17 Computer Drive West
Albany, NY 12205
518.438.9900

70 Linden Oaks, Third Floor, Suite 15
Rochester, NY 14625
585.866.1000

Waiver Requests
Proposed CarMax Auto Superstore
SW Corner of Route 9 & Smithtown Road

August 3, 2022
Revised February 3, 2023

On behalf of CarMax Auto Superstores, Inc, we are requesting the waivers from the Town Code as follows:

1. Waiver from section 240-23 F. (Exterior Lighting, Amended) which states – "In all districts, the maximum pole height for any exterior light fixture shall not exceed 15 feet as measured from the ground." This project proposes a total light pole height of 19-feet (17' poles on a 2' base). Increasing the height of the lights slightly above the Code maximum will help reduce the number of light poles needed and will reduce light pollution. The following reference information attached explains how shorter pole heights impact uniformity, aiming angles, and glare:
    - IES G-1 6.2 document page 15
    - IES G-1 7.2 document page 20
    - IES G-1 A.12 document pages 49-50

2. Waiver from section 240-96 B.(1) which states "Standard parking lots and spaces. Except as otherwise set forth below, all off-street parking spaces shall be at a ninety-degree angle and at least nine feet in width and 18 feet in length, with a two-way, twenty-four-foot wide maneuvering aisle. Curbs shall be kept to a maximum height of six inches, and 1.5 feet of the required parking space length shall be allowed to overhang islands, provided that there is no interference with sidewalks or landscaping. Such bumper overhang area shall be considered part of the parking space and shall not be counted toward meeting minimum yard setbacks or perimeter buffer screening area requirements. In this latter case, the paved length of the parking space shall be 16.5 feet"
   The waiver request is to allow two-way 20-foot wide drive aisles in the Sales Display parking lot, rather than 24-foot wide drive aisles. This parking lot area is secure, with access to employees only, therefore traffic will be lower and 20-foot drive aisles will be sufficient. The benefit sought is to reduce pavement quantities.

cause nuisance glare even when resulting illuminance levels are low. There are several methods used to control light trespass: reducing luminaire mounting height, increasing pole setback from property lines, and/or using optical designs that restrict high-angle luminous intensity. Conversely, spill light received from luminaires on an adjoining property generally should not be relied upon unless proper maintenance of such nearby systems can be ensured.

5.6.2 Sky Glow. Although not specifically a security lighting issue, *sky glow* considerations will be involved in overall facility design based on good practices and possibly local ordinances. Light emitted directly above the horizontal, reflected from the ground, or reflected from objects on the ground contributes to sky glow, which impedes views of the nighttime sky. Uplight may be greatly reduced by specifying luminaires emitting zero or minimal direct uplight, by producing light levels no higher than actually needed, and by reducing light levels during any periods of reduced need.

5.6.3 Community Responsive Design. In addition to meeting the security demands of the protected area, security lighting needs to be appropriate in relationship to the surrounding community and environment. To the extent practical, security lighting designs should minimize light trespass and sky glow. In addition to surveying existing neighborhood lighting applications, designers should consult any local lighting ordinances. (For more on local government codes and requirements, Lighting Zones, and the *Joint IDA/IES Model Lighting Ordinance [MLO]*, see **Annex F.**)

6.0 Security Zones

It is helpful to consider the various functional areas and operational needs of the facility, when assessing an existing site or planning a risk containment program for a developing design. The design team should consider such factors as times of use, movement of persons within the facility, physical and staff resources, and vulnerable or potentially "hot" spots.

Security zones are established *when security is an issue* and there is a need to provide security protection for persons, property, or critical infrastructure. Security zones are not exterior Lighting Zones (LZs), as defined in the *Model Lighting Ordinance.* Whereas exterior LZs are derived from the surrounding site development, security zones are designed around vulnerabilities and target-hardening practices. The project will typically contain various security zones within the area project. The security zone lighting plan should accommodate variations in terrain, climate, obstructions, and integration and support to other security resources, while being mindful of who and/or what is being protected.

When planning or evaluating security lighting, designers will find it useful to divide the facility into zones such as perimeter, pedestrian, building, vehicle, storage, equipment, and restricted areas. During the planning process, designers may title and plan for various other zones for evaluation of specific security lighting, as the project requires. Each zone may require consideration of a differing set of vulnerability and response factors.

