GENERAL:

1. The scope of this document is to provide requirements for switchboards, panelboards, and motor control centers.
2. Load Centers are not allowed. Minimum level of quality is a panelboard or switchboard.

DESIGN GUIDELINES:

1. Switchboards
   1.1. Switchboards shall be a metal-clad assembly design, which provides ease of maintenance and testing without service interruption. It shall be a vertical free standing rigid metal enclosure with "compartments" used for additions and removal of circuit breakers and other equipment devices.
   1.2. Circuit breakers 200 amps and larger shall have adjustable trip settings.
   1.3. The switchboard assembly and location shall allow for future additions and changes to the switchboard.
   1.4. Switchboard shall provide both front and rear access with hinged doors. Front access only shall be approved by the Project Manager.
   1.5. All power and ground lugs to the switchboard shall be compression-type, long-barrel double –hole, copper type lugs.
   1.6. Switchboard shall consist of self-supporting feeder cubicles bolted together to form rigid metal enclosure. Each device shall be capable of being operated without opening the switchboard door.
   1.7. Switchboard shall be provided with local instrumentation and control system for automatic and manual operation of the switchboard and for monitoring and control during operation.
   1.8. Switchboard shall be equipped with appropriate devices for local testing and monitoring.
   1.9. Switchboards shall have 20% spare capacity for future loads. Spare Capacity is defined as 20% feeder capacity and 20% spare poles within the panel.
   1.10. When switchboards are equipped with ground fault protection, all overcurrent protective devices installed in the switchboard shall have ground fault protection. Ground fault sensing (when installed) shall use individual phase sensing and a neutral current sensor (such as a current transformer). Single unit (zero sequence) sensors shall NOT be used.
   1.11. Service entrance switchboards should have three phase voltage monitoring relay to trip the main in the event of sustained loss of one phase or phase unbalance in excess of 8 percent (with time delay of 10 seconds +/-). The voltage monitoring relay shall be General Electric Company model SPVRB or approved equal, and include a stored energy device such as a trip capacitor. The voltage monitoring relay shall NOT operate when power is lost to all three phases within the 10 second delay.

2. Panelboards

2.1. Panelboards shall be a dead front, safety type with a door-in-door hinge and consisting of a fully rated, isolated neutral bus, an equipment ground bus and main copper bus with two bolt compression lugs used to terminate feeders.
2.2. Feed through lugs are not acceptable.
2.3. Circuit breakers shall have bolted bus connections. Plug-in circuit breakers are not acceptable.
2.4. All wire connections, with the exception of screw terminals shall be wire nut type and shall be suitable for copper wire.
2.5. Balance the loads supplied by the panelboard in accordance with NECA 407.
2.6. Panel board shall have a typewritten directory describing the service of each circuit.
2.7. Provide each panelboard with a permanently attached nameplate displaying, at a minimum, the panelboard name, voltage, phase and feeder origin. Label each circuit breaker sequentially from left to right and top to bottom with permanent tags.
2.8. Panelboard shall be sized to provide spare capacity for future loads. Do not provide spare breakers. Spare Capacity is defined as 20% feeder capacity and 30% spare poles within the panel.
2.9. All panelboards shall be located in a dedicated, lockable electrical room or closet.
2.10. Branch circuit panelboards shall be located on the same floors as the loads they serve except emergency panelboards may be located as is practical.
2.11. When panelboards are equipped with ground fault protection, all overcurrent protective devices installed in the switchboard shall have ground fault protection. Ground fault sensing (when installed) shall use individual phase sensing and a neutral current sensor (such as a current transformer). Single unit (zero sequence) sensors shall NOT be used.

3. Motor Control Centers
3.1. Motor Control Centers shall have a main circuit breaker, control devices, motor thermal overload protection devices, circuit overcurrent protective devices, etc. for all HVAC motors greater than ½ HP.
3.2. Provide vertical hinged door wiring compartments with access to each starter unit for power and control wiring. Provide accessible pullbox compartments at top and bottom of each cubicle, for horizontal wiring between cubicles. Provide conduit entrance space in top and bottom of each cubicle. Provide hinged doors same size as starter enclosure for access to starter. Provide interlocked access to starter, so that the door cannot be opened without opening starter overcurrent device. Use matching blank panel doors for unused space and future starter provisions. Enclosure shall be NEMA Type 1A gasketed-general purpose – Indoor NEMA ICS-6.
3.3. All Bussing shall be 98% conductivity, electroplated copper with fully overlapped joints. Run main bussing horizontally through cubicles connected to vertical riser busses for connection of starter units. Vertical riser bussing shall be rated 300 or 600 amperes based on size and rating of the starters connected, and shall be rated to carry full load current. Provide special bussing required for loads, which exceed standard vertical bus ratings. Arrange bussing for extension to future sections. Provide 100% rated copper neutral bus isolated from the enclosure.
3.4. Provide spare capacity for future HVAC loads. Spare Capacity is defined as 20% feeder capacity and 20% spare poles within the panel.