

# LBD-Series

## Radiator-Cooled Load Bank



### Description

Simplex LBD Load Banks are a special form of stationary, resistive, forced air-cooled load bank which utilizes the air outflow of an engine radiator for cooling of the resistive load elements. This application recovers and uses the volume and velocity of air exiting the radiator and realizes in load bank design the advantages of reduced size, complexity and cost. It may appear incongruous that "hot air" from the radiator is used for "cooling."

However, "hot" and "cold" are highly relative in this case. The air exhausting from the radiator and entering the load bank may be as hot (or cold) as 180°F. However, the load elements are heated to an average of 700°F, and, most important, the air volume and velocity is very high relative to the heat energy being dissipated by the load bank. Consequently, the critical value of "air temperature rise" is limited to a conservative nominal 100°F. Despite an apparent "hot" environment, LBD Load Banks actually operate "cooler" than comparably rated load banks with integral cooling fans which are installed in the relative "cold."

Simplex LBD Series Load Banks are intended for use with water cooled engine generator sets which are equipped with unit mounted radiators. The essential consideration for installation of an LBD Load Bank is only that it be located somewhere within the radiator air outflow. Installation is simple and adaptive to site/system conditions. The load bank can be installed in numerous ways, including direct bolted attachment to the radiator, mounting within an air duct, wall mounting over the air outflow opening, indoors or outdoors. Since the load bank design is adaptive to varying site conditions, Simplex LBD Load Banks are ideal for after market retrofit. Many accessories are available from Simplex to simplify installation.

An LBD Load Bank uses the power output of the generator to yield the tangible benefits of increased reliability and improved performance of the generating system.

## Applications

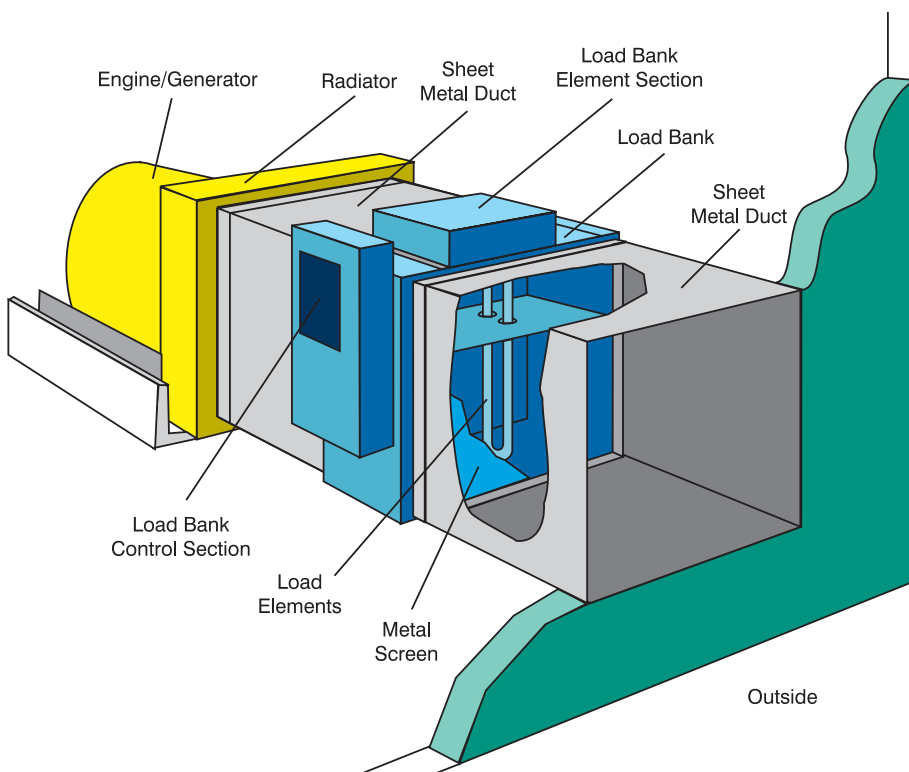
- Reliability Exercise and testing of standby generator sets to assure readiness and eliminate the negative effects of both prolonged standby and of no-load exercise.
- Base load leveling to eliminate the deleterious effects of low load operation: manual application or fully automatic in response to dynamic load demand.
- Automatic protection against generator reverse power and motoring of prime mover by power regenerated by inertial loads.

