

NFPA 110

EMERGENCY AND STANDBY POWER SYSTEMS

This 3-day course is based on the requirements of NFPA 110, Standard for Emergency and Standby Power Systems. The course addresses the installation, operation and maintenance requirements of standby generators, transfer switches, batteries and UPS Systems. It starts with an introduction to the various applicable standards and electrical generation principles. Generator set operation including the engine, the generator and controls are explained. Typical troubleshooting problems and maintenance is covered. The course then moves addresses the various other components comprising most standby power systems: Transfer switches, stationary batteries and uninterruptible power supplies (UPS).

Maintenance requirements are discussed in detail referencing such documents as NFPA 70B, Recommended Practice for Electrical Equipment Maintenance; the IEEE 3007 Series Power Systems Maintenance, Operations, and Safety and, the NETA Maintenance Test Specifications. The testing requirements of NFPA 110 are addressed with special emphasis on load bank testing methods and practical applications.



CLASS FORMAT:

Lecture

STANDARD CLASS SIZE:

NTT recommends a class of no more than 35 participants to obtain the best results.

NTT TO PROVIDE:

- Textbooks
- Classroom consumables
- Completion certificates
- Course syllabus, outline, table of contents, or training objectives
- Shipping and instructor travel logistics

CLIENT PROVIDES:

- Classroom of 500 square feet or greater
- Projection screen, white board and/or flip chart(s)

WHO SHOULD ATTEND:

- Facilities Maintenance Personnel
- Electricians



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COURSE AGENDA

STANDARDS AND REQUIREMENTS OVERVIEW

- a. Standby power systems classifications per NFPA 110
- b. EGSA standards
- c. NEC as an installation code
- d. NFPA 70B use of maintenance program development and improvement
- e. IEEE 3007 Series requirements
- f. NETA testing specifications for standby power system equipment

GENERATOR OVERVIEW:

- a. Major components and operation
- b. Generator fuel types and practical applications

ELECTRICAL THEORY FOR GENERATING ELECTRICAL POWER

- a. Electrical fundamentals
- b. How electricity is produced and controlled in generators and batteries
- c. Understanding single-phase and three-phase generator wiring configurations
- d. Understanding Generator Nameplate Data

GENERATOR CONTROL

- a. Rectification & the Brushless Exciter
- b. Elements of Alternating Current (AC) generation
- c. Power Triangle
- d. Frequency and Voltage Regulation
- e. Temperature and Environmental Considerations
- f. Detailed Generator Operation and Control

GENERATOR LOADING AND CONTROL

- a. Effects of various type loads on generator control: lighting, motors, UPS Systems
- b. Parallel operation
- c. Protection and transfer of power

THE GAS, NATURAL GAS AND DIESEL ENGINES AS PRIME MOVERS

- a. Prime mover types and fuel considerations
- b. Mechanical systems operation: fuel, intake air, lube oil, cooling, governors
- c. Typical manufacturers, ratings and operation of diesel generator sets.

TROUBLESHOOTING AND MAINTENANCE OF STANDBY GENERATORS

- a. Recommended maintenance practices from: IEEE, NFPA, NETA, EGSA
- b. Operating factors affecting maintenance
- c. Starting Battery maintenance
- d. Troubleshooting frequency control problems
- e. Troubleshooting voltage control problems
- f. Troubleshooting grounding problems

BASIC GENERATOR INSTALLATION REQUIREMENTS

- a. Marking requirements
- b. Overcurrent protection
- c. Selecting and sizing Cables and Conductors for generator output
- d. Protecting live parts
- e. Loads supplied – practical applications

TRANSFER SWITCH EQUIPMENT

- a. Types and applications of transfer switch equipment
- b. The Automatic Transfer Switch (ATS)
- c. Load shedding operations
- d. Bypass operation
- e. Protection considerations
- f. Transfer switch equipment maintenance

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STATIONARY BATTERY SYSTEMS

- a. Types of battery cells, construction and battery bank configurations
- b. Typical battery loads
- c. Battery chargers
- d. Battery safety
- e. Battery maintenance

UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEM

- a. Tying it all together
- b. Types of UPS systems
- c. Typical manufacturers, ratings and basic operation
- d. UPS maintenance

OPERATIONAL SYSTEMS AND EQUIPMENT TESTING REQUIREMENTS

- a. NFPA 110 requirements
- b. Load Banking Operations

REVIEW OF SAFETY ISSUES WITH EMERGENCY AND STANDBY POWER GENERATION

- a. The importance of code and standard requirements
- b. The three hazards to protect against
- c. Selection of Personal Protective Equipment (PPE) for work on Standby Power Systems
- d. Safe work practices to follow