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Purchase Specification
For

Test Site Load Banks

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1.0 Introduction

This purchase specification and all document referenced herein contain all of the detailed requirements for (8) load banks to be located outdoors at the Naval Surface Warfare Center, Carderock Division, Ship Systems Engineering Station (NSWCCD-SSES), Philadelphia Naval Base, Philadelphia, PA. These load banks shall be used in performing testing of an Integrated Power System.

2.0 Scope

2.1 Equipment and Services to be Provided by the Supplier:

The Load Banks shall be suitable for industrial installation and shall be constructed in accordance with the best commercial practices. It shall be the Supplier's responsibility to furnish equipment suitable and complete in details for the services intended. The equipment shall be designed, constructed and tested in accordance with the latest applicable industry standards i.e. UL, National Electric Code, etc. as applicable. The Supplier shall be responsible for delivery of each of the following to NSWCCD-SSES in Philadelphia:

Item	Qty	Description
0001	2	450VAC, 3-phase, 60Hz, 400kW Resistive Load Bank consisting of 4 isolated sections of 100kW, 128A each.(Section 5.1.2.1)
0002	2	450VAC, 3-phase, 60Hz, 400kW, 300kVAR Resistive/Reactive Load Bank consisting of 4 isolated sections of 100kW, 75kVAR, 160A each. (Section 5.1.2.2) (Note: Resistive and Reactive components can be separated into separate units, making the Qty = 4. If separate units are provided, there must be a provision to use resistive load bank cabling terminal to jumper power to the reactive load bank.)
0003	1	375VDC, 900kW Load Bank consisting of 10 isolated sections of 90kW, 240A each. (Section 5.1.2.3)
0004	1	208VAC, 3-phase, 60Hz, 60kW 45kVAR Resistive/Reactive Load Bank consisting of 6 isolated sections of (2) 20kW, 15kVAR, 70A and (4) 5kW, 3.75kVAR, 17.5A each. (Section 5.1.2.4) (Note: Resistive and Reactive components can be separated into separate units, making the Qty = 2. If separate units are provided, there must be a provision to use resistive load bank cabling terminal to jumper power to the reactive load bank.
0005	1	48VDC, 12kW Load Bank consisting of 4 isolated sections of (2) 5kW, 104A and (2) 1kW, 21A each. (Section 5.1.2.5)
0006	1	600VDC, 1020kW load bank consisting of 2 isolated sections of 510kW, 850A each. (Section 5.1.2.6)
0007	1	Release for Manufacture Documentation (Section 4.0)
0008	3	Technical Manual (Section 6.2)

2.2 Equipment and Services to be Provided by the Government:

The Government shall install the Load Banks and shall be responsible for the following items:

1. Mounting foundations, structural components and mounting bolts attaching the Supplier furnished equipment to the site structure, and,
2. Associated cabling.

3.0 Applicable Documents

1. NFPA 70, National Electric Code, 2002

4.0 Release for Manufacture

The Supplier shall submit the following to the Government, for approval, prior to obtaining Drawing Approval:

1. Assembly, Outline Drawings with mounting details and an Electrical Schematic Wiring Diagram for each design.
2. All load bank load ratings and Government cabling capabilities should be clearly identified for each design.
3. Exhaust air temperature flow pattern and temperature profile.
4. List of Special Tools and recommended Spare Parts for each design.
5. Outline for the test specified in Section 5.1.3 for each design.

5.0 Technical Requirements

5.1 Load Banks

5.1.1 General Requirements:

5.1.1A. Installation Location:	1. Outdoor installation. 2. Units shall be able to be mounted to a steel platform with open grating approximately 10' above ground. 3. Power cable shall be bottom entry. 4. Termination compartment shall be provided inside unit and shall be of sufficient size to permit adequate cable bend radius requirements. 5. Load bank design shall ensure that proper thermal isolation is provided between resistor compartment and adjacent controls compartment to ensure that cable insulation and control components will not be damaged due to overheating from adjacent Load Banks resistors.
5.1.1.B. Enclosure Construction:	1. Heavy gauge, outdoor, corrosion resistant steel enclosures with manufacturer's standard outdoor coating including a top coat with light gray ANSI 61 paint with a minimum thickness of 2 mil. 2. The intake and exhaust openings shall be designed to prevent objects .50"or larger from entering the load bank enclosure. 3. The various high temperature areas such as exhaust air openings

