

18 NOVEMBER 2000



Civil Engineering

**MAINTENANCE AND OPERATION OF
ELECTRICAL POWER SYSTEMS AND
PUMPING UNITS**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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Supersedes SAFBI 32-102, 14 March 1994.

Pages: 6
Distribution: F

This instruction outlines policies, responsibilities, and technical standards for the operation and maintenance of electrical power systems and pumping units installed as real property on Scott AFB IL and under the management responsibility of the 375 CES. It defines and establishes the interfacing between various management, operational, and maintenance organizations supported by the base commercial power system and the real property installed equipment (RPIE) standby generating systems.

SUMMARY OF REVISIONS

This instruction was revised to conform to the AF Numbering System for publications; update generator and pump testing instructions.

1. Terms Explained:

- 1.1. Prime Power. Obtained from a commercial source to support Air Force facilities. This power is the normal source of power, but may refer to generator power when such power is the only available source of power for the operation.
- 1.2. Standby Power. This term and back-up power, alternate power source, generator power or on-again/off-again power, refer to power provided by either RPIE generators or equipment authorization inventory data/organizational property (EAID) generators.
- 1.3. RPIE Generators. Power units assigned to specific facilities on a permanent basis to provide standby power in case of prime power failure.
- 1.4. Equipment Authorization Inventory Data/Organizational Property Generators. Power units assigned to the Power Production Section that may be used to support units on a temporary basis.
- 1.5. High Reliability Power. Includes the primary power source (commercial), distribution systems, and auxiliary power source that are designed to provide specified critical loads, with power having a

reliability adequate to satisfy the operational requirements. Normally, high reliability power systems are provided to communication facilities, navigational aid facilities, computer systems, and similar systems designed as high reliability power users.

1.6. Power Reliability. The ratio, in percent, of the time power of acceptable quality is available to the time power required.

2. Design of Electrical Power Systems:

2.1. The Base Civil Engineer (BCE) is responsible for engineering designs, equipment requisitions, and performs equipment installation, operation, maintenance, and repairs on power generating and distributing systems IAW procedures in AFMAN 32-1082, **Facilities Engineering-Electrical Exterior Facilities**,

AFI 32-1063, **Electric Power Systems**, and AFI 32-2001, **The Fire Protection Operations and Fire Prevention Program**.

2.2. The BCE Power Production Section has various EAID generators that will provide combinations of AMPERAGE, VOLTAGE, and PHASES.

2.3. The EAID generator units are Class "C" units normally operated as "on-again/off-again" units that do not exceed 8 hours of operational time with each start.

2.4. Organizations having power requirements submit their requirements to the BCE for programming, procurement, and installation of RPIE generators. The EAID units are available only on a temporary basis. Permanent requirements also require RPIE units.

3. The BCE's Responsibilities:

3.1. Provide technical assistance and determine technical adequacy of systems.

3.2. Install, inspect, maintain, operate, troubleshoot, and repair generating and distributing systems.

3.3. Assume maintenance responsibility for using agency owned (EAID) generators under the provisions of AFI 25-201, **Support Agreements Procedures**, if the agreement can be supported by available base resources and will provide a more economical and effective mission support.

3.4. Provide "standby generator operator" training and certification to using agency personnel ([Attachment 1](#)).

4. Using Agency Responsibilities:

4.1. The using agency is responsible for furnishing the BCE with all required data on system quality, quantity, and reliability requirements, whether the user is served separately or as a part of the base electrical power system.

4.2. When requested by the BCE, the using agency is also responsible for assisting in the performance of coordinated engineering studies. These engineering studies are used to determine equipment/system attainment of compatibility, reliability to assure mission achievement, and in assisting facility/equipment improvement.

5. Delegation of the BCE's Responsibilities:

5.1. Delegation of the BCE's responsibilities will be granted only after consideration has been given to mission response time requirements of the using agency, capability of the BCE to meet these requirements, the effectiveness and efficiency of operations, and the requirements for direct mission support. The provisions of AFI 25-201 will be followed when responsibilities are delegated.

