26 50 00 LIGHTING

This document is provided as a reference for the design team and should not be used directly as written project specifications.

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes lighting design criteria, interior and exterior luminaires, lamps and ballasts, as well as related installation guidelines.

1.02 REGULATORY AGENCIES

A. Lighting design should conform to the applicable requirements of the following agencies' most current edition of regulations and standards, unless otherwise stated:

1. American National Standards Institute (ANSI)
2. American Society for Testing Materials (ASTM)
3. Environmental Protection Agency (EPA)
4. Federal Communications Commission (FCC)
5. Illuminating Engineering Society of North America (IESNA)
6. National Electrical Manufacturers Association (NEMA)
7. National Fire Protection Association (NFPA)
8. Underwriter's Laboratories (UL)
9. U.S. Green Building Council (USGBC)

1.03 RECORD DRAWINGS

A. Refer to 'Penn Instructions to Design Professionals' for information regarding record drawings. In addition, lighting fixture record drawings shall be provided to the University in the form of standard catalog cuts and/or factory assembly drawings, and shall indicate the following:

1. Luminaire Type
2. Luminaire and lamp wattage and voltage
3. Complete photometric data
4. Manufacturer's name and catalog number including all fixture options
5. Lamp and ballast types and manufacturer's name
6. Warranty information for lamps and ballasts
7. Lamp correlated color temperature (CCT), color rendering index (CRI), and beam spread

B. Lighting control record drawings shall include the following:

1. Single line diagram showing all control components and associated wiring
2. Load schedule indicating circuit and zone number, light fixture types, lamp

source, and load per circuit or zone

3. Catalog cut sheets of control system components

C. Full size manufacturer's drawings should be provided for custom designed light fixtures.

1.04 SUBSTITUTIONS

A. Substitutions for light fixtures not specified in the Contract Documents shall be coordinated with the Office of the University Architect.

PART 2 - DESIGN CRITERIA

2.01 ILLUMINANCE LEVELS

A. Illuminance levels for spaces or areas not listed in the tables below shall be in accordance with the recommendations from the Illuminating Engineering Society of North America (IESNA).

B. Lighting design for videoconferencing spaces should follow all guidelines described in the current version of the IESNA Design Guide DG-17 Fundamentals of Lighting for Videoconferencing.

C. The illuminance levels listed below are average horizontal values unless otherwise noted and shall be calculated at the workplane height appropriate to the space. For instance, the workplane of a Corridor is the floor and an Office workplane is desk height (approximately 30" above floor).

D. Illuminance levels listed should be calculated as maintained values, using the appropriate light loss factor (LLF) for the room type, lamp, ballast, cleaning cycle and luminaire type.

Exterior Areas	**Minimum Horizontal Illuminance Level (Footcandles)**	**Average Vertical Illuminance Level (Footcandles)[1]**	**Maximum Uniformity Ratio (Maximum: Minimum)**
Pedestrian Paths (Distant from Roadways)	0.5 fc	0.5 fc	10:1
Parking Lots	0.5 fc	0.25 fc	15:1
Parking Garages [2]	1.0 fc	0.5 fc	10:1

[1] Meaured at 5 feet above walking surface

[2] A higher light level is required at parking garage entrances

Academic Building Areas	Illuminance Level (Footcandles)
Art Studio	50 fc
Auditoriums	30 - 50 fc
Circulation and Corridor Areas	10 fc
Classrooms	30 - 50 fc
Whiteboards	5 fc vertical
Chalkboards	50 fc vertical
Computer Lab	30 fc
Conference Rooms	30 – 40 fc [3]
Environmental Rooms - Workspace	50 - 60 fc [4]
Environmental Rooms - Storage	15 fc
File/Mail	30 - 50 fc
Laboratories	50 - 60 fc [4]
Libraries - General/Stacks	30 fc
Libraries - Reading Rooms	50 fc
Mechanical/Electrical rooms	20 fc
Offices	35 - 50 fc [4]
Restrooms	15 fc
Storage areas	15 fc
Theaters	30 fc

[3] Higher values may be required if the space is used for videoconferencing. Refer to Section 2.01.B.

[4] On workplane, including task lighting.