	shall be properly treated and designed so that their protective coating is not destroyed by high temperatures during unit operation. 4. Access to internal components shall be provided through access panels that prohibit water entry. 5. Exhaust airflow shall be through the top of the load bank with an offset from vertical no greater than 30°, or horizontal for resistive load banks rated at 400KW or less. If the exhaust is offset from vertical, it shall be adjustable with a deflector in either direction or exhaust hood must be able to be rotated to adjust direction of exhaust. 6. Exterior fasteners shall be stainless steel. 7. Fork lift channels or lift eyes for crane installation shall be provided. 8. Load bank air intake design shall ensure that insulation resistance is not impacted by operation of load bank in severe weather with heavy rain or snow.
5.1.1.C. Load Elements / Cooling / Heating:	1. The load elements shall be contained in one or more cases or trays, which can be removed in their entirety as a unit if service ever becomes necessary. 2. Anti condensation heaters shall be provided in required areas to prevent damage or malfunction due to moisture. Interlocks and thermostatic controls shall be provided so that heaters operate at desired temperature when load banks are off. 3. The load cases shall be constructed and installed to permit removal of one unit without having to remove any other unit. 4. Load elements shall be individually serviceable and replaceable in the field without major disassembly of the load bank. The entire length of each element shall be rigidly supported and insulated as required to preclude a broken resistance wire from creating a short circuit to an adjacent wire or ground. 5. To guard against hot spots and ensure long term reliability, the load bank shall be designed so that at rated load at nominal voltage, resistors operate at not more than 50% of the maximum continuous temperature rating of the resistance wire used. 6. Integral fans shall be provided with associated controls to maintain Load Bank temperatures within the required temperature limits.
5.1.1.D. Control and Monitoring:	1. The Government will provide a Programmable Logic Controller (PLC) to operate the load segments and monitor the status of cooling fans, temperature switches and air flow. No local control panel is required. The load bank controls shall provide an interposing relay to operate the load segment contactor. The interposing relay shall interface with a PLC dry contact with internally derived 115VAC control power. 2. Electrical contactors, fuses / circuit breakers, and protection circuitry shall be panel mounted adjacent to the load cases and within the main enclosure. 3. Load Bank protection circuits shall include (as a minimum): Fan Failure/Loss of Cooling Air, Exhaust Air Over-temperature. These fault indications shall be electrically interlocked to isolate the load upon detection of a failure. 4. Each load step shall be independently protected by its own branch circuit fuses or breakers and contactors shall be designed

	for maximum continuous voltage with maximum resistive/reactive step load. 5. Terminal blocks shall be provided for Government control circuit interfaces. 6. Auxiliary contacts shall be provided for all load bank contactors to provide position status for the Government remote PLC. The auxiliary contacts shall be wired to terminals boards for control circuit interfaces. 7. Dry contacts shall be provided for remote indication of Control Power Available, Fan On/Off Status, Fan Failure/Loss of Cooling Air and Overtemperature. 8. Control cable access shall be from the bottom of the units with adequate separation from the power cable entry.
5.1.1.E. Bus Bars:	1. Bus bars utilized shall be copper with silver or tin plating at contact points to reduce corrosion.
5.1.1.F. Grounding:	1. Provision for grounding IAW NEC Article 250 shall be provided. 2. An internal connection shall be provided for grounding to the equipment ground conductor as well as bonding to the metal platform to which the load banks will be mounted with the largest cable specified for each unit in 5.1.2
5.1.1.G. Wiring:	1. All wiring shall be copper type conductor with a minimum of 90°C insulation. 2. High temperature wire is required in the vicinity of heater elements.
5.1.1.H. Nameplate:	1. The nameplate shall be securely fastened with screws or rivets to the exterior of the enclosure and shall include the following: manufacturer, date, Contract Number and electrical ratings.
5.1.1.I. Marking:	1. Terminals & wires shall be permanently labeled with markings that remain visible after connections are made. 2. AC bus bars shall indicate phases A, B, and C. 3. DC bus bars shall be labeled + and -. 4. Parts such as relays, transformers, fuses, meters, etc. shall be supplied with identifying nameplates or labels.
5.1.1.J. Maintainability:	1. Parts that may require servicing, repair or replacement shall be readily accessible. 2. Materials and components shall be of a type, class and form that are readily available from normal sources of supply. Part Numbers and ordering information shall be provided in Technical Manual for future reordering.
5.1.1.K. Operating Temperature:	1. Ambient temperature is not expected to exceed 40°C. However, the Load Bank shall be conservatively designed for continuous operation in an ambient temperature range of –20°C to 50°C (-4°F to 122°F).
5.1.1.L. Safety:	1. Equipment shall be designed and constructed in a way that will ensure the safety of operating and maintenance personnel. 2. When the equipment is properly installed and the enclosure is grounded, there shall be no accessible way for operating

