

1.0 **GENERAL**

1.1 **Related UBC Guidelines**

- .1 Section 27 05 05 Communication Rooms Design Guidelines – 2.13

1.2 **Coordination Requirements**

- .1 UBC Energy & Water Services (Vancouver)
- .2 UBC *Facilities Electrical* (Vancouver)
- .3 UBC Information Technology.
- .4 [UBC Learning Space Design Guidelines](#)
- .5 UBC Facility Management (Okanagan)

2.0 **MATERIAL AND DESIGN REQUIREMENTS**

2.1 **General**

- .1 All interior building lighting shall be supplied from 120 volt power systems.
- .2 Lighting design shall incorporate the principles of sustainability (environmental & financial) and its products and systems shall be energy conserving, long life, have a low cost of ownership and be accessible for service and maintenance.
- .3 For interior building lighting solutions, preference shall be given to Light Emitting Diode (LED) light sources. HID lighting shall not be permitted.
- .4 Daylight harvesting opportunities shall be implemented in areas where natural daylight is available. *Where required by code, all classrooms, lecture theatres, large offices, corridors, stairways and other public spaces shall incorporate daylight harvesting via use of interior mounted photocells and arranged to take advantage of free illumination while maintaining acceptable minimum illumination levels within the space.*
- .5 Uniformity and low brightness contrast shall be achieved by judicious use of luminaires and their locations.
- .6 All lighting shall be designed to suit the task and task location rather than the general lighting. ASHRAE 90.1, IESNA and WorkSafeBC guidelines shall be taken into consideration and calculations submitted where requested.
- .7 As a general rule, the following task lighting levels shall be used:
 - .1 Offices 500 lux maintained.
 - .2 Classrooms and Seminar Rooms 500 lux maintained.
 - .3 Corridors 100 lux maintained.
 - .4 Washrooms 150 lux maintained.
 - .5 Special areas such as laboratories, Audio/Video rooms, drafting rooms, etc., in accordance with the user's task requirements and IESNA recommendations.
- .8 When mounting luminaires in high ceiling spaces, consideration must be given to ensure access for maintenance such as fixture, driver, lamp and ballast replacement. The use of scaffolding is discouraged. Indoor lighting shall be accessible either from ladders on flat surfaces such as floors or stair landings or from powered lifts with a maximum lift of 6.1

- m. Building access, floor construction, and elevators shall permit entry and use of existing UBC lift equipment for proper and safe maintenance (Genie GR20 with weight of 1,112 kg (2451 pounds) and able to pass through a standard 3'x7' door opening.) If special equipment is required for lighting maintenance, then the consultant shall present a preliminary Lighting System Maintainability Plan to UBC *Facilities* Electrical (Vancouver) / Facility Management (Okanagan) for review and approval. The preliminary plan shall contain a high-level overview of the special equipment and processes required for maintenance of the system. Architectural, Structural and Conveyancing requirements must be confirmed for moving special equipment to and from the locations after construction is completed. The finalized plan will be submitted by the contractor and it shall contain detailed documentation describing the special equipment, maintenance procedure/schedule and spare parts list. Existing operations and Work Safe BC Fall Protection procedures shall be minimized by the design. *Refer to Section 11 81 29 Facility Fall Protection for more details.*
- .9 The lighting design proposed for all public areas such as corridors and stairways shall ensure the life safety of building occupants at all times and shall also minimize lighting energy required to maintain BCBC minimum levels (i.e. lights off until occupancy has been detected or an emergency has occurred). A portion of the lighting fixtures shall be wired to a Life Safety power panel if an emergency generator or Central Inverter is available. Lighting circuits fed from emergency power panels shall be arranged so that they may be switched or dimmed during normal operation.
- .10 Suspended luminaires shall be direct/indirect. Full indirect suspended luminaires are not acceptable. Suspended luminaires shall be avoided in rooms with audio-video projection systems.
- .11 Non-linear specialty fixtures such as cylinders, wall sconces, wall washers and other decorative lighting shall be minimized and shall not exceed 10% of the total quantity of fixtures in the building project.
- .12 Metal Halide (MH) lighting solutions are not acceptable. LED solutions, especially for high bay applications, shall be pursued.
- .13 Banks of multiple switches shall be labeled to avoid confusion.
- .14 All light fixtures provided shall be stock items (no custom made fixtures) readily available from local suppliers. The fixtures are required to be in current production with no plans to cease production and support within a 5 year period.
- .15 Light fixtures shall not contain batteries.
- .16 All light fixtures shall be attached to building structure using mechanical fasteners. Tape and or adhesive methods shall not be used.
- .17 Stage lighting fixtures and control for audio-video enabled spaces shall be provided by Division 27 Audio-Video.