5.2. Responsibilities delegated are limited principally to visual preoperational/postoperational inspections of generating units, operation of the standby power units, transfer of power systems between the prime power source and the alternate power source, and record documentation of equipment performance.

5.3. Personnel designated by the commander or chief of the using agency as "emergency generator operators" will receive training from Power Production personnel on the procedures and techniques associated with operating emergency power systems. Facility managers are responsible for requesting annual training. Personnel trained will be designated on the Request for Standby Generator Training/Certification Letter (**Attachment 1**). A copy of this letter will be posted near the generator or pumping unit and will provide certification for a period of 1 year from the date of training. Only those personnel actually trained and certified on this letter are authorized to operate equipment for which the letter provides certification. All other forms of certification are obsolete. Base Fire Protection Branch personnel, as designated by the Base Fire Chief, will be trained annually by the Power Production personnel on pump operations at Bldg 39. Training will be documented and posted as stated above.

5.4. Certification will be revoked by Power Production Shop Foreman when operating personnel are found to be using unsafe practices, not following procedures, running units for prolonged periods of time (more than 15 minutes) without load connected, or misusing or abusing emergency backup power or pumping units. Power Production will forward all letters to the using agency's commander stating the reason for the revocation of certification. Only the using agency's commander may request training of decertified personnel by a letter to the BCE.

6. Using Agency's Responsibility for Coordinating Maintenance Schedules:

6.1. Using agencies are responsible for determining a specific day each week that is best suited for scheduling generator testing/exercising. This day must be provided to the BCE for inclusion into the Maintenance Schedule Program. If mission requirements change and result in incompatible scheduling, using agencies must determine a new day that will allow compatible scheduling and inform the BCE organization.

6.2. Using agencies are responsible for ensuring equipment availability for generator load testing on the date and time scheduled. If the facility cannot be load tested due to such factors as mission requirements, inclement weather, changes in flying schedules, or other justifiable reasons, coordination will be made to arrange for testing sometime during the due week of the unit. If rescheduling is not possible, a representative of the using agency will be required to sign a statement on the reverse side of an AF Form 487, **Emergency Generator Operating Log (Inspection Testing)**, attesting to the reason for failure to perform the required load testing. If the using agency repeatedly denies access to equipment for required load testing, BCE personnel cannot guarantee reliability of emergency power systems.

6.3. The BCE personnel are available for generator testing during normal duty hours only, Mon-Fri, unless otherwise specified by agreement between the BCE and the commander or the chief of the using agency.

7. Testing or Exercising of Electrical Power Systems:

7.1. Emergency power systems are operated (exercised) to supply their actual connected loads (load banks/dummy loads will not be used) as follows:

7.1.1. Unless otherwise specified, generators will be exercised 1 hour every month after the unit reaches operating temperature.

7.1.2. Gasoline engine units classified as RPIE will be exercised 30 minutes each month. Gasoline engine units classified as EAID will be exercised 15 minutes each month. Propane/natural gas engine units supplied by the base gas distribution system will be exercised according to **paragraphs 7.1.1. and 7.1.2.** Propane/natural gas engine units supplied by a tank will be exercised for 30 minutes each month. All water/waste pump engines will be exercised 15 minutes twice each month.

7.1.3. Building 39 will have all units tested by Power Production personnel for 30 minutes each month; Alarms, Water, and Waste personnel will assist. The Base Fire Protection Branch will be notified prior to any test.

7.2. Emergency power systems supporting navigational aids and Air Traffic Control (ATC) facilities are exercised according to procedures outlined above and IAW AFI 13-203, **Air Traffic Control, paragraph 1.22.**

7.3. Generator load testing can be deferred where a prime power failure has occurred within the previous 14-day period preceding the due date of the generator testing, provided the generator started, assumed facility load, carried the facility load, transferred back to prime power, and shutdown properly. Additionally, documented proof of the successful operation must be annotated on an AF Form 487. Otherwise, the facility must be exercised to demonstrate the capabilities.

