

307.6 Outline Specification Example - Electrical

Division 260000

1.1 GENERAL

A. New Instructional Building

1. The electrical system will be designed as a stand-alone project with its own service entrance and distribution.
2. The emergency power for the facility will be a new diesel powered generator installed in a new Basement Generator Room.

1.2 CODES AND STANDARDS

A. Codes

1. The Kentucky Building Code (KBC)
2. National Electrical Code (NEC)
3. Applicable Local Codes and Ordinances

B. Standards

1. American National Standards Institute (ANSI)
2. Certified Ballast Manufacturers (CBM)
3. Institute of Electrical and Electronic Engineers (IEEE)
4. National Electrical Manufacturer's Association (NEMA)
5. National Fire Protection Association (NFPA)
6. Underwriters' Laboratories (UL)
7. Electrical Testing Laboratories (ETL)
8. Occupational Safety and Health Act (OSHA)
9. National Electrical Contractors' Association (NECA)
10. IES Lighting Handbook
11. TIA/EIA Standards for Telecom, Cabling and Connectors

1.3 DESIGN CRITERIA

A. Load Densities - Lighting and Receptacles (Watts/SF)

	<u>Room or Area</u>	<u>Lighting Connected</u>	<u>Receptacles Connected</u>
1.	Electrical, Telephone, Rooms	0.7	3.0
2.	Mechanical Rooms	0.5	3.0
3.	Laboratories	0.9	6.0
4.	Lobby	0.7	0.25
5.	Office Areas	0.9	3.0
6.	Meeting Rooms and Classrooms	0.9	3.0
7.	Public & Staff Toilets	0.5	0.25
8.	Service Areas & Corridors,	0.7	0.25
9.	Stairways	0.5	0.25
10.	Storage Rooms	0.5	N/A
11.	Utility Rooms	0.5	0.5

12.	Auditorium	0.9	0.5
13.	Clinical Space	0.7	0.25

B. Load Densities

1. Heating, Ventilating and Air Conditioning Equipment, Freezers, Coolers, Apparatus, Appliances and Computer Equipment (Watts/Sq. Ft. or as indicated):

	<u>Area</u>	<u>Connected</u>
2.	Laboratories	15
3.	Support Areas	15
4.	Storage	8
5.	Office/Core	10
6.	Workrooms	10
7.	Auditorium	7

C. Illumination Levels

1. The latest addition Illuminating Engineering Society's Handbook will be used for establishing target maintained illumination levels throughout all areas. Specific influences of glare, task complexity, surface reflectance characteristics, veiling brightness and user age are addressed with this procedure.
2. Local codes will take precedence when they dictate the use of alternative procedures or require minimum lighting levels for specific areas.

1.4 SYSTEMS

A. Electric Service Entrance

1. The incoming service will consist of two incoming 15 KV primary circuits. The circuits will connect to new switches located in the existing Electrical Room in Building 55B.
2. Based on the available dual primary services and the need to enhance the reliability of the distribution system in case of any one service failure, the normal operation will be maintained by means of a double ended, fully rated unit substation with manual or automatic secondary load transfer. Substation will be located at the basement level.
3. In order to provide the required continuity and future flexibility, the main transformers will be selected to operate normally at 60 to 70% of rated capacity. The projected size of the service entrance substations is 500 KVA each.
4. The unit substation will be located in a dedicated electrical room, properly sized for accessibility, maintenance and operation.
5. 120/208-volt service for equipment and convenience outlets will be provided from a 480 volt Delta primary. 120/208-voltage secondary step-down transformers located on each floor in Electrical Closets.
6. Metering will be provided in each substation and will monitored by the Building EMS system.

B. Emergency Power

1. A local emergency generator will be provided to serve the Building. It will be located in an underground vault between Existing Building B and Muhammad Ali Blvd. the generator will be sized to feed the New Instructional Building and the Existing Buildings B and D.
2. Emergency power will be provided for the following loads:
 - a. Life safety related exit and passageway lighting.
 - b. Fire alarm and security systems.
 - c. One elevator (selection of any elevator will incorporated into the control design).
 - d. Selected critical loads, (lighting, ventilation) and miscellaneous critical equipment and apparatus.
 - e. Fire pump.
 - f. Gross Anatomy system.

C. Method

1. A diesel driven engine generator will be provided to power all emergency loads via automatic transfer switches upon normal power interruption to any auto transfer switch. There will be two transfer switches one to serve the life safety loads and a second to serve critical loads.
2. Emergency and equipment distribution systems will be provided.
3. An aboveground fuel tank will be provided.
4. The engine-generator will be air-cooled, located in a new dedicated room at the basement level, complete with batteries, charger, jacket water heater, lube oil heater, control panel, etc.

D. Distribution

1. The internal distribution system will be horizontal in nature, utilizing pipe and wire for 480 volt and 208 volt power.
2. Branch circuit design will be based upon a maximum of 1,400 VA per 20 ampere, 120-volt circuit. Minimum circuit size shall be 20 ampere.
3. Branch circuit design will be based upon a maximum of 3,600 VA per 20 ampere, 277-volt circuit. Minimum circuit size shall be 20 ampere.
4. Motors of 1/2 horsepower and larger will generally be served at 480 volt, 3 phase, 3 wire. Motors less than 1/2 horsepower will be served at 277 volt or 120-volt service, 1 phase, 2 wire.
5. The secondary distribution system will be separate into the following branches as required by governing codes:
 - a. Normal: This branch provides normal power to the bulk of the loads such as general lighting and receptacles loads, miscellaneous equipment loads, mechanical equipment loads, etc., which are not essential to building functions; therefore, they are not connected to the emergency generators.
 - b. Emergency Branch: This branch provides continuous power for lighting and communications feeding equipment made to the safety of life for all building occupants such as the illumination of means of egress, exit signs, fire alarm systems, and to critical equipment loads. The system

will be consisting of a Life Safety Branch and a Critical Load Branch. Both 55B and the new HSC will have separate transfer switches.

6. All new equipment will utilize copper buss for all phases, neutral and ground buses.
7. The method of distribution should favor the separation of critical computerized loads from all other building loads, especially mechanical equipment and elevators. Further separation may be advisable to isolate sensitive equipment from motors, rectifiers, electromagnets and similar equipment that generator line disturbances.

1.5 LIGHTING

A. Concepts

1. The lighting system will be designed to the specific visual task being performed, the local environment and desired appearance of the space.
2. Energy usage and economic constraints will play an important role in the design process and will enable the building to achieve LEED certification.
3. Specific lighting intensities will be designed in accordance with the illuminating Engineering Society (IES) lighting and building requirements.

B. General

1. In general, the project will incorporate fluorescent, metal halide and LED lighting systems utilizing energy efficient type lamps and/or ballast combinations with low brightness diffusers. Various corridor and toilet rooms, etc., fixtures will be un-switched and connected to emergency power for night-light and emergency egress. Special lens and diffusers will be utilized in areas requiring aesthetically pleasing or specialized task illumination treatment.
2. Light fixtures for specific spaces will be provided as follows:
 - a. Gross Anatomy_ -- Recessed 1x4 fluorescents, UL listed for wet locations.
 - b. Corridors -- Fluorescent.
 - c. Offices_ -- Fluorescent.
 - d. Storage Rooms -- Fluorescent.
 - e. Work Rooms -- 2' x 4' lay-in fluorescent.
 - f. Mechanical/Electrical Rooms & Loading Docks -- 1' x 4' fluorescent industrials
 - g. Auditorium – LED downlights, recessed LED step lights, spotlights, controlled through a central dimming system.
 - h. Labs – Pendent mounted direct/indirect with florescent task lights above lab benches.
 - i. Exterior Lighting -- Metal halide and LED lights.

- C. Emergency Battery Pack Light Fixtures: Will be provided for illumination during transfer to and from generator source or upon generator failure in the electrical equipment areas.

- D. Means of egress "EXIT" signs will be incorporated into design for renovation and new construction areas. LED lamps will be utilized in these fixtures for energy and longevity considerations.
- E. Emergency lights in areas requiring darkening for proper usage will be controlled by emergency transfer relays.
- F. Lighting will be controlled thru a combination of a central lighting control system with localized switches. This system will provide occupied/unoccupied control with individual space override.
- G. Wiring Devices and Wiring Considerations
 - 1. All receptacles located within six feet of sinks will be of the ground fault interrupting circuit type (G.F.C.I.). Ground fault circuit breakers will not be used.
 - 2. General-purpose receptacles will be duplex, 20A, 125 volt, grounding, 2 pole, 3 wire, specification grade.
 - 3. Receptacles for special purpose equipment will be per manufacturer's data.
 - 4. Receptacles in corridors will be of the 120-volt type for floor cleaning equipment.
 - 5. Receptacles and switches on emergency power will be red in color.
 - 6. Special receptacles with required voltages will be provided as dictated by design.
- H. Voltage Wiring and Jacks
 - 1. Distribution of voice, video and data transmission wiring and jacks will be served via cable trays where the runs are suitable for consolidation.
 - 2. Cabling will be provided in accordance with the University of Louisville wiring standard.
- I. Grounding
 - 1. System and equipment grounding will be provided. All switchgear, switchboards, transformers, motor control centers, motor starters, panelboards, power generation set, wiring systems, etc., will be effectively grounded. All feeders will contain ground wires.
- J. Equipment Connections
- K. Electrical power connections will be made to all electrically operated doors, drinking fountains, etc.; including furnishing of all electrically associated devices such as disconnect switches, lockout switches, etc. Mechanical Equipment Connections
 - 1. Electrical power connections will be made to all mechanical equipment, domestic hot water heaters, unit heaters, thermostats, etc., including furnishing of all electrically associated devices such as disconnect switches, contactors, magnetic or manual starters, lock-out switches, etc., which are not furnished under the HVAC, Plumbing and Fire Protection Sections.
- L. Power Factor Improvement