	personnel to receive an electric shock even though an internal fault between two circuits, between a circuit and a structural member or between any circuit and ground may exist. 3. The design shall hold to a practical minimum the possibility of personnel being exposed to electric shock while servicing, adjusting or checking out the equipment. 4. When unavoidable, positive protection in the form of a guard shall be provided. 5. Sharp corners and projections which may cause injury or on which clothing may catch shall be avoided. 6. Equipment shall be designed to revert to its least hazardous condition or mode of operation upon failure of a circuit or part. The design shall be such that should failure occur, any resulting damage will be confined to the smallest equipment subdivision (minimum replaceable part or subassembly) within which failure occurred.

5.1.2 Individual Load Bank Requirements:

5.1.2.1.	**Item 0001:** 450VAC, 3-phase, 60Hz, 400kW Resistive Load Bank with four isolated sections of 100kW, 128A each:
5.1.2.1.A. Power Cable Entry & Rating Item 1	1. Allowance shall be made for Government provided (4) 4/C-4/0 copper conductor, commercial cable rated at 202A/conductor in a 40°C ambient to enter from under unit into the Load Bank termination compartment. 2. Termination capability shall be provided inside unit for one cable to be connected to each isolated load bank section. Note: 4th conductor of each cable is for grounding. 3. Overall power cable outer diameter is expected to be 1.8" to 1.9".
5.1.2.1.B. Power Rating / Load Steps:	1. 450VAC, 60HZ, 3-phase, 400kW. 2. Unit shall be able to withstand 480VAC continuously at full load with ambient temperatures from -20°C to 50°C ambient. 3. Four isolated loads shall be provided at 100kW each with load steps of 25, 25, 50kW and a tolerance of 0 to +5% of rated kW at rated voltage. 4. Each isolated load bank section shall have internal electrical protection for a source with a short circuit level of up to 100,000A RMS symmetrical available at maximum rated voltage. 5. The duty cycle shall be continuous meaning that no cool down period is required between load applications.
5.1.2.1.C. Enclosure Dimensions	1. Enclosure footprint shall not exceed a maximum dimension of 72"L and 48"W. Maximum height shall be 144".
5.1.2.1.D Metering	1. Each 100 kW load segment shall provide a multi-function power meter with capability of monitoring 3-phase Voltage, Current, kW, kVAR, power factor and frequency. The power meter shall have a minimum of four Analog Outputs (0-10VDC or 4-20 mA) and a serial link interface to transmit all monitored variables.
5.1.2.1.E. Auxiliary Power	1. Government provided auxiliary power for the Load Banks will be three phase, 460VAC, 60Hz nominal. The Load Bank auxiliaries (i.e. fans, heaters, & controls) shall be designed to operate from this source. A control transformer shall be provided for 115V power required for heaters and controls. 2. The short circuit current available from the Government provided 460vac power source will be 100,000A RMS symmetrical or less. 3. The auxiliary power supply Government provided cable will be copper conductor, sized per the NEC for 40 degrees C ambient with conductor temperature not to exceed 75 degrees C. 4. The Supplier shall provide the appropriate size connection range for the auxiliary supply cable.

