

1 GENERAL

- 1.1 The work of this section includes the provision of all design, labour, materials, equipment and services required to fabricate and install exterior lighting as required for a complete project. The work includes, but is not necessarily limited to, the items referenced herein:
- 1.1.1 Lighting Fixtures
 - 1.1.2 Underground Wiring
 - 1.1.3 Lighting Control Equipment
- 1.2 Supply site lighting to meet current codes and standards and suit functional criteria for the facility. Services for site lighting to be fed from the new facility's distribution system.
- 1.3 Submittals:
- 1.3.1 Submit shop drawings.
 - 1.3.2 Submit lighting calculations, computer simulated point by point, in an approved IES format, including average levels, minimums, maximums, average/min, max/min.
- 1.4 Operations and Maintenance Manuals:
- 1.4.1 Provide maintenance details for inclusion in Operations and Maintenance Manual.
 - 1.4.2 Provide list of fixtures.
 - 1.4.3 Provide list of ballast and lamps.
 - 1.4.4 Provide list of spare parts and suppliers.
- 1.5 Commissioning:
- 1.5.1 Systems and Equipment supplied shall be tested and put into operation complete with all controls. Once the system is operational, lighting level measurements shall be completed and compared with the submitted lighting level calculations.

2 DESIGN

- 2.1 Outdoor lighting and security lighting
- 2.1.1 Educational buildings are used after dark, and it is therefore important to give careful consideration to the various aspects of outdoor lighting. Building facades, approaches and outdoor activity areas shall be illuminated both for the activity itself and for general safety, as well as for protection against vandalism and theft. Outdoor lighting and security

lighting are so closely related that they must be considered together. Often the same installation will serve both purposes.

- 2.1.2 Outdoor lighting should facilitate legitimate night-time approach and entry, whether on foot or by vehicle, provide security for the building and its contents, and enhance the architectural features of the building. Walks, driveways, internal streets and parking lots shall be illuminated at night. They may be lighted using conventional walkway, roadway and parking lot luminaires. Entrance and exit areas of the building should be more brightly illuminated with efficient light sources such as metal halide similar to adjacent building fixture.
- 2.1.3 Power circuits to be provided for exterior signage controlled by the BAS system.
- 2.2 Lighting systems to be designed to meet the functional criteria of each area and specific lighting task.
- 2.3 Exterior lighting is to generally be H.I.D. type located to provide levels of illumination as prescribed.
- 2.4 Exterior lighting shall be automatically switched by a combination photocell and building automation system.
- 2.5 All fixtures and components to bear CSA approval labels, where this is not possible, local hydro authority approval shall be obtained.
- 2.6 Lighting design levels and layouts are to be determined using software designed for this application, all calculations, printouts, etc. are to be submitted for review.
- 2.7 Services to the lighting system are to be RWU90 installed in PVC ducts.
- 2.8 Any circuit conductor to be sized to obtain maximum 3% voltage drop at furthest lighting standard.
- 2.9 Area lighting luminaires to be mounted on building walls and steel poles. Poles to be installed on concrete base to suit pole height.
- 2.10 Underground services to be buried to a minimum depth of 1 m and conduits to be set on a bed of builders sand with a minimum of 100 mm sand cover on the top. Where services run under roadways or paved areas, the conduits shall be encased in concrete. All systems to be provided with a separate ground wire.
- 2.11 The following are illumination levels for exterior building spaces, expressed as minimum acceptable values of average maintained horizontal lux levels over usable area and at pavement level.

