16500 - LIGHTING EQUIPMENT

1.1 GENERAL

Lighting shall be designed to meet the following needs: security, labor savings, resource efficiency, reduces operating expenses, decrease total maintenance cost, atmosphere and comfort.

1.2 ILLUMINANCE LEVELS

Illuminance levels must meet or exceed the Illuminating Engineering Society (IES) of North America recommended lighting levels per the IES Lighting Handbook's Currently Recommended Illuminance Categories and Illuminance Values for Lighting Design - Targeted maintained Levels for interior and exterior spaces. The table below lists the most common areas/activities and their corresponding illuminance in foot-candles. Variation in illuminance levels should appropriately reflect IES illuminance selection procedures.

Area/Activity	Illuminance (foot-candles)
Classrooms	75
Conference Rooms	30
Corridors	15
Corridors - Nursing Areas - day	15
Corridors - Nursing Areas - night	7.5
Corridors - Operating areas, delivery, recovery, and laboratory suites and service	15
Elevators	15
Food Service Facilities - Dining Areas	7.5 (15 cleaning)
Food Service Facilities - Kitchen	75
Libraries - Active Book Stacks	30
Libraries - Inactive Book Stacks	7.5
Lobbies	15
Locker Rooms	15
Lounges	15
Nursing Area	30
Nursing Area - Chart Reading	75
Offices	50
Patient Rooms	7.5
Patient Rooms - Examination	75
Reception Areas	15
Residential - common areas, public spaces	7.5
Residential - Kitchen	75
Restrooms	30
Science Laboratories	75
Stairways	15
Parking Areas/walkways	3
Building entrances	10

1.3 LAMP COLOR TEMPERATURE SCHEDULE

Application	Lamp Color/Temperature
General Office, Classroom, Hospital, Laboratory	Cool White/4100K
Residential Life	Warm White/3500K
Specialty	Daylight/5000K or other (requires Project Manager approval)
Exterior	2800K – 4000K *

* Color range to be reviewed and approved by Executive Director, Campus Planning, Design and Construction Management and University Facilities Operations Director.

2.1 PRODUCTS

2.2 LAMPS

A. T8 Fluorescent
1. Use indoors where possible for maximum energy savings and long life.
2. Two, three, and four-foot T8 lamps shall be a minimum of 85 CRI and shall contain no more than 1.7 mg of Mercury.
3. Lamps shall be long life version, where available.
4. Warranty will have no restrictions on burning hours.
5. Lamp shall be available in Kelvin temperatures as needed per 1.3 Lamp Color Temperature Schedule.
6. Rated average life shall be a minimum of 25,000 hours on 12-hour start.
7. Base shall be Medium Bi Pin
8. Design make: Philips Alto or approved equal.
9. Warrantee shall be 24 months
10. Fluorescent lamp table:

Watts	Description	CRI	Color Temp	Diameter	Length	Design Lumens	Life (hrs.)
25	F32T8/ADV835/XEW ALTO 25W	86	3500	1”	48”	2425	36,000
25	F32T8/ADV841/XEW ALTO 25W	86	4100	1”	48”	2425	36,000
25	F25T8/ADV835/ALTO	86	3500	1”	36”	2050	25,000
25	F25T8/ADV841/ALTO	86	4100	1”	36”	2050	25,000
17	F17T8/ADV835/ALTO	86	3500	1”	24”	1300	25,000
17	F17T8/ADV841/ALTO	86	4100	1”	24”	1300	25,000

B. LED
1. Use for down lights, sconces, table lamps and floodlights for maximum energy savings and long life.
2. Lamp type, lumen rating, dimmable or non-dimmable, lumens, and beam angle as needed for application.
3. Lamp shall be available in Kelvin temperatures as needed per 1.3 Lamp Color Temperature Schedule.
4. Design make: Philips Endura LED or approved equal. Manufacturer’s model is expected to change often as technology and manufacture improvements occur. Specify lamp for application with low energy use, long life and required light characteristics.

C. HID Lamps (High Intensity Discharge)
   1. Use LED where applicable.
   2. Metal Halide lamps shall be used for building entrances, outdoor architectural applications, parking areas, walkway and general outdoor circulation applications, indoor applications with high ceilings and high light level requirements.
   3. Metal Halide lamps shall be of the energy saving type and shall have a ceramic construction arc tube. Fixtures must be enclosed luminaries and lamps shall be designed to operate in a universal burning position. Mogul and medium base lamps shall be rated for operation on pulse start metal halide ballast systems.
   4. One year minimum warranty.
   5. Philips Allstart CDM or approved equal.
   6. HID lamp table:

Watts	Description	CRI	Color Temp	Mean Lumens	Life (hrs.)
60	CPO-TW 60W/728	70	2800K	6,200	30,000
90	CPO-TW 90W/728	70	2800K	8,800	30,000
140	CPO-TW 140W/728	70	2800K	14,020	30,000
210	CDM Elite MW 210/T9/930/U/E	90	3000K	21,735	27,000
315	CDM Elite MW 315/T9/930/U/E	90	3000K	34,400	30,000

D. HID - Metal Halide or High Pressure Sodium
   1. Metal Halide - Building entrance applications, outdoor architectural lighting applications, walkway, and general outdoor circulation applications.
   2. High Pressure Sodium - Roadway and parking applications.