5.1.2.2.	**Item 0002:** 450VAC, 3-phase, 60Hz, 400kW, 300kVAR Resistive/ Reactive Load Bank with four isolated sections of 100kW, 75kVAR, 160A each:
5.1.2.2.A. Power Cable Entry & Rating Item 2	1. Allowance shall be made for Government provided (4) 4/C-4/0 copper conductor, commercial cable rated at 202A/conductor in a 40°C ambient to enter from under unit into the Load Bank termination compartment. 2. Termination capability shall be provided inside unit for one cable to be connected to each isolated load bank section. Note: 4th conductor of each cable is for grounding. 3. Overall power cable outer diameter is expected to be 1.8" to 1.9".
5.1.2.2.B. Power Rating / Load Steps	1. 450VAC, 60Hz, 3-phase, 400kW, 300kVAR. Resistive/ Reactive 2. Unit shall be able to withstand 480VAC continuously at full load with ambient temperatures from -20°C to 50°C ambient. 3. Four isolated loads shall be provided at 100kW, 75kVAR each with load steps of 25, 25, 50 kW and 18.75, 18.75, 37.5kVAR and a tolerance of 0 to +5% of rated kW/kVAR at rated voltage. 4. Each isolated load bank section shall have internal electrical protection for a source with a short circuit level of up to 100,000A RMS symmetrical available at maximum rated voltage. 5. The duty cycle shall be continuous meaning that no cool down period is required between load applications. (Resistive and Reactive components may be in separate units.)
5.1.2.2.C. Enclosure Dimensions	1. Enclosure footprint shall not exceed a maximum dimension of 100"L and 64"W (combined units) or 72"L and 48"W resistive component and 60"W and 60"L reactive component (separate units). Maximum height shall be 144".
5.1.2.1.D Metering	1. Each 100 kW, 75 kVAR load segment shall provide a multi-function power meter with capability of monitoring 3-phase Voltage, Current, kW, kVAR, power factor and frequency. The power meter shall have a minimum of four Analog Outputs (0-10VDC or 4-20 mA) and a serial link interface to transmit all monitored variables.
5.1.2.2.E. Auxiliary Power	1. Government provided auxiliary power for the Load Banks will be three phase, 460VAC, 60Hz nominal. The Load Bank auxiliaries (i.e. fans, heaters, & controls) shall be designed to operate from this source. A control transformer shall be provided for 115V power required for heaters and controls. 2. The short circuit current available from the Government provided 460VAC power source will be 100,000A RMS symmetrical or less. 3. The auxiliary power supply Government provided cable will be copper conductor, sized per the NEC for 40 degrees C ambient with conductor temperature not to exceed 75 degrees C. 4. The Supplier shall provide the appropriate size connection range for the auxiliary supply cable.

5.1.2.3.	**Item 0003:** 375VDC, 900kW Load Bank with 10 isolated sections of 90kW, 240A each:
5.1.2.3.A. Power Cable Entry & Rating Item 3	1. Allowance shall be made for Government provided (10) 3/C-400 MCM copper conductor, commercial cable rated at 295A/ conductor in a 40°C ambient to enter from under unit into the Load Bank termination compartment. 2. Termination capability shall be provided inside unit for two cables to be connected to each isolated load bank section. Note: 3rd conductor of each cable is for grounding. 3. Overall power cable outer diameter is expected to be 2.2" to 2.3".
5.1.2.3.B. Power Rating / Load Steps	1. 375VDC 900kW nominal. 2. Unit shall be able to withstand 400V continuously at full load with ambient temperatures from -20°C to 50°C ambient. 3. Ten isolated loads shall be provided at 90kW each, with the following load resolution: a. 90kW, Quantity = 8 b. 90kW with (1) 30kW Step and (1) 60kW Step, Quantity = 2 Note: Each load shall have a tolerance of 0 to +5% of rated kW at rated voltage. 4. Each isolated load bank section shall have internal electrical protection for a source with a short circuit level of up to 20,000A at maximum rated voltage. 5. The duty cycle shall be continuous meaning that no cool down period is required between load applications.
5.1.2.3.C. Enclosure Dimensions	1. Enclosure footprint shall not exceed a maximum dimension of 60"L and 40"W. Maximum height shall be 144".
5.1.2.3.D. Auxiliary Power	1. Government provided auxiliary power for the Load Banks will be three phase, 460VAC, 60Hz nominal. The Load Bank auxiliaries (i.e. fans, heaters, & controls) shall be designed to operate from this source. A control transformer shall be provided for 115V power required for heaters and controls. 2. The short circuit current available from the Government provided 460vac power source will be 100,000A RMS symmetrical or less. 3. The auxiliary power supply Government provided cable will be copper conductor, sized per the NEC for 40 degrees C ambient with conductor temperature not to exceed 75 degrees C. 4. The Supplier shall provide the appropriate size connection range for the auxiliary supply cable.