6.1 Perimeter Zone

Lighting to enhance perimeter fencing or open areas may be installed for either esthetic or security reasons. *When security is an issue,* the perimeter illumination can perform any or all of the following functions: enhance observation (passive deterrent); enhance the ability of walking or stationary security personnel (active deterrent); and support the effectiveness of closed circuit television (CCTV) monitors. In situations where exterior perimeter protection is a critical element of the overall security design, designers should consider the recommendations in **Section 8.2.2.**

6.2 Pedestrian and Vehicle Movement Zone

Pedestrian and vehicle movement areas require increased visibility and different quality considerations than other zones. In parking lots, where both people and vehicle movements interact, pole mounted light sources are the more common solution. Relatively low fixture mounting heights require reduced pole spacing (more poles) and/or increased luminous intensity at the higher angles approaching 90 degrees from nadir.[14] Floodlights aimed at higher angles can create direct glare and

security applications in particular. However, as with other developing technologies, not all of the benefits or shortcomings have been thoroughly examined.[16] For more information on color metrics, including a newly developed method for evaluating color rendition, see IES TM-30-15, *IES Method for Evaluating Light Source Color Rendition*.

7.1.2 Color Rendering Index. How do the colors of surfaces and objects appear under a light source? Do colors look the same at night as they do during the day? It is as important to be able to *differentiate* between the colors of two adjacent items (such as a person's clothes next to a bush) as it is to be able to *describe* the color of a possible suspect's clothes or vehicle.

The color rendering index (CRI) metric essentially measures the average degree of color shift that objects undergo when illuminated by a particular light source, as compared with the same objects when lighted by a "perfect" reference source of equal CCT and 100 CRI. The higher the CRI, the better the color rendering ability of the light source. Research has shown that almost any nominally white light source with a CRI of 80 or higher allows more accurate and confident color identification at the illuminances used in public spaces at night. Low pressure sodium (LPS) lamps do not allow accurate color identification under any illuminance level.

The "special" color rendering index for strong red colors, denoted R_9, has recently increased in usage and is useful as a supplement to CRI. For example, some of the newer LED products have a high CRI but do a poor job of revealing red colors. This can occur when other colors are rendered exceptionally well, thereby compensating for the deficiency in red when the averaged CRI is calculated. Due to nuances in the calculation method, an R_9 value greater than zero (not negative) is considered adequate for appropriate facial recognition and video surveillance systems.

7.2 Luminaire Mounting Heights

Taller poles typically result in greater areas of coverage, and thus fewer poles required for a given area. Higher-mounted luminaires are also less prone to vandalism. In many localities, however, pole height is restricted as a means of reducing light trespass. When lower mounting heights are used, more poles and lower-output luminaires will likely be required to maintain adequate uniformity without increased glare (see **Figure 12**).

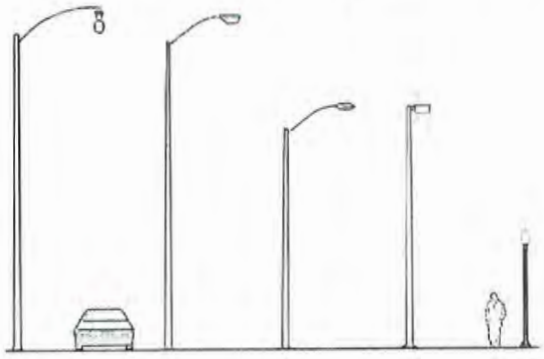

Figure 12. A typical family of luminaires exemplifying various pole heights and luminaire configurations.
(Illustration courtesy of Clanton and Associates, Inc.)

7.3 Lighting Controls

Many lighting ordinances require a reduction in light levels at certain times of the evening or during periods of reduced activity. Establishment of such curfews is a logical method to reduce both energy use and light pollution. However, the lighting designer should first evaluate security requirements to determine how, when, or whether curfew-related restrictions should be relaxed or modified. For example, retail employees may be at greater risk than customers may, since employees usually arrive earlier and depart later, when fewer people are present. Lighting levels and on/off switching can be controlled through vacancy, motion, or dimming controls. These options could enhance security functions.

