Electrical Design Guidelines
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**Net Increase in Building Electrical Load (in kVa) = ______________________**

*The Engineer has verified the existing building systems are adequate for additional capacity noted above*

Electrical Consultant’s Signature: ____________________________________________

Electrical Consultant’s Name: _______________________________________________

Electrical Planning Manager’s Name: __________________________________________

Electrical Planning Manager’s Signature: _____________________________________

**NOTE:** If the Guidelines or part of cannot be attained or fulfilled (i.e. NC or NA) during the design process, the Consultant should provide reason(s) why such Guidelines are NOT met. Any modifications or alterations to the design guidelines will need to be agreed/accepted by Facilities Management prior to inclusion in the design.
16.1 General

A. Electrical supply to any new building or facility shall be provided from the existing Dalhousie 23kV underground distribution system, and will only be supplied directly from the NS Power distribution system where this is economically justified. All primary electrical equipment supplied from the Dalhousie 23kV underground distribution system must be rated for 25kV.

B. Complete installation must be in accordance with all governing standards and codes including:
   i. Current version of the Canadian Electrical Code CSA C22.1
   ii. The Canadian National Building Code
   iii. Local building and fire regulations

C. Refer to BAS schedule for electrical equipment monitoring points.

D. Refer to and abide by Dalhousie’s University Life Cycle Guidelines for equipment selection.

16.2 Single Line Diagrams

1. Device designations on all single line diagrams will conform to the Dalhousie University Electrical Equipment Labeling Standard.

2. Maximum voltage and full load current rating for all electrical devices must be indicated on all single line diagrams.

3. Fault interrupting ratings of all protective devices must be indicated on all single line diagrams.

4. One copy of the building main power distribution single line diagram will be provided, under Plexiglas, in main electrical room.

16.3 Electric Motor Equipment and Controls

1. All motor starters, disconnect switches and MCC enclosures must be labeled as per the Dalhousie University Electrical Equipment Labeling Standard.

2. Where variable speed function is required, VFDs shall be the acceptable standard of acceptance.

16.4 Lighting

1. Exterior lighting for all driveways, walkways, parking areas, and building perimeters shall be equipped with metal halide luminaires. All outdoor area lighting applications are to be controlled by a single photocell located on the north face of the building, and mounted approximately 14’ above ground level. Dalhousie uses spun concrete exterior poles by SkyCast Inc. (Washington Series). For more information contact Electrical Planner

2. Fluorescent lighting equipment for interior applications shall employ T8 lamps and ballast which have received a “high performance” designation by Conserve Nova Scotia (48” long tubes maximum) with the following characteristics:
   - 4100 Deg Kelvin
   - Color Rendition Index (CRI) 80
- Electronic Ballast.
- Maximum tube length = 48in

Common areas may include compact fluorescents or Metal halide with electronic ballast.

3. In new buildings the lighting supply voltage shall be 347 volts.
4. Automatic occupancy based lighting controls should be used in all large common areas, washrooms and auditorium, if a building lighting control system is not used. Lighting will be manually controlled through low voltage relay switching.
5. Location of light fixtures must not interfere with maintenance access of other equipment.
6. Ceiling lighting in parking garages must maintain, at minimum, six inches greater ground clearance than indicated at the garage entrance.
7. All sinks and desk spaces in residence bedrooms, will have separately switched fluorescent task lighting installed directly above.
8. Provide three-way light switching for all rooms having two doors.
9. Custodial closet lights must be provided with protective cage.

16.5 Emergency Lighting
1. Emergency lighting will be fed from the essential services bus where there is an emergency generator installed.
2. Where there is no emergency power available, emergency lighting will consist of appropriately sized fluorescent fixtures having special energy storage ballasts providing a minimum of 90 minutes operation in the event of power failure (Bodine ballasts are standard for approval).
3. In addition to the requirements of the National Building Code the following critical areas require emergency lighting:
   1. Electrical rooms
   2. Server rooms
   3. Mechanical rooms
   4. Residence kitchens
   5. Washrooms

16.6 Lighting Controls System

New Buildings:
1. All new buildings shall have a lighting control system (LCS) which will provide daylight harvesting, remote dimming and occupancy controls.
2. The LCS shall be integrated with the Building Automation System (Johnson Controls “Metasys”) and other systems deemed necessary for the project.
3. LCS shall be compatible with other existing systems; Lighting Control & Design LCS is the Dal standard.

