Public Safety in the Healthcare Facility

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Public Safety: 15% of CBET Exam

- Electrical
- Chemical
- Radiation
- Biological
- Fire
- Codes and Standards

Ground Conductor Resistance

Chassis to ground pin of electrical plug

- NFPA 99 (2005) 8.4.1.3.2. Ground Conductor Resistance. Patient-care-related equipment in the patient care vicinity = 0.5 Ω.
- AAMI ES60601-1:2005 8.6.4. Protective Earth Impedance. Medical electrical equipment = 0.3 Ω.

Chassis Leakage Current

- NFPA 99 (2005) 8.4.1.3.5. Chassis Leakage Current. New patient-care-related equipment = 300 µA. Existing and special patient-care-related equipment = 500 µA.
- AAMI ES60601-1:2005 8.7.3. Touch Current. Medical electrical equipment. Normal Condition = 100 µA. Single Fault Condition = 500 µA.

Electrical
Microshock and Electrical Safety Testing
AAMI ES60601-1:2005 Test Load

ESM 2008 Recommendations

- Ground conductor resistance:
  - A practical limit for identifying ground conductors problems is 0.5 Ω.
- Chassis leakage current:
  - A practical limit for identifying chassis leakage current problems is 500 μA.
  - Normal polarity, power switch on and off, ground closed and open.

Electrical Safety References

- Electrical Safety Q&A. Health Devices (February 2005).

Normal Electrical System

- Branch Circuit: The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s).
- Feeder: All circuit conductors between the service equipment, the source of a separately derived system, or other power supply source and the final branch-circuit overcurrent device.
Special Electrical Systems

- Essential (emergency) electrical system
- Generator and transfer switches
- Automatic transfer within 10 seconds
- Extensive testing requirements
- TJC specifies systems to be supplied

Joint Commission: Emergency Power
EC.02.05.03 and EC.02.05.07

- Alarm systems*
- Exit Route and exit sign illumination*
- Emergency communication systems*
- Elevators (at least one)

*As required by the Life Safety Code

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EC.02.05.03 and EC.02.05.07

- Critical equipment, including:
  - Blood, bone, and tissue storage systems
  - Medical air compressors
  - Medical and surgical vacuum systems
- Critical areas, including:
  - Operating and recovery rooms
  - Obstetrical delivery rooms and nurseries
  - Urgent care areas

Joint Commission: Emergency Power
EC.02.05.03 and EC.02.05.07

- Monthly and annual testing of battery-powered lights required for egress
- Quarterly and annual testing of Stored Emergency Power Supply Systems (SEPSS)

Joint Commission: Emergency Power
EC.02.05.03 and EC.02.05.07

- Monthly testing of generators and transfer switches (30 minutes, adequate load)
- Additional testing of generators every 36 months (4 hours, adequate load)
**Special Electrical Systems**

- Isolated power system
- Isolation transformer
- Line isolation monitor (LIM)
- Significant testing requirements
- For “wet locations” where interruption of power cannot be tolerated

**Schematic Diagram**

From NFPA Health Care Facilities Handbook

**IPS Panel**

**Line Isolation Monitor (LIM)**
Decision Tree

Special Electrical Systems

- Ground Fault Circuit Interrupter
  - Trips at 6 mA current to ground
  - Subject to “nuisance” tripping
  - For “wet locations” where interruption of power can be tolerated

Power Line Color Codes

- 120 VAC Grounded (United States)
  - Hot = Black
  - Neutral = White
  - Ground = Green

- 120 VAC Grounded (European)
  - Hot = Brown
  - Neutral = Blue
  - Ground = Green (solid or yellow stripe)

- 120 VAC Isolated Power System
  - Line 1 = Orange (to “neutral” terminal)
  - Line 2 = Brown (to “hot” terminal)
  - Ground = Green
Electrical System References

OSHA
Chemical & Biological Hazards
Infection Control

Workplace Safety Pointers
- OSHA: Occupational Safety and Health Administration (www.osha.gov)
- OSHA is exclusively concerned with the safety of employees

OSHA
Occupational Safety & Health Administration
- Hazard Communication
- Material Safety Data Sheets (MSDS)
- Bloodborne Pathogens
- Universal Precautions
- Personal Protective Equipment (PPE)
- Lock-out Tag-out
OSHA: Hazard Communication
- Employees have a “Right to Know”
- Inventory of hazardous materials
- Information and training
- Access to MSDS information
- Material Safety Data Sheets
  - Hazards of using the material
  - How to use the material safely (including PPE)
  - What to do if exposed (including First Aid)
  - How to clean up spills
  - How to dispose of the material

OSHA: Lockout - Tagout

Infection Control Pointers
- APIC: Association for Professionals in Infection Control and Prevention (www.apic.org)
- Infection Control Professional vs. Infection Preventionist
- CDC Guidelines: www.cdc.gov/hicpac/pdf/guidelines/eic_in_HCF_03.pdf

