All electrical work in WUSM properties shall comply with the following:

16050-BASIC ELECTRICAL MATERIALS AND METHODS

“WUSM” – Washington University School of Medicine

“WUSM D&C” – Washington University School of Medicine Department of Design and Construction

“WUSM EH&S – WUSM Department of Environmental Health and Safety

All contractors shall have on file a copy of licenses for all personnel on site. Each person authorized to work on WUSM property shall be issued a contractors badge showing that person’s company and name. This badge will be worn at all times.

A letter of insurance must be filed with the general contractor and WUSM project manager.

All electrical work shall comply with the current revision of the NEC, IBC, local and state codes and requirements.

No smoking is permitted on WUSM property. Use of Tobacco products are not permitted on WUSM property including electronic cigarettes.

Parking of vehicles on campus property will be at the expense of the contractor.

Trash removal and clean-up shall be done on a daily basis.

WUSM EH&S has guidelines on ceiling tile removal and dust containment policies for infection control. These guidelines must be strictly followed.

All contractors shall submit their “City hot work permit.”

All contractors shall follow the adopted WUSM Arc Flash Safety Procedures. See WUSM representative for copy of procedures.
Policy: It is the goal of WUSM Facilities Management Department to install a system that is functionally efficient, maintenance friendly and modern enough to report system problems as needed. To meet these guidelines, we have requested that the following items be adhered to when installing or ordering equipment.

All wall penetrations to be sealed with appropriate compound that meets the rating of the wall penetrated.

All projects to have final drawings/As-builts submitted to facilities for record documentation. Contractor shall be held responsible for updating established AutoCad generated electrical master one-line diagrams and floor plans that have changed due to their scope of work. The master one-line diagrams and floor plans shall be obtained from the Facilities Management office. These plans shall be updated/modified and laminated on both sides and reposted in the main electrical room. (This only pertains to buildings that have an AutoCad master one-line and floor plans established. See Facilities Management for current list of established buildings.)

Electrical identification labels for electrical equipment shall be added or modified as required to meet the scope of the contractors work. Labels shall be by the Brady Corporation.

Switchboard, panelboard, MCC, transformer and disconnect labels to be 2-1/4” high with information as follows. The name of the equipment in 1/2” high bold letters, followed by the “fed from” or “feeds” and Room # letters in 1/4” bold. Labels may be on smaller stock and lettering smaller where space does not permit 2-1/4” high labels. See examples below.

Panel 1RP1
Fed From Panel 1DP1
In Room 1001

Or

Transformer 1TN1
Feeds Panel 1RP1
In Room 1001

Labels for above shall be colored as follows: Other than Health Care Facilities.

a. Normal Power – Black lettering on white background.
b. Life Safety (Emergency)/Optional Standby – White lettering on red background.

Labels for above shall be colored as follows: Health Care Facilities.

  c. Normal Power – Black lettering on white background.
  d. Life Safety – White lettering on green background.
  e. Critical branch – White lettering on red background.
  f. Equipment branch – White lettering on blue background.

All receptacle and switch cover plates to be labeled with panel name and circuit number from where fed. Provide black lettering on clear background for Normal power and white lettering on clear background for Emergency circuits.

Conduit stubbed up above accessible ceiling for fire alarm, telephone and data shall be turn into open plenum area at 90 degrees and bush. Turn into room at a minimum of 10” above drop ceiling tile.

All conduits shall contain an equipment grounding conductor. The conduit system must not be used as a grounding source.

No in-slab conduit is allowed on any project.

The j-box covers shall be labeled with permanent marker indicating panel board name and the circuit number(s) of all internal wiring.

On an existing installation or when adding to an existing panel or circuit, the panel and circuit shall be ampèred so that the added load will not exceed the breaker or panel ampacity. (80% of the maximum rating of both the circuit breaker and the panel board is the cut-off point.)

For lighting and receptacles, all old conduit and wiring shall be removed and disposed of. Feeder conduit that are to be reused shall be upgraded to THHN/THWN and have neutral and ground wires installed (Or as instructed by owner).

All patient areas will have Hospital grade receptacles installed.

All new or reused medium voltage cable (5kv) shall be tested by Low Frequency testing procedures before installation or reuse.