Residential Building Areas	Illuminance Level (Footcandles)
Hallways	10 fc

Dining Areas	20 fc
Dormitory Rooms - General	10 fc
Dormitory Rooms - Desk	30-50 fc [5]
Kitchens	50 fc
Laundry Rooms	30 fc
Lounges	30 fc

[5] Including task lighting

Athletic Facilities	**Minimum Horizontal Illuminance Level (Footcandles) [6]**	**Maximum Uniformity Ratio (Maximum: Minimum)**
Baseball		
Infield	100	2.5:1
Outfield	70	2.5:1
Basketball (Indoor)	125 fc	1.7:1
Football [7]	100 fc	1.7:1
Locker rooms	20 fc	N/A
Soccer	150 fc	2.5:1
Tennis	100 fc	2.5:1
Track & Field	50 fc	2.5:1
Training Facilities	50 fc	N/A

[6] Readings taken at 36" above ground unless otherwise noted.
[7] Readings taken at grade.

2.01 SUSTAINABLE DESIGN & ENERGY CONSERVATION

A. The USGBC Leadership in Energy and Environmental Design (LEED) Building Rating System should be used as a guideline for project lighting design. The Rating System (New Construction, Commercial Interiors, Core & Shell, etc) most appropriate to the project type should be followed.

If the New Construction (NC) rating system is deemed most appropriate, reference in particular the following credit sections; however additional sections may apply.

Sustainable Sites Credit 8 - Light Pollution
Energy & Atmosphere Credit 1 - Optimize Energy Performance
Indoor Air Quality Credit 6.1 - Controllability of Systems - Lighting
Indoor Air Quality Credit 8.1,2 - Daylighting & Views

B. Projects shall meet energy and control requirements outlined in the most current edition of the energy code as adopted by the City of Philadelphia or referenced in the LEED guidelines as described above.

C. The application of natural light is encouraged to minimize electric lighting requirements. Appropriate glare control must be provided on all windows and skylights. Automatic daylight harvesting (reducing electric lighting load when available daylight is sufficient for lighting requirements) is encouraged.

Daylight harvesting utilizing dimming should always be used in regularly occupied spaces, such as offices and classrooms, to prevent disruption to occupants. Daylight harvesting utilizing on/off switching is acceptable in transient spaces, such as lobbies, atriums, etc.

D. A lower ambient light level with undercabinet or desk mounted adjustable task lighting is recommended in all office spaces.

E. High reflectance finishes are recommended for all ceiling and wall surfaces to minimize required energy usage.

F. Lighting systems should be designed to achieve the above recommended illuminance levels while minimizing energy consumption.

G. Locate interior and exterior luminaires to minimize light trespass and glare to adjoining properties.

2.02 CONTROLS

A. Occupancy sensors shall be specified as the control scheme in all private offices, restrooms, classrooms, conference rooms, storage rooms and other enclosed areas of intermittent use.

1. Override switches or dimmers should be incorporated in offices, conference rooms, and classrooms.
2. Dual Technology (infrared and ultrasonic) sensors should be used in private offices, conference rooms, and classrooms.
3. Ultrasonic sensors are acceptable in restrooms without floor to ceiling partitions.
4. Follow manufacturer's recommendations for coverage specification and sensor placement.

B. Provide either BAS or relay panel, photocell, or a combination of both for control of all exterior lighting except code-required egress lighting. Locate controls within electrical rooms. In new construction, supply timeclock control with current transformers to provide feedback to central monitoring system at Operations Control Center (OCC) that fixtures are illuminated and drawing current.

C. Where rooms are used for a variety of functions, provide multi-level switching, fixture zoning, or dimming to accommodate light level flexibility for occupants.

D. Digital time switches with adjustable time setting should be provided for utility spaces containing large equipment.

E. MRI room lighting control shall be direct current (DC).

F. Consider the design of load shedding for lighting controls in larger new construction to provide feedback to central monitoring system at OCC.

G. Lighting control systems should be tested and calibrated by the Commissioning Agent for all projects.

H. Interior lighting controlled by relay panels for code required automatic shut-off shall have local override switches.

I. Programming of preset lighting control systems shall be coordinated with the Office of the University Architect and building occupants. A record of the settings shall be provided to building occupants.