The least expensive means of reducing light levels and energy usage is to turn off selected lighting fixtures. However, the resulting gaps in coverage greatly reduce uniformity. Dimming offers an attractive alternative since all luminaires remain energized and uniformity remains; however, special ballasts or drivers are required, and these increase initial cost.

For non-residential applications, security lighting fixtures are usually controlled automatically. An exception would be in a guardhouse application where light is needed only occasionally for undercarriage

- Supporting parking spaces should have a minimum of 32 lx (3.0 fc), consistent with the guidelines for parking lots, as discussed in Section 8.2.8.
- After-hours vestibule lighting should be designed in such a way that glare does not generally prevent users from seeing inside the vestibule from the outside as they approach from the surrounding access ways, and does not generally prevent users who are inside the vestibule from seeing the surrounding area outside.
- Users should have an unobstructed view of all accessible areas of the after-hours vestibule from the exterior of the vestibule. If necessary, this requirement can be met by supplementary security devices such as mirrors, camera and monitors, fencing, and barriers.
- Illuminance at the machine and the surrounding area should provide good-to-excellent definition of facial features at a distance up to 9.1 m (30 ft).
- Illuminance levels should support all CCTV camera operating requirements.
- Users should have a reasonably unobstructed view from the face of the unit out to a distance of 15 m (50 ft) in all unobstructed directions, and potential areas of concealment should be eliminated. If necessary, this requirement can be met by supplementary security devices such as mirrors, active CCTV monitoring camera and monitors, fencing, and barriers.
- Luminaires installed below 3.7 m (12 ft) should be should be tamper-resistant.

A post-installation assessment is strongly recommended, in accordance with the protocol provided in **Annex B**. The final design should not produce glare in the eyes of the customers or others in the area.

8.2.5.4 Exterior Vestibule Installations. Interior ATMs and AHDs come in an ever-widening variety of installations and applications. It is common to find these devices in convenience stores, supermarkets, gas stations, hospitality centers, airports, malls. Some ATMs are attended, while others are simply placed in an interior location where observers or passersby provide intermittent presence. The degree, quality and frequency of attendance should be taken into account when considering security and security lighting design. Attended device installations are those that have employees available to provide a presence and varying degrees of supervision at or near the transaction point.

Generally, unattended ATMs and ADHs place the customers at greater risk of attack. However, the quality of attendant training and job descriptions are important to consider. It is common for the ATM or AHD to be installed in a location where the attendant has a job description that does not include customer support or oversight of the ATM or AHD. At a minimum, interior ATMs and AHDs should meet the following guidelines:

- 108 lx (10 fc) minimum at the face of the ATM, and a minimum of 323 lx (30 fc) at any preparation counter or stand within 3.0 m (10 ft) of the ATM.
- Interior lighting within 3.0 m (10 ft) of the device should be raised to 108 lx (10 fc) with an average-to-minimum ratio of 3:1. These conditions can be found in bars, restaurants, and hallways where subdued lighting is applied for effect.

8.2.6 Parking Lots. When security is not an issue, recommended practices for lighting parking lots and garages are available in IES RP-20-14, *Lighting for Parking Facilities*. Walkways and bikeways within the public right of way are covered in ANSI/IES RP-8-14, *Roadway Lighting*. Other walkways and bicycle paths issues are covered in IES DG-5-94, *Lighting for Walkways and Class 1 Bikeways. When security is an issue*, the recommended security and safety illuminance for open parking facilities should be at least a maintained average of 32 lx (3.0 fc) on the pavement and to a height of 1.5 m (5.0 ft). A uniformity ratio not greater than 4:1, average-to-minimum, should be maintained throughout the hardstand. Sidewalks, footpaths, and grounds around or supporting open parking lots should be illuminated to no less than 6 lx (0.6 fc), with an average-to-minimum uniformity ratio no greater than 4:1 (see **Figure 21,** for example). (For information on illumination of parking lots serving sensitive controlled spaces, homeland security operations, or the military, see **Section 8.2.1.6.**) For security purposes, exterior lighting should have a high CRI (80 or higher). At this level, guests are better able to differentiate colors. This is also important for surveillance cameras, which record facial and vehicle colors accurately with this CRI recommendation.

