion Control.**

The BEB shall be cleaned, treated, primed, and coated to preserve material integrity for operating over the 20-year service life. Operating environment includes fresh, brackish, and sea water immersion and spray; ground contact; gravel impingement during road transport; atmospheric contamination; airborne dust and dirt; and temperature extremes (-25°F to +120°F). Only normal washing, scheduled maintenance and repair of damaged areas shall be necessary to maintain corrosion control. The fit, form, or function of any component shall not be adversely affected due to corrosion throughout the in-service life.

#### **3.8.1 Corrosion Minimized.**

All attaching hardware shall not induce corrosion, galvanic or otherwise. Equipment and material used in the construction of the BEB system shall be corrosion protected/coated or fabricated of non-corroding materials. Direct contact of electrolytically dissimilar metals shall be isolated or eliminated.

#### **3.8.2 Treatment and Painting.**

All external surfaces and metallic appliqué panels suitable for painting except those that reach a temperature of 400° F shall be cleaned, treated and (Chemical Agent Resistant Coatings) CARC painted In Accordance With (IAW) MIL-DTL-53072. High temperature external surfaces such as exhaust ducts shall be painted with high temperature paint of limited reflectivity. Surfaces not suitable for painting shall be treated to or inherently provide a surface of limited reflectivity. Components not visible or exposed during normal operation may be unpainted. The top coat color shall be 34094 green 383 conforming to FED-STD-595.

#### **3.8.3 Stainless Steel in Sea Water.**

All stainless steel raw water system attachments and piping systems shall not have a critical pitting temperature of less than 150° F or a critical crevice temperature less than 95°F. Steel and galvanized steel shall not be used for piping systems that may contain seawater.

### **3.9 Maintainability, Supportability.**

The tools required for BEB maintenance shall be found in the following tool sets (objective):

- Army General Mechanics Tool Kit, Automotive, (NSN 5180-00-177-7033)
- General Mechanics (NSN 5180-01-454-3787)
- Standard Automotive Tool Set (NSN 4910-01-490-6453)
- Supplemental #1 (NSN 4910-00-754-0653)
- Forward Repair System (NSN 4940-01-463-7940)

Special tools not contained in the tool sets shall be provided (threshold).

### **3.9.1 At Platform Diagnostic Capabilities.**

The BEB shall have at-platform diagnostics IAW 3.9.1.1 or embedded diagnostics IAW 3.9.1.2 when Line Replacement Unit (LRU) fault isolation capability is equivalent or greater than sections 3.9.1.1. In addition when practical, the BEB shall have the diagnostic ability to identify major system LRU failures (e.g. check engine lights, blinking/flashing lights etc.).

#### **3.9.1.1 Electronic.**

The BEB must be compatible with current U.S. Army Standard Unit Level Test Equipment which is presently the MSD (Maintenance Support Device) with the auxiliary MSD-ICE (Internal Combustion Engine) test hardware. Diagnostic connectors and circuits must be compatible with current standard Army test equipment. Diagnostic connectors shall be easily accessible, hard mounted and environmentally protected. The diagnostic connectors shall be equipped with a cover, which shall prevent entrance of moisture and contaminants.

The BEB shall feature either a single data bus network as specified by SAE J1939, J1708, or a multiple data bus network in accordance with J1939, which defines the interface between J1708 and J1939. The BEB data bus shall have built in sensors that provide fault isolation capability sufficient to identify failures of major components of each system monitored by the data bus. Diagnostic outputs shall be transmitted to the vehicle mounted J1939 female 9 pin Deutsch Connector, which shall conform to SAE J1939/13 'Off-board Diagnostic Connector' dated July 1999. Software required to interface, retrieve, and interpret vehicle system's diagnostic data shall be provided to the government. Software shall be display operator/driver informational data associated with each error code.

#### **3.9.1.2 Embedded Diagnostics.**

The BEB shall have an on-board display screen which shall retrieve and interpret diagnostic error codes of major components of each system monitored by the data bus. The BEB shall feature either a single data bus network as specified by SAE J1939, J1708, or a multiple data bus network in accordance with J1939, which defines the interface between J1708 and J1939. The BEB data bus shall have built in sensors that provide fault isolation capability sufficient to identify failures of major components of each system monitored by the data bus. Software required to interface, retrieve, and interpret vehicle system's diagnostic data shall be provided to the government. Software shall also display operator/driver informational data associated with each error code.

### **3.10 Human Factors Engineering and Safety.**

Human Factor Engineering (HFE) principles and design standards shall be applied IAW ASTM F1166 Sections 5.1.8, 5.1.9, 6.1.10, 15 (all sub paragraphs), 17.1.1, 17.1.7.16, 17.1.10, 17.1.12, 17.2.7.1, 17.2.8, 17.2.9.2, 17.4.1, 17.7.1, 17.7.2, and 18.1 (all sub paragraphs). Belts, filters, lubrication fittings, oil sampling valves on machinery shall be readily inspectable and replaceable without component removal.

### **3.10.1 Human Factors Range.**

Operation, maintenance, and repair activities and procedures shall be performed by soldiers ranging from a 5<sup>th</sup> percentile female to a 95<sup>th</sup> percentile male as defined in section 9 of ASTM F1166 and dressed in protective gear (i.e. IBA, cold weather gloves, and Mission-Oriented Protective Posture (MOPP) 4).

### **3.10.2 Whole Body Vibration.**

Whole body vibration shall be below the health caution zone of ISO 2631-1 during calm water operations.

### **3.10.3 Noise Limit.**

Steady-state noise on deck with the engine compartment hatch closed shall not exceed 85 dB(A) IAW MIL-STD-1474 compensated with single-level hearing protection (threshold), without hearing protection (objective).

### **3.10.4 Hatch Securing.**

All machinery hatches shall be hinged and shall be securable in the open position. All hatches shall be operable by a single Soldier. Hatch latches shall be operable without the use of tools. Hatch latches shall not entrap water which can freeze making the latch inoperable.

### **3.11 Identification and Marking.**

All attachments or components removed or disassembled for shipment shall be visually match-marked for proper re-assembly.

#### **3.11.1 BEB Shipping Data Plate.**

Each BEB shall be furnished with a shipping data plate in accordance with MIL-STD-209 Section 5.7.1. The shipping data plate shall be readable by a person on the ground.

### **3.12 Workmanship.**

All welding, brazing and related procedures including joint design, joint strength calculations, edge preparation, fabrication, and records, shall be IAW the standards set forth by the American Welding Society (AWS) for the materials being welded and the intended service. The applicable standards are listed in Table 1 below. Weld Procedures and welder's qualifications shall be IAW D1.1, Structural Welding Code - Steel, and D1.2-2008 Structural Welding Code - Aluminum, welding standards. All recommendations and information in AWS D3.7-2004 "Guide for Aluminum Hull Welding" shall be followed. When welded MIL- DTL-46100, "Armor Plate, Steel, Wrought, High-Hardness" is used on the BEB, the steel armor plate 5/8 inch from the toe of the weld at any location of weldment shall meet the hardness requirements of MIL- DTL-46100 Section 3.2.5.1.

<b>Table 1</b>	
Structural Steel	American Welding Society (AWS) D1.1
Structural Aluminum	American Welding Society (AWS) D1.2
Structural Sheet Metal	American Welding Society (AWS) D1.3
Stainless Steel	American Welding Society (AWS) D1.6
Titanium	American Welding Society (AWS) D1.9
Specification for Automotive Weld Quality – Resistance Spot Welding of Steel	American Welding Society (AWS) D8.1
Specification for Automotive Spot Welding Electrodes	American Welding Society (AWS) D8.6
Recommended Practices for Automotive Weld Quality – Resistance Spot Welding	American Welding Society (AWS) D8.7
Recommended Practices for Test Methods for Evaluating the Resistance Spot Welding Behavior of Automotive Sheet Steel Materials	American Welding Society (AWS) D8.9
Specification for Robotic Arc Welding Safety	American Welding Society (AWS) D16.1
Guide for Components of Robotic Arc Welding Installations	American Welding Society (AWS) D16.2
Risk Assessment Guide for Robotic Arc Welding	American Welding Society (AWS) D16.3
Specification for the Qualification of Robotic Arc Welding Personnel	American Welding Society (AWS) D16.4
Specification for Friction Stir Welding of Aluminum Alloys for Aerospace Applications	American Welding Society (AWS) D17.3
Recommended Practices for Resistance Welding	American Welding Society (AWS) C1.1
Armor Steel	Ground Combat Vehicle Welding Code –Steel TACOM Drawing Number 12479550 <a href="http://contracting.tacom.army.mil/engr/gcv_weldingcodes.htm">http://contracting.tacom.army.mil/engr/gcv_weldingcodes.htm</a>
Section IX qualification standard for welding and brazing procedures, welders, braziers, and welding and brazing operators	ASME Section IX



## **4. QUALITY ASSURANCE PROVISIONS.**

### **4.1 Responsibility for Inspection.**

The party responsible for each verification is specified herein. The contractor may use any Government approved facility suitable for performance of the verification. The Government reserves the right to perform or witness any verifications where such verifications are deemed necessary to assure supplies and services conform to the requirements. The Government reserves the right to waive any verification requirements.

#### **4.1.1 Responsibility for Compliance.**

The contractor shall assure that all items produced meet the verification requirements of this PD. The verifications set forth in this specification shall become part of the contractor's verification system or quality program.