PART 3 - PRODUCTS

3.01 LUMINAIRES

A. Luminaires should be constructed and installed to allow easy access for luminaire maintenance. Lenses, reflectors, and connectors should be captive to fixture where practical.

B. Interior Lighting

1. Mounting of luminaires above stairs and in locations that are higher than single floor ceiling heights shall be coordinated with the Office of the University Architect to confirm access to the fixtures is possible with available maintenance equipment.

2. Luminaires must be hard-wired. Flexible cord (SJO) connecters are not acceptable. MC cable is permitted.

3. Where luminaires from manufacturer's standard product lines do not meet the requirements of the project or application, custom designed fixtures are acceptable with approval by the University provided they meet the following criteria:

a. The fixture shall utilize commonly available lamp types, preferably those used elsewhere on the project.

b. The entire fixture assembly must be listed by U.L. or other Nationally Recognized Testing Laboratory (NRTL) to U.L standards.

c. The lamp and ballast must be easily accessible for maintenance without major disassembly of the fixture.

4. Luminaires should have low iridescent reflectors, baffles, and louvers.

5. Adjustable luminaires shall be capable of being locked into position with a legible aiming angle for consistency between fixtures.

6. Compact fluorescent luminaires shall be manufactured specifically for compact fluorescent lamps with ballasts integral to the luminaire. Providing assemblies designed to retrofit incandescent luminaires is prohibited unless approved by the Office of the University Architect.

7. Luminaires shall bear U.L. label or other Nationally Recognized Testing Laboratory (NRTL) tested to U.L. standards.

8. Where luminaires utilize flat lenses, 100% UV stabilized virgin acrylic with minimum 0.125" thickness shall be specified. When lensed fixtures are specified in areas where the fixtures are subject to damage, polycarbonate lenses shall be specified in lieu of acrylic.

9. Luminaires with painted components should be painted after fabrication.

10. Specify luminaires utilizing linear fluorescent lamps in lieu of compact fluorescent whenever appropriate.

C. Exterior Lighting

1. Exterior pathway light poles shall be either of the following fixtures. Any deviations must be pre-approved by the Office of the University Architect.

a. Decorative exterior pole fixture with overall 12' tall dimension, pole with decorative aluminum base cover and traditional style luminaire, both with custom color finish. Post shall be tapered aluminum construction with 3" diameter top and 5" diameter base. Luminaire shall have Lexan diffuser and injection molded clear closer with specular reflectors. Lamp is 175-watt metal halide.

Catalog number: Street Lighting Corporation PLV/3-14MH 175 MODIFIED SPECIAL

Refer to cut sheet A at end of the Design Guide.

b. Decorative exterior pole fixture with nominal 14' tall pole with decorative tapered base and traditional style luminaire. Post shall be aluminum construction with 4-1/4" diameter shaft with wiring access door within base and 3" by 3" round tenon. Luminaire shall be 18" diameter by 40-1/2" tall with cast aluminum cage, roof, and finial, and clear textured acrylic globe and clear acrylic dome lens, and stainless steel hardware. Lamp is 150-watt metal halide with medium base. Luminaire and pole shall have a custom finish to

match Rockwood Shutter Green, SW #2809.

Catalog number: Antique Street Lamps, Philadelphia Series
PX PD18 13-11 S4X FG-S AB4/11 CM PD28 S 150M MED ACT TB CDL L-6355A CM

Refer to cut sheet B at end of the Design Guide.

2. Poles shall be spaced a maximum of thirty (30) feet on center.

3. Luminaires should be either located or specified to prevent possible damage from vandalism.

4. Exterior luminaires and poles shall have the ability to withstand wind speeds of 80 miles per hour.

3.02 LAMPS

A. General

1. The selection of luminaires should minimize the quantity of different lamp types utilized to the extent possible.

2. The use of incandescent lamps is acceptable only in specialty accent or decorative lighting applications and must be halogen type. Standard incandescent (A-shape) lamps may only be used in Dark Room and MRI Room applications and should be 130V rated.