2.3 LUMINAIRES

A. Corridor Single Lamp Fixture
   1. 1x4 foot Recessed Parabolic Fixture
   2. 8 or 9 cell lay-in type
   3. Reflecting surfaces of body and reflector/wireway cover match precise parabolic contours of louver.

2.4 PARKING AREA LUMINAIRES

A. Poles
   1. 30 foot parking, 15 foot roadway tall, 6 inch nominal square pole
   2. 6063-T6 aluminum alloy
   3. 3 foot Mounting arm
   4. 356-T6 cast aluminum anchor base
   5. Dark bronze duranodic finish
   6. 2-1/2 x 4-1/2 inch handhold, 18 inches above top of base
   7. Tamper resistant anchor bolts or covers

B. Luminaire
   1. McGraw Edison Design 20 series or approved equal
   2. Provide waterproof inline fim in base of fixture
   3. Outside lighting to be wired on alternate phases to allow staggered operation on phase loss.

C. Base
   1. precast base (see standard detail E-2)
   2. 10 foot Ground rod

D. Lamp
   1. High Pressure Sodium

2.5 WALKWAY AND ROADWAY LUMINAIRES

A. Poles - Walkway
   1. Wadsworth 12 foot cast aluminum with 17 inch base - poured concrete. Holophane model to be Wadsworth, aluminum, 12 foot cast pole with "FTJ" fluted tapered (cast) .25 shaft style with 17 inch round base (TMP-85), with tenon PO7 and with anchor bolt (ABG) mounting with black finish.
   2. This is the standard pole height; however, pole height may vary throughout the University. Confirm pole heights with Project Manager. Poles, once delivered, cannot be returned to the manufacturer.

B. Poles - Roadway
   1. Wadsworth 14 foot cast aluminum with 17 inch base - poured concrete. Holophane model to be Wadsworth, aluminum, 14 foot cast pole with "FTJ" fluted tapered (cast) .25 shaft style with 17 inch round base (TMP-85), with tenon PO7 and with anchor bolt (ABG) mounting with black finish.
   2. This is the standard pole height; however, pole height may vary throughout the University. Confirm pole heights with Project Manager. Poles, once delivered, cannot be returned to the manufacturer.

C. Luminaire – Walkway and Roadway
   1. Granville Series luminaire with 5 inch decorative standard black finial, leaf style black housing, 175 Pulse MH; multitap volts; lunar optics cut off shield.

D. All new lighting for walkway and roadway areas is to include a control panel to be provided by the University of Rochester for interconnection to building energy and management system's Direct Digital Control (DDC) equipment

2.6 BALLASTS

A. T-8 Fluorescent Ballasts
   1. Ballasts shall be electronic, UL listed, Class P type.
   2. Ballast shall be instant start.
   3. Ballast shall provide Independent Lamp Operation (ILO) for Instant Start Ballasts allowing remaining lamps full light output when one or more lamps fail.
   4. Ballast shall contain auto restart circuitry in order to restart lamps without resetting power.
   5. Ballast shall operate from 50/60 Hz input source of 120V through 277V.
   6. Ballast shall provide for a Lamp Current Crest Factor of 1.7 or less.
   7. Ballast input current shall have Total Harmonic Distortion (THD) of less than 10%.
   8. Ballast shall have a Class A sound rating.
   9. Ballast shall not contain any Polychlorinated Biphenyl (PCB).
   10. Ballast shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (class A) for EMI/RFI (conducted and radiated).
   11. Ballast shall comply with ANSI C62.41 Category A for transient protection.
   12. Ballast shall carry a five-year warranty from date of manufacture.
   13. Design Make: Philips Advance Optanium or approved equal:

Length	Watts	Number of Lamps	Instant Start	Voltage
24	17	(1) T8	IOPA-1P32-N	120/277
24	17	(2) T8	IOPA-2P32-N	120/277
24	17	(3) T8	IOPA-3P32-SC	120/277
24	17	(4) T8	IOPA-4P32-SC	120/277
36	25	(1) T8	IOPA-1P32-N	120/277
36	25	(2) T8	IOPA-2P32-N	120/277

36	25	(3) T8	IOPA-3P32-SC	120/277
36	25	(4) T8	IOPA-4P32-SC	120/277
48	25	(1) T8	IOPA-1P32-N	120/277
48	25	(2) T8	IOPA-2P32-N	120/277
48	25	(3) T8	IOPA-3P32-SC	120/277
48	25	(4) T8	IOPA-4P32-SC	120/277

B. HID Ballasts (High Intensity Discharge Ballasts)
   1. Ballasts used for HID shall be thermally protected, multi-tapped 120/208/240/277 volt. Use of 480 volt only ballasts is not acceptable.
   2. Metal halide - constant wattage, autotransformer.
   3. High pressure sodium.