#### **4.1.2 Verification Equipment.**

The contractor is responsible for the provision and maintenance of the verification equipment necessary to assure that supplies and services conform to contract verification requirements. Calibration of verification equipment shall be in accordance with ANSI/NCSL Z540-1, ISO 10012, or comparable standard.

#### **4.1.3 Certification.**

Where Certification is required to verify material or component conformance to the requirements, the contractor shall furnish such Certification along with documented test results and performance and analytical data, as applicable. For each requirement, only one certification for the entire class of BEBs is required unless otherwise noted. The Certification(s) and documented test results shall be updated and resubmitted if changes to the material or component(s) are made. Certifications shall be provided in accordance with the contract requirements.

#### **4.1.4 Test Facilities.**

The contractor is responsible for maintaining access to a test facility. These facilities include, but are not limited to:

- Open water space for the testing of the boat during PUI and Sea Trials
- An area for launching and retrieving of the boat

#### **4.1.5 Classification of Inspections and Tests.**

The inspection and testing requirements specified herein are classified as follows, and detailed in sections following Table 2:

- Production Unit Inspection (PUI)
- Sea Trial (ST)
- Quality Conformance Inspection (QCI)
- Production Qualification Test (PQT)

The verification methods referenced herein may be modified at the discretion of the Government by the deletion or addition of verifications to assure adherence to specifications and contract requirements.

**Table 2.** Classification of Inspection and Tests

<b>TITLE</b>	<b>Method</b>	<b>PUI</b>	<b>Certifi- cation</b>	<b>QCI</b>	<b>PQT</b>
<b>General Design Requirements.</b>	4.2				
<b>EU 94/25/EC.</b>	4.2.1		X		
<b>ISO Structural Requirements.</b>	4.2.2		X		
<b>Code of Federal Regulations.</b>	4.2.3		X		
<b>American Boat and Yacht Council Standards.</b>	4.2.4		X		
<b>MRBC Interface.</b>	4.2.5	X			X
<b>Performance.</b>	4.3				
<b>Launch, Retrieve Performance.</b>	4.3.1	X			X
<b>Launch, Retrieve Personnel.</b>	4.3.2				X
<b>Temporary Bridge Anchoring.</b>	4.3.3				X
<b>Rafting.</b>	4.3.4				X
<b>Navigational Draft.</b>	4.3.5	X			X
<b>Shallow Water Operation.</b>	4.3.6	X			X
<b>Out of Water Operation.</b>	4.3.7	X			X
<b>Ambient Conditions.</b>	4.3.8				X
<b>BEB Speed.</b>	4.3.9	X			X
<b>Unloaded Bay Maneuverability.</b>	4.3.10				X
<b>Reliability.</b>	4.3.11				X
<b>Maintenance Ratio.</b>	4.3.12				X
<b>Physical Characteristics.</b>	4.4				
<b>Hull.</b>	4.4.1	X			X
<b>Ground Supported.</b>	4.4.1.1	X			X
<b>Hull Material.</b>	4.4.1.2		X		
<b>Hull Drainage.</b>	4.4.1.3	X		X	X
<b>Buoyancy (Objective).</b>	4.4.1.4	X	X		
<b>Intact Stability.</b>	4.4.1.5	X	X		
<b>Payload.</b>	4.4.1.6				X
<b>Anodes.</b>	4.4.1.7	X		X	X
<b>Rub Rail(s).</b>	4.4.1.8	X		X	X
<b>Dive Platform.</b>	4.4.1.9	X		X	X
<b>Push Knees.</b>	4.4.1.10				X
<b>Tie-Offs.</b>	4.4.1.11	X	X	X	X
<b>Capstan.</b>	4.4.1.12	X	X	X	X
<b>Line Take Up Device (Objective)</b>	4.4.1.13	X		X	X
<b>Anchor Fairlead.</b>	4.4.1.14				X
<b>Personnel Safety Aids.</b>	4.4.1.15	X		X	X
<b>Crew Station.</b>	4.4.1.16	X		X	X
<b>Operator's Seat</b>	4.4.1.17				X

<b>TITLE</b>	<b>Method</b>	<b>PUI</b>	<b>Certifi- cation</b>	<b>QCI</b>	<b>PQT</b>
<b>Heater.</b>	4.4.1.18	X	X	X	X
<b>Mast(s).</b>	4.4.1.19	X		X	X
<b>Crew Station Bimini Top.</b>	4.4.1.20				X
<b>Crew Station Enclosure.</b>	4.4.1.21	X		X	X
<b>Weapon Brackets.</b>	4.4.1.22			X	X
<b>Storage Compartments.</b>	4.4.1.23	X		X	
<b>Basic Issue Items.</b>	4.4.1.24	X		X	X
<b>Personal Flotation Device.</b>	4.4.1.24.1	X	X	X	X
<b>Throwable Flotation.</b>	4.4.1.24.2	X	X	X	X
<b>Anchor and Line.</b>	4.4.1.24.3	X	X	X	X
<b>Mooring, Towing, and Steering Lines.</b>	4.4.1.24.4	X	X	X	
<b>Hand Tools.</b>	4.4.1.24.5	X		X	X
<b>First Aid Kit.</b>	4.4.1.24.6	X		X	X
<b>Line Cutting Device.</b>	4.4.1.24.7	X		X	X
<b>Document Pouch.</b>	4.4.1.24.8	X		X	X
<b>Mat(s).</b>	4.4.1.24.9	X	X	X	X
<b>Headsets.</b>	4.4.1.24.10				X
<b>Digital Range Finder.</b>	4.4.1.24.11	X		X	X
<b>Hand Portable Fire Extinguisher.</b>	4.4.1.24.12	X	X	X	X
<b>Boat Hook.</b>	4.4.1.24.13				X
<b>Mechanical Systems.</b>	4.4.2				X
<b>Lubricants and Fluids.</b>	4.4.2.1	X		X	X
<b>Lubrication Fittings.</b>	4.4.2.2	X		X	X
<b>Petroleum, Oils, and Lubricants Leakage.</b>	4.4.2.3	X		X	X
<b>Propulsion.</b>	4.4.2.4		X		
<b>Oil Change System.</b>	4.4.2.4.1				X
<b>Oil Filters.</b>	4.4.2.4.2				X
<b>Oil Sampling Valves.</b>	4.4.2.4.3				X
<b>Engine Configuration Performance.</b>	4.4.2.4.4				X
<b>Fuel.</b>	4.4.2.4.4.1	X			X
<b>Emissions Technologies.</b>	4.4.2.4.4.2				X
<b>Ignition.</b>	4.4.2.4.4.3			X	X
<b>Shut Down.</b>	4.4.2.4.4.4				X
<b>Automatic Engine Shut Down Override.</b>	4.4.2.4.4.4.1				X
<b>Hour Meter.</b>	4.4.2.4.4.5	X		X	X
<b>Exhaust System.</b>	4.4.2.4.4.6	X		X	X
<b>Engine Cooling.</b>	4.4.2.4.4.7				X
<b>Raw Water Cooling.</b>	4.4.2.4.4.8	X			X
<b>Water Jets.</b>	4.4.2.4.5	X		X	X

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<b>TITLE</b>	<b>Method</b>	<b>PUI</b>	<b>Certifi- cation</b>	<b>QCI</b>	<b>PQT</b>
<b>Fire Protection.</b>	4.4.2.4.6		X		X
<b>Actuation.</b>	4.4.2.4.6.1				X
<b>Alarm.</b>	4.4.2.4.6.2				X
<b>Extinguishing Agent.</b>	4.4.2.4.6.3	X		X	X
<b>Engine Space Confinement.</b>	4.4.2.4.6.4	X		X	X
<b>Fuel System.</b>	4.4.2.5				X
<b>Discharge Control.</b>	4.4.2.5.1				
<b>Fuel Tank.</b>	4.4.2.5.2	X	X		X
<b>Electrical Systems.</b>	4.4.3	X			X
<b>Alternator.</b>	4.4.3.1	X	X	X	X
<b>Batteries.</b>	4.4.3.2	X	X	X	X
<b>Battery Cables.</b>	4.4.3.2.1	X	X		X
<b>Battery Disconnect Master Switch.</b>	4.4.3.3				X
<b>Cabling and Wiring.</b>	4.4.3.4	X			
<b>Connectors and Labels.</b>	4.4.3.4.1	X			
<b>Connection Boxes.</b>	4.4.3.4.2				X
<b>NATO Slave Receptacle.</b>	4.4.3.4.3	X			X
<b>24 Vdc to 12 Vdc Converter.</b>	4.4.3.5	X	X	X	X
<b>Circuit Breaker Panel.</b>	4.4.3.6				X
<b>Searchlight.</b>	4.4.3.7	X	X	X	X
<b>Inspection Light.</b>	4.4.3.8	X	X	X	X
<b>Lighting.</b>	4.4.3.9	X		X	X
<b>Instrument Panel(s).</b>	4.4.3.10				X
<b>Fuel Level Gauge.</b>	4.4.3.10.1				X
<b>Gauges.</b>	4.4.3.10.2				X
<b>Malfunction Indicators.</b>	4.4.3.10.3				X
<b>Horn.</b>	4.4.3.11	X	X	X	
<b>Navigation Lights.</b>	4.4.3.12	X	X	X	
<b>Communications-Electronics Complement.</b>	4.4.4				X
<b>SINCGARS Radio Capability.</b>	4.4.4.1				X
<b>Global Positioning System.</b>	4.4.4.2				X
<b>Infrared Strobe.</b>	4.4.4.3				X
<b>Depth Sounder.</b>	4.4.4.4				X
<b>Bilge Drainage System.</b>	4.4.5	X		X	X
<b>Transportation.</b>	4.5				X
<b>Reconfiguration for Transport.</b>	4.5.1				X
<b>Rail Transport.</b>	4.5.2		X		X
<b>Marine Transport.</b>	4.5.3		X		X
<b>Highway Transport.</b>	4.5.4		X		X
<b>MRBC Transport System.</b>	4.5.4.1	X			X
<b>Transload.</b>	4.5.4.2	X			X
<b>Air Transport.</b>	4.5.5		X		X