3. Mercury vapor and low pressure sodium lamps are not acceptable.

4. T-12 fluorescent lamps are not acceptable.

5. U-shaped fluorescent lamps are not preferred.

6. For renovation projects, the lamp specification must match that of adjacent areas.

7. Energy-saving linear fluorescent (eg Philips Energy Advantage) lamps should not be used in exterior low temperature or dimming applications.

B. Linear Fluorescent Lamps

1. Lamps with upgraded life and/or energy efficiency over the requirements listed below are encouraged if appropriate to the project.

2. Lamps should have a correlated color temperature (CCT) of 3500K and minimum color rendering index (CRI) of 85.

3. Lamps should meet the US EPA's Toxicity Characteristic Leaching Procedure (TCLP) requirements.

4. T8 Lamps:

    a. Lamp warranty period should be a minimum of 30 months.

    b. When run on an instant start ballast, lamp life shall be minimum 24,000 hours at three hours per start and 30,000 hours at 12 hours per start. When a programmed start ballast is utilized, lamp life shall be minimum 30,000 hours at three hours per start and 36,000 hours at 12 hours per start.

    c. Four-foot long lamps shall have a minimum initial light output rating of 2950 lumens.

5. T5 Lamps:

    a. Lamp warranty period should be a minimum of 36 months.

    b. Lamp life shall be minimum 25,000 hours at three hours per start and 35,000 hours at 12 hours per start.

    c. Four-foot long lamps shall have a minimum initial light output rating of 2900 lumens.

6. T5 High Output Lamps:

    d. Lamp warranty period should be a minimum of 36 months.

    e. Lamp life shall be minimum 25,000 hours at three hours per start and 35,000 hours at 12 hours per start.

    f. Four-foot long lamps shall have a minimum initial light output rating of 5000 lumens.

C. Compact Fluorescent Lamps

1. Compact fluorescent lamps should utilize 4-pin bases wherever possible.

2. Lamps shall have a minimum 12,000 hour life.

D. Induction Lamps

1. Utilize induction lamps where access for maintenance is difficult or where fixture will experience extreme hot or cold temperatures.

2. Either Philips QL or Sylvania Icetron shaped lamps are acceptable.

3. Lamp life shall be rated minimum 100,000 hours.

4. Lamps shall have a minimum 80 CRI.

5. Lamps shall have a CCT of 3000-4000K, depending on application.

E. LED Lighting

1. Consider LED sources based on durability, energy efficiency, and reduced maintenance. The use should be approved by the Office of the University Architect prior to specification.

3.03 BALLASTS

A. General

1. Programmed start ballasts should be specified in fixtures when used in conjunction with occupancy sensors for control.

2. All ballasts should have end-of-life protection.

3. Utilize tandem wiring to avoid single-lamp ballasts.

4. Ballasts used in fixtures mounted in an exterior location shall have a starting temperature of 0˚F.

B. Fluorescent

1. Electronic ballasts shall be specified for all fluorescent and compact fluorescent lamps.

2. Fluorescent ballasts should be listed UL Class P with a Sound Rating of A and a minimum power factor of 95.

3. Confirm all dimming ballasts are compatible with the control systems operating them.

4. Electronic fluorescent ballasts shall have a warranty for a minimum of five (5) years against defects in material or workmanship.

5. Emergency battery and dimming ballasts for fluorescent lamps shall have a warranty for a minimum of three (3) years, against defects in material or workmanship.

6. Dimming ballasts shall be capable of striking lamps at any light level without first flashing to full output.

7. Ballasts should have total harmonic current distortion of less than 10% unless determined that related inrush current would be detrimental to the control system.

C. High Intensity Discharge

1. Electronic or pulse start ballasts shall be specified for all metal halide sources.

2. Electronic metal halide ballasts shall have a warranty for a minimum of three

(3) years against defects in material or workmanship.

3. Metal halide ballasts should have total harmonic current distortion of less than 15%.

3.04 EMERGENCY LIGHTING

A. Provide self-contained emergency lighting units in all generator, switchgear, ATS, and UPS rooms, regardless of whether or not generator power is available on the project.