2.2 Lamps (*Renovations Only*)

- .1 Preference will be given to LED linear T8 lamps, linear fluorescent T8 lamps shall not be used.

- .2 T8 LED lamps shall be rated for at least 50,000 hours operation with 3 hours per start. Acceptable manufacturers are: General Electric, Osram, Sylvania, or Philips.
- .3 T8 - 15 watt (maximum) LED lamps with 3500' K color temperature operating from 120 volt instant start ballasts with standard ballast factors shall be the standard.
- .4 T8 LED lamps shall not be line-voltage connected.
- .5 LED lamps shall be used as substitutes for traditional applications involving CFL, MR-16, PAR 20, PAR 30, PAR 38 lamps. LED lamps shall be Energy Star rated. Acceptable manufacturers are: General Electric, Osram, Sylvania, or Philips.

2.3 Ballasts *(Renovations Only)*

- .1 If fluorescent lighting must be used, the ballasts specified shall be compatible with GE and Philips T8 LED lamps. Ballasts shall have parallel lamp operation. Acceptable manufacturers are: General Electric, Osram, Sylvania, Philips/Advance or Universal.
- .2 Ballast output frequency shall be greater than 42 kHz.
- .3 Dimming ballasts shall be instant start with 0-10 volt control.
- .4 Ballasts shall have lamp end-of-life detection and shutdown circuitry that meets ANSI standards.

2.4 Lighting Controls

- .1 *Design Philosophy:*
 - .1 *Lighting Control Panel(s) shall be used in the following areas: Entrances, Vestibules, Lobbies, Atriums, Corridors, General/Public/Circulation Areas*
 - .2 *Room Controllers shall be used in areas that require zoning, dimming, occupancy sensing and daylight harvesting (if applicable). This includes but is not limited to the following areas: Meeting Rooms, Classrooms, Offices, Restrooms, Gymnasiums, Laboratories (Dry, Wet) and Reception Areas.*
 - .3 *Service rooms shall utilize ON/OFF switching only. This includes but is not limited to the following areas: Electrical Room, Mechanical Room, Generator Room, Elevator Machine Room.*
 - .4 *Areas that require single zoning, dimming and occupancy sensing shall utilize standalone line or low voltage control with wall or ceiling occupancy sensors.*
 - .5 *Areas that require single zoning and occupancy sensing shall utilize standalone line or low voltage control with wall or ceiling occupancy sensors.*
 - .6 *Stairwells shall utilize standalone line voltage control with fixture mounted occupancy sensors.*
- .2 *The following lighting control protocols shall be utilized at UBC:*
 - .1 *0-10V - All spaces shall utilize 0-10V control systems except for the locations described in the subsections .2 and 3.*

- .2 *DALI - Locations with specific lighting requirements that cannot be satisfied by 0-10V. IE: Research, Animal care.*
- .3 *DMX - Theatrical Spaces.*
- .3 *Manufacturers:*
 - .1 *The following product lines are approved for use by UBC. Alternative product lines are not approved (including alternative lines from a manufacturer listed below) and must be reviewed by UBC Facilities Electrical (Vancouver) / Facility Management (Okanagan):*
 - .1 *Legrand Wattstopper*
 - .2 *Copper Greengate*
 - .3 *Hubbell Current*
- .4 *Lighting Control Panels and Controllers:*
 - .1 *Control Panels and Room controllers are required to operate standalone. Networking between panels and controllers will only be allowed in instances required by ASHRAE or where specific operational requirements of a building deem it a necessity.*
 - .2 *Where low voltage lighting controls are provided they shall include a BACNET compatible BMS interface device.*
 - .3 *The lighting control system shall have the capability of being controlled by the BMS system however will not be connected to it and will operate independently. A 1" conduit (with pull string) between the lighting control panel(s) and BMS system will be required for future connection between systems.*
 - .4 *Wireless controls and programming solutions shall not be utilized unless approved in writing by UBC IT information security office and UBC Facilities Electrical (Vancouver) / Facilities Management (Okanagan).*
 - .5 *Hardwired programming is required for all panels and controllers. Systems that require special software and/or licensing fees are not acceptable. Main control panels or controllers shall have the ability to access the programming or firmware updating through an IP based web browser method.*
- .5 *Occupancy Sensors, Switching and Dimming:*
 - .1 *Occupancy sensors shall meet the following requirements:*
 - .1 *Dual technology type with both Passive Infrared (PIR) and acoustic/ultra-sonic sensors,*
 - .2 *Line voltage or low voltage types.*
 - .3 *Low voltage occupancy sensors shall have 1 or 2 poles, local power packs and Form C dry contact isolated relays for BMS connection. Slave power packs are not acceptable.*
 - .4 *Occupancy sensor time delay settings shall be adjusted to 20 minutes for offices, classrooms, theatres and washrooms.*
 - .5 *Occupancy sensors shall be positioned, masked and calibrated to prevent triggering by motion in adjacent areas.*