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<b>TITLE</b>	<b>Method</b>	<b>PUI</b>	<b>Certifi- cation</b>	<b>QCI</b>	<b>PQT</b>
<b>Tie-Down Provisions.</b>	4.5.6	X	X		X
<b>External Air Transport.</b>	4.5.7		X		X
<b>Slinging/Lift Provisions.</b>	4.5.8	X	X		X
<b>Environmental</b>	4.6				
<b>Hazardous Materials Management.</b>	4.6.1		X		
<b>Airborne Concerns.</b>	4.6.2		X		
<b>Survivability.</b>	4.7				
<b>Appiqué Panel Support Structure.</b>	4.7.1	X	X		X
<b>Surrogate Panels</b>	4.7.1.1	X	X	X	X
<b>Electromagnetic Environmental Effects.</b>	4.7.2				X
<b>Near Strike Lightning.</b>	4.7.2.1				X
<b>High-Altitude Electromagnetic Pulse.</b>	4.7.2.2				X
<b>Electrostatic Discharge (Helicopter and Personnel).</b>	4.7.2.3				X
<b>Electromagnetic Compatibility.</b>	4.7.2.4				X
<b>Radiation Hazard.</b>	4.7.2.5				X
<b>Chemical, Biological, Radiological and Nuclear Contamination.</b>	4.7.3				X
<b>Corrosion Control.</b>	4.8				X
<b>Corrosion Minimized.</b>	4.8.1	X	X		
<b>Treatment and Painting.</b>	4.8.2	X	X	X	X
<b>Stainless Steel in Sea Water.</b>	4.8.3		X		
<b>Maintainability, Supportability.</b>	4.9				X
<b>At Platform Diagnostic Capabilities.</b>	4.9.1				X
<b>Electronic.</b>	4.9.1.1				X
<b>Embedded Diagnostics.</b>	4.9.1.2				X
<b>Human Factors Engineering and Safety.</b>	4.1		X		
<b>Human Factors Range.</b>	4.10.1				X
<b>Whole Body Vibration.</b>	4.10.2				X
<b>Noise Limit.</b>	4.10.3				X
<b>Hatch Securing.</b>	4.10.4	X		X	X
<b>Identification and Marking.</b>	4.11				X
<b>BEB Transportability Data Plate(s).</b>	4.11.1	X		X	
<b>Item Unique Identification Marking.</b>	4.11.2	X	X	X	
<b>Workmanship.</b>	4.12		X		

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#### 4.1.6 **Test Locations.**

Test identified herein shall be conducted at the following locations:

- Production Unit Inspection - Place of Manufacture
- Sea Trial – Determined by manufacturer
- Production Qualification Test - Government Proving Grounds
- Quality Conformance Inspection - Place of Manufacture

#### 4.1.7 **In-Process Inspection.**

During fabrication, in-process inspections will be performed by the Government. Government representatives shall have access to the contractor or subcontractor's facility as appropriate to evaluate conformance of materials and workmanship to the requirements of specified documents. Examples of items to be reviewed are welding, calibration and calibration records, non-destructive test processes and procedures, quality system – including quality documentation as defined in the quality plan, inspection records, non conformances and associated corrective actions (including 8D, 5Y, 5S, etc.), and welder certifications.

#### 4.1.8 **Production Unit Inspection.**

A Production Unit Inspection (PUI) shall be performed by the contractor on the BEBs which will be tested during PQT. PUI inspections will be witnessed by a Government representative at the Government's option. As part of the PUI, each BEB shall perform a PUI Sea Trial in accordance with 4.1.8.1. Upon completion of PUI, the contractor shall submit the BEBs and make available all inspection records, quality plans, and certifications to the responsible Government inspection element at the contractor's facility. The approved Final Inspection Report (FIR) shall be submitted to the Government with each BEB offered for acceptance.

##### 4.1.8.1 **PUI Sea Trial.**

The contractor shall perform a PUI Sea Trial for each PUI BEB. The PUI Sea Trial shall be performed on JP-8 fuel with the BEB in the full load condition. Upon completion of testing, the contractor shall submit the PUI Sea Trial Inspection Sheet to the responsible Government element. The Government, at its option, may elect to witness the contractor's PUI Sea Trial. During the PUI Sea Trial, the following shall be performed with each BEB in water:

1. Verify that the gauges are operating properly by visually inspecting each meter and noting that the indicator is pointing to the normal operating position. Shut engine off assure gauges are not stuck, but return to non-operating position. Do not continue if any gauge is not functioning properly.
2. Verify that the steering system is functioning properly and water jet nozzles move freely.
3. Operate the waterjets in forward and reverse.
4. Backflush the waterjets.
5. Run for 10 minutes at 45% of maximum RPM. Check for leaks. Record BEB speed and engine & gearbox parameters.
6. Run for 10 minutes at 60% of maximum RPM. Check for leaks. Record BEB speed and engine & gearbox parameters.

7. Run for 10 minutes at 80% of maximum RPM. Check for leaks. Record BEB speed and engine & gearbox parameters.
8. Run for 15 minutes at 90% of maximum RPM. Check for leaks. Record BEB speed and engine & gearbox parameters.
9. Run for 10 minutes at maximum RPM. Check for leaks. Record engine & gearbox parameters.
10. Complete two hours of steady state (generally straight ahead) operation between 45% and 70% of maximum engine RPM. Perform a series of four figure eight maneuvers during the two hour period. At the end of the two hour period, begin ten-minutes of engine operation at 50% of maximum RPM. Record engine and instrument panel parameters at steady state operation. At 50% of maximum RPM perform one emergency stop by rapidly moving from forward to reverse operation.
11. Complete 30 minutes of steady state (generally straight ahead) operation between 70% and 80% of maximum RPM. At the end of the 30-minute period, perform a series of four figure eight maneuvers. At completion of the 30 minutes begin ten minutes of steady engine operation at 80% of maximum RPM. Record engine and instrument panel parameters at steady state operation. At 80% of maximum RPM, perform one emergency stop by rapidly moving from forward to reverse operation.
12. Complete 30 minutes of steady state (generally straight ahead) operation at maximum engine RPM. At the end of the 30 minute period, perform a series of four figure eight maneuvers. Record engine and instrument panel parameters at steady state operation (including maximum engine RPM achieved).
13. In calm water, at maximum RPM, perform one emergency stop by rapidly moving from forward to reverse operation. Extreme caution to be exercised by personnel during this maneuver.
14. Repeat sea trial twice. Two complete cycles should take no more than eight hours of operation.
15. Remove from water and inspect BEB for defects.
16. Contractor shall correct any defects found during sea trial.

#### 4.1.8.1.1 **PUI Sea Trial Inspection Sheet.**

The PUI Sea Trial Inspection Sheet shall include:

- Serial number of boat
- Date and time of PUI Sea Trial
- Ambient air and water conditions – temperature, wind speed, precipitation, water current, wave amplitude.
- Engine hours on all engines before and after test
- Inspector's name
- Safety equipment inspection
- Fuel level checks and leakage inspection
- Oil level checks and leakage inspection
- Water Jet fluid level checks and leakage inspection
- Recorded BEB speeds and engine and gearbox parameters from PUI Sea Trial

#### **4.1.9 Quality Conformance Inspection**

The contractor shall perform a Quality Conformance Inspection (QCI) of each BEB which will not be tested during PQT. The QCI shall be performed as defined herein utilizing a Government approved Final Inspection Record (FIR) format. The type of inspection is dependent on the requirement as defined in Section 4. The contractor shall perform a QCI Sea Trial on each QCI BEB as specified in 4.1.8.2.1.

##### **4.1.9.1 QCI Sea Trial**

The contractor shall perform a QCI Sea Trial of each QCI BEB to ensure that each BEB is fully operational before delivery. The QCI Sea Trial is not required to be performed using JP-8 fuel. Upon completion of the QCI Sea Trial, the contractor shall submit a QCI Sea Trial Inspection Sheet for each BEB as specified in 4.1.9.1.1. The Government, at its option, may elect to witness the QCI Sea Trial. The QCI Sea Trial shall be performed with the BEB in the full load condition. During the QCI Sea Trial, the following shall be performed with each BEB in water:

1. Verify that steering system is functioning properly and water jet nozzles move freely.
2. Operate the waterjets in forward and reverse.
3. Backflush the waterjets.
4. Run for 10 minutes at 45% of maximum RPM. Check for leaks. Record engine & gearbox parameters.
5. Run for 10 minutes at 60% of maximum RPM. Check for leaks. Record engine & gearbox parameters.
6. Run for 10 minutes at 80% of maximum RPM. Check for leaks. Record engine & gearbox parameters.
7. Run for 10 minutes at 90% of maximum RPM. Check for leaks. Record engine & gearbox parameters.
8. Run for 10 minutes at maximum RPM. Check for leaks. Record BEB speed and engine & gearbox parameters.
9. In calm water, at maximum RPM, perform one emergency stop by rapidly moving from forward to reverse operation. Extreme caution to be exercised by personnel during this maneuver.
10. Remove BEB from water and inspect for defects.
11. Contractor shall correct any defects found during QCI Sea Trial.

