.1 General

.1 In general, lighting design shall consider sustainability and energy efficiency in order to meet the desire sustainability goals of the University.

.2 Although this section makes reference to compact fluorescent lamps and fixtures, these are not preferred by the University. The preference is to use 4' long fluorescent lamps throughout the building, where possible. The use of LED downlighting may be considered in some situations, however, prior approvals must be obtain from the [Department Representative] [University Facilities Management].

.3 Lighting shall be designed to IES, BC Building Code and WCB requirements on all projects.

.2 Lamps

.1 Incandescent lamps:

.1 Bulb shape A to 150W, medium base, inside frosted, 130V rated.

.2 Halogen lamps:

.1 PAR30S IR type lower wattage energy saving types lamps, 4,200 hours average life, minimum initial lumens

.1 40W, Spot 10°, Flood 25°, Wide Flood 40° - 720 (equivalent to 60W non-IR)

.2 50W, Spot 10°, Flood 25°, Wide Flood 40° - 970 (equivalent to 75W non-IR)

.3 50W (130V long life), Spot 10°, Flood 25°, Wide Flood 40° - 650 (equivalent to 50W non-IR)

.4 Manufacturer: GE Quartzline, Philips

.2 MR16 type to be 12V, solid nickel steel pins, and total infill ceramic base. Lamp life rated 4000 hours, enclosed reflector with clear glass cover, 3000K colour.

.1	Narrow spot	10° to 13° beam angle
.2	Spot	20° to 26° beam angle
.3	Narrow flood	32° to 35° beam angle
.4	Flood	38° to 45° beam angle
.5	Wide Flood	55° to 65° beam angle

.6 Manufacturer: EYE Iwasaki Electric Co. Ltd., Philips, Osram

.3 Fluorescent Lamps

.1 T8-Type

.1 Instant start 265 mA, bulb shape T8, medium bi-pin base, 20,000 hours life, 3500K, CRI 86 (min), Minimum initial lumens:

.1 30W - 2950 lumens T8

.2 Acceptable manufacturer: Philips Energy Advantage 835

.2 T5-Type

.1 Programmed start high output, bulb shape T5, miniature bi-pin base, 35,000 hours life, 3500k, CRI 98 (min), minimum initial lumens:

.1 54W – 5000 lumens T5

.2 Acceptable manufacturer: Philips F54T5

.3 PL Type

.1 Instant start, two pin base, double looped or quad, rated average life 10,000 hours, colour temperature 3500k, minimum initial lumens:

.1 13W - 1250

.2 26W - 1800

.2 Manufacturer: Osram, Phillips

.4 Compact Fluorescent

.1 Instant start, four pin base, twin tube, rated average life 20,000 hours, colour temperature 3500K, minimum initial lumens:

40W - 3150 lumens.

.4 Metal Halide:
.1 ED type bulb, mogul base for vertical mount and position oriented mogul base for horizontal use, 20,000 hours average life, colour temperature 3000 degrees K, minimum initial lumens:
.1 100W - 8000 250W - 21500
.2 175W - 14000 400W - 37000
.3 Manufacturer: Philips M/3K/ALTO

.5 High Pressure Sodium
.1 Bulb shape E, mogul base, rated life 24,000 hours, colour corrected type, 2200K colour temperature, colour rendering index: 65, coated, minimum initial lumens:
.1 70W - 5985
.2 100W - 8800
.3 150W - 13500

.3 Ballasts

.1 Fluorescent electronic ballast:
.1 All fluorescent ballasts are to be electronic, instant start or programmed start type, refer to luminaire schedule. Rating: 60Hz voltage as indicated. Suitable for lamp quantity as indicated in luminaire schedule.
.2 Totally encased and shall not exceed 25°C temperature rise over 40°C ambient.
.3 Ballast shall have a power factor of 90% or above.
.4 Ballast shall not contain PCBs.
.5 Sequenced start progression which first heats cathode filaments and then ignites lamp.
.6 Sound rated: shall not exceed Class A.
.7 Mounting: integral with luminaire.
.8 Warranted for five years - date of installation to be marked on ballast.
.9 Input total harmonic distortion (THD) shall not exceed 10%.
.10 Ballast shall have a frequency of operation of 20 kHz or greater and operate without visible flickers.
.11 Electrical contractor to provide 10 spare ballasts.
.12 Advance Centium or Optanium or pre-approved equal.

.2 Fluorescent Electronic 50/100 Step Dim Type Ballast
.1 All fluorescent ballast's are to be electronic type. Rating: 60Hz voltage as indicated, for use with rapid start lamps, and shall have an average lamp current crest factor of 1.4.
.2 Ballast shall have a ballast factor of 95%.
.3 Sequenced start progression which first heats cathode filaments and then ignites lamp.
.4 Mounting: integral with luminaire.
.5 Warranted for five years - date of installation to be marked on ballast.
.6 Input total harmonic distortion (THD) shall not exceed 10%.
.7 Ballast shall have a frequency of operation of 20 KHz or greater and operate without visible flickers.
.8 Step dim function to switch ballast between 50% and 100% output.
.9 Electrical contractor to provide 10 spare ballasts.
.10 Manufacturer: Advance Optanium or pre-approved equal.