5.1.2.4.	**Item 0004:** 208VAC, 3-phase, 60Hz, 60kW 45kVAR Resistive/ Reactive Load Bank with 6 isolated sections of (2) 20kW, 15kVAR, 70A and (4) 5kW, 3.75kVAR, 17.5A each:
5.1.2.4.A. Power Cable Entry & Rating Item 4	1. Allowance shall be made for Government provided (2) 4C-#3AWG and (4) 4C-#10AWG copper conductor, commercial cable rated at 88A and 31A respectively in a 40°C ambient to enter from under unit into the Load Bank termination compartment. 2. Termination capability shall be provided inside unit for one 4/C-#3AWG cable to be connected to each 25kVA load bank section and one 4C-#10AWG cable to be connected to each 6.25kVA load bank section. Note: 4th conductor of each cable is for grounding. 3. Overall power cable outer diameter is expected to be 1.0" to 1.1" and .6" to .7" (respectively).
5.1.2.4.B. Power Rating / Load Steps	1. 208VAC, 60Hz, 3-phase, 60kW, 45kVAR. Resistive/Reactive 2. Unit shall be able to withstand 220 VAC continuously at full load with ambient temperatures from -20°C to 50°C ambient. 3. Six isolated loads shall be provided: (2) 20kW, 15kVAR and (4) 5kW, 3.75kVAR load sections. The 20kW, 15kVAR load section shall have load resolution of 5, 5 and 10kW and 3.75, 3.75 and 7.5kVAR. A single load segment of 5kW and 3.75kVAR for each 5kW isolated section is required. The load tolerance shall be 0 to +5% of rated kW/kVAR at rated voltage. 4. Each isolated load bank section shall have internal electrical protection for a source with a short circuit level of up to 22,000A RMS symmetrical available at maximum rated voltage. 5. The duty cycle shall be continuous meaning that no cool down period is required between load applications. (Resistive and Reactive components may be in separate units.)
5.1.2.4.C. Enclosure Dimensions	1. Enclosure footprint shall not exceed a maximum of 100"L and 60"W (combined) or 72"L and 48" W (resistive), 60"L and 60"W (reactive) if separated. Maximum height shall be 144".
5.1.2.4.D. Auxiliary Power	1. Government provided auxiliary power for the Load Banks will be three phase, 460VAC, 60Hz nominal. The Load Bank auxiliaries (i.e. fans, heaters, & controls) shall be designed to operate from this source. A control transformer shall be provided for 115V power required for heaters and controls. 2. The short circuit current available from the Government provided 460vac power source will be 100,000A RMS symmetrical or less. 3. The auxiliary power supply Government provided cable will be copper conductor, sized per the NEC for 40 degrees C ambient with conductor temperature not to exceed 75 degrees C. 4. The Supplier shall provide the appropriate size connection range for the auxiliary supply cable.

5.1.2.5.	**Item 0005:** 48VDC, 12kW Load Bank with 4 isolated sections of (2) 5kW, 104A and (2) 1kW, 21A each:
5.1.2.5.A. Power Cable Entry & Rating Item 5	1. Allowance shall be made for Government provided (2) 3C-1/0 and (2) 3C-#10AWG copper conductor, commercial cable rated at 132A and 31A (respectively) conductor in a 40°C ambient to enter from under unit into the Load Bank termination compartment. 2. Termination capability shall be provided inside unit for one 3C-1/0 cable to be connected to each 5kW load bank section and one 3C-#10awg cable to be connected to each 1kW load bank section. Note: 3rd conductor of each cable is for grounding. 3. Overall power cable outer diameter is expected to be 1.2" to 1.3" and .5" to .6" (respectively).
5.1.2.5.B. Power Rating / Load Steps	1. 48VDC, 12kW nominal. 2. Unit shall be able to withstand 51V continuously at full load with ambient temperatures from -20°C to 50°C ambient. 3. 4 isolated loads shall be provided at (2) 5kW and (2) 1kW each with load steps of 5kW for each 5kW isolated load bank section and 1kW for each 1kW isolated load bank section with a tolerance of 0 to 5% of rated kW at rated voltage. 4. Each isolated load bank section shall have internal electrical protection for a source with a short circuit level of up to 20,000A. 5. The duty cycle shall be continuous meaning that no cool down period is required between load applications.
5.1.2.5.C. Enclosure Dimensions	1. Enclosure footprint should not exceed a maximum dimension of 48"L and 24"W. Maximum height shall be 60".
5.1.2.5.D. Auxiliary Power	1. Government provided auxiliary power for the Load Banks will be 3-phase, 460VAC, 60Hz nominal or 120VAC, 60 Hz, 1-phase. The Load Bank auxiliaries (i.e. fans, heaters, & controls) shall be designed to operate from this source. 2. The short circuit current available from the Government provided power source will be 100,000A (for 460V source) or 22,000A (for 120V source) RMS symmetrical or less. 3. The auxiliary power supply Government provided cable will be copper conductor, sized per the NEC for 40 degrees C ambient with conductor temperature not to exceed 75 degrees C. 4. The Supplier shall provide the appropriate size connection range for the auxiliary supply cable.