B. All new exit signs shall utilize LED lamping.

C. Self-powered exit signs should be provided with sealed maintenance-free batteries and self diagnostics.

D. When generator power is unavailable, emergency fluorescent battery ballasts utilized within general lighting fixtures or self-contained emergency battery units are acceptable for code required egress lighting. Coordinate with the Office of the University Architect.

E. Radioactive self-luminous exit signs are not acceptable. Self-luminous exit signs which are toxin free may be considered on a case by case basis.

F. Emergency lighting levels shall meet National Fire Protection Association (NFPA) 101 and International Building Code (IBC) requirements.

PART 4 - EXECUTION

A. Fluorescent lamps, especially those to be dimmed, should be burned in as recommended by the lamp manufacturer prior to acceptance by the University.

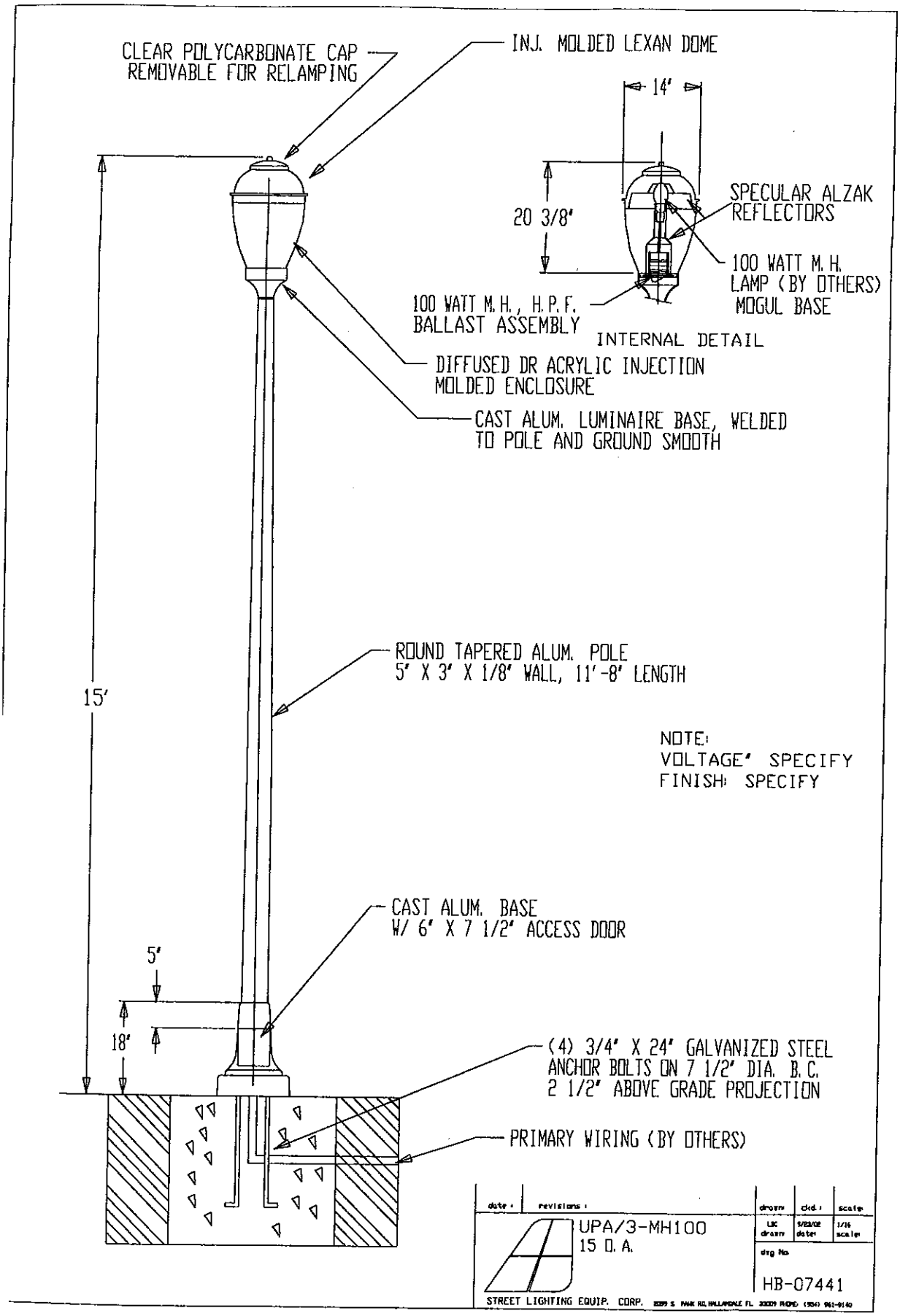
B. All luminaires recessed or suspended from the ceiling shall be supported by the structure above the ceiling at a minimum of two locations for every four feet of fixture length.