All new construction, other than health Care Facilities, shall have the minimum following power systems provided: (This assumes a generator is available).

  a. Emergency Power (Life Safety)
  b. Emergency Optional Standby Power (Other than Life Safety)
c. Normal Power

All new construction for Health Care Facilities, shall have the minimum following power systems provided:

d. Emergency Power (Life Safety)

e. Emergency Power (Critical Branch)

f. Emergency Power (Equipment Branch)

g. Normal Power

All lighting and receptacle feeds shall be in conduit from the source panel out to a junction box in the vicinity of the loads being served. Use of MC cable in situations other than whips must be approved by WUSM, otherwise install entire run in conduit. In no case shall MC cable originate from the source panel.

All receptacles in hallways used for housekeeping appliances, shall be connected to its own respective circuit. Run #10 stranded wire as a minimum to these duplex receptacles.

Hallway lights shall have every third light unswitched and connected to the emergency power panel. The remaining lights will be controlled by ceiling mounted ultrasonic sensors powered via power packs. The sensors shall have an adjustable delay.

Restrooms to be controlled via ultrasonic technology sensors powered via power packs. The sensors shall have an adjustable delay. (Use Watt Stopper Brand.)

Offices and meeting rooms to be controlled via a dual technology sensor with on/off capability installed at the light switch location. The sensor shall have an adjustable delay.

Lab light control sensor technology shall be determined by the design team based on lab equipment.

Manufacturer for above-mentioned sensors shall be Watt Stopper.

Mechanical and electrical room lighting to be controlled via a digital time switch installed at the switch location. Switch to have reset capability and warning blinks before lights out. The sensor shall have an adjustable delay.

No die-cast fittings are acceptable, steel set screw and compression fittings are acceptable for use on EMT installations.

All exposed conduit used in outside/exterior electrical applications shall be rigid IMC conduit or aluminum.
All electrical switchgear and panel boards shall be free of dust, dirt and trash along with their associated closets or rooms prior to final acceptance by WUSM.

**Wire Color Coding**

<table>
<thead>
<tr>
<th>480/277V</th>
<th>208/120V &amp; 4160V</th>
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</thead>
<tbody>
<tr>
<td><strong>Phase</strong></td>
<td><strong>Color</strong></td>
</tr>
<tr>
<td>A</td>
<td>Brown</td>
</tr>
<tr>
<td>B</td>
<td>Orange</td>
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<tr>
<td>C</td>
<td>Yellow</td>
</tr>
<tr>
<td>Neutral</td>
<td>Gray</td>
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<tr>
<td>Ground</td>
<td>Green</td>
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277 Volt – The colors used for switch legs on 277V lighting circuits shall be the color of the phase conductor that provides power to that circuit with purple being used for travelers on 3-way and 4-way switches. Also, the phase conductor shall be labeled at each switch with its designated branch circuit number.

120 Volt – The colors used for switch legs on 120V lighting circuits shall be the color of the phase conductor that provides power to that circuit, with purple being used for travelers on 3-way and 4-way switches. Also, the phase conductor shall be labeled at each switch with its designated branch circuit number.

Hoods must be UL listed as a system and energy efficient. Meet with WUSM D&C and EH&S to discuss other requirements.

No blue “Smurf” tubing is allowed.

Identify raceways and cables of certain systems with color banding as follows:

- **a)** Bands: Colored adhesive marking tape. Make each color band 2 inches wide, completely encircling the conduit and place adjacent bands of 2-color markings in contact, side by side.

- **b)** Locate bands at changes in direction at penetrations of walls and floors at 50 foot maximum intervals in straight runs and at 25 foot intervals in congested areas.

- **c)** **Colors:** As follows:

  1) Fire-Alarm System: Red.
GROUNDING

All grounding shall be sized and installed in accordance with the NEC (National Electric Code). New construction shall have a main ground bar with stand off bushings near the service entrance (minimum size to be 24” long x 4” high x ¼” thick). Lightning protection, structural steel, main water pipe, transformers, other grounding electrode risers for electric, and IS closets shall all terminate at the main ground bar.

Ground bar shall be made of copper.

BONDING

All devices, panels, equipment, etc. shall be bonded per NEC (National Electric Code).

16120-BUILDING WIRE AND CABLE

Service entrance, feeders, branch circuits and class 1 control circuits: All conductors shall be copper with THHN/TWHN insulation.

Fire alarm circuits: Power limited fire protective signaling circuit cable. Where staged evacuation is used, the riser cable and horizontal cable to next zone shall be CIC (Circuit Integrity in Conduit) cable.

