SPECIFICATION FOR MEDIUM VOLTAGE OUTDOOR RESISTIVE LOAD BANK WITH TRANSFORMER

PART 1.0 GENERAL

1.1 SCOPE

A. This specification contains the minimum requirements for the design, manufacture and testing of outdoor weatherproof resistive load bank and outdoor, dry-type step down transformer. Both the load bank and the transformer are to be factory mounted and interconnected on a common structural steel skid base.

B. The medium voltage load bank is required for periodic exercising and testing of the (standby) emergency power source.

C. This specification shall apply if the load bank is supplied to the purchaser, or as a part of other equipment.

D. Should the vendor take exception to any part of this specification, it shall be stated in the bid, and referenced to the specification line number.

1.2 SUBMITTALS

A. The manufacturer shall submit for review technical data including features, performance, electrical characteristics, physical characteristics, ratings, accessories, and finishes.

B. Shop drawings shall include dimensional plans and mounting details sufficient to properly install the load bank. Load bus configuration and load connections termination area shall be clearly identified.

C. Electrical schematic drawings shall be provided to detail the operation of the load bank and the provided safety circuits. Over-current protection and control devices shall be identified and their ratings marked. An interconnection drawing shall be included for control wiring related to the load bank.

1.3 STANDARDS

A. The equipment covered by this specification shall be designed with the latest applicable NFPA-70, NEMA, NEC, IEEE, and ANSI standards.

B. The load bank certified to a Nationally Recognized Training Laboratory (NRTL) such as UL or CSA.

PART 2.0 PRODUCTS

2.1 RATINGS

A. The total capacity of the load bank system shall be rated (_____) kW at (_____) Volts, 3-Phase, 3-Wire, 60 Hertz, (___) Amps per Phase at unity Power Factor and 50 kW minimum load step resolution.

B. The duty cycle shall be continuous and the load bank shall operate in an ambient temperature of -28°C to 49°C (-20°F to 120°F).

2.2 LOW VOLTAGE LOAD BANK

A. The load bank shall be constructed of heavy gauge aluminized steel per ASTM A463 or coated mild steel that meets or exceeds physical and chemical performance of polyurethane enamel coatings. Galvanized steel has a low corrosion threshold and shall not be used for exterior load bank construction.

B. The main input load bus, load step relays, fuses and blower/control relays shall be located within the load bank enclosure. A thermostatically controlled heater shall be located within the control section to protect control devices from the effects of moisture and condensation.

C. The load bank shall be outdoor weatherproof construction. All exterior fasteners shall be stainless steel. The load bank shall include forklift channels in the base for lifting.

D. Airflow throughout the load bank shall be vertical. Ambient intake air shall be drawn in from the sides/bottom of the unit and heated air exhausted out the top. Intake openings shall be designed to prevent objects greater than 0.50” diameter from entering the unit. A straight vertical exhaust hood is not acceptable in preventing rain/moisture from entering the unit. The load bank exhaust hood shall be angled and constructed of non-corrosive aluminized steel or aluminum. Unpainted galvanized steel is not acceptable.

E. The exterior of the load bank shall be painted ASA-61 grey and have a baked polyester powder coated finish with a film thickness of 2.8 +/- 0.4 mils per coat.

F. Load elements shall be contained in multiple resistor cases or trays. Each can be removed in their entirety as a unit if service becomes necessary.

2.3 RESISTIVE LOAD ELEMENTS

A. Load elements shall be ASCO Helidyne, helically wound chromium alloy rated to operate at approximately ½ of maximum continuous rating of wire. Elements must be fully supported across the entire length within the air stream by segmented ceramic insulators on stainless steel rods. Element supports shall be designed to prevent a short circuit to adjacent elements or to ground.

B. The change in resistance due to temperature shall be minimized by maintaining conservative watt densities.

C. The overall tolerance of the load bank shall be –0% to +5% kW at rated voltage. A –5%, +5% rating allows the load bank to deliver less than rated kW and shall not be used. The load bank must deliver full rated kW at rated voltage.

2.4 COOLING

A. The load bank shall be cooled by integral TEFC or TEAO motor(s) which is direct coupled to the cooling fan blade. The fan motor must be electrically protected against overload using a motor overload device and short circuit protected using three (3) current limiting fuses with an interrupting rating of 200K A.I.C.