5.1.2.6.	**Item 0006:** 600VDC, 1020kW load bank with 2 isolated sections of 510kW, 850A each:
5.1.2.6.A. Power cable Entry & Rating Item 6	1. Allowance shall be made for Government provided (8) 4C-4/0 copper conductor, commercial cables rated at 161A per conductor in a 40°C ambient to enter from under unit into the Load Bank termination compartment. 2. Termination capability shall be provided inside unit for (4) 4/C-4/0 cables for each isolated load section. Note: Two conductors out of sixteen will be used for grounding. 3. Overall power cable outer diameter is expected to be 1.8" to 1.9".
5.1.2.6.B. Power Rating / Load Steps	1. 600VDC 1020kW nominal. 2. Unit shall be able to withstand 650V continuously at full load with ambient temperatures from -20°C to 50°C ambient. 3. Two isolated loads shall be provided at 510 kW each with load steps of 10, 20, 30, 50, 100, 100, and 200kW and a tolerance of 0 to +5% of rated kW at rated voltage. 4. Each isolated load bank section shall have internal electrical protection for a source with a short circuit level of up to 20,000A. 5. The duty cycle shall be continuous meaning that no cool down period is required between load applications.
5.1.2.6.C. Enclosure Dimensions	1. Enclosure footprint shall not exceed a maximum dimension of 60"L and 80"W. Maximum height shall be 144".
5.1.2.6.D. Auxiliary Power	1. Government provided auxiliary power for the Load Banks will be (3) phase, 460VAC, 60Hz nominal. The Load Bank auxiliaries (i.e. fans, heaters, & controls) shall be designed to operate from this source. A control transformer shall be provided for 115VAC power required for heaters and controls. 2. The short circuit current available from the Government provided 460VAC power source will be 100,000A RMS symmetrical or less. 3. The auxiliary power supply Government provided cable will be copper conductor, sized per the NEC for 40 degrees C ambient with conductor temperature not to exceed 75 degrees C. 4. The Supplier shall provide the appropriate size connection range for the auxiliary supply cable.

5.1.3 Testing

5.1.3.A. Continuity:	1. Continuity tests shall be performed on all wiring and load bank units as necessary during equipment manufacture.
5.1.3.B. Dielectric Test:	1. The load bank unit and associated auxiliaries shall be hipot tested according to accepted industry standards. 2. Test data shall be documented and shall be shipped with the equipment.
5.1.3.C. Load & Functional Tests:	1. The Load Bank testing shall verify the functionality of each load step and associated controls. 2. All protection features shall be verified through test. 3. Resistance measurements shall be made for each load segment. 4. Load testing of the resistor segments shall be performed at the maximum continuous voltage. Load testing can be waived if the manufacturer can provide documentation to prove that the resistor elements used have been successfully qualified. 5. During testing, the load data shall be recorded from calibrated test equipment to verify proper operation. 6. The load shall be applied for sufficient duration to permit thermal stability, identify loose connections or degraded components prior to shipment. 7. The test data shall be provided in a test report.

6.0 Technical Data

6.1 Drawings

Final Outline, Detail, and Electrical Drawings are required to include the following information: mounting dimensions, rigging features, space limitations, location of center of gravity and load bank weight, customer interface locations, electrical schematics, wiring diagrams, and nameplate data for each design. The drawings shall be included in the Technical Manual (6.2). The Government will also approve the Suppliers Drawings to provide a Release for Manufacture.

6.2 Technical Manuals

Three sets of Technical Manuals, for each design, shall be forwarded not later than the delivery date of the equipment. Technical Manuals shall consist of various technical data including: Drawings (6.1), Special Tools / Equipment (6.3), Recommended Maintenance (6.4), Temperature Profile (6.5), and any other technical information required to install, operate, maintain and troubleshoot the load bank or its accessories.

6.3 Special Tools / Equipment

A list of special tools / equipment required to put the load bank in service shall be provided for Release to Manufacture and shall also be included in the Technical Manual.

6.4 Recommended Maintenance

Recommendations shall be provided on the maintenance to be performed and the frequency of maintenance actions for the equipment specified in this document. Also, a recommended spare parts list shall be included with the maintenance recommendations. This information shall be provided in the Technical Manual not later than the delivery date of the equipment.