MC cable is acceptable for “whips” from junction boxes to a device.

Conductors shall not be spliced with “pinch connectors” or “butt splices”. All branch circuits shall be wire-nuted or wing-nuted or equal.

Wiring to fixtures shall be “hard-wired” (no plug-in type, i.e. Reloc, Holoflex, or other modular wiring system).

All electrical circuits will be pulled with dedicated neutrals. The neutral conductor shall be numbered and identified with the associated phase conductor at the panel board as well as all junction boxes.

Any electrical wiring that is connected to the emergency generator shall be in its own conduit system. Do not combine with normal power. This includes legally-required and optional standby.

16140-WIRING DEVICES

Wireway installed at labs to be prewired using wing nuts or wire nuts, no “pinch connectors” or “butt splices”.

Wireway shall be 4000 series (dual service) with brushed aluminum finish in labs, cold rooms, and wet areas. In offices, Wiremold shall be steel, color-coordinated through Architect. Plastic Wiremold is not allowed.

Each strip of Wiremold shall have 6 to 8 receptacles per circuit, 2 circuits per strip.

Wiremold shall be mounted above the backsplash on a wall, or below shelves, above counter, on islands.

Receptacles in wet areas, cold rooms, outside, and within 6 feet of a sink shall be protected by GFCI circuit breakers.

Receptacles shall be NEMA 5-20R configuration unless otherwise required. Use Hubbell heavy duty, specification grade and/or hospital grade duplex receptacles (Or equal) (Ivory standard, red on emergency power).

Receptacles shall be white or ivory in color (co-ordinate color with Architect). Receptacles connected to emergency power shall be red in color.

Receptacles cover plates shall be nylon, white or ivory in color (co-ordinate color with Architect). Receptacle cover plates shall be red in color when connected to emergency power. Leviton high abuse nylon wall plates shall be used in all areas (Or equal). Plastic wall plates are not acceptable.

All special equipment plugs should be verified with the equipment plug configuration before ordering.

Receptacles that are to be located/used outdoors shall use: Cast aluminum Hubbell WP8M weatherproof while-in-use covers (Or equal).

Light switches and plates shall be white or ivory in color (co-ordinate color with Architect). Mercury switches are not allowed. Use Hubbell # HBL 1221 series (Or equal). Use red switches when connected to emergency power.

Dimmer switches shall be Nova T* by Lutron. The dimming ballast shall match the dimmer manufacturer.

Test wiring devices for proper polarity and ground continuity. Operate each operable device at least 6 times.

Test ground fault circuit interrupter operation with fault simulations according to manufacturer recommendations.

In case of discrepancy between details of wiring and architectural/mechanical drawings, consult architect as to exact location. Owner reserves the right to relocate any outlet or device prior to its installation within 10 feet of its original location without extra cost.

Floor outlets for special applications shall be reviewed with WUSM D&C.
Wall receptacles shall be mounted 18" above finished floor to center unless otherwise noted.

Wall switches shall be mounted 48" above finished floor to center unless otherwise noted.

16400-SERVICE AND DISTRIBUTION

WUSM has four outdoor main substations through-out the campus. These outdoor substations are fed by two separate Ameren U.E. primary feeders. The four substations are the Mckinley substation, CSRB substation, Duncan substation and Mid Campus substation.

Buildings served by the above outdoor substations shall have indoor substations designed as double-ended with automatic open transition on the tie breaker if power is lost from either of the two outdoor substation feeds and closed transition on restoration. The substation shall have manual closed transition features to transfer power from either end of the substation to the other. Lockout features shall be provided on both main breakers to prevent the automatic closing of those breakers into a fault, overload or work environment. The substations shall be provided with Basler Electric instantaneous and time overcurrent, undervoltage, overvoltage, lockout and phase sequencing relays. Substation ends to be provided with Square-D power logic 7650 or 4350 meters. Indoor substation main breakers to have LSIG function.

Present campus substations have a primary of 4.16 kV, 480Y/277 V secondary.

Substations shall be designed for arc flash mitigation on the 5KV breakers.

Power quality shall be assumed adequate; no power conditioning is required.

Provide hinged doors at the rear of all freestanding switchboards and substation distribution sections.

16441-ENCLOSED SWITCHES

Disconnect switches shall be heavy duty type either fused or non-fused as required and as manufactured by Square-D or Cutler-Hammer.

