WSP-4 SITE – EXTERIOR LIGHTING

1. SCOPE

This section outlines the requirements for site lighting for Women's institutions including perimeter fence lighting and provides design guidelines for the following:

- Type of lighting systems and standards.
- Recommendations for lighting levels.
- Quality of illumination.
- Recommendations for control of glare.
- Recommendations for uniformity and brightness control of the environment.
- Recommendations for maintenance of the lighting system.

2. RELATED SECTIONS

WSP–2 – Fences
WSP–5 – Traffic Circulation
TCD E–1 – General Electrical Engineering and Electrical Distribution
TCD E–7 – Emergency Electrical

3. GENERAL REQUIREMENTS

3.1 Exterior lighting is provided for safety and security within institutional grounds; to assist in the visual detection of escape attempts, and to permit the use of outdoor amenities after daylight.

3.2 Exterior lighting shall be situated to minimize light entering sleeping areas.

3.3 Exterior lighting systems shall be designed to caste a practicably uniform level of lighting, free of shadows or dark spots and with minimal glare.

3.4 Energy saving features and systems shall be used in accordance with government policy.

3.5 Levels of illumination herein presented refer to average and avg./min. ratio values for either horizontal, ground level, or vertical illumination, unless otherwise stated. Local conditions may make it necessary to adjust values.

3.6 Lighting is provided to assist CCTV monitoring.

3.7 Systems shall be designed to withstand a wind velocity of 160 km/h and ice loading characteristic of the area in which the institution is located.

3.8 All security lighting systems shall be equipped with automatic control and manual override. The manual override shall reset itself to the automatic mode after it has been left in the manual mode for 24 hours. Recreation area lighting controls shall be manual only.

4. APPLICATIONS

4.1 Exterior lighting is designed to provide illumination of the following:

- Signage
- Entranceways and exits, including exterior stairways and ramps
- Pedestrian walks
- Institutional Grounds
- Parking lots and roadways
- Outdoor amenity areas
- Secure perimeter

5. PERFORMANCE REQUIREMENTS

5.1 Security Lighting

5.1.1 Lighting requiring Emergency Power Source

5.1.1.1 Perimeter Fence Lighting System - Special requirements for the perimeter system are covered in item 5.2.

5.1.1.2 Institutional Compound – the entire area within the perimeter fence illuminated to 10 ℓx average to allow silhouetting surveillance.

5.1.2 Illumination

5.1.1.3 Entrances and Sally ports shall be illuminated to allow recognition of persons entering the institution after daylight hours. Fixture placement shall achieve optimal visibility. The Entrance and Sally ports shall generally have an illumination level matching that of the perimeter fence.

5.1.1.4 Glare Control - Lighting system shall be engineered to ensure that spill light will not produce a glare problem without affecting the minimum illumination levels.

5.1.1.5 Uniformity – The placement of the luminaires should be arranged so as to ensure good uniformity of illumination over the area illuminated. Uniformity is expressed as the ratio of average illumination to minimum. In the area between perimeter fences the ratio should not exceed 3:1.

5.1.1.6 Luminaires – perimeter security lighting fixtures shall be based on the following requirements:

a) Shatterproof lenses and vandal resistant housings
b) Non yellowing lenses
c) Pole, luminaires and brackets capable of withstanding the force of 160 km/h wind
d) Lighting fixtures location to facilitate replacement of components.

5.1.1.7 Electrical System – The electrical system must meet the following minimum requirements.

a) The security lighting system including the perimeter fence lighting shall be connected to the standby power system for continuity of service.

b) Grounding methods shall meet the requirements of the Canadian Electrical Code, *CSA C22.1-09*[13].

c) Protect each phase with dedicated single phase circuit breaker. This will prevent the possibility of a fault on one phase affecting the other two.

5.1.1.8 Codes and Standards – Installation shall comply with the latest edition of the Canadian Electrical Code, Part 1, *CSA C22.1-09* (see footnote 2) and any applicable local or provincial regulation. Requirements outlined herein however, shall take precedence.

5.2 Perimeter Fence Lighting

5.2.1 General

5.2.1.1 Security Lighting for the Perimeter fence shall:

a) Discourage or deter escape attempts.
b) Make detection certain should an escape be attempted at scaling the perimeter fence.
c) Avoid glare that can impact good visibility while not adversely affecting surrounding area.
d) Ensure high system reliability.
e) Meet levels of illumination indicated in Plates SP-4-2 and SP-4-6.
f) Have automatic control.
g) Consist of poles, lighting equipment and components located inside the perimeter fence and be made vandal or sabotage proof.
h) Be connected to the standby power system for continuity of service.
i) Provide a monochromatic light source.
j) Provide minimum illumination level of 10 ℓx at the fence line.

5.2.2 Design

Perimeter Fence Lighting System shall be designed to achieve and maintain lighting quality based on the following factors and considerations:

5.2.2.1 Where a Women's institution is located in an area with little light from off property, the lighting system shall independently enable clear viewing within the illuminated area of the fence line.

5.2.2.2 Where an institution is located in close proximity to the community and more specifically housing, the lighting system shall reduce the impact of light spill beyond the institutional reserve.

5.2.2.3 A maintenance factor shall be applied in the design calculation to make allowance for luminaire dirt and any depreciation. Also consider weather conditions which will adversely affect visibility.