Infection Control
- Airborne Infection Isolation (AlI) room:
  - Protects people in surrounding areas from airborne pathogens
  - Negative pressure; external exhaust
- Protective Environment (PE) room:
  - Protects patient from airborne pathogens in surrounding areas.
  - Positive pressure; HEPA filtration
Radiation Hazards
Laser Safety

Radiation Safety References

Basic facts:
- www.epa.gov/radiation/understand/ionize_nonionize.htm

Laser safety:
- www.safety.vanderbilt.edu/training/topics_laser.htm
- Protective goggles
- Avoid direct and reflected beam

Fire Safety
Classes of Fires & Extinguishers

Wikipedia: “Fire Triangle”
Fire Tetrahedron

Fire Types

- **Class A**: Ordinary combustibles such as wood, paper, cloth, trash plastics.
- **Class B**: Flammable liquids such as gasoline and paint. Also propane and butane. Not cooking oils and grease.
- **Class C**: Energized electrical equipment such as motors and appliances. If power is removed, fire becomes another class.
- **Class D**: Combustible metals such as potassium, sodium, aluminum, and magnesium.
- **Class K**: Cooking oils and greases.

Extinguisher Types

- **Dry Chemical**: Class ABC fires
- **Water and Foam**: Class A only.
- **Carbon Dioxide**: Class BC fires.
- **Wet Chemical**: Class K fires.
- **Halogenated or Clean Agent**: Class ABC fires.
- **Dry Powder**: Class D fires only.
- **Water Mist**: Primarily Class A fires.

Fire Safety

Principles of Life Safety

- Patients "incapable of self-preservation"
- "Defend in place" versus evacuation
- Building "compartments"

Building compartments

- Patient room
- Smoke compartment
- Floor assembly
- Building separation
- Exits and methods of egress
CABMET Study Group – Public Safety in the Healthcare Facility

Fire Safety Pointers
- Current edition: 2012
- CMS (and TJC): 2000

Codes & Standards
Joint Commission

Joint Commission Management Plans

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[Note 1] All moved to new EM chapter. Emergency Operations Plan
[Note 2] ILSM and SOC standards moved to new chapter.
Medical Equipment Management
- Management plan
- Selection and acquisition of equipment
- Equipment inventory
- Inspection and maintenance strategies
- Inspection and maintenance schedule
- Hazard notices and recalls
- FDA Medical Device Reporting
- Emergency procedures

Performance Monitoring & Improvement
- Performance monitoring
- Annual evaluation:
  - Scope
  - Objectives
  - Performance
  - Effectiveness
  - Performance improvement

Joint Commission References
- Comprehensive Accreditation Manual for Hospitals (Joint Commission)
- Environment of Care Essentials for Health Care (Joint Commission)
- The Performance Improvement Cycle (Baretich Engineering)

Codes & Standards
NFPA

NFPA Codes and Standards
- NFPA 70: National Electrical Code
- NFPA 99: Healthcare Facilities
  - Electrical Equipment
  - Medical Gas Systems

Joint Commission: Medical Gas Systems EC.02.05.09
- Inspect, test, maintain critical components (time frames defined by the hospital)
- Master signal panels
- Area alarms
- Automatic pressure switches
- Shutoff valves
- Flexible connectors
- Outlets
Joint Commission: Medical Gas Systems
EC.02.05.09
• Test for ...
  • Purity
  • Correct gas
  • Proper pressure
• Whenever systems are ...
  • Installed
  • Modified
  • Repaired

Storage and Handling of Gas Cylinders
• Compressed Gas Association poster
• Air Products Safetygram #10

Medical Gas Color Codes

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<tr>
<td>Nitrogen</td>
<td>Black</td>
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<td>Nitrous Oxide</td>
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<tr>
<td>Oxygen</td>
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www.sciencecases.org/gas_cylinders/handout3.asp

Codes & Standards
FDA

FDA Medical Device Reporting
• Safe Medical Devices Act: Requires medical device reporting by Device User Facilities.
• Referenced by the Joint Commission (EC.02.04.01 EP5).
• FDA: www.fda.gov/cdrh/mdr

FDA Medical Device Reporting
• Report to the manufacturer and FDA when the facility has information that reasonably suggests a device has or may have caused or contributed to a patient’s death.
• File FDA Form 3500A within 10 work days.
FDA Medical Device Reporting

- Report to the manufacturer when the facility has information that reasonably suggests that a device has or may have caused or contributed to patient’s serious injury (requiring medical or surgical intervention).
- File FDA Form 3500A within 10 workdays.

Codes & Standards
Other

- AABB: American Association of Blood Banks
- ACR: American College of Radiology
- ANSI: American National Standards Institute
- FCC: Federal Communications Commission
- IEC: International Electrotechnical Commission
- CMS: Centers for Medicaid and Medicare Services
- Joint Commission
- American Osteopathic Association (AOA)
- DNV Healthcare