Indoor switches shall be NEMA 1; outdoor and unprotected switches shall be NEMA 4X; outdoor and protected switches shall be NEMA 3R.

Service entrance switches shall be UL listed for use as Service Equipment.

16461-DRY TYPE TRANSFORMERS

Square D or Cutler-Hammer, floor mounted dry type transformers.
All distribution transformers shall meet the NEMA TP1 standards for energy efficiency as mandated by the Energy Policy Act of 2005.

Transformers shall meet the NEMA standard 20 sound levels.

Transformers in substations shall have a sound rating of 6db below NEMA 20 standards.

Transformers that serve heavy computer loads shall be K-13 rated with fully rated double neutral secondary.

Transformers shall have both primary and secondary over-current protection.

Loads must be balanced by design.

Large (150-300 kva) 480-208Y/120 V transformers feed distribution panels

All transformers including substation shall be type EE Energy Efficient transformers with a maximum 115 deg C temperature rise. Use 220 deg C insulation.

For transformers 3kva and above: Four 2.5-percent taps, 2 above and 2 below rated high voltage.

Provide transformer lug kits for each transformer.

Adjust transformer taps to provide optimum voltage conditions at utilization equipment through-out the normal operating cycle of the facility. Record voltage and tap settings and post on transformer.

Transformers shall be mounted on concrete pads with vibration isolators installed between transformer and pad, secured with 3/8" bolts to pad.

Dry Type & Padmount Oil filled Transformers Accessories: (Required where indicated to be installed by electrical engineer for that particular type of transformer.)


2. Electrostatic Shielding: Insulated metallic shield between primary and secondary windings.

3. AA/FA 33% Overload Rating with model 98 Temperature Monitor on Power Dry transformers.

4. Pressure vacuum gage (with alarm contacts).

5. Thermometer with maximum temperature indicator (with contacts).

6. Winding temperature gage (with contacts)
7. Fan control box.
8. Pressure test valve
10. Copper or aluminum windings are acceptable
11. Hinged Rear doors with padlock provisions.
12. Lightning arrestors
13. Liquid level gage
14. Drain valve with sampler

16470 – PANELBOARDS

Panels shall be as manufactured by Square D or Cutler-Hammer.

All panels shall be rated for their associated available short circuit.

Lighting and receptacle panels shall have Main Circuit Breakers.

Panels shall have bolt-on branch circuit breakers.

Panels shall have copper bus.

Panels shall have a ground bus.

Provide panels with feed thru lugs for a second section, where more than 42 poles are indicated. Multi-section boards to have the same size enclosure.

Minimum lighting and receptacle panel amperage rating is 100 amps. 225 amp, 42 circuit is preferred.

Panels shall be flush or surface mounted, depending upon location.

Lighting panels shall be 480Y/277 Volt, 3 phase, 4 wire, and ground.

Receptacle panels shall be 208Y/120 Volt, 3 phase, 4 wire, and ground

Distribution panels may be fusible or circuit breaker type, 400, 600, or 800 amp bus, and 3 phase, 4 wire and ground, 480Y/277 Volt or 208Y/120 Volt, as required.

Distribution panelboard, all sections, will have copper bussing the full height of the panelboard to allow maximum space for future breakers. Provide 42” wide minimum
interior width. Panel height/breaker mounting space, as determined by electrical engineer.

Contact WUSM D&C for Panel Identification. In existing rehab work, follow existing method of panel identification.

**16471-SWITCHBOARDS**

Switchboards shall be as manufactured by Square D or Cutler-Hammer.

Switchboards shall be rated for their associated available short circuit.

Switchboards shall have copper bussing.

Switchboards shall have rear hinged doors when part of a substation.

Switchboards shall be rear connected.

Switchboards shall have a ground bus.

Switchboards shall be free standing type unless noted otherwise by engineer.

**16472-MOTOR CONTROL CENTERS**

Shall have the following features:

1.) 20” deep free standing construction.

2.) Copper bussing

3.) CU ground bus

4.) 22KAIC minimum @ 480V 3-phase 3-wire (To be determined by electrical engineer).

5.) Combination circuit breaker starters to include:

   a.) Hand-Off-Auto selector switch

   b.) Red ‘ON’ LED Pilot Light

   c.) 2-N.O. and 2-N.C. Aux. contacts

   d.) 120V control power transformer

6.) Wires to be labeled.

7.) 12” pull-box on top of all sections
8.) 9” vertical wireway.