6.5 Temperature Profile

Exhaust air temperature flow pattern and temperature profile shall be provided for Release to Manufacture and shall also be included in the Technical Manual.

7.0 Inspection and Testing

Testing of the equipment shall be performed by the Supplier as specified in Section 5.1.3. The Government reserves the right to witness Supplier testing and to perform equipment inspections where such inspections are deemed necessary to assure supplies and services conform to the prescribed requirements. A Test Report, containing as a minimum, the data specified in Section 5.1.3 must be provided no later than the delivery date of the equipment. An outline of the testing which will be performed including voltage level shall be provided for prior to start of testing.

8.0 Shipping

8.1 Packaging

Equipment shall be packed for shipping in a manner which will ensure acceptance and safe delivery at destination. Supplier is responsible for damage during shipment.

8.2 Marking

Each package shall be marked with the Contract Number, Contract Item Number and Purchase Specification Number TS050-15.

8.3 Delivery

All equipment and technical data specified in this document shall be delivered to NSWCCD-SSES in accordance with the following schedule:

Item 0001:	Within 16 weeks after contract award or within 10 weeks after Drawing Approval, whichever is later.
Item 0002:	Within 16 weeks after contract award or within 10 weeks after Drawing Approval, whichever is later.
Item 0003:	Within 16 weeks after contract award or within 10 weeks after Drawing Approval, whichever is later.

Item 0004:	Within 16 weeks after contract award or within 10 weeks after Drawing Approval, whichever is later.
Item 0005:	Within 16 weeks after contract award or within 10 weeks after Drawing Approval, whichever is later.
Item 0006:	Within 16 weeks after contract award or within 10 weeks after Drawing Approval, whichever is later.
Item 0007:	Within 4 weeks after contract award. Note: NSWC shall be given 2 weeks to review and provide Drawing Approval
Item 0008:	Within 16 weeks after contract award

All deliverables shall be forwarded to the address given below:

Commander
Naval Surface Warfare Center Carderock Division
Philadelphia Naval Business Center, Bldg 542
Philadelphia, PA 19112-5083
Attn: Ed Harvey, Code 9345

ITEM 0001 – Load Bank 1

LB1A 450VAC, 60HZ, 3-phase, 100kW, 1.0PF, RESISTIVE	ACLC 21 (1) 4C-4/0
LB1B 450VAC, 60HZ, 3-phase, 100kW, 1.0PF, RESISTIVE	ACLC 21 (1) 4C-4/0
LB1C 450VAC, 60HZ, 3-phase, 100kW, 1.0PF, RESISTIVE	ACLC 22 (1) 4C-4/0
LB1D 450VAC, 60HZ, 3-phase, 100kW, 1.0PF, RESISTIVE	ACLC 22 (1) 4C-4/0

ITEM 0001 – Load Bank 3

LB3A 450VAC, 60HZ, 3-phase, 100kW, 1.0PF, RESISTIVE	ACLC 31 (1) 4C-4/0
LB3B 450VAC, 60HZ, 3-phase, 100kW, 1.0PF, RESISTIVE	ACLC 31 (1) 4C-4/0
LB3C 450VAC, 60HZ, 3-phase, 100kW, 1.0PF, RESISTIVE	ACLC 32 (1) 4C-4/0
LB3D 450VAC, 60HZ, 3-phase, 100kW, 1.0PF, RESISTIVE	ACLC32 (1) 4C-4/0

Figure 1

Note: These figures show Load Bank sections and expected power source and cabling to each Load Bank. Auxiliary power cabling is not shown in this figure.

ITEM 0002 – Load Bank 2

LB2A 450VAC, 60HZ, 3-phase, 100kW, 75kVAR, 0.8PF, RESISTIVE / INDUCTIVE REACTIVE	ACLC 21 (1) 4C-4/0
LB2B 450VAC, 60HZ, 3-phase, 100kW, 75kVAR, 0.8PF, RESISTIVE / INDUCTIVE REACTIVE	ACLC 21 (1) 4C-4/0
LB2C 450VAC, 60HZ, 3-phase, 100kW, 75kVAR, 0.8PF, RESISTIVE / INDUCTIVE REACTIVE	ACLC 22 (1) 4C-4/0
LB2D 450VAC, 60HZ, 3-phase, 100kW, 75kVAR, 0.8PF, RESISTIVE / INDUCTIVE REACTIVE	ACLC 22 (1) 4C-4/0