In order to afford the engineer and buyer the greatest application flexibility, Simplex has designed the LBD Load Bank product line to permit virtually any kilowatt capacity up to 1200KW to be specified. The load bank may be specified for application at any common 50, 60 or 400 Hertz AC voltage. Simplex LBD Load Bank design is highly standardized and includes many

features and capabilities to permit broad application within the framework of a standard product. Many options are available to suit additional individual requirements.

## Features

- The bolt-together design LBD Load Bank (up to 400KW) has earned the UL Listing Mark
- The bolt-together design LBD Load Bank (up to 400KW) utilizes the Simplex Pow'r-Rod Load Element (UL Recognized Component, totally enclosed, sealed and weatherproof)
- The weld-together design LBD Load Bank (400KW-1200KW) utilizes the Simplex Pow'r-Web Load Element (UL Recognized Component)
- Comprehensive branch circuit fuse protection
- Magnetic contactor control of load
- Multiple step load configurations
- 150°C XLP insulated power wiring
- Power terminal block with standard size pressure terminals for common building wire
- Local or remote control is available
- Manual or automatic control available
- 120V control circuits
- Install at any point within radiator air outflow
- Install indoors or outdoors
- Many installation accessories available
- The bolt-together design LBD Load Bank (up to 400KW) utilizes a galvanized steel construction
- The weld-together LBD (400KW-1200KW) enclosure is finish painted with a UL Listed process consisting of either a powder-coated finish or a liquid-coated finish consisting of an epoxy primer and a polyurethane finish
- Automatic over temperature protection
- Control components separate and isolated from load elements
- Continuous duty

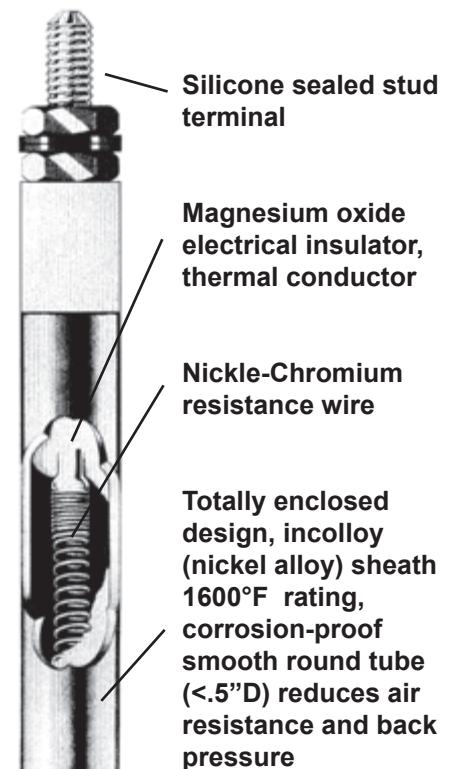


### Pow'r Rod Load Element

Simplex bolt-together design LBD Load Bank (up to 400KW) utilizes the Pow'r Rod Load Element (UL Recognized Component, totally enclosed, sealed and weatherproof). Considerations of personnel safety and equipment durability dictate the use of totally enclosed load elements in a radiator airflow cooled load bank. In this application the load bank will be installed in front of the engine radiator where the load elements are visible and within reach of personnel and exposed to the weather. The elements will be subject to mechanical stresses and airborne contamination by the radiator air blast. The Pow'r Rod element consists of a nickel-chromium resistance wire which is electrically insulated and sealed within a metallic sheath. Since the element is electrically dead on the outside, it reduces the hazard of electric shock to personnel and eliminates the danger of short circuit of the elements by foreign object penetration. The element is unaffected by rain and by airborne dirt and oil. Since the element is essentially a solid metallic tube, it is extremely rugged and will not fatigue from engine or air-blast vibrations and will not sag or stretch if overheated. The element sheath material is "incolloy," a rustproof nickel alloy with a very high temperature rating (1600°F). The element does not require a cool-down period.