9.) Electronic overload protection such as Square-D “Feature Unit” or equivalent.

10.) Get approval from WUSM before installing MCC’s. Most MCC’s are being replaced by VFD’s.

16473-5KV SWITCHES

Shall have the following features:

1.) Silver plated copper bus

2.) ANSI 49 paint

3.) Glass insulators

4.) Hot stick with fuse handling tool

5.) Current limiting fuses or time delayed fuses as specified by engineer.

6.) Spare fuses (1 per switch)

7.) Hinged rear doors

8.) Rear connection assembly

9.) Pad lockable

10.) Surge arrester where shown or specified by engineer.

16474-CIRCUIT BREAKERS

Sub-feed breakers shall not exceed the rating of the main breaker of the panel or switchboard.

Circuit breakers for switching lights at panel boards shall be switch duty rated.

Circuit breakers for HACR equipment shall be HACR rated.

Ground fault circuit breakers shall be color coded, with separate neutral.

Branch circuit breakers shall be bolt-on-type, replaceable without disturbing adjacent breakers.

Circuit breakers shall be furnished with lug kits to accept cabling as shown on plans and one-lines.
Micrologic Trip, Solid State breakers, unless noted otherwise, are to be equipped with the following features.

1.) 100% rated unless noted otherwise.
2.) Long-Short-Instantaneous & Ground Fault trip
3.) True RMS sensing
4.) Interchangeable rating plugs.
5.) Thermal and magnetic back-up protection.

16475-METERING FOR POWER DISTRIBUTION ON MAIN 277/480V AND 120/208V SUBSTATIONS

Provide CM-7650 or 4350 Circuit Monitor including CT’s and PT’s. Circuit monitors to include an Ethernet card, display and complete internal wiring for interface to the Power-logic communication system. Connected to the Schneider Electric WAGES metering system via WUSM Ethernet connectivity. Schneider Electric to add the meter(s) to the WAGES software for storage of data, graphics and alarming.

16481-ENCLOSED MOTOR CONTROLLERS

Combination starters shall be either non-fused, fused or circuit breaker type as required by engineer and shall be as manufactured by Square D or Cutler-Hammer.

Indoor enclosures shall be NEMA 1; outdoor and unprotected enclosures shall be NEMA 4X; outdoor and protected enclosures shall be NEMA 3R.

Manual Motor Starters shall be: Square-D Class 2510.

Magnetic Motor Controllers shall be: Full Voltage, Non-Reversing, across-the-line controllers or combination disconnect controllers.

1. Minimum controller size is NEMA Size 0. Size 00 is not permitted.

2. Control circuit: 120V Provide control power transformer integral with controller unless other supply of 120V control power is indicated. Provide control power transformer with adequate capacity to operate connected pilot light, indicating and control devices. Control power transformer shall have two primary fuses, one secondary fuse.

3. Where separate control power is provided to starter, provide separate integral control power disconnect.
4. Combination controller: Switch type; fuses or nonfused as indicated; quick-make, quick break switch; factory assembled unit.


7. 2 normally open and 2 normally closed auxiliary contacts.

8. Start-Stop pushbutton.

9. Overload protection (Solid state overload relay) such as Square-D “Feature Unit”.

16482-MOTORS

All motors shall be high efficiency rated and shall have Copper windings only. Motors to be VFD rated NEMA MG1 part 31.

16483-VARIABLE FREQUENCY CONTROLLERS

Acceptable manufacturers of VFD’s are Toshiba, ABB.

Review with WUSM D&C the use of VFD’s on pumps and HVAC equipment prior to design.

Drive to include the following features:

1. Nema type 1 enclosure (Nema enclosure type subject to environment.)

2. Variable torque

3. Three contactor manual bypass or two contactor bypass w/maintenance safety switch.

4. 22KAIC rating minimum (To be determined by electrical engineer).


6. AFC controls include: Red power ‘ON’ Pilot light, Green AFC ‘Run’ Pilot light, Yellow AFC ‘Fault’ Pilot light and Yellow AFC ‘Bypass run’ light.

7. Pilot light clusters include power on (Red), run (Green), fault (Yellow) and Bypass (Yellow).

8. Line reactors: A 3% line reactor minimum required on all drives, with reactors installed within the drive enclosure on drives 5HP and above.
9. AFC Fault Contact.
10. AFC Run Contact.
11. Fire/Freeze Stats Interlock for fans.
14. Power Supply

Communications: All AFC to be used with external system within a multidrop LAN configuration. Interface shall allow all parameters settings of AFC to be programmed via BAS control. Provide capability for AFC to retain these settings within the nonvolatile memory. The interface shall be compatible with Johnson Controls. Provide a communications card (N2 or similar) with the AFC.

