CHAPTER 8 ENCLOSURES FOR ELECTRICAL EQUIPMENT

8. 1 DESCRIPTION

This section shall apply to:

A. Type-tested devices or components operating above 600 V (see Chapter 4, paragraph 4.5). Exception: Enclosures for commercial electrical apparatus when fabricated, tested, and installed in accordance with ANSI C37 series standards and manufacturer's recommendations.

B. Non type-tested devices or components operating over 50 V.

C. Radio-frequency (rf) and microwave equipment.

D. Energy-storage equipment having stored energy above 50 J.

8. 2 TYPES OF HAZARDS

A. Electrical shock hazard from ungrounded or poorly grounded enclosures.

B. Burns resulting from rf, eddy-current, or microwave heating.

C. Burns to skin and eyes from electrical arcing and molten metal.

D. Faults occurring inside the enclosure that may rupture the enclosure and injure personnel or damage adjacent equipment.

E. Failure of personnel-safety-interlocks, permitting personnel to come in contact with energized equipment within an enclosure.

F. Crowded working conditions within enclosures, resulting in personnel-safety hazards.

8. 3 DESIGN AND CONSTRUCTION CRITERIA

Design and construction of enclosures shall:

A. Prevent objects outside enclosures from making contact with live electrical parts.

B. Provide adequate interior working space (ref. NEC Article 312, “Cabinets, Cutout Boxes, and Meter Socket Enclosures”)

C. Provide electrical PSIs on all doors and hinged access panels on high-voltage enclosures arranged to prevent normal access without interrupting the interlock circuit. Provide door locks to limit access to authorized personnel.

D. Install suitable barriers between any two or more of the following circuits where they exist in one enclosure:

1. High-voltage Class E circuits (above 600 volts),
2. Class C and D circuits (240 & 480 volts),
2, Low-voltage Classes B (below 240 volts),
3. Instrumentation and control Class A circuits (below 50 volts),
4. Computer I/O and millivolt or milliamp signal circuits.

See Chapter 3, paragraph 3.3 for Class definitions. See Chapter 4 for barrier descriptions. Communication circuits shall be run through dedicated enclosures and raceways.

E. Barrier or isolate all Computer I/O and millivolt or milliamp signal circuits that extend outside enclosures from any higher-voltage circuits within the enclosure. Use grounded metal barriers, 1:1 transformers having suitable withstand rating, fiber-optic isolators, or other approved means.

F. Provide suitable covers over any exposed parts of Class C and/or Class D circuits when they exist in an enclosure with Class A circuits. Existing equipment is subject to inspection within the guidelines of paragraph 3.1.2 in Chapter 3.

G. Provide properly shielded and grounded enclosures for rf and microwave equipment and give particular attention to all openings, such as doors, access ports, and viewing windows, to prevent radiation leakage (see Section 4.0 of ES&HD- 5008).

H. Provide enclosures structurally adequate for their intended use and environment. Use wire glass or its equivalent material in viewing windows.

I. Provide adequately sized grounding of the enclosure and its appurtenances. See NEC article 250 for grounding requirements. Diagnostic and Electronic rack wiring requirements are specified in PPPL Engineering Standard ES-ELEC-001.

J. Design the wiring and equipment furnished inside control enclosures operated below 600 volts to comply with the provisions of NFPA 79, " Electrical Standard for Industrial Machinery."

8. 4 OPERATING CRITERIA

A. All personnel shall be cleared from an enclosure where hazardous conditions exist before energizing the equipment.

B. Safety signs and/or warning lights shall be provided to indicate equipment hazards. Energy and Safety Barriers shall be installed in accordance with Chapter 4, Isolation of Hazards.

C. When a temporary enclosure is necessary, it should be electrically interlocked and should meet the same requirements as a permanent enclosure, where practicable.

D. All electrical equipment must be de-energized prior to working on or near the components. An “Energized Work Permit is required to work on energized equipment, except for testing and troubleshooting (see Chapter 3 for detailed requirements.