Figure 21. Well-shielded luminaires in an employee parking lot provide uniform illumination for workers leaving after normal business hours and excellent surveillance opportunities for observers from an upper floor in the building. (Photo courtesy of OSS – Law Enforcement Advisors®)

Figure 22. Instant-on, reflectorized fluorescent prison lighting appears as a "wall of light" to inmates. Patrol personnel and vehicles cannot be detected during patrol. (Photo courtesy of Magnaray)

New designs in exterior wall packs, floodlights, pole-mounted fixtures, and parking garage luminaires are all available with multiple lighting technologies that allow for instant-on features. (For an example of an instant-on application for a perimeter fence, see **Figure 22**.) Some fixtures come equipped with individual occupancy sensing controls that control multi-level ballasts. Individually selected fixtures can dim down to reduced power usage (40 percent to 70 percent of full power) when no activity is present, to conserve energy. When the fixture's built-in occupancy sensor picks up activity or a thermal signature, the ballast instantly goes to full power for a pre-set duration. With no activity detected, the fixture returns to its dimmed down state at reduced power. This configuration works well with security cameras and guards who monitor security systems. As the lighting level increases, each lighting fixture takes on the role of a sentry, letting trespassers know they have been detected. Security personnel who survey monitors can easily determine that an event triggered an occupancy sensor and caused a fixture to switch to full power in a specific area. These types of lighting technology are available with light sources in a range or CCTs with high CRIs and instant on technology, including fluorescent, induction, and LED.

8.2.7 Parking Garages. The security threat to unescorted people and unsecured property in covered parking garages can be very high. Isolated floors, numerous places to hide, lack of unobstructed surveillance, and limited escape routes often combine to create this condition. *When security is an issue* in multilevel parking facilities, the recommended minimum illuminance is an average of 65 lx (6.0 fc) on the pavement, with approximately the same values measured at 1.5 m (5.0 ft) above the pavement, and with an average-to-minimum uniformity ratio not greater than 4:1. (See **Figure 23** for an example of good uniformity.) These illuminance levels are maintained whenever access is allowed to the parking areas. It is important for glare to be avoided in such installations. Structural elements afford concealment of luminaires. When coupled with a low ceiling, the designer may be challenged to provide uniform lighting in the space, especially between parked cars.

Figure 23. Multiple structural elements coupled with a low ceiling can make it difficult to achieve uniformity, especially between parked cars. In this example, the designer was successful. (Photo courtesy of Larry Leetzow)

Planners need to consider the following issues when designing lighting and other security components for parks open at night:

- Prior history of crime in the park and surrounding areas
- Social conditions and citizen use of the park
- Hours of public access
- Local cultural values
- Traffic patterns and access
- Patrol frequency
- Light pollution and light trespass

Where security is an issue in parks and public spaces, the recommended average maintained horizontal illuminance for open parking facilities in or adjacent to parks should be no less than 32 lx (3.0 fc) on the pavement, with an average-to-minimum uniformity ratio not greater than 4:1.

In locations where loitering and criminal attacks are likely to occur, illuminated levels should be at least 11 lx (1.0 fc) horizontal at ground level and to a height above ground of 1.5 m (5.0 ft), with an average-to-minimum uniformity ratio not greater than 4:1. Glare should always be avoided.

When security is an issue, park trails and walkways open to the public at night need to be illuminated to at least 6 lx (0.6 fc) at grade and at 1.5 m (5.0 ft) above grade along the axis of the walkway, along the length of the trail. Both sides of the pathway should have illumination out to a distance of 9.1 m (30 ft), with an average-to-minimum ratio of 4:1. Where trails are situated in woods, landscaped areas, or broken terrain, lighting should blend with the environment whenever practical. Creative combinations of light sources and mounting devices can assist in these applications. Glare and sky glow need to be taken under consideration and controlled.

8.2.8.2 Nature and Parks. Parks primarily set aside for the enjoyment of natural habitat emphasize maximum use of natural features while minimizing the impact of built-up structures. Exceptions to this general rule are parks that have installed parking, rest areas, restaurants, hotels, and laundry facilities. In such instances, park officials should refer to the park guidelines above, and to other applicable parts of **Section of 8.2**, with an eye toward limiting the area covered for safety and security lighting. Limiting glare and sky glow is particularly desirable.