Units shall have automatic high temperature shut down at and above 40°C.

All components shall be designed for continuous (24/7) operation without replacement more frequently than once every 2 years (except for filters if included).

Unit shall be designed for easy fan replacement.

VFD’s shall be energy efficient type.

Drives shall be provided with a 5-year factory warranty.

16484-ATS SWITCHES

ASCO model 7000 with communication package or later model. (Preferred)

Russ electric, or other brands on approval from WUSM.

Transfer switches shall be closed transition type except for 5KV transfer switches which shall be as instructed by engineer. Furnish transfer switches with bypass feature on all new construction and where physical space allows on existing buildings.

Provide with a 5 year warranty.
16510-INTERIOR LIGHTING

General LED

The use of LED fixtures shall be approved by the owner. A mockup of individual fixtures shall be demonstrated to the owner and approved prior to installing for all applications.

Color temperature for LED fixtures shall be approved by owner.

All LED fixtures shall use the **Ideal PowerPlug** or equal luminaire disconnect for connection between the A.C. power and the LED driver(s) for ease of removing power to the luminaire.

Use 277 volt where available in building.

MC cable is acceptable for “whips” from junction boxes.

Fixtures shall be hard wired (no plug-in” type, i.e. Reloc, Holoflex, or other modular wiring system).

Troffer fixtures shall have 4-point support independent of grid. Other fixtures shall be supported per applicable codes.

Fixtures shall not be wired using “pinch connectors” or “butt splices”.

General Fluorescent:

Use G.E. lamps or equals by Sylvania.

Use F28T8/SP41/UMX/ECO UltraMax Watt Miser lamps on 4’ non-dimming lamp applications.

Or use F32T8/XL/SPX4100/HL/ECO lamps when used in dimming applications.

Use F17T8/SPX41/ECO lamps on 2’ applications.

All fluorescent fixtures shall use the **Ideal PowerPlug** or equal luminaire disconnect for connection between the A.C. power and the electronic ballast(s) for ease of removing power to the luminaire.

Electronic ballasts:

1.) Use G.E. UltraMax Ballasts on 4’ and 8’ applications or Equals by Sylvania.

2.) Otherwise use electronic nema premium high efficiency ballasts with less than 10% total harmonic distortion.

3.) 90% minimum power factor
Use 277 volt where available in building.
MC cable is acceptable for “whips” from junction boxes.

Fixtures shall be hard wired (no plug-in” type, i.e. Reloc, Holoflex, or other modular wiring system).
Fixtures shall be static troffers.
Fixtures shall have 4-point support independent of grid.
All lamps shall have a 4100K color temperature and minimum 82 CRI.
Fixtures shall not be wired using “pinch connectors” or “butt splices”.

All areas except Labs: (See use of LED fixtures above)

Use 2’x4’ fluorescent fixtures with (3) F28T8SPX41 lamps (1 ballast).
Use 2’x2’ fluorescent fixtures with (3) F17T8/SPX41 lamps (1 ballast).
Use indirect or combination direct/indirect recessed fluorescent fixtures when directed by WUSM D&C.

(if plenum space is a problem, this item to be reviewed with WUSM D&C)
Avoid deep “high-hat” ballasted fixtures.

Provide incandescent down lights in conference rooms. Lights controlled by Lutron dimming system. Others must be approved by the WUSM project manager.

Labs: (See use of LED fixtures above)

Use 1’x4’ 2-lamp (1-ballast) lay-in direct or combination direct/indirect recessed pendant mounted fluorescent fixtures as directed by WUSM D&C.

Switch alternating lights in each row with respect to 1’x4’ row mounted recessed or pendant mounted direct/indirect fixtures.

Exit Fixtures:
Exit Fixtures shall be LED Lithonia Model # LQMSW3R120/277 or universal LED equal.
Exit fixtures are to be fed from emergency panel circuit where available.

Auxiliary Lights: (See use of LED fixtures above)
Night light fixtures are to be fed from the emergency panel circuit where available.
No battery ballasts and no unit equipment allowed.