ITEM 0002 – Load Bank 4

LB4A 450VAC, 60HZ, 3-phase, 100kW, 75kVAR, 0.8PF, RESISTIVE / INDUCTIVE REACTIVE	ACLC 31 (1) 4C-4/0
LB4B 450VAC, 60HZ, 3-phase, 100kW, 75kVAR, 0.8PF, RESISTIVE / INDUCTIVE REACTIVE	ACLC 31 (1) 4C-4/0
LB4C 450VAC, 60HZ, 3-phase, 100kW, 75kVAR, 0.8PF, RESISTIVE / INDUCTIVE REACTIVE	ACLC 32 (1) 4C-4/0
LB4D 450VAC, 60HZ, 3-phase, 100kW, 75kVAR, 0.8PF, RESISTIVE / INDUCTIVE REACTIVE	ACLC 32 (1) 4C-4/0

Figure 2

Note: These figures show Load Bank sections and expected power source and cabling to each Load Bank. Auxiliary power cabling is not shown in this figure.

ITEM 0003 – Load Bank 5 / 6

LB5A 375VDC, 90kW, RESISTIVE	DCLC 21/22 (1) 3C-400MCM
LB5B 375VDC, 90kW, RESISTIVE	DCLC 21/22 (1) 3C-400MCM
LB5C 375VDC, 90kW, RESISTIVE	DCLC 21/22 (1) 3C-400MCM
LB5D 375VDC, 90kW, RESISTIVE	DCLC 21/22 (1) 3C-400MCM
LB5E 375VDC, 90kW, RESISTIVE INCLUDES (1) 30kW and (1) 60kW LOAD STEP	DCLC 21/22 (1) 3C-400MCM
LB6A 375VDC, 90kW, RESISTIVE	DCLC 21/32 (1) 3C-400MCM
LB6B 375VDC, 90kW, RESISTIVE	DCLC 31/32 (1) 3C-400MCM
LB6C 375VDC, 90kW, RESISTIVE	DCLC 31/32 (1) 3C-400MCM
LB6D 375VDC, 90kW, RESISTIVE	DCLC 31/32 (1) 3C-400MCM
LB6E 375VDC, 90kW, RESISTIVE INCLUDES (1) 30kW AND (1) 60 kW LOAD STEP	DCLC 31/32 (1) 3C-400MCM

Figure 3

Note: These figures show Load Bank sections and expected power source and cabling to each Load Bank. Auxiliary power cabling is not shown in this figure.

ITEM 0004 – Load bank 7 / 8

LB7A 208VAC, 60Hz, 3-phase, 20kW, 15kVAR, 0.8PF, RESISTIVE / REACTIVE	SSIM21 (1) 4C-#3AWG
LB7B 208VAC, 60Hz, 3-phase, 5kW, 3.75kVAR, 0.8PF, RESISTIVE / REACTIVE	SSIM22 (1) 4C-#10AWG
LB7C 208VAC, 60Hz, 3-phase, 5kW, 3.75kVAR, 0.8PF, RESISTIVE / REACTIVE	SSIM23 (1) 4C-#10AWG
LB8A 208VAC, 60Hz, 3-phase, 20kW, 15kVAR, 0.8PF, RESISTIVE / REACTIVE	SSIM31 (1) 4C-#3AWG
LB8B 208VAC, 60Hz, 3-phase, 5kW, 3.75kVAR, 0.8PF, RESISTIVE / REACTIVE	SSIM32 (1) 4C-#10AWG
LB8C 208VAC, 60Hz, 3-phase, 5kW, 3.75kVAR, 0.8PF, RESISTIVE / REACTIVE	SSIM33 (1) 4C-#10AWG

Figure 4

ITEM 0005 – Load Bank 9 / 10

LB9A 48VDC, 5kW, RESISTIVE	SSCM21 (1) 3C-1/0
LB9B 48VDC, 1kW, RESISTIVE	SSCM22 (1) 3C-#10AWG
LB10A 48VDC, 5kW, RESISTIVE	SSCM31 (1) 3C-1/0
LB10B 48VDC, 1kW, RESISTIVE	SSCM32 (1) 3C-#10AWG

Figure 5

ITEM 0006 – Load Bank NL 1 / 2

LB-NL1 600VDC, 510kW, RESISTIVE	ACLC21 (4) 4C-4/0
LB-NL2 600VDC, 510kW, RESISTIVE	ACLC32 (4) 4C-4/0

Figure 6

Note: These figures show Load Bank sections and expected power source and cabling to each Load Bank. Auxiliary power cabling is not shown in this figure.