- .6 In classrooms and lecture theatres, occupancy sensors shall cover 100% of the seating area and instructor area. The occupancy sensor shall be able to detect the lower activity levels of seated occupants.
- .2 *ASHRAE requirements for occupancy sensors and timers shall be overridden in interior spaces where a hazardous situation may be introduced to building users due to the absence of light. This includes but is not limited to spaces such as Laboratories and Service Rooms. Designers shall consult with users to confirm specific space requirements that require omission.*
- .3 Offices, classrooms, and lecture theatres shall have light control switches at all entrances, exits and vestibules. These interior spaces shall also have occupancy sensors, mounted at a high level in a corner and arranged for semi-automatic operation such that manual operation of the local switches is required to energize the lighting while occupancy sensors and local switches will de-energize the lighting. Large spaces may need more than one sensor.
- .4 *Entry/Vestible/Corridor switches shall not be located in publicly accessible locations and shall be in areas accessible by maintenance personnel. Custodial rooms are preferred. Switches shall not be located in electrical or mechanical service rooms.*
- .5 LED dimmers shall be compatible with the LED lamps used and their drivers.
- .6 *Installation Requirements:*
 - .1 Lighting controllers shall be installed in locations that do not exceed 4 meters of elevation and are easily accessible by maintenance personnel. *The preferred location is adjacent/above entrance doorways.*
 - .2 *Concealed lighting controllers must be accessible by a removable tile, panel or hatch. The access must be sized large enough to allow for all tasks that will be required for replacement and maintenance of the controllers. Controllers shall not be concealed behind equipment that may require removal for proper access to controllers.*
 - .3 *The following is required for control wiring:*
 - .1 *Purple and pink colour.*
 - .2 *Wiring shall utilize an independent, dedicated raceway.*
 - .4 *The following is required for Cat5/Cat5e/Cat6 communication cables used for connections between devices and controllers:*
 - .1 *Purple/Violet coloured jacket.*
 - .2 *Cable shall not be in free air in excess of 300mm.*
 - .3 *Cable shall utilize an independent raceway. Usage of cable ties and supporting off other raceways is not acceptable.*
 - .4 *Cable cannot be utilized in the same raceway as IT.*

2.5 Lighting Controls – AV Enabled Space Requirements

- .1 Lighting in audio/video enabled spaces, including theatre (type 1), classroom (type 2), seminar room (type 3), and video-conferencing/AV capture enabled shall be controlled by Crestron lighting control or equivalent. Equivalents will be evaluated by UBC IT Audio Visual. Approval of equivalent equipment will be provided in writing by UBC IT Audio Visual Technical Specialist. Refer to UBC Learning Space Design Guidelines for space type definitions and further lighting requirements.