**16520-EXTERIOR LIGHTING**

Parking lot and pedestrian walkway site lighting:

All parking lot lighting fixtures, walkway bollards or other pedestrian walkway lighting shall have fusing at each individual pole or bollard.

Use LED exterior fixtures unless owner does not approve of chosen fixture and there are no LED equivalents. A mockup of the fixture and approval from the owner must be obtained before installing.

**16613-EMERGENCY POWER SUPPLY**

Diesel Generators will provide the emergency power.

Emergency generators may be furnished by Caterpillar, Onan or Kohler.

Emergency power is required for the following: Fire pumps; egress lighting, including exit signs and night-lights; fire alarm system; security system and elevator. One elevator shall run on emergency power per bank of elevators or as instructed by engineer and WUSM. WUSM D&C must review other systems prior to design. Emergency power for mechanical systems shall be reviewed on a building by building basis. Emergency power for tenant spaces shall not exceed 2 watt/sq.ft. unless approved by WUSM representative.

**Buildings other than Health Care Facilities (See Nec 700)**

The emergency system shall contain a minimum of two distinct emergency systems (Two transfer switches) that will automatically supply illumination, power, or both to designated areas upon failure of the normal supply. One system shall be dedicated for emergency loads only. These loads supply, distribute and control power and illumination essential for safety to human life. The second system shall be a legally required/optional standby system that serves loads such as heating and refrigeration systems, communication systems and other systems that are not of the life safety nature.

**16700-COMMUNICATIONS**

For voice and data cabling requirements and specifications, see Washington University School of Medicine, BJC and Telecommunications Facility Corporation Low Voltage Voice and Data Pathways and Spaces Standards.
16721-FIRE ALARM SYSTEMS

The preferred providers are Notifier (Tech. Elec.), and Siemens.

The fire alarm system shall be addressable.

Photo/Thermal multisensing sensors shall be used for general open area protection. Smoke detectors are not to be used in autoclave areas. Use Ionization type for special applications only.

Duct detectors shall be photoelectric type, located upstream of humidifiers.

Elevators need speaker and shielded traveling cable if voice system is used or required.

Strobes and speakers must be suitable for the environment (i.e., wet and cold areas).

Fireman's telephone jack must have insulating sleeve to prevent grounds.

Telephone in elevator shall be ADA - Rath Microtech type, linked to outside monitoring.

Fire Alarm Control Panel (FACP) to have owner specified bypass function. FACP reports to the central facility in the North Building basement over hard wired copper, fiber or leased telephone lines.

Fire alarm combination speaker/strobes, individual speakers and strobes shall be used when the buildings highest occupied floor is less than 75'.

Fire alarm combination speaker/strobes, individual speakers and strobes shall be used when the highest occupied floor is greater than 75'.

Fire alarm wiring shall be in conduit when located in mechanical rooms and above hard ceilings.

Fire alarm wiring above lay-in ceilings to be routed through support rings dedicated for fire alarm wiring.

All fire alarm wiring shall be plenum rated, red in color. Used in all areas except where CIC or other special type cable is required.

Fire Alarm System shall be designed per ADA or NFPA 72. Use the stricter requirements of either.

Fire alarm speaker and strobes or combinations shall be mounted 80” above finished floor to center unless otherwise noted. Engineer to determine locations that require a ceiling mounted device.

All new fire alarm systems shall have an Alertus mass notification system installed to communicate emergency messages to the building occupants via the fire alarm speaker.
Program the fire alarm system such that a fire alarm takes precedence over the Alertus messaging.

A remodel or expansion of an existing building that affects the fire alarm system shall take into consideration the Alertus mass notification intelligible coverage.

**Fire Alarm Installations:**

a. Risers shall be a minimum of 1-1/2” EMT connected to a 12”x12” minimum Hoffman box at each floor level. (preference in electrical rooms)

b. All fire alarm system panels shall be connected to a dedicated 120v, 20 amp emergency circuit (if available).

c. Fire alarm system wiring in conduit shall be a minimum of 3/4” EMT unless noted to be larger.

d. All device junction boxes shall be 2-1/8” deep 4” square boxes (unless noted to be larger).

e. All junction box covers shall be painted **RED**.

f. Follow fire alarm manufacturers device back box requirements, device wire size and type. All devices to be mounted in or on a box.

**16727-SECURITY ACCESS SYSTEM**

Coordinate with campus security for specific needs. The present security system on campus is the LENEL Security System.

Security systems shall be powered from an emergency panel circuit.