C. The Contractor shall provide a list of lamp types used on the project with the associated installation locations noted.

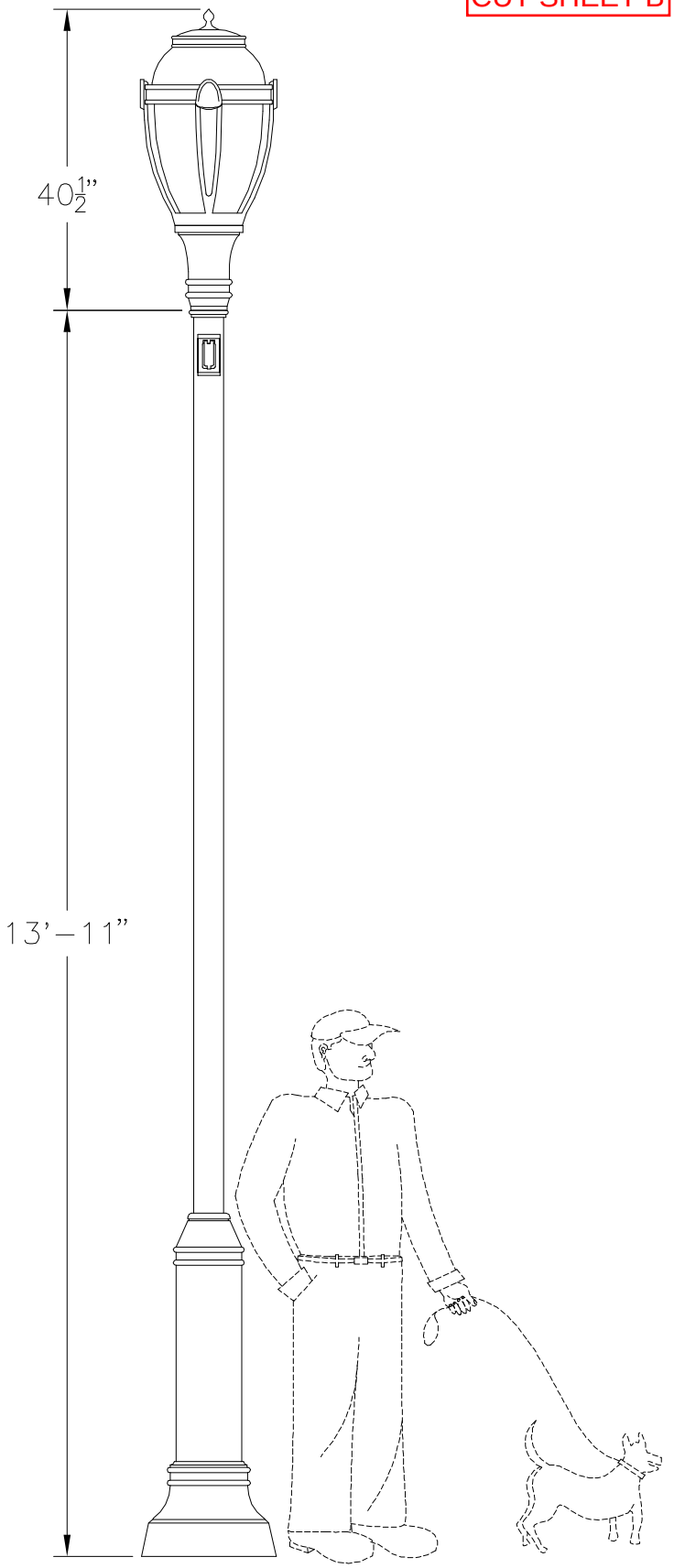
D. All adjustable interior and exterior light fixtures should be aimed by the Contractor to the satisfaction of the Architect and the University.