Existing Buildings:
1. Lighting control requirements shall be dealt with on a case by case basis
16.7 Electrical Cable & Conduit
1. All electrical cables are to be copper conductor and all neutral conductors are to be oversized to minimize harmonic distortion.
2. All electrical cables are to be installed in EMT raceway or cable tray, sized to allow for 30% spare capacity.
3. All duct banks must be supplied with 100% spare duct capacity.
4. Breaker panels are to be equipped with a main breaker, 25% spare breakers and space for an additional 25% more breakers.
5. Power loads are to include separate neutral for each branch circuit phase.
6. Conduit sleeves in concrete slabs are to protrude 2 inches above slab.
7. Junction boxes for parking garage lighting and electrical installations to be flush mounted and installed prior to concrete pour.

16.8 Electrical Equipment Finishes
1. Enclosures of panels and junction boxes in exterior, wet, or corrosive environments shall be stainless steel.
2. Equipment scratched or marred during shipment or installation, shall be touched up to match original paint.
3. All hangers, racks and fastenings shall be galvanized.

16.9 Electrical Equipment Identification
1. Refer to Dalhousie University Labeling Guidelines for further details.

16.10 Locations of Outlets & Switches
1. Align all outlets, fire alarm devices, thermostats, etc, so that they are aligned horizontally and vertically and are center on wall panels or wall reveals.
2. All service areas (electrical, mechanical, custodial rooms) shall have stainless steel face plates on all outlets.

16.11 Electrical Vaults & Switchgear Rooms
1. No water lines, water drains or other sources of water are to be installed in electrical vaults or switchgear rooms, to avoid risk of flooding.
2. Electrical vaults and switchgear rooms are not to be located under:
   a. podium areas
   b. parking garages
   c. custodial closets
   d. washrooms
   e. labs
   f. staff lounges
3. Electrical vaults and switchgear rooms containing transformers must not be located adjacent to areas such as classrooms, offices, etc.
4. Electrical panels and equipment must be installed in dedicated walk in electrical rooms; this equipment is not to be installed in custodial or other closets. In all electrical rooms and vaults where the floor level is below grade, all floor mounted panels and equipment must be mounted on 2in concrete housekeeping pads.
5. All ventilation or air conditioning equipment and diffusers for electrical vaults or switchgear rooms shall be located so as to prevent water infiltration into those areas.

6. Electrical vaults and switchgear rooms shall be provided with sufficient filtered ventilation capacity (thermostatically controlled), based on equipment heat loss calculations, to provide for the maximum loading capacity of equipment in those areas.

7. Electrical rooms are not to be used as thoroughfare to access other rooms, e.g. mechanical rooms, tunnel, etc.

8. All main electrical rooms/vaults are to be provided with a dedicated telephone extension.

16.12 Electrical Metering

1. Electrical energy metering must be included on the building primary distribution switchboard to measure total electrical demand and monitor power quality.

2. Power Measurement ION Meter is the Dal standard and shall be used as indicated below:
   a. All main services shall have three element metering (i.e. 3PTs & 3CTs), and will use an ION P7550 meter with:
      i. 2 x 4-20ma analogue outputs
      ii. 1 x Ethernet port
   b. All submetering within a building shall be three element metering (i.e. 3PTs & 3CTs), and will use an ION P7330 meter with:
      i. 2 x 4-20ma analogue outputs
      ii. 1 x RS485 to Ethernet converter

3. For all new switchboard installations an Ethernet line shall run, in conduit, from the nearest comm. room that has unused network ports available to a duplex box mounted in the meter cabinet. Dal’s Network Group will terminate the Ethernet line and mount it in a faceplate on the duplex box. They will also provide a short jumper to connect the meter to the network jack.

