1. This section provides guidelines for basic materials and methods for electrical distribution installations.

2. General design guidelines
   a. Provide fault current study on all new buildings to properly protect all electrical equipment. Settings shall be clearly indicated for each breaker and shall be given to the contractor for implementing. Consulting engineer shall verify that the electrical contractor properly implemented the breaker settings.
   b. Provide mechanically attached [not adhered] engraved white on black nameplate with minimum ¼” high lettering on each disconnect switch. Use white letters on red nameplate for emergency system.

3. Main electrical rooms
   a. Locate rooms to permit movement of very large pieces of equipment into and out of the room and to prevent flooding and water damage.
   b. Rooms shall house unit substation, main switchgear, motor control centers, panelboards, etc.
   c. Size room to accommodate all electrical equipment plus 25% spare usable space.
   d. Do not run piping for any other systems in or through electrical rooms.
   e. Do not provide sprinklers in electrical rooms; instead use fire rated walls and doors as allowed by IBC.

4. Switchgear and switchboards
   a. Provide double ended with secondary tie breaker, totally enclosed, metal clad, dead front switchboards with draw-out insulated case air or vacuum circuit breakers.
   b. Manufacturers: G.E., Square D, Siemens, Cutler Hammer. Provide 25% spare or space
   c. See DIV 26 Electrical Switchgear – “Primary Metering” campus standard for metering requirements.
   d. When ground fault protection is used on the main breaker it must also be specified for all of the feeder breakers in that switchgear or switchboard.
   e. Bus over 1200A shall be copper.
   f. Indicating lights shall be LED.
   g. Provide mechanically attached (not adhered) engraved white on black nameplates with minimum ¼” high lettering at each feeder circuit breaker. Use white letters on red nameplate for emergency system.

5. Panelboards
   b. Provide door-in-door panel covers
   c. Keep all lighting and power circuits separate with dedicated lighting and power panels, unless impractical and approved by university electrical engineer.
   d. Provide common trip for all multiple pole breakers. Do not use single pole breakers with removable breaker tie.
   e. All new buildings shall have fault current study done to properly size all new electrical equipment. Settings shall be clearly indicated for each breaker and shall be given to the contractor for implementing. Consulting engineer shall verify that the electrical contractor has properly implemented the breaker settings.
   f. All circuit breakers shall be fully rated. Series rated breakers are not allowed.
   g. Provide mechanically attached (not adhered) engraved white on black nameplates with minimum ¼” high lettering on each panelboard and disconnect switch. Use white letters on red nameplate for panelboards and disconnect switches connected to the emergency system. Indicate system voltage on nameplate.
i. Panelboard naming convention is as follows:

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## - BLN1
## - Bldg number to be provided by WWU
B – B – basement, 1 – first floor, etc
L – L-120/208, H-277/480
N – Normal power, E – Emergency power
1 – Panel number, sequentially numbered
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h. Circuit breakers shall be power quick-make, quick-break, trip free, circuit breakers with inverse time characteristics and bolted bus connections. Plug-in breakers are not acceptable.

i. Bus shall be either copper or tin plated aluminum.

j. Protect panelboard interiors from paint over-spray at all times during construction.

k. Provide a minimum of 25% spare 20A,1-pole circuit breaker spaces in all panelboards.

l. Provide dated typewritten panelboard directory card in plastic window frame on inside of panelboard doors.

i. Clearly indicate the area and devices supplied by each circuit.

ii. At the top of the directory, in bold letters, type the location in the building of the breaker which feeds this panel. The directory must reflect the actual room numbers if there is a conflict with the “architectural room number” as shown on the plans. If at anytime after occupancy the directory is found to be incorrect due to negligence by the installing contractor, they shall come back at such time and make it correct. Require contractors to keep working copy of the panel schedule up to date, to indicate all deletions and additions, and to note the date of all changes on the working panel schedule.

6. Motor control centers

a. Provide totally enclosed, dead front, NEMA Class 11, Type B or C motor control centers each having combination circuit breakers with breaker ahead of the magnetic starter, industrial grade motor starters, and other necessary equipment.

b. Minimum size starter – NEMA 1.

c. All motor control centers used shall be from the same manufacturer: Square D, General Electric, Westinghouse or Siemens.

d. Provide only long life lamps such as LED that indicate “green” pilot light for off and “red” pilot light for on.

e. Provide “Hand-Off-Auto” switch mounted on each controller with lockout capability.

7. Building distribution system

a. Main electrical service for buildings shall be at 480Y/277V, except for small buildings.

b. Ballasted light fixtures shall be 277V.

c. Separate lighting and power systems are required.

d. Design building risers to accommodate flexibility of building loads and future loads. Provide a minimum of 25% spare capacity in all systems.

e. Separate power wiring raceways away from communication raceways by one foot (12”) minimum to avoid noise to computer workstations caused by EMI.

f. When making connections to existing electrical lighting or power panels, confirm and show evidence that the existing panel capacity is capable of supporting the load to be connected in the new design. This will require 30 day, 15 min. peak demand recording meter data.

g. Install all panelboards within electrical rooms or closets. Provide at least one electrical closet per floor. Minimum closet dimension shall be 5’wide and 18” deep. Provide access from corridor or lobby and not through lab or office. Do not provide access to an electrical closet through a telephone/data closet.
h. Design circuits to maintain voltage to within ±5% at all outlets. Finer regulation will be provided to accommodate specific users on an as needed basis through the use of voltage regulating equipment provided as part of the specific user equipment.

i. Equipment voltage must be specified to match building. If user equipment does not match building voltage, provide buck-boost transformer to correct voltage.

j. Design feeders for a voltage drop of not more than 2% between phases at the NEC calculated connected load. Provide documentation that this criteria is met prior to final design.

k. Do not locate panelboards on the other side of walls with computer equipment.

8. Transformers
   a. Transformer windings can be either copper or aluminum, Class H insulation with temperature rise not exceeding 150°C above a 40°C ambient, with maximum hot spot temperature of 220°C.
   b. Low voltage distribution transformers should be K rated, depending on load type. Generally, low, medium, and high nonlinear harmonic loads should have K-4, K-13, and K-20 rated transformers, respectively. The engineer shall size the primary overcurrent protection to prevent nuisance tripping due to high in-rush currents and pay particular attention for transformers K-13 and over.
   c. Transformers rated greater than 25kVA shall not be mounted on or near the wall adjacent to an office, computer room or laboratory unless the wall is magnetically shielded.
   d. Raceway connections shall be flexible metal conduit.
   e. Noise level shall not exceed NEMA ST20 requirements.
   f. Secure floor mounted types via rubber pad isolators sized to give a 400% safety factor.
   g. Secure wall mounted types via rubber-in-shear isolators sized to give a 400% safety factor.

9. Motors
   h. Provide high-energy efficiency motors appropriate for use and location.
   i. Dedicated motors used for systems such as fire pumps and smoke exhaust fans do not need to be energy efficient.
   j. For multi-speed motors, select motor and speed control and selection devices for high efficiency at all expected operational speeds, not only maximum or design speed.
   k. Variable speed controls furnished so that resonant frequencies, which would cause damage to mechanical equipment, shall be blocked out.
   l. Motors less than ½ HP: Generally, provide single phase, 120 VAC, 60 Hz.
   m. Motors ½ HP and larger: Generally, provide 480 VAC, 3-phase, 60 Hz where available.
   n. Coordination required: Coordinate motor selection with mechanical and other equipment's requirements for high-energy efficiency

End