+ + END OF SECTION + +

CUT SHEET A


CLEAR POLYCARBONATE CAP
REMOVABLE FOR RELAMPING
INJ. MOLDED LEXAN DOME
14"
20 3/8"
SPECULAR ALZAK
REFLECTORS
100 WATT M.H.
LAMP (BY OTHERS)
MOGUL BASE
100 WATT M.H., H.P.F.
BALLAST ASSEMBLY
INTERNAL DETAIL
DIFFUSED DR ACRYLIC INJECTION
MOLDED ENCLOSURE
CAST ALUM. LUMINAIRE BASE, WELDED
TO POLE AND GROUND SMOOTH
ROUND TAPERED ALUM. POLE
5" X 3" X 1/8" WALL, 11'-8" LENGTH
15'
NOTE:
VOLTAGE: SPECIFY
FINISH: SPECIFY
CAST ALUM. BASE
W/ 6" X 7 1/2" ACCESS DOOR
5"
18"
(4) 3/4" X 24" GALVANIZED STEEL
ANCHOR BOLTS ON 7 1/2" DIA. B.C.
2 1/2" ABOVE GRADE PROJECTION
PRIMARY WIRING (BY OTHERS)
date:
revisions:
drawn:
chkd.:
scale:
UPA/3-MH100
15 O.A.
drg No.
HB-07441
STREET LIGHTING EQUIP. CORP.

CUT SHEET B



sign & date

Customer Approval

Catalog#

PX PD18 13-11 S4X FG-S AB4/11 CM
PD28 S 150M MED ACT TB CDL L-6355A CM

Philadelphia Series
Aluminum Post

Post:

Post shall be all aluminum construction consisting of a classic tapered base and a Ø4" ¼" wall aluminum shaft with a Ø3" x 3" tenon. A door is located in the base for anchorage and wiring access.

Luminaire:

Luminaire shall be Ø18" x 40½" tall with a cast aluminum,cage, roof and finial with a clear textured acrylic globe and a clear acrylic dome lens.
Luminaire shall be furnished with a high intensity discharge ballast and socket assembly.

Lamp Type	*Mercury Vapor*	*Metal Halide*	*High Pressure Sodium*	*Voltage*
HID Socket Size	☐ - 50H	☐ - 50M	☐ - 35S	☐/120
	☐ - 75H	☐ - 70M	☐ - 50S	☐/208
■ - MED	☐ - 100H	☐ - 100M	☐ - 70S	☐/240
☐ - MOG	☐ - 175H	■ - 150M	☐ - 100S	☐/277
	☐ - 250H	☐ - 175M	☐ - 150S	☐/480
		☐ - 250M	☐ - 250S	■/TB

Accessories:

FG-S - duplex GFCI outlet with weatherproof cover.

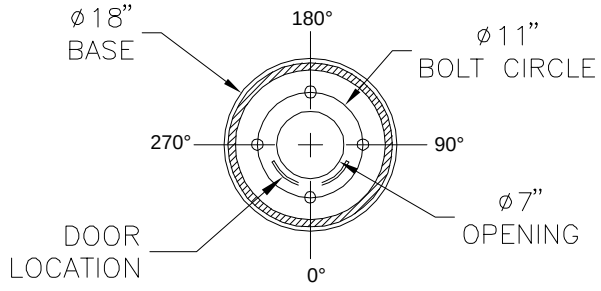
Anchorage:

Post shall be furnished with (4) 1" hot-dip galvanized L-type anchor bolts.

Finish:

Post shall be furnished with a custom match finish. Finish specified as Rockwood Shutter Green; SW #2809.

Anchorage Detail



Note:

All hardware shall be stainless steel. All easily accessible exterior hardware shall be tamper resistant.

Post Height: 13'-11"
Base Size: Ø18"

Overall Height: 16'-3½"
Top Light Center: 15'-8"

date:	scale:	dwg#:
4/13/05	NTS	L-6355A

ANTIQUE Street Lamps

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