.3 Fluorescent dimmable ballast
.1 All fluorescent ballast's are to be electronic type. Rating: 60Hz voltage as indicated, for use with rapid start lamps, and shall have an average lamp current crest factor of

1.4.

.2 Ballast shall have a power factor of 90% or above.
.3 Ballast shall not contain PCBs.
.4 Sequenced start progression which first heats cathode filaments and then ignites lamp.
.5 Mounting: integral with luminaire.
.6 Warranted for five years - date of installation to be marked on ballast.
.7 Input current Third Harmonic content shall not exceed 10%, and total harmonic distortion (THD) of less than 10%.
.8 Ballast shall have a frequency of operation of 20 KHz or greater and operate without visible flickers.
.9 Dimmable to 5% output.
.10 Electrical contractor to provide 10 spare ballasts.
.11 Manufacturer: Lutron or Advance Mark Series

.4 Metal Halide ballast: design linear type:
.1 Rating: 60Hz voltage as indicated, for use with metal halide lamp
.2 Totally encased and designed for 40°C ambient temperature
.3 Power factor: minimum 95% with 95% of rated lamp lumens
.4 Type: constant wattage auto-transformer
.5 Capacitor: non PCB
.6 Input voltage range: plus or minus 10% of nominal.
.7 Minimum starting temperature: minus 29°C at 90% line voltage
.8 Mounting: indoor and outdoor integral with luminaire, or as noted.
.9 Crest factor: 1.8 minimum

.5 High pressure sodium ballast: to ANSI C82.4-1978, design linear type:
.1 Rating: voltage as indicated, for use with high pressure sodium lamp.
.2 Totally encased and designed for 40°C ambient temperature
.3 Power factor: minimum 95% with 95% of rated lamp lumens.
.4 Type: constant wattage, isolated secondary magnetic regulated with matching igniter as recommended by manufacturer.
.5 Capacitor: non-PCB.
.6 Input voltage range: plus 5% to minus 5%.
.7 Minimum starting temperature: minus 34°C at 90% line voltage.
.8 Mounting: indoor integral with luminaire, unless noted otherwise.

.4 Finishes

.1 Baked enamel finish:
.1 Conditioning of metal before painting:
.1 For corrosion resistance conversion coating to ASTM F1137.
.2 For paint base, conversion coating to ASTM F1137.
.2 Metal surfaces of luminaire housing and reflectors finished with high gloss baked enamel or alzak aluminum to give smooth, uniform appearance, free from pinholes or defects.
.3 Reflector and other inside surfaces finished as follows:
.1 White, minimum reflection factor 85%.
.2 Colour fastness: yellowness factor not above 0.02 and after 250 hours exposure in Atlas fade-ometer not to exceed 0.05.
.3 Film thickness, not less than 0.03 mm average and in no areas less than 0.025 mm.
.4 Gloss not less than 80 units as measured with Gardner 60E gloss meter.

.5 Flexibility: withstand bending over 12 mm mandrel without showing signs of cracking or flaking under 10 times magnification.

.6 Adhesion: 24 mm square lattice made of 3 mm squares cut through film to metal with sharp razor blade. Adhesive cellulose tape applied over lattice and pulled. Adhesion satisfactory if no coating removed.

.2 Alzak finish:

.1 Aluminium sheet fabricated from special aluminum alloys and chemically brightened, subsequently anodically treated to specifications established by Alcoa, to produce:

.1 Finish for mild commercial service, minimum density of coating 7.8 g/m^2, minimum reflectivity 83% for specular, 80.5% for semi-specular and 75% for diffuse.

.2 Finish for regular industrial service, minimum density of coating 14.8 g/m^2, minimum reflectivity 82% for specular and 73% for diffuse.

.3 Finish for heavy duty service, minimum density of coating [21.8] g/m^2, minimum reflectivity 85% for specular, 65% for diffuse.

.5 Accessories

.1 Pendant Mounting

.1 Pendant mounting shall be with white enamelled luminaire tubing provided as an accessory with luminaire unless otherwise specified.

.2 Slope ceiling mounting adapters shall be white enamelled supports provided as an accessory with luminaire unless otherwise specified.

.2 Wire Guards

.1 Wire guards shall be spot welded at crossing of members and be a minimum of 4.5mm thick galvanized steel. Guards shall be hinged from either side and be secured using wing nuts

.6 Exterior Lighting Controls

.1 All exterior luminaires, whether indicated on plans or not, must be provided with photocell and timer controls complete with manual override switch

.7 Lenses

.1 Refer to luminaire schedule.

.8 Luminaires

.1 For luminaire specifications, refer to luminaire schedule except for luminaires at white boards in teaching spaces.

.2 Luminaires for whiteboards in teaching spaces shall be Insite Compact-5 Interior Architectural Fluorescent or equivalent with T5HO lamp placed continuously along the entire length of whiteboards. The switching arrangement shall be such that each 8 foot section can be switched separately. Whiteboard luminaires shall be wall mounted above whiteboards.