7.4. Emergency load testing consists of the following:

7.4.1. Interruption of the prime power source.

7.4.2. Automatic starting of engine by the transfer panel.

7.4.3. Load transfer by panel to generator.

7.4.4. Generator operation for the time period specified in **paragraph 7.1.1.**, this instruction.

7.4.5. Return of prime power source.

7.4.6. Load transfer from generator to prime power source.

7.4.7. Engine cool-down period and automatic shutdown of unit.

8. High Reliability Power (HRP) Systems:

8.1. Using agencies are required to advise the BCE organization when electrical power generating or distribution systems reduce the facility reliability.

8.2. Using agencies are responsible for ensuring that additional load-creating equipment is not installed, until a load study has been completed and the capability of the prime and backup power systems have been determined adequate to support the increased load demands.

8.3. Using agencies experiencing generator malfunctions/failures should immediately contact the BCE Service Call Desk at 256-2202 for dispatch of maintenance personnel.

8.4. Using agencies should immediately contact the BCE Service Call Desk any time a transfer of power occurs. This will ensure that the Power Production personnel are properly notified of unscheduled generator runs so any maintenance required can be accomplished.

9. Maintenance and Performance Data:

9.1. An AF Form 487 must be completed each time an emergency generator is operated, unless the unit is located at an unmanned site/facility or during emergency power restoration of auto start system facilities (Control Tower/RAPCON) by ATC personnel.

9.2. Maintenance and Performance Data Records are maintained in the BCE Power Production Section and available to using agencies for review.

9.3. Completed AF Forms 487 by operator personnel are secured to the unit. These forms are gathered by Power Production personnel during each site/facility load test and posted to the unit's historical records.

9.4. The following equipment tolerances will be maintained on power generating units to ensure equipment damage does not occur to either the generating unit or the facility supported:

9.4.1. Frequency will be 60 cycles +/- 0.5 percent nominal.

9.4.2. Voltages will be within +/- 0.5 percent of generator rated output.

9.4.3. Phase current balancing will be maintained within 20 percent between the high current phase and the low current phase.

9.4.4. The kW loading will be maintained between 50 to 80 percent of rated capacity of the unit. Units with fewer loads will be replaced with smaller units, and units with greater loads will be replaced with larger units.

9.5. The above-equipment tolerances will be maintained at stricter specifications for navigational aids, as required by AFI 32-1063, **paragraph 7**. At locations where a combination of systems are installed, the one complete system with all related equipment providing the lowest approach minimal will be provided with high reliability power. These systems include RAPCON, GCA, ILS, TACAN, VOR, and associated critical ATC communications/microwave equipment.

JAMES S. BRACKETT, Lt Col, USAF
Base Civil Engineer

Attachment 1

SAMPLE LETTER, REQUEST
FOR STANDBY GENERATOR TRAINING/CERTIFICATION

(Date)

MEMORANDUM FOR 375 CES/CEOIP

ATTN: Supervisor

FROM: (Organization/Office Symbol)

(Street Address and Bldg #)

Scott AFB IL 62225-5035

SUBJECT: Request for Standby Generator Training/Certification

ACTION MEMORANDUM

A2.1. In accordance with AFI 32-1063, **Electrical Power System**, request the following listed personnel receive training as "Standby Emergency Generator Operators" for this facility:

SIGNATURES

<u>GRADE/NAME</u>	<u>ORGANIZATION</u>	<u>DATE TRAINED</u>	<u>TRAINER</u>	<u>TRAINEE</u>

A2.2. The above list has been screened to ensure that only mission-essential personnel have been selected as "Standby Emergency Generator Operators."

A2.3. This organization will ensure that only the above-listed personnel operate the standby generator units and complete the necessary preop/postop inspections, operational procedures posted on or near the equipment, and complete record documentation as required by AFI 32-1063.

JOHN E. DOE, Lt Col, USAF

Commander