8.2.9 Retail Stores and Centers. Many retail centers and superstores today are high volume operations, well in excess of 9,300 m^2 (100,000 ft^2), offering a vast array of services while attracting thousands of customers a day. Many operate 24 hours a day or late into the night, and parking lots for these facilities are large and often congested. A large percentage of violent crime at retail facilities occurs in parking lots where customers and employees are often isolated and vulnerable. The size and complexity of the store or center does not seem to matter to would-be attackers. Proper illumination is a critical component of the overall security plan for retailers.

When security is an issue, illuminance levels should be at least 32 lx (3.0 fc) on the pavement, with an average-to-minimum uniformity ratio not greater than not greater than 4:1 in parking lots, including parking and support areas used by employees and vendors. To conserve energy and provide additional security for stores with a late-night or 24-hour operation, additional illumination should be provided closer to the entrances where customers will be parking during these low-activity, high-vulnerability hours. Illuminance in this area should be at least an average of 54 lx (5.0 fc) on the pavement, with a uniformity ratio not greater than 4:1 average-to-minimum. The size of the area provided with this additional illumination is determined based on projected customer count during these hours, and on the history of crime on the property and in the neighborhood. In such a design, the light sources not within the 54-lx (5.0-fc) zone can be cycled off or provided with instant-strike sensors. In such an arrangement, the customer is encouraged to park closer to the store; visibility by fellow customers and store personnel is improved, and the customer has less distance to travel. If security is an issue, illuminance in the area of delivery docks, outdoor trash compactors, and recycling bins in the back of the store should be at least an average of 32 lx (3.0 fc) on the pavement, with a uniformity ratio not greater than 4:1 average-to-minimum. This will provide adequate performance and security lighting for delivery personnel as well as for employees needing to work or move about in these areas.

Considering the complexity of many retail centers, designers and crime prevention specialists should survey the various businesses located in the center regarding their individual security lighting needs. A review of the other specific applications addressed in **Section 8.2** will help in this effort. For example, if automatic teller machines are located on the property, the designer should refer to **Section 8.2.5**; for restaurants and eating establishments, **Section 8.2.10**.

Approach roadways to the complex and rear areas of stores should be illuminated based on IES RP-8-14, *Roadway Lighting,* and IES RP-20-14, *Lighting for Parking Facilities - Revised.*

8.2.10 Restaurants and Eating Establishments. Local and franchise restaurants are typically late-night operations, and many are 24-hour operations. Neighborhood establishments often rely on patrol officer patrons for intermittent security presence inside their establishments while consuming discounted menu items. In addition to the presence of uniformed customers, these officers can be valuable resource against local criminal activity. Others, such as national chains, have developed system-wide security plans, policies and training, while regularly tracking and reacting to reported crime statistics. For the various categories, patron and employee security is a high priority. For facilities allowing consumption of alcoholic beverages on site, the designer should consider the guidelines provided in **Section 8.2.19**.

The effectiveness of syndicated restaurants that are initially not a part of the neighborhood fabric depends heavily on quality site selection, tested plot and facility design, operational and security policies, staff training, and integration of layers of security. Critical among these security features is *security lighting.* Areas of meaningful security concern to managers are customer drive-thru or take-out windows, general parking, refuse disposal areas, and places where employees perform tasks outside the building after dark.

Customers are especially vulnerable to attack on "blind" sides of the restaurant and at the drive-thru lane or take-out lane, particularly when patrons are transacting business at the payment or order window(s). Customer attention is on tendering of payment, collecting purchased food, or receiving change. An attacker typically approaches the patron between the building and the left rear of the automobile. Building and lighting designs should allow window-service personnel to view the driver's side of cars, as this is a major deterrent to this type attack. The best designs provide a setback from the window-service area to the rear of the building, and a side window from which the store's personnel have a 180-degree view from building wall to building wall. Store security mirrors are also an effective deterrent to unobserved approaches (see, for example, **Figure 25**).