##### **4.1.9.1.1 QCI Sea Trial Inspection Sheet**

The QCI Sea Trial Inspection Sheet shall include:

- Serial number of boat
- Date and time of QCI Sea Trial
- Ambient air and water conditions – temperature, wind speed, precipitation, water current, wave amplitude.
- Engine hours on all engines before and after test
- Inspector's name
- Fuel level checks and leakage inspection



- Oil level checks and leakage inspection
- Water Jet fluid level checks and leakage inspection
- Recorded BEB speeds and engine and gearbox parameters from QCI Sea Trial

#### 4.1.10 **Repair of Defects.**

The contractor shall correct defects found during PUI or QCI at no cost to the Government.

#### 4.1.11 **Inspection or Test Failure.**

If a BEB fails to pass any verification during PUI or QCI, the Government will withhold acceptance until the contractor provides evidence that corrective action has been taken.

#### 4.1.12 **Production Qualification Test.**

The Government will perform a Production Qualification Test (PQT) on ten BEBs at a Government test facility. The PQT will verify that the BEB meets the requirements of Section 3 of the PD. To verify conformance to Section 3 verification will be performed in accordance with paragraphs 4.2 through 4.12. All verifications will be performed with the BEB in the full load condition unless otherwise noted.

#### 4.1.13 **Limited User Test (LUT)**

The Government will perform a Limited User Test at a Government test facility. The LUT will be performed to validate that the BEB can operate effectively in a simulated in-service environment.

### 4.2 **General Design Requirements.**

#### 4.2.1 **EU 94/25/EC.**

To determine conformance to 3.2.1, the contractor shall provide certification that the BEB meets the requirements of the Recreational Craft Sectoral Group (RSG) Guidelines 2008 for the Recreational Craft Directive 94/25/EC as amended by Directive 2003/44/EC. Module Aa shall be used. A Notified Body is not required. All documentation required for this certification shall be provided to the Government.

#### 4.2.2 **ISO Structural Requirements.**

To determine conformance to 3.2.2, the contractor shall provide Certification in the form of structural drawings and calculations.

#### 4.2.3 **Code of Federal Regulation.**

To determine conformance to 3.2.3, the contractor shall provide Certification that the BEB meets the requirements of Code of Federal Regulations (CFR) Title 46 Shipping, Chapter I Coast Guard, Subchapter C Uninspected Vessels (Parts 24, 25, 26) as a motorboat vessel.

#### 4.2.4 **American Boat and Yacht Council Standards.**

To determine conformance to 3.2.4, the contractor shall provide Certification that the BEB meets the requirements of the sections of the ABYC standard noted in paragraph 3.2.4.

#### **4.2.5 MRBC Interface.**

To determine conformance to 3.2.5, installation and removal of any required modifications to the CBT, PLST, IBC, or BAP shall be demonstrated on one set of MRBC equipment using BEB BII during PUI. Installation and removal of any modifications to the CBT, PLST, IBC, or BAP will be demonstrated on MRBC equipment using BEB BII during PQT. The BEB will be transported, launched and retrieved using the modified MRBC equipment to verify proper operation during PQT.

### **4.3 Performance.**

#### **4.3.1 Launch, Retrieve, Performance.**

To determine conformance to 3.3.1 and 3.3.2, launch and retrieval of the BEB from the CBT will be demonstrated multiple times during PQT. The elapsed time will be recorded and averaged. Launch and retrieval of the BEB from the CBT shall be demonstrated on one BEB during PUI.

#### **4.3.2 Launch, Retrieve, Personnel.**

See 4.3.1.

#### **4.3.3 Temporary Bridge Anchoring.**

To determine conformance to 3.3.3, a test will be performed in which the BEBs will hold a floating bridge being crossed by wheeled or tracked vehicles for up to 72 hours in fast water during LUT.

#### **4.3.4 Rafting.**

To determine conformance to 3.3.4, a test will be performed during PQT in which two BEBs will push a loaded 7-bay raft in both conventional and longitudinal rafting configurations. Rafting speed will be recorded for reciprocal runs with and against the wind and current. The results of the reciprocal runs will be averaged to determine the rafting speed over water. The rafting speed shall be corrected from ambient conditions at the time of testing to an air temperature of 120° F and water temperature of 95° F.

#### **4.3.5 Navigational Draft.**

To determine conformance to 3.3.5, a test shall be performed in which the draft of one BEB is measured in the Full Load condition during PUI. The specific gravity of the water during the Navigational Draft test shall be recorded. The measured draft shall be corrected for a specific gravity of 1.00. A test will be performed in which the draft of the BEB is measured in the Full Load condition during PQT.

#### **4.3.6 Shallow Water Operation.**

To determine conformance to 3.3.6, one BEB shall be operated at approximately 6 fps in approximately 4 feet of water at full power for 30 minutes during PUI. The drive train (engines, transmissions, and jet drives) shall be monitored for any temperatures or pressures outside of the manufacturer's specifications. The BEB will be operated at approximately 6 fps in approximately 4 feet of water at full power for 30 minutes during PQT.

#### **4.3.7 Out of Water Operation.**

To determine conformance to 3.3.7, the ability of the engines of one BEB to be started out of water without any configuration changes shall be demonstrated during PUI. The engines ability to run at idle speed, with transmission and water jets in neutral gear, for a period of 10 minutes shall be demonstrated during PUI. During PQT, the engines of the BEB will be started out of water without any configuration changes. The engines will be run at idle speed, with transmission and water jets in neutral gear, for a period of 10 minutes during PQT. Sensors will monitor the engine temperatures and any temperatures that are outside of the engine manufacturer's limit for normal operations will be recorded.

#### **4.3.8 Ambient Conditions.**

To determine conformance to 3.3.8, a test will be performed during PQT in which the BEB will be subjected to a range of operating temperatures. The BEB with arctic lubricants, coolant, and any plug-in accessories will be tested for a successful engine start in an environmentally controlled chamber at -25°F after being stored at -50°F.

#### **4.3.9 BEB Speed.**

To determine conformance to 3.3.9, the maximum steady state speed over water corrected for ambient temperature of all PUI BEBs shall be tested in water depth greater than 23 feet during PUI. The steady state speed over water shall be determined by performing reciprocal runs with and against the wind and current. The speeds of the reciprocal runs shall be averaged to determine the relative water speed. The BEB speed shall be corrected from ambient conditions at the time of testing to an air temperature of 120° F and water temperature of 95° F. One PUI BEB shall be operated in reverse at 4 knots during PUI. Any water coming on board or safety issues during forward or reverse operations shall be noted. The BEB speed in greater than 23 feet of water corrected for ambient temperatures will be tested during PQT.

#### **4.3.10 Unloaded Bay Maneuverability.**

To determine conformance to 3.3.10, a demonstration will be performed in which the BEB will maneuver individual bays and multiple combinations of up to 4 bays during PQT. Unloaded bay maneuverability in fast water will be demonstrated during LUT.

#### **4.3.11 Reliability.**

To determine conformance to 3.3.11, the BEB will be tested during PQT for at least 2000 hours of operation in accordance with the Operational Duty Cycle Simulation defined in Annex B. Failures will be scored in accordance with the Failure Description and Scoring Criteria (FDSC).

#### **4.3.12 Maintenance Ratio.**

To determine conformance to 3.3.12, the Maintenance Ratio (MR) will be assessed during PQT.

#### 4.4 **Physical Characteristics.**

##### 4.4.1 **Hull.**

To determine conformance to 3.4.1, parts of the BEB that contact the ground during beaching, loading, unloading, launching, and recovery operations shall be inspected during PUI on one BEB for protection or reinforcement as required to withstand the contact. The hull will be inspected for damage throughout PQT.

##### 4.4.1.1 **Ground Supported.**

To determine conformance to 3.4.1.1, the BEB's ground support shall be demonstrated by placing one BEB on a flat, hard surface during PUI. The ground supported BEB shall be inspected for damage and stability. The BEB's ground support will be demonstrated by placing the BEB on a flat, hard surface during PQT.

##### 4.4.1.2 **Hull Material.**

To determine conformance to 3.4.1.2 the contractor shall provide Certification in the form of material certificates for the aluminum used in the construction of the BEB to certify the type of material used.

##### 4.4.1.3 **Hull Drainage.**

To determine conformance to 3.4.1.3, hull drainage shall be inspected on all BEBs during PUI or QCI. Drain plugs shall be inspected for attachment devices on all BEBs during PUI or QCI. The BEB will be inspected for hull drainage during PQT.

##### 4.4.1.4 **Buoyancy (Objective).**

If applicable, to determine conformance to 3.4.1.4, the contractor shall provide calculations to certify that the BEB meets the requirements of ISO 12217-1 Annex E: Level Flotation Test. The contractor shall perform the Level Flotation Test on one BEB during PUI. Testing shall be genuine flooding of the BEB's hull.