2.7 EXIT SIGNS - All Areas Excluding Residential Life

A. LED lamp assembly needs no maintenance or replacement under normal operating conditions, power consumption less than 5.5 watts (red) or 8.0 watts (green).
B. Welded steel, black matte finish frame.
C. Brushed aluminum face plate.
D. Red or green letters to match existing. New construction green letters.
E. 5-year minimum unconditional warranty.
F. Underwriters Laboratories (UL) listed.
G. Complies with all applicable NEC, OSHA standards and NFPA Life Safety Codes.
H. Trace-Lite LED Classic Series; Self-Powered Lighting, Inc, LED Model CLS exit; McPhilben 55 Line LED exit sign, Sure-Lite CAX-6-1, 2-00-AC or CAX-7-1,2-70-Battery or approved equal.

2.8 EMERGENCY POWER EXIT SIGNS - All Areas Excluding Residential Life

A. Same as above Exit Signs with battery back-up.

2.9 EXIT SIGNS - Residential Life Areas

A. Indirect LED lamp assembly needs no maintenance or replacement under normal operating conditions, power consumption less than 5.5 watts.
B. 0. 125 inch injection molded polycarbonate housing.
C. Die formed 16 gauge baseplate.
B. Stainless steel tamper resistant hardware.
C. Green letters on white background with universal letters.
D. Dual 120/277V operation.
E. 3-year unconditional warranty.
F. UL Listed.
G. Complies with all applicable NEC, OSHA standards and NFPA Life Safety Codes.
H. Kendall Trailmaster High Abuse LED Indirect Model 6504-GW, 6594-GW, 6554-GW, 6532A-GW, as required or approved equal.

2.10 EMERGENCY POWER EXIT SIGNS - Residential Life Areas

A. Same as above Exit Signs with battery back-up option.

2.11 AUTOMATIC LIGHTING CONTROLS

A. Conference rooms, classrooms less than 1,000 square feet:
   1. Occupancy sensor shall be a wall mounted infrared type with automatic and off switch only.
   2. User adjustable time delay control to be set for 11 minutes.
   3. Acceptable: Unenco model SOM-1000-A Series B (for I circuit application) or SOM-1000-A-2 (for 2 circuit application), or approved equal.

B. Conference rooms and classrooms ≥ 1,000 sq. ft.
   1. Occupancy sensors shall be a ceiling mounted ultrasonic.
   2. Occupancy sensors shall be designed specifically for the size and use of the area.
   3. Use adjustable time delay control to be set for 12 minutes.
   4. To be used in conjunction with wall switch.
   5. Acceptable: Novitas Light-o-Matic models 01-072 (one way), 01-083 (two way) and 13-011 switchpack, (required for each space), Unenco models C-500-1000-QTI (up to 1,000 sq. ft. coverage), C500-2000-QTI (up to 2,000 sq. ft. coverage) and 213-QTI (powerpack, required for each space) or approved equal.

C. Corridors and Restrooms
   1. Occupancy sensors shall be a ceiling mounted ultrasonic type.
   2. Occupancy sensors shall be designed specifically for the size and use of the area.
   3. User adjustable time delay control to be set for 30 minutes.
   4. To be used in lieu of wall switch or other control mechanism.
   5. Shall provide wall type switch override for sensors mounted at heights over 20' or those not easily accessible.
   6. Acceptable: MyTech restroom models: MAS-35OSF (up to 350 sq. ft. coverage), MAS-700SF (up to 700 sq. It coverage), LAS-1000SF (up to 1,000 sq. ft. coverage), LAS-1800SF (up to 1,800 sq. ft. coverage), MyTech corridor models: CS-1 (up to 65 linear ft., one way), CS-C (up to 100 linear ft., two-way comer), CS-2 (coverage to 100 linear ft., two-way), CS-3 (coverage to 150 linear ft., three-way) and PCS-24 power control required for each space) or approved equal.

D. Corridor luminaires located within 15 feet of a window (center of luminaries to the center of the window, measured horizontally) shall be controlled by a photocell.
   1. Lights shall be controlled so as to meet Illuminating Engineering Society minimum foot-candle levels.
   2. Acceptable: Area Lighting Research Photocontrol model AA-105at l2OVAC, Model AA-1068at 208/277 VAC or approved equal.

E. Occupancy sensors shall not be used in laboratories or mechanical rooms without University of Rochester approval.

F. Outside lights shall be connected to and controlled by the existing Building Energy and Management System's Direct Digital Control (DDC) equipment, except for special applications such as athletic fields.

G. Fluorescent dimming ballasts should be considered for daylighting applications, where appropriate.

3.1 INSTALLATION

A. Troffers
   1. 1 x 4 - two supports minimum.
   2. 2x 4 - four supports minimum.
   3. 2 x 2 - two supports minimum.

B. Pendant Mounted
   1. Swivel type hangers.

C. Aligning luminaries to be adjusted during dark hours.

END OF SECTION 16500