### Features

- Totally enclosed element, eliminates shock and short circuit hazard
- Sealed design is weatherproof, unaffected by airborne oil and crud
- Rugged metallic housing unaffected by engine and airblast vibrations - ideal for portable gensets
- High temperature design with great overtemperature tolerance retains mechanical integrity when overheated
- Requires no cooldown
- Long life, rustproof
- UL Recognized Component





## Powr-Web Resistive Load Element

Simplex weld-together design LBD Load Bank (400KW-1200KW) utilizes "Powr-Web" load elements. The "Powr-Web" is an advanced design, air-cooled power resistor specifically designed for application to Load Bank systems. The "Powr-Web" is conservatively operated at half the maximum temperature rating of the alloy and features a short-circuit-safe design based on continuous mechanical support of the element by high temperature, ceramic clad stainless steel rods.

## Specifications

- Alloy: FeCrAl
- Maximum continuous temperature rating: 1920°F
- Maximum operating temperature as applied in Load Bank: 1080° F
- Cool down time from operating to ambient temperature is 10 seconds.

## Construction

- Ceramic clad, stainless steel through-rods.
- UL Recognized

## Branch Circuit Fuse Protection

Load banks must have branch circuit fuse protection of the load elements. A load bank without fuse protection as defined in the nec is a safety and fire hazard.

All Simplex load banks are built-up in fused branch circuits of not more than 70A each. All wiring and devices within the branch circuit are rated in accordance with the fuse rating.

Simplex virtually eliminates the danger of short circuit of the load elements and consequent catastrophic damage to the load bank and the installation, through the use of discrete branch circuit fusing of the load elements

- Fuse protection scheme per NEC 110-9, 110-10, 230-98
- UL Listed Class-T, CSA HRC-1 Fuses
- 200,000 A.I.C. current limiting
- Single element, very fast acting
- Discrete circuit design, 70A maximum per fuse

## Dimensions & Calculations

Simplex LBD Series Radiator Airflow Cooled Load Banks are of a modular-building block design which enables Simplex to build-up a load bank, from stock modular parts, to exactly match your radiator or duct dimensions. Mounting adaptors, feet and outflow guards are also available from stock.

The control section's standard location is on the left side, but it may be ordered on the right side.

A control section may be required on both sides in some applications.

**Please contact Simplex Sales Support for product dimensional information specific to your generator model and load requirements. It will be helpful to have your radiator dimensions and site clearance requirements available for the call.**



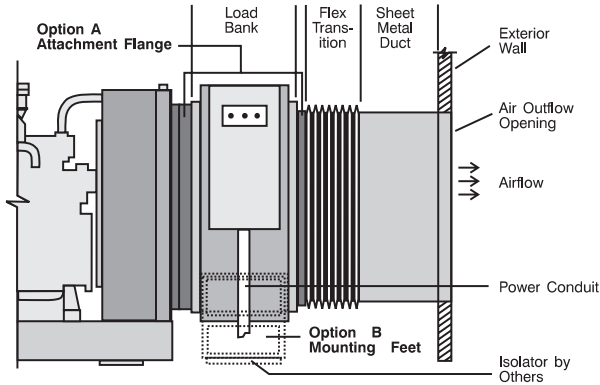
Local Control Panel

## Installation

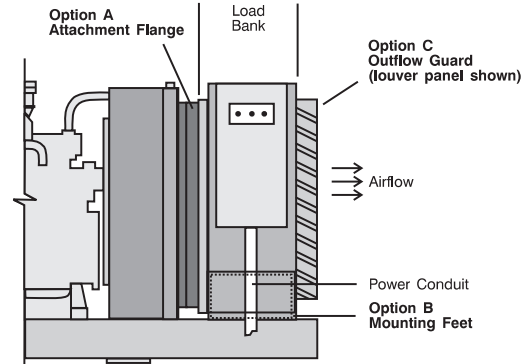
Simplex LBD Series Load Banks can be installed at any point within the radiator air outflow, either indoors or out.