##### 4.4.1.5 **Intact Stability.**

To determine conformance to 3.4.1.5, the contractor shall provide Certification in the form of stability calculations to show that the BEB meets the requirements of ISO 12217-1. The contractor shall perform an inclining test on one BEB during PUI.

##### 4.4.1.6 **Payload.**

To determine conformance to 3.4.1.6, the BEB's ability to be operated in the Full Load with payload condition will be demonstrated to ensure safety and stability during PQT.

##### 4.4.1.7 **Anodes.**

To determine conformance to 3.4.1.7, the anodes shall be inspected for proper installation on all BEBs during PUI or QCI. Removal and reinstallation of anodes using common hand tools will be demonstrated during PQT.

#### **4.4.1.8 Rub Rail(s).**

To determine conformance to 3.4.1.8, the rub rails shall be inspected for proper installation on all BEBs during PUI or QCI. The rub rails will be subjected to impacts during PQT. The BEB will be inspected for damage after impacts.

#### **4.4.1.9 Dive Platform.**

To determine conformance to 3.4.1.9, use of the dive platform will be demonstrated on all BEBs during PUI or QCI to ensure it is stowable without tools (if applicable) and that the ladder is operational. The dive platform will be weighted during PQT to demonstrate the ability to support two Soldiers. Boarding operations will be demonstrated with one Soldier in no less than 10 feet of water on one BEB during PQT.

#### **4.4.1.10 Push Knees.**

To determine conformance to 3.4.1.10, the BEB's push knee interface with the IRB will be demonstrated during the PQT rafting test (see 3.3.4). The push knees of one BEB will be demonstrated during PQT by impacting a stationary IRB at 3 knots. The push knees of one BEB will be demonstrated during PQT by impacting a stationary IRB bay at a 45 degree angle at 2 knots.

#### **4.4.1.11 Tie-Offs.**

To determine conformance to 3.4.1.11, the contractor shall provide Certification of the strength of the tie-offs by providing dimensioned drawings and structural calculations. The ability of the tie-offs on one BEB to accept a one-inch diameter line shall be demonstrated during PUI. During PUI, all tie-offs on one BEB shall be pull tested to the greater of the bollard pull or the maximum calculated load from bay handling and maneuvering. Failure of the pull test is defined as any visible permanent deformation, yielding, or bending of the tie-off or surrounding structure. Welds will be subjected to non-destructive testing by the Government during production. Tie-offs will be pull tested during PQT.

#### **4.4.1.12 Capstan.**

To determine conformance to 3.4.1.12, the capstan on one BEB shall be pull tested to the bollard pull of the BEB during PUI. Failure of the pull test is defined as any visible permanent deformation, yielding, or bending of the capstan, its foundation, or the surrounding structure. The contractor shall provide Certification of the strength of the capstan foundation by providing dimensioned drawings and structural calculations. The contractor shall provide Certification of the strength of the capstan by providing commercial literature stating the rated strength of the capstan. The capstan shall be demonstrated on all BEBs by tensioning a towing or steering line against a tie-off during PUI or QCI.

#### **4.4.1.13 Line Take Up Device (Objective)**

If applicable, to determine conformance to 3.4.1.13, the line take up device shall be demonstrated on one BEB by using the device to attach to and maneuver an unloaded IRB bay during PUI. The line take up device will be demonstrated during PQT. The over-

tightening prevention system will be tested during PQT. Operation of the line take up device shall be demonstrated with no load on all BEBs during PUI or QCI.

#### 4.4.1.14 **Anchor Fairlead.**

To determine conformance to 3.4.1.14, the anchor fairlead will be demonstrated by anchoring the BEB during PQT.

#### 4.4.1.15 **Personnel Safety Aids.**

To determine conformance to 3.4.1.15, all grabrails, handholds, footholds, and other safety aids will be inspected for safety and functionality during PQT. All grabrails, handholds, footholds, and other safety aids shall be inspected on all BEBs for proper installation during PUI or QCI.

#### 4.4.1.16 **Crew Station.**

To determine conformance to 3.4.1.16, operation of the BEB by one Soldier and by two Soldiers from the crew station will be demonstrated during PQT. Windshield glass (if provided) shall be inspected on all BEBs during PUI or QCI to verify that the glass is automotive-style (tempered). Operation of windshield wipers and washers (if provided) shall be demonstrated on all BEBs during PUI or QCI. Removal, stowage, and reinstallation of the windshield (if applicable) shall be demonstrated on all BEBs during PUI or QCI.

#### 4.4.1.17 **Operator's Seat.**

To determine conformance to 3.4.1.17, the operator's seat will be demonstrated during PQT.

#### 4.4.1.18 **Heater.**

To determine conformance to 3.4.1.18, the contractor shall provide commercial literature for the heater and a calculation of the output BTUs as installed. Operation of the heater will be demonstrated on all BEBs during PUI or QCI. The output of the heater will be tested during PQT.

#### 4.4.1.19 **Mast(s).**

To determine conformance to 3.4.1.19, the mast(s) will be inspected for interference of operation when stowed during PQT. Lowering and raising of the mast shall be demonstrated on all BEBs during PUI or QCI.

#### 4.4.1.20 **Crew Station Top.**

To determine conformance to 3.4.1.20, an inspection for storage location (if provided), fit, form, and function will be performed during PQT. The ability of the crew station top to withstand a 25 knot head wind at the BEB's top speed will be demonstrated on one BEB during PQT. Removal, storage, and reinstallation of the crew station top shall be demonstrated on all BEBs during PUI or QCI.

#### **4.4.1.21 Crew Station Enclosure.**

To determine conformance to 3.4.1.21, a visual inspection for storage location (if provided), material and fit, form, and function will be performed for the crew station enclosure of one BEB during PQT. Installation, removal, and storage of the crew station enclosure shall be demonstrated on all BEBs during PUI or QCI.

#### **4.4.1.22 Weapon Brackets.**

To determine conformance to 3.4.1.22, the weapons brackets will be inspected for proper location and capability during PQT. The weapons brackets shall be inspected on all BEBs during PUI or QCI.

#### **4.4.1.23 Storage Compartments.**

To determine conformance to 3.4.1.23, storage compartments shall be subjected to water tight testing on one BEB during PUI. Water testing shall be performed in accordance with ISO 12216 test for watertightness degree 4.

#### **4.4.1.24 Basic Issue Items.**

To determine conformance to 3.4.1.24, an inspection shall be performed on all BEBs during PUI or QCI to ensure that all BII items are provided. An inspection will be performed on one BEB during PQT to verify that proper stowage locations are provided for all BII. An inspection will be performed on all BEBs during PQT to ensure that all BII items are provided.

##### **4.4.1.24.1 Personal Flotation Device.**

To determine conformance to 3.4.1.24.1, the Personal Flotation Devices shall be inspected on all BEBs during PUI or QCI for number, condition, and type. The contractor shall provide commercial literature to certify the type and color of the PFD.

##### **4.4.1.24.2 Throwable Flotation.**

To determine conformance to 3.4.1.24.2, the throwable flotation will be tested for deployment time on one BEB during PQT. The contractor shall provide commercial literature to certify the type of throwable flotation provided. The throwable flotation shall be inspected on all BEBs during PUI or QCI for condition and type.

##### **4.4.1.24.3 Anchoring and Line.**

To determine conformance to 3.4.1.24.3, the anchor and line will be demonstrated by anchoring one BEB in wind and fast water during PQT. The contractor shall provide Certification in the form of commercial literature defining the holding capacity of the anchor and the rated strength of the anchor line.

##### **4.4.1.24.4 Mooring, Towing, and Steering Lines.**

To determine conformance to 3.4.1.24.4, the mooring, towing, and steering lines shall be inspected for number on all BEBs during PUI or QCI. The contractor shall provide Certification in the form of commercial literature and calculated loads to certify that the towing and steering lines meet the strength requirements.

#### 4.4.1.24.5 **Hand Tools.**

To determine conformance to 3.4.1.24.5, the hand tools will be inspected during PUI or QCI to ensure that all tools required for PMCS are provided on all BEBs. Throughout PQT, it will be noted if any additional tools are required to perform PMCS.

#### 4.4.1.24.6 **First Aid Kit.**

To determine conformance to 3.4.1.24.6, the first aid kit shall be inspected for proper storage location on all BEBs during PUI or QCI.

#### 4.4.1.24.7 **Line Cutting Device.**

To determine conformance to 3.4.1.24.7, removal, stowage, and usage of the line cutting device to cut a mooring and steering line will be demonstrated during PQT. The line cutting device will be inspected on all BEBs during PUI or QCI.

#### 4.4.1.24.8 **Document Pouch.**

To determine conformance to 3.4.1.24.8, the document pouch shall be inspected on all BEBs during PUI or QCI.

#### 4.4.1.24.9 **Mat(s).**

To determine conformance to 3.4.1.24.9, the mat will be inspected for location, and self-draining capability during PQT. The contractor shall provide Certification in the form of commercial literature describing the mat type and characteristics. The mat shall be inspected for proper fit on all BEBs during PUI or QCI.

#### 4.4.1.24.10 **Headsets.**

To determine conformance to 3.4.1.24.10, storage of headsets will be demonstrated during PQT.