4. When a new meter is being installed but existing switchboards are not being replaced, the ION meter will be provided by the supplier already installed in self-contained metal cabinet that can be mounted on a wall or surface mounted on the existing switchboard. In this case the Ethernet line (see above) must be run in conduit to a duplex receptacle mounted on the electrical room wall, as close to the meter location as possible. Another conduit, with pull string, must be installed between the duplex box and the meter cabinet to allow Dal Networks staff to install the interconnection jumper.

5. If a building is supplied directly from NS Power, an ION 8600 is to be requested. This meter will require a dedicated telephone line, installed in conduit, to allow NS Power to remotely interrogate the meter. It will also require an Ethernet connection to Dal’s intranet via an Ethernet line installed in conduit from the nearest comm. room that has network ports available. Dal Facilities Management should be consulted for installation details of the duplex outlet (1 Ethernet and 1 Telephone).

16.13 Fire Alarm Systems

1. General
   a) Fire and security alarms are routed to a central monitoring location at Dalhousie Security Services in the McCain Building through a Remote Alarm Annunciation System (RAAS) which is a Simplex MapNet system.
b) An “alarm” and a “trouble” contact from the fire alarm panel shall be connected to a new remote node (IAM) of the RAAS communication network, which will be installed by Dal staff inside a metal junction box in the main comm. room.

c) The contractor will be responsible to install, in conduit, the comm. cable connecting the new remote RAAS node to the nearest existing node, which will be identified by Dal Facilities Management.

2. Addressable Fire Systems
   a) All fire alarm systems must be addressable to provide for the ability to block operation of individual or selected groups, of sensors or alarm devices.
   b) A fire alarm riser diagram shall be included on the appropriate design drawings.
   c) A Building Directory shall be mounted adjacent to the fire alarm annunciator panel located at the main entrance, which shows the location of all fire exits, fire extinguishers, sprinkler rooms and alarm devices.
   d) A list of fire alarm zone addresses complete with device locations shall be provided to Dalhousie Facilities Management, in electronic format, by the Contractor.
   e) An identification address label is required at all remote devices connected to the fire panel that matches the address in the fire panel.
   f) All fire alarm modules for sprinkler supervision shall be identified as such and labeled appropriately (Refer to Dalhousie University Labeling Guidelines).
   g) All air handlers and gas supplies shall be shutdown when a fire alarm is activated.
   h) All electrical rooms & mechanical rooms to be provided with separately zoned thermal detectors.
   i) All fire alarm devices located above suspended ceilings must be identified on ceiling grid by an approved LED indicator.
   j) For computer server rooms a pre-action two stage sprinkler system is required.
   k) Fire alarm system batteries are to have ten year warranty.

16.14 Electrical Coordination Study
   1. The Engineer is to provide an electrical coordination study at conceptual design stage for the project as outlined below:
      a. Study must encompass all system components from the utility supply point through to and including the new 600-volt switchboard.
      b. Study must include
         i. All pertinent data for the installed equipment
         ii. Short circuit analysis
         iii. Arc Flash calculations for all main switchgear including the appropriate labels shall be provided.
         iv. Settings for all relays and protective devices from the Utility Supply to the largest downstream device on all the feeder secondary distribution levels.
         v. A report, including coordination diagrams, fuse data and protective device settings
16.15 Emergency Generators and automatic transfer switches
Where emergency generators are required, the unit shall:
   1. Be a standalone, noise abated, outdoor unit.
   2. Have a fuel tank with capacity to supply the generator at 60% of full load for 24 hours.
   3. Have a security protection against vandalism
   4. Have a non corrosive service platform(s) for maintenance purposes.
   5. Have a generator output breaker that can be locked in the open position for maintenance purposes.

Automatic transfer switches shall have:
   1. A full-bypass feature which allows the transfer mechanism and primary contacts to be withdrawn from the unit for periodic maintenance or replacement.
   2. A dedicated circuit breaker for the normal supply that can be locked out for maintenance purposes.

End of Section