Mounting accessories and outlet screens, guards, and louvers are available as options.

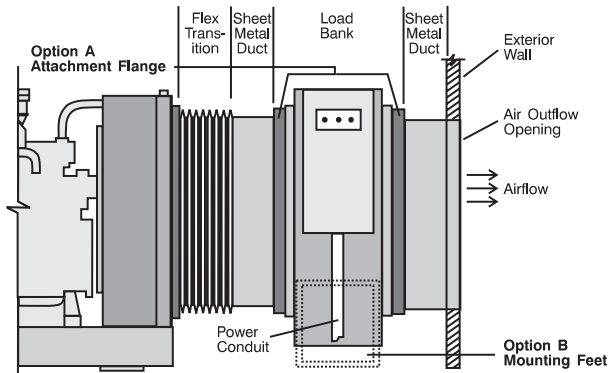
**1. Installed on engine radiator. Hot air exhaust through duct to outdoors.**



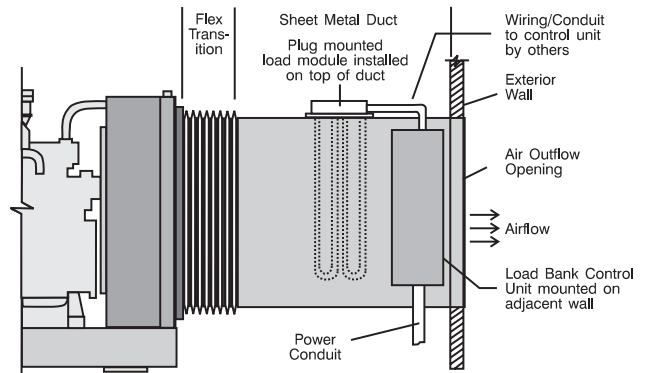
**2. Installed on engine radiator. Hot air exhaust directly to atmosphere.**



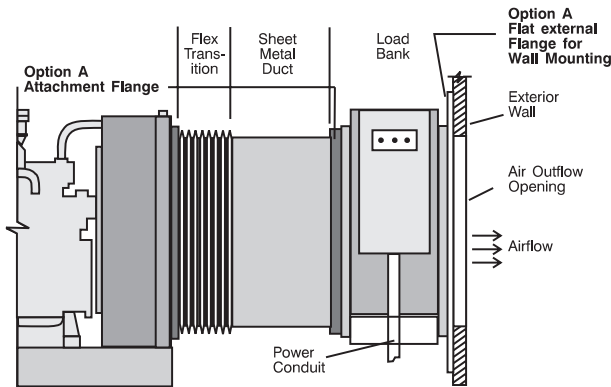
**3. Installed within radiator air exhaust duct.**



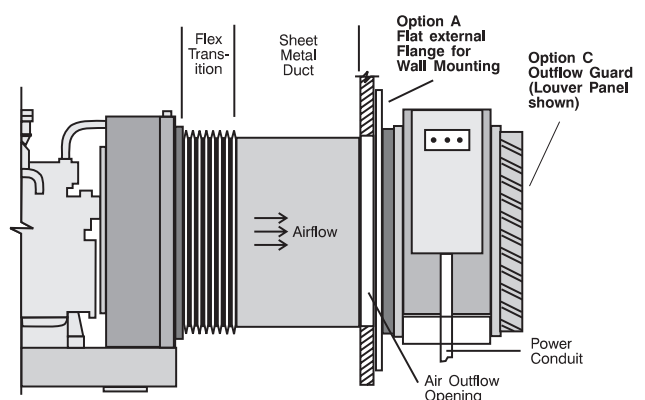
**4. Plug-mounted within radiator air exhaust duct. With separately mounted control unit.**