<u>Description of Task</u>	<u>Illumination Level (lx)</u>	<u>Uniformity Ratio</u>
Open Parking:		

Vehicular traffic	10	4:1
Vehicular intersections	30	3:1
Pedestrian walkways	10	4:1
Pedestrian walkways and Vehicular intersection	30	3:1
Other areas	10	4:1

3 MATERIALS

3.1 Metal Halide Ballast:

- 3.1.1 Rating: voltage as required, for use with metal halide lamp.
- 3.1.2 Totally encased and designed for 40 °C ambient temperature.
- 3.1.3 Power factor: minimum 95% with 95% of rated lamp lumens.
- 3.1.4 Type: constant wattage auto-transformer isolated secondary solid state.
- 3.1.5 Capacitor: Non-PCB.
- 3.1.6 Input voltage range: plus or minus 10% of nominal.
- 3.1.7 Minimum starting temperature: minus 30°C at 90% line voltage.
- 3.1.8 Mounting: outdoor integral with luminaire.
- 3.1.9 Crest factor: 1.4 maximum.

3.2 Steel Poles: to [NEMA SH5-1969(R1974)], designed for underground wiring and:

- 3.2.1 Mounting on concrete anchor base without transformer base.
- 3.2.2 Style: monotube, round tapered one-piece construction.
- 3.2.3 Straight for number of luminaire mounting brackets, as required.
- 3.2.4 Access handhole above pole base for wiring connections, with welded-on reinforcing frame and gasketed bolted-on cover.
- 3.2.5 Size: as required.
- 3.2.6 Anchor bolts: dimensions and numbers as per manufacturer's recommendations, galvanized steel with shims, nuts and covers.
- 3.2.7 Finish: to match fixture. Pole to be galvanized (minimum 3-4 mils as per [CSA G164-M]) before painting or to be painted inside and outside using powder coating, minimum 3 mils.
- 3.2.8 Grounding lug.
- 3.2.9 The poles shall have sufficient strength to withstand steady wind speeds of

135 km/h with a 1.3 gust factor.

3.2.10 Pole style and height to be similar to existing on campus.

3.3 HID Luminaire

3.3.1 Housing:

3.3.1.1 One-piece, die cast aluminum with integral cooling fins.

3.3.1.2 Solid heat barrier wall to separate optical and electrical compartments.

3.3.1.3 All hardware is to be stainless steel or electro-zinc plated steel.

3.3.1.4 Half-cylinder shape with 55° front plane and undercut ballast area.

3.3.1.5 85 A, 600 V box clamp terminal block for field wire connections mounted to housing inside electrical compartment and factory-prewired to electrical module disconnect plug.

3.3.2 Lens Frame and Latch:

3.3.2.1 Rigid, one-piece die cast aluminum door frame with no tool mounting and removal.

3.3.2.2 Single die cast aluminum cam latch to lock door in place.

3.3.2.3 Optical chamber to be sealed by one-piece E.P.D.M. gasket.

3.3.2.4 Clear 3/16" tempered glass lens.

3.3.3 Fixture Support Arm:

3.3.3.1 One-piece, oval-shaped extruded aluminum with internal guides for draw bolts.

3.3.3.2 Arm to be radius-cut for specified round pole providing automatic alignment when bolts are tightened.

3.3.4 Finish:

3.3.4.1 Fixture and support arm to be supplied in TGIC thermoset, polyester powder-coat (minimum 2.5 mil thick) applied over a chromate conversion coating.