#### 4.4.1.24.11 **Digital Range Finder.**

To determine conformance to 3.4.1.24.11, operation of the digital range finder from one BEB will be demonstrated during PQT. The digital range finder shall be inspected for proper storage location on all BEBs during PUI or QCI.

#### 4.4.1.24.12 **Hand Portable Fire Extinguisher.**

To determine conformance to 3.4.1.24.12, removal and stowage of the hand portable fire extinguisher will be demonstrated during PQT. The contractor shall provide Certification in the form of commercial literature defining the type and size of fire extinguisher provided. The hand portable fire extinguisher shall be inspected for proper storage location on all BEBs during PUI or QCI.

#### 4.4.1.24.13 **Boat Hook.**

To determine conformance to 3.4.1.24.13, stowage space shall be inspected for secure fit of the boat hook on all BEBs during PUI or QCI.



#### **4.4.2 Mechanical Systems.**

To determine conformance to 3.4.2, operation of each propulsion system will be demonstrated independently and in tandem during PQT.

##### **4.4.2.1 Lubricants and Fluids.**

To determine conformance to 3.4.2.1 the contractor shall provide a list of lubricants and fluids used on the BEB for Certification.

##### **4.4.2.2 Lubrication Fittings.**

To determine conformance to 3.4.2.2 a demonstration of each fitting will be performed during PQT to verify location and accessibility.

##### **4.4.2.3 Petroleum, Oils, and Lubricants Leakage.**

To determine conformance to 3.4.2.3, an inspection shall be performed on all BEBs after PUI Sea Trial or QCI Sea Trial for leakage of fuel, coolant, and lubricants. An inspection will be performed during and after PQT testing for leakage of fuel, coolant, and lubricants.

##### **4.4.2.4 Propulsion.**

To determine conformance to 3.4.2.4, the contractor shall provide Certification in the form of commercial literature to certify that the engine, transmission, and water jet do not exceed the horsepower, RPM, or torque limits of the manufacturers as installed.

###### **4.4.2.4.1 Oil Change System.**

To determine conformance to 3.4.2.4.1, oil changes will be demonstrated on each engine during PQT.

###### **4.4.2.4.2 Oil Filters.**

To determine conformance to 3.4.2.4.2, changing of oil filters will be demonstrated during PQT. The oil filters will be checked for leaks during PQT.

###### **4.4.2.4.3 Oil Sampling Valves.**

To determine conformance to 3.4.2.4.3, use of the oil sampling will be demonstrated during PQT.

###### **4.4.2.4.4 Engine Configuration and Performance.**

###### **4.4.2.4.4.1 Fuel.**

To determine conformance to 3.4.2.4.4.1, the BEB will be tested while running on JP-8 and ULSD fuels during PQT. All PUI BEBs shall perform the PUI Sea Trial running on JP-8 fuel.

###### **4.4.2.4.4.2 Emissions Technologies.**

To determine conformance to 3.4.2.4.4.2, the BEB will be inspected during PQT to ensure that pollution control technologies which are impacted by high sulfur level fuels are not used.

#### 4.4.2.4.4.3 **Ignition.**

To determine conformance to 3.4.2.4.4.3, the engine ignition switch shall be demonstrated on all BEBs during PUI or QCI.

#### 4.4.2.4.4.4 **Shut Down.**

To determine conformance to 3.4.2.4.4.4, engine shut down will be demonstrated using both the primary and emergency systems during PQT.

##### 4.4.2.4.4.4.1 **Automatic Engine Shut Down Override.**

If automatic shut down is provided, to determine conformance to 3.4.2.4.4.4.1, an engine will be placed into a simulated automatic shut down procedure and the automatic engine shut down override will be demonstrated during PQT.

#### 4.4.2.4.4.5 **Hour Meter.**

To determine conformance to 3.4.2.4.4.5, an inspection will be performed for the location and operation of each hour meter.

#### 4.4.2.4.4.6 **Exhaust System.**

To determine conformance to 3.4.2.4.4.6, the exhaust system shall be inspected for proper installation during PUI or QCI. During PQT, a BEB will be removed from the water and inspected to ensure that all water drains from the exhaust..

#### 4.4.2.4.4.7 **Engine Cooling.**

To determine conformance to 3.4.2.4.4.7, the engine cooling system will be inspected during PQT.

#### 4.4.2.4.4.8 **Raw Water Cooling.**

To determine conformance to 3.4.2.4.4.8, if non-self-cleaning strainers are used, cleaning of the raw water strainers shall be demonstrated on one boat during PUI to ensure that the strainers are readily accessible. During PQT, the BEB will be removed from the water and inspected to verify that all water drains from the raw water system.

#### 4.4.2.4.5 **Water Jets.**

To determine conformance to paragraph 3.4.2.4.5, backflushing of the water jets shall be demonstrated on all BEBs during PUI Sea Trial or QCI Sea Trial. Backflushing of the water jets will be demonstrated during PQT.

#### 4.4.2.4.6 **Fire Protection.**

To determine conformance to paragraph 3.4.2.4.6, the fixed fire extinguishing system will be inspected during PQT. The contractor shall provide Certification in the form of commercial literature defining the size and extinguishing agent used in the fire protection system.

##### 4.4.2.4.6.1 **Actuation.**

To determine conformance to paragraph 3.4.2.4.6.1, the fire protection system actuation device will be tested during PQT.

#### 4.4.2.4.6.2 **Alarm.**

To determine conformance to paragraph 3.4.2.4.6.2, the fire alarm will be demonstrated during PQT.

#### 4.4.2.4.6.3 **Extinguishing Agent.**

To determine conformance to paragraph 3.4.2.4.6.3, see 4.4.2.4.6.

#### 4.4.2.5 **Fuel System.**

To determine conformance to 3.4.2.5, the fuel system will be inspected for fuel shut off valves, leakage, and a fuel-water separator during PQT. Testing of the engine fuel priming system will be demonstrated during PQT.

#### 4.4.2.5.1 **Discharge Control.**

To determine conformance to 3.4.2.5.1 the BEB will be inspected for POL discharge throughout PQT.

#### 4.4.2.5.2 **Fuel Tank.**

To determine conformance to 3.4.2.5.2, the contractor shall provide Certification in the form of fuel usage calculations to certify that the fuel tank is sized appropriately, The fuel tank filler neck and fuel overflow container will be demonstrated for proper size and fuel flow rate. During PQT the low fuel alarm will be demonstrated by operating the BEB with 10% fuel remaining.

#### 4.4.3 **Electrical Systems.**

To determine conformance to paragraph 3.4.3 and 3.4.3.6, the contractor shall provide Certification to show that the electrical system for proper wiring size for electrical load applied to the wire, grounding type, and circuit breakers sizing. The electrical system will be inspected for proper location and performance of components, common busses, wire caps and securing of the harness.

#### 4.4.3.1 **Alternator.**

To determine conformance to 3.4.3.1, the contractor shall provide an electrical load calculation to certify that the alternator is sized correctly.

#### 4.4.3.2 **Batteries.**

To determine conformance to 3.4.3 and 3.4.3.2, the ability to parallel the batteries, access the batteries from the deck, and start engines at -25°F will be demonstrated during PQT. The contractor shall provide commercial literature to certify the type of batteries used and the NSN.

#### 4.4.3.2.1 **Battery Cables.**

To determine conformance to 3.4.3.2.1, the battery cables will be inspected. The contractor shall provide commercial literature to certify that the cables meet the requirements of 3.4.3.3.1.

#### **4.4.3.3 Battery Disconnect Master Switch.**

To determine conformance to 3.4.3.3 the master electrical power switch will be demonstrated during PQT.

#### **4.4.3.4 Cabling and Wiring.**

To determine conformance to 3.4.3.4, the contractor shall provide commercial literature to certify that the cabling and wiring meet requirements.

##### **4.4.3.4.1 Connectors and Labels.**

To determine conformance to 3.4.3.4.1, the contractor shall certify that the connectors and cables meet requirements.

##### **4.4.3.4.2 Connection Boxes.**

To determine conformance to 3.4.3.4.2, the connection boxes will be inspected for watertightness. All connection boxes will be tested during 4.4.1.24.

##### **4.4.3.4.3 NATO Slave Receptacle.**

To determine conformance to 3.4.3.4.3, the contractor shall provide Certification in the form of commercial literature for the NATO slave receptacle. Engine jump-start/battery charging capability with the NATO cables installed between the BEB and an outside power source will be demonstrated during PQT.

##### **4.4.3.5 24 Vdc to 12 Vdc Converter.**

To determine conformance to 3.4.3.5, if provided, the contractor shall certify that the converter and grounding meet requirements.

##### **4.4.3.6 Circuit Breaker Panel.**

See 4.4.3.

##### **4.4.3.7 Searchlight.**

To determine conformance to 3.4.3.7, operation of the searchlight will be demonstrated during PQT. Operation of the searchlight shall be demonstrated on all BEBs during PUI or QCI. The contractor shall provide Certification in the form of commercial literature showing that the searchlight meets the requirements of 3.4.3.7.

##### **4.4.3.8 Inspection Light.**

To determine conformance to 3.4.3.8, operation of the inspection light will be demonstrated during PQT. Operation of the inspection light shall be demonstrated on all BEBs during PUI or QCI. The contractor shall provide Certification in the form of commercial literature showing that the inspection light meets the requirements 3.4.3.8.