5.2.3 Luminaires

5.2.3.1 Luminaire type – The current choice for lighting is Light Emitting Diode (LED) or Induction lighting. These will normally be fully operable between -40°C (or less) and + 50°C (or more) and emit a white and bright light quality which enhances vision. LED systems can also be integrated with PIDS to allow the lighting to run at two illumination settings: low and high. Lighting could normally run at the low setting but

[13] CSA C22.1-09 -- Canadian electrical code, part I (21st edition), safety standard for electrical installations.

should the perimeter fence be disturbed as detected by the FDS, the lighting for that zone only could increase to the high setting. This will signal to the escapee that his attempt has been detected and as well highlight the disturbed zone to the any officer on ground. The lighting therefore operates at 50% power increasing to 100% for the disturbed zone reducing the power output even beyond its already highly efficient performance. See Plate SP-4-6 for LED layout.

5.2.3.2 LED lamps are specified by manufacturers and must be selected based on engineer's recommendation for CSC application.

5.2.4 Poles are specified as follows:

5.2.4.1 Octagonal tapered of steel complete with transformer bases, eye bolts and gasketed electrical outlet boxes.

5.2.4.2 Hot dipped galvanized on interior and exterior surfaces as per *ASTM A123–09 and* hot dipped galvanized anchor bolts and hardware accessories where possible.

5.2.4.3 Height and luminaire spacing to match type of lighting system as shown on Plates SP-4-3 & SP-4-6.

5.2.4.4 Hardwood plywood template for retaining anchor bolts when grouting them in place in the concrete base.

5.2.4.5 With non-shrink grout.

5.2.4.6 Transformer base plates drilled in the manufacturer's plant to match the anchor bolt configuration set in the bases.

5.2.4.7 Access doors in the transformer bases are c/w gasket and use tamperproof hardware for securing doors in place.

5.2.4.8 Transformer base oriented so that their access doors are parallel to but facing away from the fence.

5.2.4.9 For grounding requirement specify:

a) 10 mm threaded copper grounding stud welded to the inside of each transformer base at the back and above the bottom of the door opening. Ground studs are supplied complete with two nuts, one lock washer and one copper clamp type lug for minimum 13 mm^2 stranded bare copper wire.

b) Ground studs welded to the transformer bases in such a manner as to present a smooth surface on the exterior of the bases.

5.2.4.10 Aluminium nameplate located one foot above its base to include the manufacturer's name or identification mark, year of manufacture, pole length and ordering reference number.

5.2.4.11 Shims for levelling consisting of one 1.5 mm and two "U" shaped 3 mm.

5.2.5 Pole Mounted Luminaires and Lamps

5.2.5.1 Distance between luminaires shall be based on Light diffusion modelling using approved lighting, their manufacturers and fixtures. Plate SP-4-6 illustrates existing installation characteristics for pole mounted luminaires.

5.2.6 Controls

Perimeter fence lighting shall be controlled by a photo cell and meet the following requirements:

5.2.7.1 A photo control unit shall automatically turn on the security fence lighting system.

5.2.7.2 The weatherproof unit capable of operating over a range of -60°C to +55°C shall be mounted on a fence lighting pole located closest to the Main entrance.

5.2.7.3 The control shall energize the lamps on a preset (adjustable) value.

5.2.7.4 A manual control override turns the lights on and off as required.

5.2.7.5 The system shall operate on stand-by power and "be fail-secure".

5.2.7.6 Controls shall be connected in parallel with the "ON" contacts of the "ON OFF" selector switch located as specified.

5.2.7.7 The photo control shall have a standard NEMA twist lock plug.

5.2.7.8 The photocell shall be temperature stabilized pre-aged and hermetically sealed.

5.2.7.9 The Installation Contractor shall adjust the photo control unit to switch on at not less than 40 ℓx. The unit shall be rated 1000 W incandescent, 120 volts, 60 HZ and CSA approved.

5.3 Other Exterior Lighting

5.3.1 Luminaire type

Lighting type shall be selected based on energy efficiency, economy and accepted practices for Recreation Areas, Parking Lots, Signage, Roads and sidewalks, Building entranceways and exits, and Institutional grounds. Luminaires must be fully operable between -40°C (or less) and + 50°C (or more).

5.3.2 Recreation Areas and Yards

5.3.2.1 The recreation area illumination system shall be installed on a project specific basis so as to form an integral system as part of the exterior lighting system. Illumination levels for dedicated yards connected to living areas -70 lx.

5.3.3 Parking Lots, Institutional Grounds. Roads and sidewalks

5.3.3.1 Average Illumination Levels – 10 lx.

5.3.3.2 Illumination Uniformity – Maintain a maximum ratio of average lux to minimum lux of 3:1.

5.3.3.3 Illumination Quality – To minimize shadows especially between parked cars illuminate each point from at least two luminaire locations.

5.3.4 Signage, Building entranceways and exits

5.3.4.1 Direct lighting with similar luminaires to that for sidewalks and roads will serve to illuminate the target door or sign to a higher level.

5.3.5 Controls

5.3.5.1 The recreation area lighting controls shall be manually switched on and off as required from a specified location.

5.3.5.2 All other exterior lighting shall be controlled by photocell or astronomical dial time clock with manual bypass from a specified location. Lighting controls shall be separated for each use.

5.3.6 Poles

5.3.6.1 Specify that all poles used as light standards shall be fabricated from steel conforming to *CSA Standard G40.21-04 (R2009)*[14] Type T, grade 60T, Low silicon, 60,000 psi yield strength. Do not use concrete poles.

5.3.6.2 Avoid having steps on poles.

5.3.6.3 Minimum height of post for pedestrian walks 3.05 m, for parking lots 6.1 m.

5.3.6.4 The lighting system should incorporate a method by which luminaires on poles may be easily and economically maintained.

5.3.6.5 High Standards (30 m poles) are shall not be used for Women's institutions. Maximum height shall not exceed 13 m.

[14] CSA G40.20-04/G40.21-04 (R2009) – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel