



## USE OF GUIDELINES

The University of Saskatchewan (USask) Design Guidelines are intended to provide information on systems and design components that must be followed for projects on campus. The information provided herein is considered minimum design standards for any system component noted. Designers are required to meet applicable Codes and standards for all systems and components not specifically mentioned within this document.

The Design Guidelines are living documents and as such, consultants are encouraged to engage the USask PDC team to suggest updates or clarifications to the guidelines as necessary to ensure USask procedures and specifications stay up to date with industry practices. It is the Consultant's responsibility to ensure they are using the most up to date version of each section of the Guidelines for any new projects undertaken. **Latest updates are shown as bolded and underlined text, in blue.**

## SECTION 26 ELECTRICAL

### General

1. The Consultant shall exercise great care in accepting or rejecting items as equivalents to those specified, as varying qualities of similar equipment undoubtedly exist. The University has experienced problems in the past, where due consideration had not been given to this process, resulting in the installation of inferior products with subsequent disastrous, costly results. The Facilities Management Division should be consulted if any question as to the acceptability of a product exists. When "equivalents" are listed in the specification, actual product models or types should be included, not just the manufacturer's name.
2. **The Consultant shall submit all required electrical calculations—including, but not limited to, load analysis, voltage-drop calculations, and equipment-sizing calculations—as part of the design deliverables beginning at the 66% design phase and continuing through all subsequent design phases.**
3. Any vibrating equipment should be provided with isolation treatment, and any other equipment requiring special acoustic treatment should be properly accommodated.

### Electrical Service & Distribution

#### 1. Power Supply

- 1.1. Buildings shall be supplied with power from the University's 25kV distribution system. Heating plant is supplied via a 2.4kV system.

#### 1.2 **Main distribution transformer:**

**Primary: Delta Secondary: Wye**

**Secondary grounding: solidly grounded neutral for non-critical infrastructure and impedance grounding system for critical infrastructure**

**600 V System (Secondary)**

**Three-wire distribution (ungrounded/grounded-neutral not distributed)**

**208/120 V System (Secondary)**

**Four-wire distribution (Wye with neutral available)**

**All distribution system configurations (3-wire or 4-wire) shall comply with the University of Saskatchewan's standards and direction. Any project-specific deviations or additional requirements must be reviewed and approved by the PDC Electrical Engineer prior to implementation.**



1.3. Cables: Single conductor, cross-linked polyethylene, 133% insulation

[1.4 Interrupting capacity @ 25 KV: refer to the latest ETAP model from Usask.](#)

[1.5 All instrument transformers—including Current Transformers \(CTs\) and Potential Transformers \(PTs\)—shall be sized appropriately to ensure full compatibility with protection relays, metering devices, and the associated protection-coordination settings requirements.](#)

## 2. Emergency Power

### 2.1. Emergency standby generator

2.1.1. Design for natural gas generators where required by project.

2.1.2. Generators will be 600V/3ph/3 wire. Four- wire may be required to suit existing building demands.

2.1.3. Size for 50% future growth.

### 2.2. Generator Interface Panel

2.2.1. Capacity size to match emergency standby generator size.

2.2.2. Requires generator interface control panel. Refer to USask standard details for more information. Confirm details with Electrical Engineering Department.

## 3. Building Distribution

3.1. Generally, new services for buildings shall be 600V 4-wire at the main distribution only. The rest of the building distribution should be 600V 3-wire. Step down transformers for lighting and general use power would optimally be located on each floor or every other floor.

3.2. The power supply to the building shall be metered using revenue-approved 3-element, demand energy type meters with test switches. Metering shall satisfy Measurements Canada requirements where tenant is responsible for electrical utility costs.

3.2.1. Metering shall be provided at the main service feed and for each voltage level at the central distribution panel (CDP) level.

3.3. Design system for 50% future load growth.

3.4. Conduit shall not be embedded in concrete. Conduits shall be either surface mounted or concealed in wall and ceiling spaces. No metallic conduit is acceptable below slab on grade or otherwise in contact with ground water. Use Schedule 40 PVC conduit for underground conduit larger than 50 mm. All conduit runs shall contain a bonding wire.

3.5. Wire basket trays shall not be used on campus.

3.6. Do not exceed 70% fill on panels feeding lighting and office areas. Do not exceed 60% fill on panels feeding laboratory areas. Additional conduits and conduit space should be provided to ceiling spaces both above and below panels. Conduits should be oversized for most computers and 120 V distribution and not be at capacity when a new installation is turned over to the University. The lighting and general flush mounted power panels should preferably be located in corridors. In level one and two laboratories, power panels should be located near the doorway and interior to the laboratory. In level three and four laboratories power panels should be located according to the applicable standards. All panels accessible to the public should be behind lockable covers for safety and security. Panels supplied from the emergency power system should be located in electrical rooms or other secure rooms.

3.7. Motor control centres shall be used to house starters and control circuits with the exception of manual starters which shall be located adjacent to the motor which it serves. Motors larger than 3/4hp shall be three-phase and 600 V. For motors 15hp and larger consideration should be given to provide soft-start starters or variable frequency drives. The choice of starter is to be justified by duty-cycle and power system stability. Motor



numbering is to be obtained from the University of Saskatchewan.

- 3.8. Variable frequency drives shall be used where reduced operating and maintenance costs can be realized. Drives shall be separately enclosed and located adjacent to the motor it serves. Drives up to 15 hp shall be allowed to be installed in MCC enclosures.

## Lighting & Branch Wiring

### General

1. In general, the design should aim to avoid the cold, stark effect of many contemporary lighting installations used in work areas.
2. When locating the fixtures, the problems of lamp replacement should be considered. Gymnasiums and other large, high spaces should have catwalks so as to avoid the requirements of lifts or scaffolding for maintenance and lamp replacement. In atriums, fixtures should be so placed that scaffolding or the use of pogo sticks is not required. Place fixtures at a more accessible level.

### Illumination Levels

1. [Unless otherwise indicated, illumination levels shall conform to the recommended minimum values identified by the current edition of the Illuminating Engineering Society of North America \(IESNA\) Lighting Handbook.](#)
2. [Lighting designs shall follow the guidelines outlined by the IESNA Recommended Practice RP-3-20: Lighting Educational Facilities.](#)

### Interior Lighting

1. Standard incandescent lighting is not permitted. Special use incandescent lamps should be kept to a minimum and used only where other lighting technology is not available.
2. The variety of lamp types required should be no greater than necessary, and unless special circumstances warrant otherwise, should be restricted to the common types and sizes. Storage space in the caretaker's closets should be designed to suit the types and quantities of lamps to be used.
3. LED lighting standard: 2 x 2 fixtures with 4000K color temperature and CRI of 80 or better.
4. New lighting shall be 120V for all types. Dimming LED drivers should be continuous (0 – 10 VDC) or bi-level. Renovated areas in existing buildings shall have all 347V lighting removed and replaced.
5. Switching for lighting systems should generally be 120 V line switching. The use of low voltage switching should be limited to multimedia consoles, photocell-controlled lighting, or other special installations. Refer to the lighting control matrix for additional information.
6. Occupancy sensor-controlled lights should shut off automatically after 15 minutes. Where possible, sensors should be wall mounted.
7. Scheduling of lighting shall be determined on a project basis. Consideration must be given to the perception of personal safety.
8. Automatic lighting controls shall be compatible with the building control system. The lighting controls should remain independent from the building control system so that one can function without the other.

### Exterior Lighting

1. Exterior lighting is to be 120V LED lighting [with 3000K colour temperature and CRI of 80 or better.](#)
2. Luminaires on buildings shall be dark sky compliant. Lights should be on separate circuits from other building services but may be on the same contactor and photocell as street lighting if they are located within the building.
3. Exterior lighting for roads, walks and parking is to be the [standard University luminaires: refer to Usask standard](#)



[details drawing E5](#). Lighting is to be controlled by a contactor and photocell on either an existing circuit or a new circuit. New circuits shall be sized for future growth and shall be obtained from an adjacent building or parking lot. Contactors shall have a hand-off-auto switch for maintenance of the lighting system.

### Emergency Lighting

1. Theatres with tiered seating, some wet labs, and fume hoods should all have emergency lighting. Emergency lighting in entrances, corridors, stairwells, and washrooms should be unswitched. Fume hood lighting may be switched. Multi-occupancy washrooms shall be equipped with emergency lights.

### Lighting for Service Spaces

1. Provide locally switched LED lighting in mechanical duct systems, at filter locations and near mechanical units where frequent maintenance will occur. Must be rated for enclosed fixtures.
2. Provide LED lighting in crawl spaces.

### Convenience Receptacles

1. As a general rule, electrical receptacles should be spaced approximately every 3600 mm around the walls in all offices and work rooms. Receptacles should not be mounted back-to-back. Classrooms will normally require one receptacle at the back of the room, and one or more at the front near the lecture station.
2. Receptacles shall be mounted at a height of 450mm above finished floor, except in work areas where a mounting height of 175 mm above the work surfaces shall be considered. Placement of all receptacles should be checked for co-ordination with loose furnishings when the room elevation detail work sheets are available.
3. Receptacles are needed in lobbies and corridors in sufficient numbers to require no more than a 15 m cord for power driven housekeeping machines. These receptacles should be 15/20 amp T-slot type and not be on the same circuit with receptacles in user spaces. Provide one of these receptacles near in each caretaker's closet.
4. All offices should have two duplex receptacles on separate circuits adjacent to the desk location and one on the opposing wall. The receptacles should be spaced, in separate boxes, at least 150 mm centre to centre and not installed in one 4 x 4 box.
5. No more than four receptacles should be on one 15A circuit.
6. In computers and other labs no more than three (3) receptacles should be on one circuit.
7. Provide two split duplex receptacles for the kitchenette areas.
8. Provide power receptacles in ceiling and crawl spaces where equipment requiring maintenance is located.
9. Provide a 208V single phase 50-amp welder receptacle in mechanical rooms.
10. Provide a receptacle in mechanical duct systems at filter locations.
11. Provide weatherproof receptacles along exterior building perimeter as required. As a minimum, provide a receptacle adjacent to building entrances.
12. Special features such as isolated ground, surge suppression or labels of "computer use only" are not required unless specifically noted in the project requirements.
13. Service outlet shall be provided with all rooftop equipment.

### Computer Networks

1. All network connection labels must be shown on consultant drawings.

### AV Networks

1. AV infrastructure must be shown on consultant drawings.