##### **4.4.3.9 Lighting.**

To determine conformance to 3.4.3.9, the electronic dimmer switch will be demonstrated during PQT. The electronic dimmer switch shall be demonstrated on all BEBs during PUI or QCI.

#### **4.4.3.10 Instrument Panel.**

To determine conformance to 3.4.3.10, the instrument panel will be inspected for readability in full sun during PQT.

##### **4.4.3.10.1 Fuel Level Gauge.**

To determine conformance to 3.4.3.10.1, the fuel level gauge will be inspected during 4.4.2.5.2 and 4.4.3.11.

##### **4.4.3.10.2 Gauges.**

To determine conformance to 3.4.3.10.2, the gauges will be inspected during 4.4.3.11.

##### **4.4.3.10.3 Malfunction Indicators.**

To determine conformance to 3.4.3.10.3, audible alarms will be demonstrated as part of 4.4.3.11.

##### **4.4.3.11 Horn.**

To determine conformance to 3.4.3.11, the contractor shall provide Certification in the form of commercial literature defining the sound pressure level of the horn. The horn shall be demonstrated on all BEBs during PUI or QCI.

##### **4.4.3.12 Navigation Lights.**

To determine conformance to 3.4.3.12, the contractor shall provide Certification in the form of a dimensional drawing of the navigation light heights, spacing, and sectors to certify that the navigation lights meet the requirements of COLREGS 72 for power driven vessels when pushing. Operation of the navigation lights shall be demonstrated on all BEBs during PUI or QCI.

#### **4.4.4 Communications-Electronics Complement.**

To determine conformance to 3.4.4, an inspection of the communications-electronics complement will be performed during PQT.

##### **4.4.4.1 SINCGARS Radio Capability.**

To determine conformance to 3.4.4.1, operation of the specified equipment will be demonstrated by connecting to a Government furnished SINCGARS radio-during PQT.

##### **4.4.4.2 Global Positioning System.**

To determine conformance to 3.4.4.2, operation of the GPS will be demonstrated during PQT.

##### **4.4.4.3 Infrared Strobe.**

To determine conformance to 3.4.4.3, operation of the infrared strobe will be demonstrated during PQT.

##### **4.4.4.4 Depth Sounder.**

To determine conformance to 3.4.4.4, operation of the depth sounder will be demonstrated during PQT.

#### **4.4.5 Bilge Drainage System.**

To determine conformance to 3.4.5, the contractor shall provide commercial literature to certify that the bilge pumps have sufficient capacity. The bilge pumps will be demonstrated during PQT. The bilge pump breaker will be inspected for a hood during PQT.

#### **4.5 Transportation.**

To determine conformance to 3.5, the physical characteristics of the BEB will be measured during PQT.

##### **4.5.1 Reconfiguration for Transport.**

To determine conformance to 3.5.1, time required for disassembly and reassembly of the BEB system before and after transport will be tested during PQT.

##### **4.5.2 Rail Transport.**

To determine the conformance to 3.5.2, the contractor shall provide Certification that the BEB System fits within the NATO Envelope-M and AAR transportation diagrams. The BEB System will be subject to military standard rail impact test during PQT. The BEB System will be inspected before, during and after the rail impact test to check for failures.

##### **4.5.3 Marine Transport.**

To determine the conformance to 3.5.3, the contractor shall provide certification that the BEB meets marine transportation requirements. Marine transport of the BEB will be tested during PQT.

##### **4.5.4 Highway Transport.**

To determine the conformance to 3.5.4, the contractor shall provide Certification of conformance to the highway transportation requirements. The BEB System will be inspected to verify that highway transportation requirements are met during PQT.

###### **4.5.4.1 MRBC Transport System.**

To determine conformance to 3.5.4.1, one BEB system shall be transported on a CBT while towing a loaded PLST to check for interference during PUI. The system shall be operated in the forward direction while conducting minimum diameter turns in both directions. Clearances shall be measured in the turn and at multiple points while entering and exiting the turn. MRBC Transport of the BEB system on a CBT towing a loaded PLST will be demonstrated during PQT.

###### **4.5.4.2 Transload.**

To determine conformance to 3.5.4.2, the transloading of one BEB System from the CBT to the PLST and from the PLST to the CBT shall be demonstrated during PUI. Damage to any equipment shall be recorded. Transloading of the BEB system will be demonstrated during PQT.

#### **4.5.5 Air Transport.**

To determine the conformance to 3.5.5, the contractor shall provide Certification in the form of drawings showing that the BEB system fits in the air transport envelopes. During PQT, the BEB System will be inspected to verify that air transportation requirements are met.

#### **4.5.6 Tie-Down Provisions.**

To determine conformance to 3.5.6, the contractor shall provide Certification in the form of structural calculations and dimensioned drawings to certify that the tie-down provisions meet the requirements of MIL-STD-209. Tie-down provisions will be pull tested in accordance with MIL-STD-209 during PQT.

#### **4.5.7 External Air Transport.**

To determine the conformance to 3.5.7, the contractor shall provide Certification in the form of structural analysis and dimensioned drawings to certify that the lift fittings meet the external air transportation requirements. The BEB System will be inspected and tested to verify that External Air transportation requirements are met during PQT.

#### **4.5.8 Slinging/Lift Provisions.**

To determine conformance to 3.5.8, the contractor shall provide Certification in the form of structural analysis and dimensioned drawings to certify that the slinging/lift provisions meet the requirements of MIL-STD-209. The lift provisions shall be pull tested on one BEB in accordance with MIL-STD-209 during PUI. Lift provisions will be pull tested during PQT

### **4.6 Environmental.**

#### **4.6.1 Hazardous Materials Management.**

To determine conformance to 3.6.1, the contractor shall provide Certification that the hazardous materials prohibited in 3.6.1 are not used in the construction of the BEB.

#### **4.6.2 Airborne Concerns.**

To determine conformance to 3.6.1, the contractor shall provide Certification that the airborne concerns prohibited in 3.6.2 are not used in the construction of the BEB.

### **4.7 Survivability.**

#### **4.7.1 Appliqué Panel Support structure**

To determine conformance to 3.7.1, the contractor shall provide Certification in the form of commercial literature to certify the type of armor material used. Removal and installation of appliqué panels shall be demonstrated on one BEB during PUI to check for interface issues and verify structural integrity of appliqué panel mounting provisions and lifting provisions. The contractor shall provide Certification that the lifting means for the appliqué panels are sufficiently strong to lift the panels. A ballistic test of an armor test structure will be performed during PQT.

#### **4.7.1.1 Surrogate Panels**

To determine conformance to 3.7.1.1, the contractor shall demonstrate the installation and removal of the surrogate panels on one BEB during PUI to ensure that the method of installation and removal is the same as for the appliqué panels. The contractor shall inspect the surrogate panels for proper installation on all BEBs during PUI or QCI. The contractor shall provide Certification that the lifting means for the surrogate panels are sufficiently strong to lift the panels. The installation of the surrogate panels will be demonstrated during PQT.

#### **4.7.2 Electromagnetic Environmental Effects.**

To determine conformance to 3.7.2, the BEB will be tested in a series of PQT events for EMI, NSL, HEMP, HESD, EMC, and RADHAZ. After these PQT events, the contractor shall provide lists of components needing replacement to restore BEB functionality.

##### **4.7.2.1 Near Strike Lightning.**

See 4.7.2.

##### **4.7.2.2 High Altitude Electromagnetic Pulse.**

See 4.7.2.

##### **4.7.2.3 Electrostatic Discharge (Helicopter and Personnel).**

See 4.7.2.

##### **4.7.2.4 Electromagnetic Capability.**

See 4.7.2.

##### **4.7.2.5 Radiation Hazard.**

To determine conformance to 3.7.2.5, the BEB will be inspected for compliance with the personnel safety standards of MIL-STD-464 during PQT.

#### **4.7.3 Chemical, Biological, Radiological, and Nuclear Contamination.**

To determine conformance to 3.7.3, the BEB will be inspected during PQT for items which would need to be replaced in the case of a CBRN contamination. The contractor shall provide a list of components needing replacement after a CBRN event.

#### **4.8 Corrosion Control.**

To determine conformance to 3.8, all BEB surfaces will be inspected at the initiation and conclusion of PQT for corrosion and for proper paint, coatings, and sealants.

##### **4.8.1 Corrosion Minimized.**

To determine conformance to 3.8.1, the contractor shall provide Certification that dissimilar metal contact is isolated or eliminated.



#### **4.8.2 Treatment and Painting.**

To determine conformance to 3.8.2, a paint adhesion test shall be performed in accordance with ASTM D3359 on all BEBs during PUI or QCI. The contractor shall provide Certification that paint conforms to the color, gloss, and spectral reflectance requirements. The paint applied to the BEB will be inspected at the initiation and conclusion of PQT. Any signs of poor paint application, adhesion issues or paint cracking will be reported.

#### **4.8.3 Stainless Steel in Sea Water.**

To determine conformance to 3.8.3, the contractor shall provide commercial literature for any stainless steel piping and attachments used in the raw water system of the BEB to certify that the stainless steel in the raw water system meets the critical pitting temperature and critical crevice temperature requirements of 3.8.3.