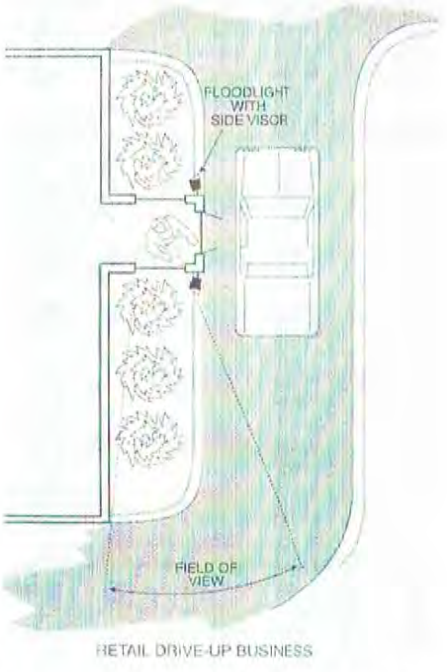

Figure 25. in this design, light is emitted from the floodlights to project down the lane and parallel to the car to enable detection of intruders from the rear corner of the building. (Illustration courtesy of Occupational Safety Systems, Inc.)

When security is an issue, the average maintained illuminance for the area within 9.1 m (30 ft) of the exterior service window(s) is 65 lux (6.0 fc) on the pavement, and equal illuminance levels at 0.9 m (3.0 ft) and 1.5 m (5.0 ft) above the pavement, with an average-to-minimum uniformity ratio not greater than 3:1. General parking areas, sidewalks, footpaths, play areas, and areas adjacent to the structure should be illuminated to at least an average maintained illuminance of 32 lx (3.0

Colleges and universities in the US that receive federal funds are now required to publish their crime and certain disciplinary offense statistics through a uniform reporting system known as the Clery Act. The Act also requires institutions of higher learning to notify students and staff of immediate threats affecting the school, students, or staff. Such warnings are made immediately following confirmation of the emergency and are generally sent in the form of emails, text messages to cell phones, and automated phone call announcements to pre-registered numbers provided by students and staff. (For more information on the *Clery Act* and *foreseeability of crime,* refer to **Annex B**.) Designers and stakeholders responsible for campus security should refer to reported Clery data when planning new facilities or upgrading existing facilities. This review should include lighting design that that can support mass evacuations in case of an on-campus emergency.

Campuses with dormitories or offsite fraternity or sorority houses should review and consider implementation of the guidance provided in **Sections 8.2.6, 8.2.7,** and **8.2.13**.

8.2.17 Vehicle Display and Sales Lots. Many lots will have planned average illumination on the surface of the lot of 215 lx (20 fc) or more. Because vehicle color is important to the potential customer, fixtures and light sources are selected with a maximum color range. It is common for vehicle display lots to have more than $10 million in inventory displayed at any one time. This amount climbs dramatically when you consider inventories of heavy equipment and lots for over-the-road trucks. Given the amount of inventory combined with the need for high-volume sales, it is little wonder that vehicle sales businesses often benefit from major code variances,[53] where lighting codes exist. There is some security lighting consideration in all of the illumination that is highlighting the displayed vehicles and striking the surface of the lot.

Dealers often do not fence their lots and do not restrict access to the vehicles after normal business hours. Perimeter security is limited in many cases to guard rails and ditches that do necessitate a minimum amount of criminal ingenuity in order to steal a displayed vehicle. Despite these vulnerabilities, not all display lots are guarded by trained security personnel. Clearly, *security is an issue* for dealers, and many vehicle retailers could benefit from a detailed physical security assessment (see **Annex A**). Beyond what is current marketing practice for many dealers, a full color spectrum illumination pattern producing 86 to 108 lx (8.0 to 10 fc) with an average-to-minimum ration of 3:1 is recommended for reasonable security, when combined with other *active* security measures.

8.2.18 Sporting and Concert Events. When evaluating security lighting at a location with a sporting or concert facility, and the playing field is included in the analysis process, it is recommended that the assessment team refer to IES RP-6-15, *Sports and Recreational Area Lighting. When security is an issue,* pathways, wayfinding, and parking areas should have average maintained illuminance of 32 lx (3.0 fc), with an average-to-minimum uniformity ratio not greater than 4:1. For additional parking garage guidelines, refer to **Section 8.2.7**. Designers should consider the illumination on the field and in the viewing areas, exit ways and tunnels, and parking areas to allow for an orderly eye adjustment from the brighter lights of the field to the parking lot or public transportation areas.