- .2 Each lighting controller in an audio/video enabled space shall have an IT network data drop in order to allow control from the AV system. Firewall rules shall be arranged with UBC IT to allow communication between lighting controller and AV system controller as required. Refer to Section 27 05 08 for IT cable infrastructure requirements.
- .3 Lighting in audio/video enabled spaces, including informal learning spaces (type 4) and dry and wet labs (type 5) do not require audio/video integration and can match other controller solutions in the building.
- .4 Audio/video enabled spaces shall have lighting zones to accommodate the use-cases of the spaces. The extent of zoning will vary depending upon the size and geometry of the spaces.
 - .1 Spaces with 75 seats or more shall have, at minimum, the following zones:
 - .1 Zone 1 – Marker boards/blackboards should have uniform lighting with sufficient illumination for legibility of writing from all seats.
 - .2 Zone 2 – Front of the room should have uniform lighting for the front of room instructor area with sufficient illumination to support visibility of instructor, other front of room participants, and anticipated demonstrations, without directing light onto the screen surface.
 - .3 Zone 3 – Front seating should have uniform lighting for the front rows of seats with sufficient illumination to support reading, note-taking and visibility of seat occupants by the instructor and by other room occupants.
 - .4 Zone 4 – Back seating should have uniform lighting for the back rows of seats with sufficient illumination to support reading, note-taking and visibility of seat occupants by the instructor and by other room occupants.
 - .5 Refer to UBC Learning Space Design Guidelines for additional lighting zone guidelines.
 - .2 Spaces with less than 75 seats shall have, at minimum, the following zones:
 - .1 Zone 1 – Front of the room should have uniform lighting for the front of room instructor area with sufficient illumination to support visibility of instructor, other front of room participants, and anticipated demonstrations, without directing light onto the screen surface.
 - .2 Zone 2 – Seating should have uniform lighting for all rows of seats with sufficient illumination to support reading, note-taking and visibility of seat occupants by the instructor and by other room occupants.
 - .3 Refer to UBC Learning Space Design Guidelines for additional lighting zone guidelines.
 - .3 Video conferencing enabled spaces shall have, at minimum, the following zones:
 - .1 Zone 1 – Front of the Room should have uniform lighting for the front of the room area with sufficient illumination to support visibility of the presenter, without directing light onto the screen surface.
 - .2 Zone 2 – Primary seating should have uniform lighting for all seats with sufficient illumination to support reading, note-taking and visibility of seat occupants by the instructor, and by other room occupants. Each occupant location shall have an average of 1.2:1 to 2.5:1 key:fill luminance ratio to allow for optimal facial rendering by the video conferencing camera.
 - .3 Zone 3 – Rear and side walls should have uniform lighting with sufficient illumination to provide an average of 0.7:1 to 1.8:1 wall:occupants luminance ratio to allow for optimal depth rendering by the video conferencing camera.

- .4 For all other audio/video enabled spaces, the lighting zones shall be designed to meet the application of the space and shall take into account audio/video technology being used. The design shall be approved by UBC IT Audio Visual in writing.
- .5 Low-voltage lighting button panels in audio/video enabled spaces shall confirm to the following guidelines:
 - .1 Lecture theatres shall have a button panel at each entrance/exit with the following button and label:
 - .1 ALL ON
 - .2 ALL OFF
 - .2 All other spaces with an audio/video touch panel shall have a button panel at each entrance/exit with the following button and label:
 - .1 ALL ON
 - .2 ALL OFF
 - .3 All other spaces without an audio/video touch panel shall have a button panel at each entrance/exit with buttons and labels for each zone's "ON" and "OFF" control.
- .6 For spaces with an audio/video touch panel and integration to the local lighting controller, the lighting system shall implement simple button panel switches and not touch panels for every location defined in this section.
- .7 *Refer to Section 2.4.6 for Installation requirements.*

2.6 Exit Signage

- .1 Exit lighting shall be provided in accordance with the BC Building Code and the Canadian Electrical Code as amended by BC Electrical Safety regulations.
- .2 All exit signs shall be illuminated by LED light sources.
- .3 Exit signs shall be powered at 120 volts from Life Safety power panels or central inverter power panels if available. If not available, Exit Signs shall be AC/DC compatible and be fed from Unit Equipment DC supply.
- .4 Approved manufacturers are Ready-Lite, or approved equal.
- .5 Exit signs shall not incorporate batteries or any other type of stored energy source.

2.7 Emergency Lighting

- .1 Emergency lighting shall be installed in accordance with the B.C. Building Code and the latest edition of the Canadian Electrical Code.
- .2 Emergency lighting Unit Equipment shall only be installed in buildings less than 2,500 GSM. In no case shall the total pieces of Unit Equipment installed in a single building exceed 10.
- .3 Emergency lighting installed as part of renovations or tenant improvements shall be designed to incorporate the existing emergency lighting system in the building.
- .4 Individual light fixtures shall not contain batteries.

- .5 All Unit Equipment lighting, remote heads and exit lights shall be manufactured by 'Ready-Lite' or approved equivalent.
- .6 The Unit Equipment shall be 360 Watt battery pack capacity, 12V DC or approved equivalent. The Unit Equipment shall not be self-testing.
- .7 Unit Equipment shall be mounted on a manufacture-supplied shelf specifically design for the purpose.
- .8 Generator and Electrical rooms containing Transfer Switches shall be provided with Unit Equipment. The unit equipment shall be sized to run for a minimum of 4 hours.
- .9 Unit Equipment and remote heads shall be 12V, minimum 5W LED lamps.
- .10 Unit Equipment shall be inclusive of a cord-set for cord-connection to a 120V receptacle mounted adjacent to the unit. Receptacle shall be connected to a local, un-switched 120V lighting circuit. In buildings with existing 347V lighting, 120V receptacle shall be connected to a dedicated circuit from a local panel.
- .11 *Unit Equipment is not allowed to be installed above ceiling tiles or architectural panels.*

END OF SECTION