B. The fan blade is to be an airfoil design constructed from aluminum or non-corroding material.

2.5 PROTECTIVE DEVICES

A. A differential pressure switch(s) shall be provided to detect air loss (one for each stack). The switch(s) shall be electrically interlocked with the load application controls to prevent load from being applied if cooling air is not present.

B. An over-temperature switch shall be provided to sense the load bank exhaust in each stack. The switch shall be electrically interlocked with the load application controls to prevent load from being applied in the event of an over temperature condition.

C. To provide for major fault protection, branch fuses shall be provided on all three phases of switched load steps above 50kW. Branch fuses shall be current limiting type with an interrupting rating of 200K A.I.C.

D. The exterior of the load bank shall have appropriate warning/caution statements on access panels.

E. A standard remote load dump circuit shall be provided as part of the load bank control circuit. Provisions shall be provided to remove the load bank off-line from the operation of a remote normally closed set of auxiliary contacts from a transfer switch or other device. In the event of the remote contact opening, all load is removed.

F. An integral control power transformer shall be provided to supply 120V, 1 phase, 60 Hz to the load banks control and motor starter circuitry. Transformer primary and secondary control circuits shall be fuse protected.

NOTE CHOOSE ONLY ONE SECTION 2.6 DIGITAL CONTROLS OR 2.7 MANUAL CONTROLS

2.6 CONTROL SYSTEMS – DIGITAL CONTROLS

A. A robust purpose designed microprocessor based module with industrial connectors and LED status display shall be installed in the load bank. The module shall connect with Voltage and Current Transformers to obtain real time monitoring of the load bank at a sampling rate of at least 28.8 kHz. The module shall have large flash memory, which allows remote upgrading and space for configuration data and calibration maps. Non-volatile RAM provides 500 event history log time stamped by on-board real time clock.

B. Usage counters shall provide information on individual contactor operation, element run times, overall power-on time, load-on time and kWh. Load monitoring checks each phase for faulty contactors, blown fuses or faulty elements. Faults are logged with visual indication via blinking stop lamp and warning code. Automatic detection senses the supply-on-test voltage, frequency, phase and phase rotation.

C. The module shall have a load correction facility, which shall compensate for any voltage drop on supply.

D. The module shall balance the usage of each load element to increase the life of the load bank.

E. An HMI Hand Held controller shall also be provided with a 10 meter cable for operator interface with all functionality faults and features. When carrying out full-load testing, one page will show the three-phase measurements of voltage (V), frequency (Hz), current (A), power (both kW and kVA) and power factor (Cos ø).

F. Building Management Interface: Load bank control module shall have provisions to interface with existing building management system. Modbus communications protocol which shall allow integration of load bank with building supervisory & monitoring systems through a PLC, HMI or SCADA systems. Interface shall be directly from an Ethernet port within the load bank.

G. Switchgear Interface: Load bank shall have provisions to interface with the switchgear critical power management system. This shall be done through Modbus Ethernet.

2.7 CONTROL SYSTEMS – MANUAL CONTROLS

A. The control panel shall be a (remote) or (local) 19″ rack mounted panel housed in a NEMA 4 type enclosure. The control panel shall contain the following manual controls:

1. Power ON/OFF switch
2. Blower START/STOP pushbuttons.
3. Master load ON/OFF switch.
4. Load step switches for ON/OFF application of individual load steps.

Control panel visual indicators shall be as follows:

1. Power ON indication light.
2. Blower ON light.
3. Blower/Air FAILURE light.
4. OVERTEMPERATURE light.

B. A digital meter shall be installed in the control panel to show 3 line digital display of voltage, current, frequency, and power measurement. The software interface to the meter shall allow for real-time data acquisition and data logging from a laptop PC.

2.8 LIQUID FILLED STEP-DOWN TRANSFORMER

A. The transformer(s) shall be UL listed and labeled compartment type per UL1561, self-cooled, for mounting on a pad and shall comply with the latest applicable standards. Transformers shall comply with 10 CFR 431 as registered on US Department of Energy's Compliance Certification Database per 10 CFR 429

B. The average temperature rise of the windings, measured by the resistance method, shall be 65° C when the transformer is operated at rated kVA output in a 40° C ambient. The transformer shall be capable of being operated at rated load in a 30° C average, 40° C maximum ambient, as defined by IEEE C57.12.00 without loss of service life expectancy. (For temperature rise, 65° C is standard)

C. Coolant and insulating fluid shall be inhibited mineral oil

D. If the lower-voltage compartment has exposed live parts that are over 600 V, a non-hygroscopic barrier shall be placed to require its removal or opening before access to the lower-voltage compartment can be attained.

