



Codes and Specifications of Electro-Mechanical Systems



EME508

Lecture 6&7

Codes and Specifications Required for Hospital Design

INSTRUCTOR

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➤ **Introduction**

- 1) These lectures are a guide for electrical and telecommunications engineers and designers (hereafter referred as A/E) for the planning and design of the electrical power distribution, lighting, signal, telecommunications, and related systems (hereinafter referred to as systems) at Department of Veterans Affairs (VA) facilities.

➤ **Responsibility**

- The A/E shall provide all necessary professional services to perform planning and design of the systems for the project. The A/E is responsible and liable for the professional design in accordance with the contract, good engineering practices, VA standards, VA project-specific requirements if any, and applicable codes.

➤ **Design submission requirements**

❑ **The Instructions accomplishes this purpose by:**

- Progressively listing tasks as Schematic, Design Development and Construction Documents stages
- Requiring task completion and submission for each stage according to a Critical Path Method (CPM) calendar
- Implementation of a QA/QC process to assure a quality design product
- Requiring life cycle analysis of alternatives in order to optimize the design/cost tradeoff
- Listing and detailing all the drawings, calculations and specifications required for a complete design package
- Indicating the final distribution of bid documents

➤ **Applicable codes and standards**

- (a) American National Standards Institute (ANSI)
- (b) American Society for Testing Materials (ASTM)
- (c) Building Industry Consulting Service International (BICSI)
- (d) Federal Communications Commission (FCC), all Regulations, Procedures and Standards for Two-Way Radio Equipment, Systems and Operation
- (e) Illuminating Engineering Society of North America (IESNA)
- (f) Institute of Electrical and Electronic Engineers (IEEE)
- (g) International Organization for Standardization (ISO), Standards for Protocols and Interfaces that include Open System Interconnections (OSI)

➤ **Applicable codes and standards (cont.)**

(h) Joint Commission on Accreditation of Healthcare Organizations (JACHO),
Environment of Care Guidelines and Standards

(i) National Fire Protection Association (NFPA): A/E shall pay particular attention to the following publications:

- NFPA 20 – Standard for the Installation of Stationary Pumps for Fire Protection
- NFPA 70 – National Electrical Code
- NFPA 70 E – Standard for Electrical Safety Requirements for Employee Workplaces
- NFPA 72 – National Fire Alarm Code
- NFPA 75 – Standard for the Protection of Electronic Computer/Data Processing

Equipment

➤ **Applicable codes and standards (cont.)**

- ❑ NFPA 77 – Recommended Practice on Static Electricity
- ❑ NFPA 99 – Standard for Health Care Facilities
- ❑ NFPA 101 – Life Safety Code
- ❑ NFPA 110 – Standard for Emergency and Standby Power Systems
- ❑ NFPA 780 – Standard for the Installation of Lightning Protection Systems

(j) National Electrical Manufacturers Association (NEMA)

(k) Underwriters' Laboratories, Inc. (UL)

(l) Telecommunications Industry Association and Electronic Alliance Standards Association (EIA/TIA) 568 and/or 569A, Communications Cabling Circuits and

Equipment

➤ **Sequence of electrical drawings**

- Symbols and Abbreviations
- Demolition Plans
- Electrical Site Plan(s)
- Lighting Plans
- Power Plans
- Lightning Protection Plans (may be combined with roof and ground floor/site power plans on projects with few lightning protection components)
- Telecommunications Plans

➤ **Sequence of electrical drawings (cont.)**

- Signal or Other Plans
- One-line Diagrams and Riser Diagrams
- Details
- Schedules, Summary Load Studies, Lighting Fixture Schedule

Fire alarm systems are part of the Fire Protection discipline and shall be shown on the Fire Protection Plans.

Signal Systems may be combined with Power Systems on projects with a minimal number of signal devices.

➤ **Calculations**

- Fault current calculations
- Protective device coordination calculations
- Arc flash calculations
- Load calculations
- Generator sizing calculations
- Voltage drop calculations
- Harmonic distortion calculations
- Lightning protection calculations

RECEPTACLE AND POWER REQUIREMENTS

➤ **Receptacle and power requirements**

- “Receptacle” refers to power receptacles, except where signal types are specifically noted.
- Provide safety receptacles, ground fault current interrupter receptacles, or other special purpose receptacles as required for the project.
- In patient care buildings, all receptacles shall be listed as Hospital Grade, where available, in the size, type and configuration required.

➤ **Essential electrical system circuits**

RECEPTACLE CIRCUITS

- No more than 6 receptacles shall be installed on a single branch circuit for general use.

GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLES

- Provide GFCI receptacles at all locations required by NFPA 70 and 99.
- GFCI receptacles shall not serve other receptacles from their load-side terminals.

➤ **Essential electrical system circuits (cont.)**

HUMAN SURGERY ROOMS

- a) Refer to Surgical Service Design Guide.
- b) Each receptacle shall be on its own Critical Power dedicated circuit in a dedicated conduit, except for those mounted in the service columns which may be wired two to a circuit.
- c) Wall mounted receptacles shall be 18 in. [450mm] above the floor.
- d) The need for special receptacles for surgical lasers or portable equipment shall be determined on a project-by-project basis.

➤ **Exterior electrical receptacles**

➤ Provide exterior weatherproof GFCI receptacles mounted in NEMA weatherproof enclosures, at a maximum of 75 ft. [25m] spacing, at the following locations.

- Exterior walls of penthouses for maintenance of roof areas
- Major entrances to buildings
- Courtyards and enclosed (or partially enclosed) garden areas
- Loading docks and maintenance yards
- Major mechanical equipment enclosures
- Cooling towers
- Major service equipment enclosures

➤ **Self-illuminated emergency receptacles**

- In rooms without general illumination on emergency power, emergency receptacles shall be of the self-illuminated type.
- Night lights, pilot lights, and instrument lights are not considered general illumination.

ESSENTIAL AND STANDBY ELECTRICAL POWER SYSTEMS

➤ **Generators**

- Generators used for the Standby Electrical System shall be rated as limited-running-time prime power.
- If separate from the Standby Electrical System generators, generators dedicated to the Essential Electrical System shall be rated as standby.

➤ **Automatic transfer switches (ATS)**

- ATS shall be 4-pole and shall include the maintenance-bypass option.
- ATS shall be limited to adequate amperes maximum size and located to provide the highest practicable reliability in service to the load.
- This generally means minimizing the switch-to-load distance.

➤ **Control network**

- ATS, generator remote alarm systems, load shedding controls, and other interconnecting control components of the Standby Electrical System and/or the Essential Electrical System shall be networked over a fiber-optic communications network, which shall not be used to transport information of other systems and shall be installed in dedicated raceways.
- The ATS shall be able to be monitored, tested, and operated from a single location; typically, the paralleling switchgear.

➤ **Location**

- Do not locate the first level of distribution of the Standby Electrical System or Essential Electrical System, such as the generators and paralleling switchgear, in the same room with other power systems.
- In the generator paralleling switchgear or distribution switchboard, Life Safety Branch overcurrent protective devices shall occupy a dedicated section or sections.

ELECTRICAL POWER DISTRIBUTION

Thank
you

