Basis of Design

This section applies to the design and installation relating to motor control centers and motor control equipment.

Design Criteria

- MCCs shall be standard manufacturer design and construction to permit ready installation, removal, or replacement of standard components.
- Provide continuous metering for MCC breakers that will interface with the University’s centralized EMMS system.

Design Evaluation

The following information is required to evaluate the design:

- **Schematic Design Phase**: Description of overall design concept. Identification of motors to be supplied from the MCCs. Preliminary drawings showing location of equipment.
- **Design Development Phase**: Preliminary drawings showing location and sizes of the MCCs and motors. Preliminary drawings showing feeder routing to the MCCs. Draft specifications.
- **Construction Document Phase**: Final drawings showing location and sizes of the MCCs and motors. Final control wiring diagrams including terminal strip information if required to accomplish control functions. Final MCC elevations. Final layout drawings of the MCCs with the motor and capacitor cubicles shown. Complete specifications for motor control centers and electric motor starters.

Submittals

- Equipment catalog cuts
- Dimensioned installation drawings

Products, Materials and Equipment

- **Approved Manufacturers**
  1) Cutler Hammer
  2) GE
  3) Siemens
- Construction shall be according to NEMA standards, with unit terminal strips only.
- Starter units shall be the circuit breaker combination type.
- Provide all motors with proper starting and overload protective devices. Provide overload protections in all three phases for three-phase motors, in all “hot” legs for single-phase motors.
- Combination circuit breaker-type starters are preferred over separate components.
• Full voltage starters shall normally be used. Provide reduced voltage starters in case of motors over 60HP, limited supply power, or unusual load characteristics.

• Magnetic motor starters shall have Rotary Selector Switch “Hand-Off – Automatic” controls. This shall be for three-phase and single-phase motors. For motors without automatic control, the automatic position shall be left open.

• Motor starter circuits shall provide demarcation terminals to allow others to introduce controls both before and after the HOA switch.

• Manual position shall have no automatic controls except overload protection.

• Use automatic position for any automatic control including freezestats, load shed, smoke control, remote manual control, and process control.

• Automatic and manual positions shall have status contacts wired to the starter control terminal strip for smoke control fans and other critical motors.

• Only intermittent, task-oriented motor starters shall have locally mounted “start-stop” push-button control (in addition to the starter HOA). If safety is a concern, local emergency stop buttons shall be provided.

• Pushbuttons, selector switches, pilot lights bases, etc. shall be heavy-duty “oil-tight” devices.

• Control circuits shall operate at 120 volts. 480-volt starters shall have internal control transformers; motor control centers AUG utilize a common control transformer if a control circuit fuse or breaker separately protects each unit.

• Every control or remote pushbutton shall have an “ON” pilot light.

• Provide red “ON” pilot light and “OFF” pushbutton.

• Provide a green “OFF” pilot light and “ON” push button.

• Pilot lights shall be LED type.

• Motors over 20hp should have time delays on “restart after outage” to minimize inrush on start-up, and to prevent closing in on a back EMF. Provide staggered starting where necessary using adjustable relays.

• Provide power factor correction capacitors for motors over 15hp. Power factor shall be corrected to 97%.

• Electronic starters, following a power failure, shall automatically assume the mode that the starter was in before the power failure. To provide this for electronic starters, specifications need to state that electronic control modules shall provide this function.

Installation, Fabrication and Construction

• Vertical wiring access shall be accessible from the front without opening individual control units, with hinged cover and captive screws.

• Locate units away from high ambient temperatures and radiant heat sources.

END OF DESIGN GUIDE SECTION