**5. Wall mounting to exterior wall on the inside.**



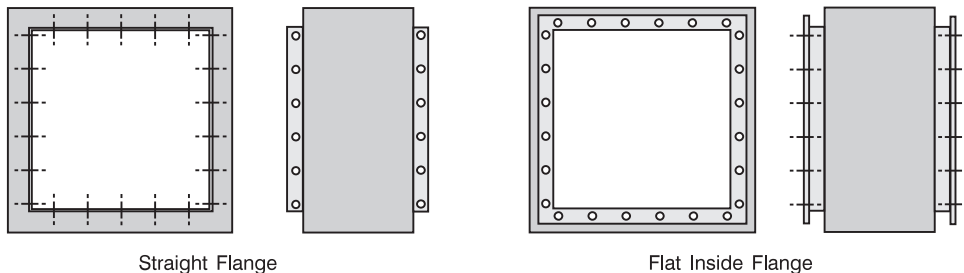
**6. Wall mounting to exterior wall on the outside.**



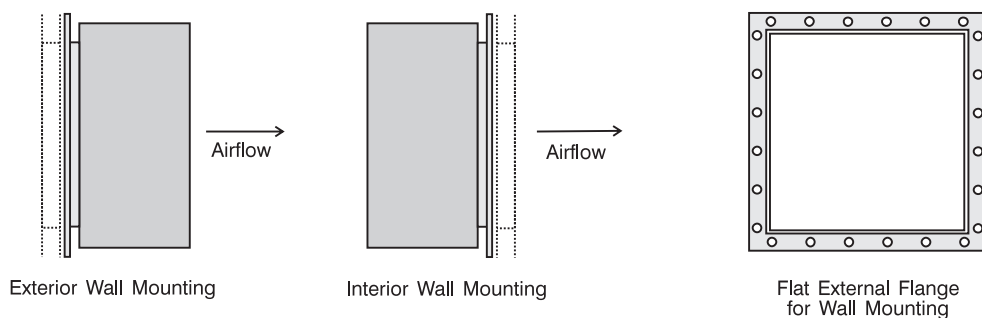
## Mounting Accessories

### A. Load Bearing Flanges

Load bearing attachment flange for either inlet or outlet side for mounting to radiator, or to sheet metal duct.

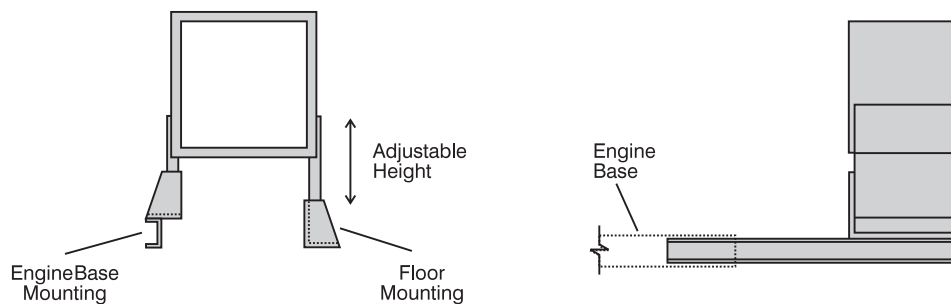


Load bearing attachment flange, for wall mounting, for inlet or outlet side of load bank, for indoor or outdoor installation of load bank.



