



ENGINEERING SPECIFICATION FOR RADIATOR MOUNTED RESISTIVE LOAD BANK (10-1000 KW)

PART 1.0 GENERAL

1.1 SCOPE

- A. This specification contains the minimum requirements for the design, manufacture and testing of a UL listed, radiator style resistive load bank.
- B. The load bank is required for periodic exercising and testing of the (standby) emergency power source. The load bank shall use the air discharge from the generator radiator for cooling.
- 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 NEMA, NEC, and ANSI standards.
- B. The load bank shall be listed to UL Standard 508A.

PART 2.0 PRODUCTS

2.1 RATINGS

- A. The total capacity of the load bank shall be rated (_____) KW at (_____) Volts, 3-Phase, 3-Wire, 60 Hertz, (_____) Amps per Phase at unity Power Factor.
- B. The load step resolution shall be a nominal 20% of the load bank rating.
- C. The load bank shall be designed for continuous duty cycle operation with no limitations.
- D. Radiator/Duct mounted load banks are designed as a supplemental load to the generator set, and shall be sized at 50-60% of generator nameplate KW rating (not 100%).

2.2 MATERIAL AND CONSTRUCTION

- A. The load bank shall be suitable for installation on the generator radiator core, or within the radiator exhaust ductwork.
- B. Due to the high radiator exhaust from the generator, the load bank shall be constructed of heavy gauge aluminized steel per ASTM A463. Aluminized steel provides superior corrosion protection and extended service life, with a better tolerance to high heat exposure compared to the more common Galvanized steel.
- C. The main input load bus, load step relays, fuses and control relays shall be located within the load bank enclosure.
- D. The load bank shall have a core size of (____) W" x (____) H" with a self-contained 2" flange on the top and bottom edges for mounting. Load banks with a depth of 13" shall have provisions for overhead lifting and duct adaptors.
- E. The load bank shall be designed for installation and operation indoors. All exterior fasteners shall be stainless steel.
- F. **(OPTIONAL)** The load bank shall be designed for installation and operation outdoors. Load Bank shall have a screened exhaust louver. Load bank will 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.

2.3 RESISTIVE LOAD ELEMENTS

- A. Load elements shall be Avtron 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.
- D. Sealed wire type elements (which have the internal resistance wire totally enclosed) prevent internal cooling of the element wire and shall not be used.

2.4 COOLING

- A. The engine generator shall provide _____ CFM of air to cool the load bank. The load bank shall have a static pressure drop of approximately 0.1" H₂O at design velocity (850 ft/min).

2.5 PROTECTIVE DEVICES

- A. An over-temperature switch shall be provided to sense the load bank exhaust. 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.

2.6 CONTROL PANEL

- A. The control panel shall be a local panel mounted on the load bank. The control panel shall contain the following manual controls:
1. Power ON/OFF switch
 2. Master load ON/OFF switch.
 3. 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. OVER-TEMPERATURE light.
- B. 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.
- C. **(OPTIONAL)** Remote 19" control panel housed in a NEMA 4 type wall mount enclosure shall be provided.
- D. **(OPTIONAL)** An Automatic Load Step Controller shall be provided for maintaining a minimum load on the generator set. The controller shall monitor the connected downstream loads and will automatically add or subtract load steps in response to building load changes as to maintain a minimum load level on the generator set. The controller includes an initial time-delay circuit, and automatic time delayed load step application circuit. A remote contact closure is required for activation and transfer of control. A separate current transformer shall be supplied loose for mounting and sensing of downstream loads.
- E. **(OPTIONAL)** An integral control power transformer shall be provided to supply 120V, 1 phase, 60 Hz to the load banks control and safety circuitry. Transformer primary and secondary control circuits shall be fuse protected.

2.7 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. Two (2) sets of manuals shall be provided with the load bank.

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 electrical circuits shall have a high potential insulation resistance test performed at twice rated voltage plus 1000 VAC to assure insulation integrity.
- D. All quality control test equipment shall be regularly maintained and calibrated to traceable national standards.
- E. The Company's Quality System shall be ISO9001 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 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 load bank shall be as manufactured by:

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