1. Alternate Power Sources: Where the interruption of electric power supply to a building would result in hazard to life or property, major loss of research or equipment, provision shall be made for a standby supply of power to be used in the event of failure of the normal supply. Details of the plans as they apply to the project shall be explained and included in the early design development submittals and conferences. If tie-in on existing circuit or feeder is not practical at present, provision shall be made for future tie-in. Emergency and standby power systems are of two basic types:
   a. An electric power source set apart from the prime source of power operating in parallel that maintains power to the critical loads should the prime source fail.
   b. An available reliable power source to which critical loads are rapidly switched automatically when the prime source of power fails (AC source).

2. Automatic Transfer Equipment: Reliable equipment and transfer switch must be specified. Where both emergency systems and standby power systems are provided, separate transfer switches shall be provided for each system. Refer to NEC 700, 701 and 702 for system descriptions.

3. Emergency/Standby Systems: It is required that provision be made by designing an emergency system/standby power source supplied by:
   a. Engine generator
   b. Separate emergency source

4. Emergency generator drives shall be natural gas or diesel engines depending on the availability of natural gas the size of the unit.

5. When an emergency lighting system or generator system is available supplying either emergency or standby power, the lights, receptacles, and similar critical loads at the generator, all mechanical equipment spaces, in transformer, switchgear, switchboard or substation spaces should be connected to the emergency/standby system.

6. Electrical lighting and power equipment fed from an emergency/standby generator or any two sources shall have the face painted yellow or a yellow band around it unless in a public area. In both public and non-public areas the equipment shall have a distinctive warning sign and indicate the location of both sources of power.

7. An emergency panelboard shall be provided for:
   a. Exit lights
   b. Minimal hallway and stairway lighting and telephone power
   c. Fire alarms, building security equipment and fire protection systems; this does not eliminate the need for batteries. Batteries shall be tested to indicate amp hour availability. The manufacturer shall provide documentation that indicates conformance with repaired rating to the University.
   d. Elevators and/or elevator rooms when required by the University.
   e. Emergency Illumination: Emergency illumination shall be part of emergency lighting that shall include illuminating all required means of egress lighting, illuminated exit signs, stairwell lights, and all locations where emergency lighting must provide at least code required minimum illumination to allow easy and safe egress from the area involved.

8. A standby power panelboard shall be provided for:
   a. Building system equipment which is used to heat the building (to prevent freeze-up in the winter) to include heat pumps, condensate pumps and other equipment as may be designated by the Owner.
9. Wiring for emergency systems shall be in separate conduits. Specify that all emergency system junction boxes and covers shall be painted yellow.
   a. Switches for emergency lighting circuits shall not be accessible to the public.

10. Transfer Switch: Transfer switch is a vital part of the proper operation of the system. In addition to current carrying abilities, transfer switch must be able to withstand voltage surges to meet reliability requirements. Special consideration over normal circuit devices or breakers should be given to transfer switch because of its application requirements. Its design must include normal duty and fault current ratings of the switch. These play an important part of transfer switch application and protection scheme. It shall be capable of closing into high current, of fault currents without damage and withstanding severe duty cycle in switching normal rated load. The design and operation of transfer switch must meet the requirements of this standard and the following codes and standards: NSI/NFPA 70-1987 (12), National Electrical Code (NEC), NFPA 99-2002 and NEC 700-2005. Provide a separate transfer switch for emergency loads such as exit lighting, egress lighting, fire detection, public safety communications, and fire protection pumps from standby or backup power loads. All transfer switches must be connected to a remote control switching device to enable starting the generator and transferring load remotely.

ELECTRICAL PROVISIONS FOR ELEVATORS
MARCH 17, 2008

1. Wiring and Switching: Wiring shall be extended to heavy-duty lockable fused switches located in elevator machine room.

2. Emergency Circuit: An emergency circuit to the elevator machine room shall be provided for the elevator cab light, fan and equipment room.

3. Pit Installations: Refer to Division 14. A light, light switch and GFCI convenience outlet must be provided in the pit of each elevator, each on separate circuits in accordance with the State of Michigan Elevator Code.

FACILITY LIGHTNING PROTECTION
MARCH 17, 2008

1. Each building shall be equipped with lightning protection, which shall be designed and specified as an Underwriter’s Laboratory Master Label System.

2. Grounding System Requirement: Because of possibility that a breakdown in grounding insulation may accidentally energize all plant or facilities, this standard requires that ground connections shall be made to the electrode by methods providing the required permanence and ampacity, such as:
   a. Thermite weld.
   b. All non-current carrying metallic structures or steel frame building are grounded.

3. The main purpose of ground system is as follows:
   a. To maintain low potential difference between metallic parts, ensuring freedom from electric shocks to personnel in the area.
   b. To avoid fires from volatile materials and ignition in combustible atmospheres by providing an effective electric conductor system for the flow of ground fault currents and lightning. The connection between the grounding electrode and the earth should have a resistance less than 5 ohms.
   c. To create a low impedance path to ground to dissipate the energy from a lightning strike to minimize structural failures and to maximize personnel safety.
4. All existing lightning protection system shall be maintained during building renovations and extended to any additions to the building.

CATHODIC PROTECTION
MARCH 17, 2008

1. Underground Piping: Refer to 22 70 30 (15490) for cathodic protection method when such protection is determined to be appropriate.