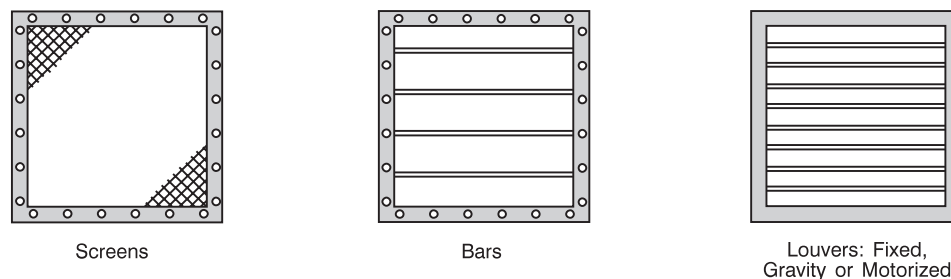
### B. Adjustable Feet

Adjustable mounting feet for floor mounting, or mounting to extension of engine base



### C. Outflow Guards

Outflow guards for air outlet side of load bank to guard against contact with hot surfaces and/or to provide weather protection



## Sample Specifications

### Engineer's Specification for Engine Radiator Airflow Cooled Load Bank

Options in the specifications are italicized within parentheses. Blanks are provided in section 1.4, Ratings, for the addition of specific rating values.

#### 1. GENERATOR LOAD BANK

1.1 General: An engine radiator airflow cooled, resistive load bank is required for permanent, on site installation as a component of a standby engine generator system. The load bank shall be designed for (remote, local), (automatic, manual) control. The load bank (bolt-together design *only* - up to 400KW) shall bear the listing mark of Underwriters Laboratories (UL Listing).

1.2 Installation: The load bank shall be installed within the air outflow of the engine unit mounted radiator and shall be cooled by the radiator airflow. The load bank may be installed by one of the following methods:

1.2.1 Bolted attachment to radiator with duct and flex coupling to air outlet in wall.

1.2.2 Installation within air duct; flex transition to radiator and solid duct transition to air outlet in wall.

1.2.3 Bolted attachment to interior wall with duct and flex coupling to radiator.

1.2.4 Bolted attachment to exterior wall over air outlet. Load Bank should be weatherproof for this installation.

1.3 Electrical Connection: Power source to load bank connection is 3-phase, 3-wire plus ground. Additional control wire connections for remote control as required.

#### 1.4 Load Bank Rating:

1.4.1 Capacity: \_\_\_\_\_ KW, 1.0 p.f.

1.4.2 Load Steps (5, 10, 20, 25, 40, 50) KW load step resolution

1.4.3 Voltage: \_\_\_\_\_ V AC, 3-ph., 3-W

1.4.4 Frequency: (50, 60, 400) Hertz

1.4.5 Air intake temperature: 155°F max (radiator air outflow)

1.4.6 Airflow requirements: Radiator air outflow

1.4.7 Duty Cycle: Continuous

1.4.8 Air temp. rise: 100°F, nominal

1.4.9 Air back pressure: .25-.50" water column

#### 1.5 Load Bank Design

1.5.1 General: The load bank shall be a completely self-contained unit which includes all resistive load elements, load control devices, load element branch circuit fuse protection, main load bus and terminals, control terminals, system protection devices and enclosure of required type.

1.5.2 The load bank shall be the manufacturer's standard product that has been investigated, tested and listed by Underwriters Laboratories as a system for the purpose intended. Simple assemblies of listed parts that are not system UL listed shall not be acceptable.

#### 1.5.3 Enclosure:

Bolt-together design (up to 400KW): Type (1, 3R), galvanized steel, unit construction, consisting of a power section, for installation and wiring of the load elements and a control section for installation and wiring of control components. The control section is to be physically and thermally isolated from both the hot load elements and the heated airflow. Mounting adaptors suitable for the installation method selected shall be supplied with the load bank. The exhaust of the load bank shall be screened and, if installed outdoors, louvers shall be provided.