#### **4.9 Maintainability, Supportability.**

To determine conformance to 3.9, the contractor shall provide a list of special tools required for maintaining the BEB. Any additional special tools required for maintenance and repair tasks accomplished during PQT will be identified.

##### **4.9.1 At Platform Diagnostic Capabilities.**

To determine conformance to 3.9.1, the BEB will be connected to the current U.S. Army Standard Unit Level Test Measurement and Diagnostic Equipment during PQT. A non-destructive fault will be inserted and diagnosed, as defined in sections 4.9.1.1 and 4.9.1.2.

###### **4.9.1.1 Electronic.**

To determine conformance to 3.9.1.1, during PQT, the BEB will be tested with the Army Standard test equipment (MSD/ICE) to determine that the vehicle's ECM/ECU diagnostic outputs are transmitted to the vehicle mounted J1939/13 female 9 pin Deutsch connector, using a format conforming to SAE J1587.

###### **4.9.1.2 Embedded Diagnostics.**

To determine conformance to 3.9.1.2, a demonstration will be performed in which the on-board diagnostic software transmits diagnostic error codes to the on-system display screen during PQT.

#### **4.10 Human Factors Engineering and Safety.**

To determine conformance to 4.11, the contractor shall certify that the BEB meets the requirements of ASTM F1166 as invoked.

##### **4.10.1 Human Factors Range.**

To determine conformance to 3.10.1 the BEB will be operated during PQT by operators ranging in size from 5 percent female to 95 percent male with and without protective gear.

##### **4.10.2 Whole Body Vibration.**

To determine conformance to 3.10.2, the BEB will be tested during PQT to measure the intensity of vibrations in the crew station in various operating conditions.

#### **4.10.3 Noise Limit.**

To determine conformance to 3.10.3, the BEB will be tested for sound level in various operating conditions , during PQT. Test procedures shall be in accordance with MIL-STD-1474.

#### **4.10.4 Hatch Securing.**

To determine conformance to 3.10.4, machinery hatches will be inspected for hinges and a hold open device during PQT. The hold open device on all machinery hatches of all BEBs shall be demonstrated during PUI or QCI.

#### **4.11 Identification and Marking.**

To determine conformance to 3.11, the BEB will be inspected for marking during PQT.

##### **4.11.1 BEB Transportability Data Plate(s).**

To determine conformance to 3.11.1, the BEB shall be inspected on all BEBs during PUI or QCI.

#### **4.12 Workmanship.**

To determine conformance to 3.12, the contractor shall provide Certification of conformance to AWS standards. All welds are subject to non-destructive testing by the government. The Government reserves the right to conduct an on-site review of the contractor's supplier(s) quality system and weld processes to verify the capability of producing acceptable welds.

### **5. Packaging.**

#### **5.1 Packaging.**

For acquisition purposes, the packaging requirements shall be as specified in the contract. When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

### **6. Notes.**

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

#### **6.1 Intended Use.**

The BEB will be the sole waterborne assembly and disassembly aid to propel and anchor the IRB during rafting and bridging operations. The BEB will have a secondary mission

to serve in support of diving operations, transporting personnel, and as a water safety craft.

## 6.2 **Acquisition requirements.**

Acquisition documents should specify the following:

- a. Title, number, and date of this specification.

## 6.3 **Definitions.**

The following definitions will be considered throughout this document:

### 6.3.1 **Light Ship.**

The light ship condition is the as-delivered condition: the BEB is ready for service in every respect, including permanent ballast, BII, and liquids in machinery at operating levels, with appliqué panels, and with a 500 pound reserve at the BEB's CG for future material additions, without any items of variable load.

### 6.3.2 **Full Load.**

The Full Load condition (combat ready) is light ship, plus the following three loads: Fuel tank(s) at 95 % capacity, crew of two with personal effects including personnel weapons (368 pounds each), and entrained water in waterjets.

### 6.3.3 **Conventional Rafting.**

Two or more BEBs are secured perpendicularly to the same side of the raft with two or four lines each. The push knees of the BEBs make contact with the raft.

### 6.3.4 **Longitudinal Rafting.**

BEBs are secured parallel to each side of the rafts with brackets and lines. Brackets are required to prevent the BEBs from rolling under the raft due to the tapered base pontoon hulls and to provide a secure attachment point.

### 6.3.5 **BEB System**

The BEB System is defined as BEB alone, or BEB with IBC if used, or BEB with BAP if used.

Custodian:  
Army – AT

Preparing activity:  
Army – AT

## ANNEX A

### Acronym List

The following acronyms are used within this Purchase Description:

AAR	Association of American Railroads
ABYC	American Boat and Yacht Council
ASTM	American Society of Testing Materials
AWG	American Wire Gauge
AWS	American Welding Society
BAP	Bridge Adapter Pallet
BEB	Bridge Erection Boat
BHF	Biodegradable Hydraulic Fluid
BII	Basic Issue Items
CARC	Chemical Agent Resistant Coatings
CBRN	Chemical, Biological, Radiological and Nuclear
CBT	Common Bridge Transporter
CFR	Code of Federal Regulations
CG	Center of Gravity
CO2	Carbon Dioxide
CONUS	Continental United States
COTS	Common-Off-The-Shelf
DODISS	Department of Defense Index of Specifications and Standards
DOL	Department of Labor
DOT	Department of Transportation
DTIC	Defense Technical Information Center
E3	Electromagnetic Environmental Effects
EFF	Essential Function Failure
EGR	Exhaust Gas Recirculation
EMC	ElectroMagnetic Compatibility
EME	ElectroMagnetic Environmental
EMI	Electromagnetic Interference
EPA	Environmental Protection Agency
FIR	Final Inspection Record
FR	Federal Register
GPS	Global Positioning System
HAP	Hazardous Air Pollutants
HAZMAT	Hazardous Materials
HEMP	High-Altitude Electromagnetic Pulse
HERP	Hazards of Electromagnetic Radiation to Personnel
HESD	Helicopter Electrostatic Discharge
HFE	Human Factor Engineering

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IAW	In Accordance With
IBA	Individual Body Armor
IBC	Improved Boat Cradle
ICE	Internal Combustion Engine
IR	Infrared
IRB	Improved Ribbon Bridge
ISO	International Organization for Standardization
IUID	Item Unique Identification Marking
LED	Light Emitting Diode
LHS	Load Handling System
LOCB	Line of Communication Bridge
LRU	Line Replacement Unit
MLC	Military Load Class
MMH/OH	Maintenance Man Hour per Operating Hour
MOPP	Mission Oriented Protective Posture
MR	Maintenance Ratio
MRBC	Multi-Role Bridge Company
MSD	Maintenance Support Device
MTBEFF	Mean Time Between Essential Function Failure
MTBSA	Mean Time Between System Abort
NATO	North Atlantic Treaty Organization
NOX	Nitrogen Oxide
NSL	Near Strike Lightning
NSN	National Stock Number
OASA(ALT)	Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology
ODS	Ozone Depleting Substances
OSHA	Occupational Safety and Health Standards
PA	Power Amplifier
PCO	Procuring Contracting Officer
PD	Purchase Description
PFD	Personal Flotation Device
PLST	Palletized Loading System Trailer, M1076
PMCS	Preventive Maintenance Checks and Services
POL	Petroleum, Oils, and Lubricants
PPQT	Pre Production Qualification Test
PPUI	Pre Production Unit Inspection
QCI	Quality Conformance Inspection
QPL	Qualified Products List
RADHAZ	Radiation Hazard
RSG	Recreational Craft Sectoral Group
SAE	Society of Automotive Engineers
SDDCTEA	Surface Deployment And Distribution Command Transportation Engineering

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	Agency
SINCGARS	Single Channel Ground and Airborne Radio System
ST	Sea Trial
STANAG	Standardization Agreement
ULSD	Ultra Low Sulfur Diesel
USCG	United States Coast Guard
VAA	Vehicle Adapter Assembly
Vdc	Volt Direct Current
VOC	Volatile Organic Compounds

## ANNEX B

### **Operational Duty Cycle Simulation For U.S. Army BEB**

The below BEB operational duty cycle simulation shall be conducted using JP-8 fuel. When simulating anchoring, bridge building/retrieval, and rafting, 2-bays (IRB) shall be attached to the BEB.

- Step 1: Simulate rafting – full throttle for 37 mins; 2-bay conventional-configuration (alternate: 2-bay longitudinal configuration)
- Step 2: Simulate bridge building/retrieval – run 8 varied-throttle cycles  
One varied-throttle cycle =       5 mins full throttle  
  30 secs idle  
  30 secs full throttle  
  30 secs idle
- Step 3: Simulate anchoring – ½ throttle for 11 mins
- Step 4: Disconnect bays from BEB
- Step 5: Simulate patrol – full throttle for 25 mins
- Step 6: Reconnect bays to BEB
- Step 7: Simulate rafting – full throttle for 42 mins
- Step 8: Simulate bridge building/retrieval – run 7 varied-throttle cycles
- Step 9: Simulate anchoring – ½ throttle for 14 mins
- Step 10: Disconnect bays from BEB
- Step 11: Simulate patrol – full throttle for 42 mins
- Step 12: Reconnect bays to BEB
- Step 13: Shut down engine in accordance with COTS manuals. Conduct immediate re-start on each engine using proper procedures.
- Step 14: Shut down engines for 5 minutes, or longer as necessary if refueling. After the engine-off period, conduct another re-start.

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