E. The transformer tank and compartment shall conform to IEEE C57.12.28 or C57.12.29, as appropriate and be so constructed as to limit disassembly, breakage, and prying open of any doors, panels, and sills when the doors are in the closed and locked position.

F. The transformer(s) shall be rated (_____) kVA self-cooled (ONAN). Primary voltage (_____) V delta Secondary voltage (_____) V wye, 60 Hz with two 2-1/2% full capacity above normal and two 2-1/2% below normal taps. Impedance shall be (_____) % , ±7-1/2%. Basic impulse level of the primary winding shall be [kV] [as specified in IEEE C57.12.00 for comparable kV class].

G. The transformer shall be of sealed-tank construction of sufficient strength to withstand a pressure of 7 psi without permanent distortion. The cover shall be welded and the handhole fastenings tamper-resistant. The transformer shall remain effectively sealed for a top oil temperature range of -5° C to 105° C. When required, cooling panels will be provided on the back and sides of the tank. Lifting eyes and jacking pads will be provided.

H. Coils shall be wound with aluminum conductors.

I. The core shall be manufactured using high grade, grain-oriented silicon steel laminations carefully annealed after fabrication to restore high magnetic permeability. Magnetic flux is to be kept well below the saturation point.

J. The high voltage terminations and equipment shall be [live front] dead front.

K. Live front bushings shall be porcelain with blade terminals incorporating a 2-hole drilling pattern. Bushings shall be externally clamped and front removable.

L. The low voltage bushings (<600V) shall be molded polymer, and provided with blade-type spade terminals with NEMA standard hole spacing arranged for vertical take-off. The low voltage neutral shall be an insulated bushing, grounded to the tank by a removable ground strap.

2.9 DOCUMENTATION

A. Installation and operation manuals shall be provided with the equipment and shall include complete details for the installation, commissioning, operation, and maintenance of the load bank.

B. The manuals shall include the electrical schematic and interconnect drawings for the power and control wiring for the load bank and all control devices.

C. A complete parts list with part numbers, device identification, and rating shall be included in the manuals. The original manufacturers name and part number shall be included in the parts listing.

D. The manuals shall be provided electronically on a USB drive.

PART 3.0 QUALITY ASSURANCE

3.1 QUALITY CONTROL

A. The load bank shall be fully tested using a test specification written by the supplier. Tests shall include electrical functional testing, verifying conformance to assembly drawings and specifications. Each load step shall be cold resistance checked to verify proper calibration of resistive load steps and proper ohmic value.

B. The manufacturer shall maintain this data on file for inspection purposes by the purchaser. Tests using high potential equipment shall be performed to ensure isolation of the load circuits from the control circuits and to determine isolation of the load circuits from the load bank frame. Tests of all safety circuits shall be performed to verify conformance to the specification.

C. All quality control test equipment shall be regularly maintained and calibrated to traceable national standards.

D. The Company’s Quality System shall be at least ISO9001:2015 Certified.

3.2 QUALIFICATIONS OF MANUFACTURER

A. The load bank shall be manufactured by a firm regularly engaged in the manufacture of load banks and who can demonstrate at least twenty five (25) years of experience with at least twenty five (25) installations of load banks similar or equal to the ones specified herein.

B. The manufacturer shall have a written Quality Control procedure available for review by the purchaser, which will document all phases of operations, engineering, and manufacturing.

C. Manufacturer must have a field service organization with service personnel having a minimum of an Associate Degree in Electrical Engineering.

D. The manufacturer shall have a service organization capable of providing service within a 4 hour time frame.

E. A 2-Year warranty shall be provided for both the resistors and the load bank. A longer warranty period shall be available as a purchased option.

F. The load bank shall be manufactured by:

ASCO Power Technologies Load Bank Products
6255 Halle Drive, Cleveland, Ohio 44125
Phone 216-573-7600 **Fax** 216-573-5953
Email customercare@ascopower.com **Web** loadbanks.ascopower.com