Weld-together design (400KW-1200KW): Type (1, 3R), finish painted with a UL Listed process consisting of either a powder-coated finish or a liquid-coated finish consisting of an epoxy primer and a polyurethane finish, unit construction, consisting of a power section, for installation and wiring of the load elements and a control section for installation and wiring of control components. The control section is to be physically and thermally isolated from both the hot load elements and the heated airflow. Mounting adaptors suitable for the installation method selected shall be supplied with the load bank. The exhaust of the load bank shall be screened and, if installed outdoors, louvers shall be provided.

#### 1.5.4 Load Elements:

Simplex "Powr-Rod" Brand (bolt-together design - up to 400KW).

Simplex "Powr-Web" Brand (weld-together design - 400KW-1200KW).

1.5.5 Load element short circuit protection: Branch circuit fuses, per each 50KW load branch circuit. Fuses shall be 200,000 A.I.C current limiting type.

1.5.6 Load control: One magnetic contactor per each fused branch circuit.

1.5.7 Load bank power wiring shall be 150°C XLP insulated.

1.5.8 Main terminals: Barrier type power terminal block with compression type terminal to accept stranded building wire. Provide chassis ground stud with compression type terminal.

1.5.9 Control wiring shall be 105°C XLP insulated.

1.5.10 Control power shall be derived internally from the main load bus. Control and protective circuits shall operate at 120V via control power transformer or line-neutral circuit and shall be fused.

1.5.11 System protection: The load bank shall include a comprehensive protection system to protect against overheating. The system shall function to disconnect the load elements from the power source and activate an alarm upon sensing an exhaust air temperature greater than 300°F.

#### 1.6 (Local, Remote) Control Panel

1.6.1 A Type (1,3R) control panel for (automatic, manual) operation shall be provided. The panel shall include:

1.6.2 Control power on-off pushbuttons

1.6.3 "Normal operation" indicator lamp

1.6.4 Master load control switch

1.6.5 Load step control switches

1.6.6 "Cooling failure" alarm indicator lamp

1.6.7 Remote control panel shall be UL listed.

1.7 Warranty: The load bank shall be supplied with a 2-year manufacturer's warranty which covers all materials and service labor. The manufacturer shall demonstrate the availability of factory service technicians in support of the load bank.

1.8 Start-up Service: The load bank manufacturer is to provide one day start-up service of the load bank, on site, after the load bank has been installed and connected.

#### 1.9 Qualifications of Load Bank Manufacturer

1.9.1 The load bank shall be a product of a firm regularly engaged in the design and manufacture of generator load banks.

1.9.2 The load bank manufacturer shall demonstrate at least five years experience with at least twenty-five successful installations of load banks similar or equal to the load bank specified herein.

1.9.3 The load bank for this application shall be a Simplex LBD Series as manufactured by Simplex, Inc. 5300 Rising Moon Road, Springfield, Illinois, 62711-6228, 217-483-1600.

ADD THE FOLLOWING SECTION TO PROVIDE FOR LOAD BANK OPERATION AS AN AUTOMATIC LOAD REGULATOR TO MAINTAIN A PRESET LOAD LEVEL

#### 1.10 Automatic Load Bank Controller

1.10.1 The load bank is to be equipped with an automatic controller which will be activated when the load bank mode control selector switch is placed in the "automatic" position.

1.10.2 In automatic mode, the load bank is to be on-line and continuously operative whenever the power source runs. The load bank shall provide a component of the total power source load and shall be automatically variable in response to dynamic total load demands upon the power source.

1.10.3 The automatic controller shall include control logic, solid-state sensors and time delays which shall act to apply/remove load bank component in multiple steps in response to dynamic output of the power source.

1.10.4 The automatic controller shall function to maintain total load upon the power source within a preset bandwidth by adding load bank load component as external load component drops and removing load bank component as external load rises.

1.10.5 The automatic controller shall sense load (amperes, kilowatts)

1.10.6 Full manual control of the load bank shall be restored when the mode selector switch is placed in the "manual" position.

1.10.7 The automatic controller shall include a solid-state load sensor with level and time delay adjustment and output contacts for each load step. A current transformer for external installation shall be provided.