8.2.19 Taverns, Bars, and Clubs. Businesses open to the public, and social clubs that serve alcoholic beverages, are governed by owner practices, dram shop[56] regulations, and state laws. In many localities, public laws and ordinances consider it a privilege, not a right, to serve alcoholic beverages on a business premises. Clubs' interiors need to be intimate. However, designers and operators should not choose intimacy over safety and security; a balanced approach should be used. By their very nature, taverns, bars, and social clubs serving alcoholic beverages are establishments *where security is an issue.*

General parking areas, sidewalks, footpaths, play areas, and areas adjacent to the structure, should be illuminated to at least an average maintained illuminance of 32 lux (3.0 fc) at grade, with an average-to-minimum uniformity ratio not greater than 4:1. The entrance to the facility should be illuminated for security, safety, and identification of customers. Often

- Small flashlight
- Digital camera to aid memory recall
- Distance measuring device (e.g., tape, wheel roller, or laser)

Two people are optimum for most assessments and taking light measurements. The survey team should not ignore considerations for personal protection, especially in locations that are considered moderate-to-high risk areas. An assessment template or survey guideline needs to be created that ensures that all critical areas are included in the assessment. A lighting survey for senior citizen housing, for example, should include assessment of the lighting on both sides of the property lines, at the bus stops, at parking lot entrances, in the parking lots, in the common areas inside and outside the building, along walkways, under the canopy or vestibule, in the entrance and lobby, at the elevators and inside the elevators, in front of the mailboxes, inside and outside the emergency exits, and in the stairwells and corridors.

A.8 Recording Light Values

Illuminance measurements should be noted in the survey plan. (For details on taking and recording photometric readings, refer to **Annex B**.)

A.9 Technical Specifications

As part of the survey process, technical specifications of lamps, luminaires, locations, aiming angles, mounting heights, and controls should be examined to see whether existing conditions require change. Important lighting equipment considerations include:

- Quantity of light (lumen output of each luminaire)
- Spatial distribution of light (zonal lumens, beam angles)
- Spectral distribution of light (color attributes of the lighting)
- Temporal distribution of light (flicker)
- Maintenance requirements
- Optional accessories; e.g., external shields or louvers

** Light meters should be calibrated (and periodically recalibrated) according to manufacturer's recommendations. Refer to IES *LM-50-13, IES Approved Method for Photometric Measurement of Roadway and Street Lighting Installations*, for appropriate field measurement procedures.

A.10 Use of Light Values

Light measurements should be performed in a manner facilitating comparison with predicted values and applicable criteria. *When security is an issue,* measurement of light values on properties allowing public access should be performed and recorded on a recurring basis.

A.11 Additional Factors of Lighting

In addition to taking objective light meter readings and evaluating technical specifications, subjective aspects should be considered. It is wise to consider the advice of non-technical personnel, representing both sexes and a range of ages, in evaluating psychological responses. For example, consideration should be given to how the physical senses are impacted when passing through each lighted area. Does the ambient lighting create a sense of fear or security? Are the shadows harsh, creating very dark areas, or are they soft, permitting one to look into the shadows easily?

A.12 Light Pollution, Light Trespass, and Glare

The surrounding environment will affect lighting needs on the property. Adjacent street lighting or light spillover from adjacent properties may interfere with CCTV cameras by producing too much backlighting against which an intruder's face will appear in silhouette. Conversely, neighboring property management or civil authorities may complain of spill light. Ambient light that spills over onto neighboring properties or into the wrong internal area(s) can be controlled with internal or external light shields, as one option.