1. Power capacitors will be provided to maintain the power factor at a minimum of 90% lagging and a maximum of 100%, to increase efficiency and prohibit a utility penalty charge.

1.6 EQUIPMENT SPECIFICATIONS

A. Motor Control Centers, Starters and Controls

1. Motor control centers (MCC) will be NEMA type 1 enclosure, class 1 and type B wiring with minimum withstand rating equal to the available symmetrical amperes. Spaces will be provided for future combination starters in each MCC.
2. All temperature control and equipment interlock wiring, raceways and associated devices will be provided under the Mechanical Section. All alarms, plumbing and fire protection control and equipment interlocks, wiring, raceways and associated devices will be provided under this section. All life safety control wiring devices will be provided under this section.
3. Magnetic starters will be complete with 2 sets of N.O. and 2 sets of N.C. auxiliary contacts, 3 overload relays, individual fused control transformer, hand-off automatic selector switch with spring return from manual to auto, or start-stop pushbutton and pilot lights.
4. Motor starters will be horsepower rated.
5. Combination starters will be furnished with motor circuit protector over current protection.
6. Magnetic starters will have NEMA size 1 minimum rating.
7. 480-volt delta to 208/120-volt dry type transformers will be provided to step down power in the electric closets.

B. Branch Circuit Panelboards

1. Panelboards will be 3 phases, 4 wire and will be copper construction.
2. Main breakers or Main Lugs will be provided as required depending on the service and location.
3. Type written directories will be provided in each panelboard.
4. 30% spare capacity will be provided in each panelboard.

C. Distribution Panelboards

1. 480Y/277 volt panelboards will be utilized for boards that are 1200 amp or less and will be utilize molded case circuit breakers.
2. 208Y/120 volt panelboards will be utilized for boards that are 1200 amp or less and will be utilize molded case circuit breakers.
3. 30% spare capacity will be provided in each panelboard.

D. Cables, Wiring, Raceways

1. Cables and wiring will be copper conductors and color-coded.
2. Lighting and receptacle branch circuit wire will be type "THWN" or "THHN", minimum #12 size.
3. Feeder wires will be type "THHN" or "XHHW".

4. Wires connected to motors will be copper type "THHN" or "XHHW" and will be stranded regardless of size. Flexible liquid tight conduits will be used for all connections to vibrating and rotating equipment.
5. Wire sizes #10 AWG and smaller will be solid copper. Wire sizes larger than #10 AWG will be stranded copper except as otherwise noted.
6. Raceways will be rigid galvanized steel with threaded fittings, electrical metallic tubing with compression fittings and Schedule 40 PVC. Setscrew connectors will be utilized in sizes 2-1/2" and larger.
7. Cable and conduit supports, expansion fittings, couplings and fittings, pullboxes, and other wiring materials and devices will be provided as required.
8. Armored cable, type "AC" will not be used.
9. Aluminum cable will not be used.

E. Lighting Fixtures

1. Lighting fixtures in ceilings will conform to Code requirements and be per previous description.

F. Lighting Switches and Receptacles

1. Lighting switches will be either low voltage where they are connected to the lighting control switches or 20 amp snap switches where manual control is used.
2. Duplex receptacles will be 20A commercial grade.
3. Plates for wall devices will be stainless steel, standard grade .032" thick, brush finish. All plates for multiple gang requirements will be one-piece combination.

G. Power Generation Set

1. Power generation set will be diesel fueled controls, batteries and charger, critical silencers, jacket heater, timer and running time indicator, spring isolation, etc.
2. Transfer switches will be supplied with generator.
3. Signals will be provided from transfer switches to elevator controllers for sequential operation.

H. Concrete Pads, Supports, Access and Sealing

1. Concrete pedestals, bases, pads, vibration isolation, curbs, anchor blocks, anchor bolts, slab inserts, hangers, channels, cradles, saddles, grating, access doors, etc., will be provided for electrical equipment and apparatus in the building and in the transformer vaults. Floors, walls and ceiling openings will be sealed to prevent air movement and noise transmissions from floor to floor and room to room.

END