3.3.5 Ballast assembly:

3.3.5.1 Mounted on a single ballast plate to be factory prewired with quick-disconnect plugs.

3.3.5.2 Attaches to fixture housing with no tool hinge/latch.

3.3.6 Reflectors:

3.3.6.1 Four light distributions to be available.

- 3.3.6.2 Specular Alzak optical segments to be assembled as one-piece modules which are field-rotatable in 90 increments and are easily interchangeable.
- 3.3.6.3 All sockets to be prewired with quick-disconnect plugs that terminate in the ballast compartment.
- 3.3.6.4 Wires to be sealed by a removable silicone grommet in the barrier wall between the optical and electrical compartments.
- 3.3.7 Optical Chamber:
 - 3.3.7.1 Totally sealed from outside moisture, insect and air contamination.
 - 3.3.7.2 Totally sealed from electrical compartment, including wire penetrations.
 - 3.3.7.3 Air filter shall permit the optical chamber to breath and to filter out all particles above 500 microns. Filter to be mounted in solid wall between optical compartment and latch cavity.
- 3.3.8 Lamp Stabilizer:
 - 3.3.8.1 Silicone socket/lamp stabilizer to be applied on all M.H.
- 3.3.9 Style of luminaire to be similar to adjacent buildings.
- 3.4 Perimeter Building Mounted Security Luminaire
 - 3.4.1 Housing:
 - 3.4.1.1 One-piece, durable diecast aluminum housing shall be designed for recessed dry or concrete pour applications, surface mounting to wall.
 - 3.4.1.2 Finish on housing shall be premium, abrasion and fade resistant, electrostatically-applied, over-cured, polyester powder paint. All exterior hardware shall be of stainless steel.
 - 3.4.2 Lens
 - 3.4.2.1 One-piece, injection-moulded, five-facet polycarbonate lens, high impact resistant for exceptional durability and vandal resistance. Upper portion of lens shall have opaque surface which shields lamp from normal viewing angles.
 - 3.4.2.2 Lens shall have clear front facet and vertical prisms on side facets to spread light horizontally without affecting vertical distribution produced by reflector. Entire outer surface shall be smooth for ease of maintenance with four stainless steel screws and retained with a drop hinge in open position.
 - 3.4.3 Ballast and Electrical Assembly:
 - 3.4.3.1 Suitable for outdoor wet locations.

- 3.4.3.2 Luminaire ballast assembly shall be completely wired with leads and quick disconnects for connecting to power source and lamp. Leads shall be mounted directly to cast aluminum housing for maximum heat dissipation.
- 3.4.4 Reflector System:
 - 3.4.4.1 Consists of one element: a hydroformed, primary reflector mounted to aluminum housing with four screws, and smaller secondary reflector mounted to the polycarbonate lens with four permanent anchor clips.
 - 3.4.4.2 Both primary and secondary reflectors have a specular Alzak finish.
- 3.4.5 Style of luminaire to be similar to adjacent parking lot and buildings.

4 INSTALLATION

- 4.1 Install concrete bases, conduits and wiring.
- 4.2 Poles shall be handled using suitable non-abrasive slings at the pole pick-up points specified by the pole manufacturer.
- 4.3 Anchorage templates shall be removed prior to installation of poles. All bolts and nuts shall be cleaned and coated with white lithium-based grease.
- 4.4 Mount poles on concrete base in accordance with the manufacturer's instructions.
- 4.5 Poles shall be secured to the anchorage assembly base by setting all nuts to an initial torque as specified by the manufacturer. Poles shall then be set in plumb alignment by adjustment of combinations of levelling nuts and holding nuts. Final tightening of nuts shall be to a minimum torque as specified by the manufacturer.
- 4.6 Lamps shall be installed after poles have been erected and the brackets and luminaires mounted and levelled. All lamps will be of the type suitable for the fixture in which they are installed. The installation date shall be marked on each lamp base.
- 4.7 Luminaires shall be kept free of conditions where moisture or dirt could damage the ballasts or reflecting surfaces of the optical system.
- 4.8 Luminaires shall be checked for the correct optical system settings to give the designated type of light distribution. If required, the *[Design Builder]* shall reset the lampholder in accordance with the manufacturer's instructions to give the proper type of distribution required. Luminaires shall be mounted on poles and shall be installed level along both the longitudinal and transverse axis.
- 4.9 Luminaire clamping assemblies shall be securely tightened, upon completion of levelling, to prevent shifting by wind.
- 4.10 Riser wires in poles shall be terminated at top of pole. Connections shall be made with compression connectors insulated with insulating covers.

- 4.11 Energize system aim or adjust luminaires verify automatic control leave in working condition.

End of Section