Glare can work for or against an effective security lighting system. Glare reduces visibility when low-mounted luminaires are aimed out and away from the property to be protected. This will create glare in the eyes of the potential trespasser, while allowing personnel or cameras positioned behind or directly under the lights to view the perimeter without being detected. The glare makes the criminal uncertain about what is in the area and how well it is guarded. To be effective, the secure area should be left dark and the low-mounted luminaires should floodlight all the approaches to the area. Glare, however, in the wrong areas can limit the ability to see a perpetrator. Just as glare can hinder the trespasser, it can also hinder the police officer or security officer who is patrolling from the perimeter. If glare is used within a

facility, it should be carefully placed so as not to inhibit the operation of cameras or security personnel assigned to protect an area. Unnecessary or unwanted glare can be minimized by using higher fixture mounting heights and steeper aiming angles, thereby putting the light where it is needed, while reducing the visibility of the actual light source (direct glare), and minimizing light pollution and light trespass.

A.13 Special Needs

In addition to the security requirements already discussed, the visual needs of senior citizens should be considered. Older eyes have special needs. (For more information on security lighting for the elderly and sight challenged individuals, refer to **Section 8.2.14 Senior Living Multi-residence Facilities** and to ANSI/IES RP-28-16, *Lighting and the Visual Environment for Seniors and the Low Vision Population.*)

A.14 Structuring the Assessment

Assessments should be as thorough and visually graphic as possible. **Figures A1** and **A2** show examples of lighting maps that were designed based on a lighting assessment in a northeastern US community. The crime data is for the year 2000, and results are indicated using icons. For each building development, lighting values were taken in footcandles and plotted on the site maps.

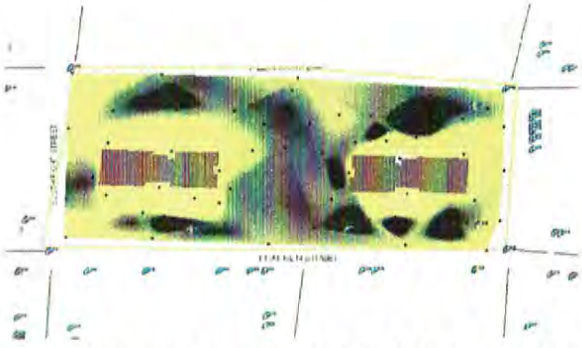

Figure A1. This is an example of crime and light mapping used for crime assessment associated with high-rise buildings for the elderly. Black dots are the locations where readings were taken around the property, while the light blue pistol symbols indicate where a reported crime occurred on or adjacent to the property over a given period. The red "human" figures represent where an individual was injured during a criminal event. (Provided courtesy of SPARTA Consulting Corporation)

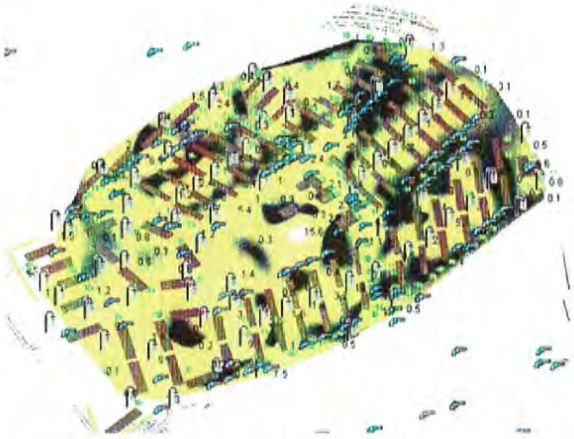

Figure A2. An example of a lighting and crime assessment in and around a multi-family housing complex, using a light map associated with an apartment complex. Locations of light poles and of crime are shown, as well as location of trees. Numbers indicate the location of the light reading, with the value in footcandles. (Image provided courtesy of SPARTA Consulting Corporation)

A.15 Recommendations

Following an analysis of the survey, the next step is to consider the need for change. Recommendations for any changes in lighting patterns or for improved lighting should be detailed and specific, providing a rationale for the change. These recommendations should mention applicable alternatives, and the estimated or quoted cost involved for each. Qualified lighting professionals can provide the necessary data.

Annex B – Taking Security Illumination Measurements: A Working Protocol

B.1 Background

Taking lighting measurements in the field for security purposes is often quite different in practice and purpose from taking measurements for other kinds of lighting applications. Security lighting recordings are often performed by police officers investigating a crime scene. They may also be performed by a security officer or maintenance personnel making