

Chapter 10: Lighting

10.1 Introduction

Lighting of public streets and other public spaces represents a large portion of a city's energy budget, it affects a community's sense of safety and security, and it also has an impact on the degree that a city provides an inviting and aesthetic environment for business and quality residential growth. Therefore, it is important to strike a balance between fiscal responsibility, environmental stewardship, safety, and aesthetics. Overall, it is important to understand that many factors contribute to a good lighting design, and too much lighting can be just as bad as too little lighting.

Major advantages of street lighting includes: prevention of accidents and increase in safety. Studies have shown that darkness results in a large number of crashes and fatalities, especially those involving pedestrians. Therefore, areas that have higher vehicle traffic volumes, higher vehicle speeds, higher pedestrian volumes, or unique geometric considerations such as horizontal or vertical curves would benefit from street lighting. Disadvantages to street lighting include light pollution, glare, and increased energy consumption. The advantages and disadvantages of street lighting should be balanced based on the type, characteristics, and use of the street; treatments should be utilized to protect vulnerable road users; and new technologies should be used where feasible to minimize the negative aspects of lighting.

The City of Hilliard is committed to incorporating advanced lighting technologies, such as the use of light emitting diode (LED) lights, in the city's publicly owned and maintained street lighting systems to reduce the City's power consumption. These advanced technologies are more energy-efficient and longer-lasting than the street lighting technology used in the past in the City, specifically high-pressure sodium (also known as high intensity discharge or HID). For several decades the international lighting community has discussed the need to revise photometric practice to recognize that the *color* of light has a significant effect on vision, particularly peripheral vision, in outdoor, low-light conditions. The results of studies have shown that a high pressure sodium (orange-pink light) streetlight can be replaced with a broad spectrum (white) streetlight that emits less light for equal or better visibility.

The City of Hilliard is also committed to reducing light pollution by focusing lighting downward toward the streets and pedestrian areas through the use of shielded or cut-off fixtures for all new lighting installations. New installations should avoid glare, eliminate light disbursement above 90 degrees, and minimize light trespass beyond the areas intended to be lit.

The transition to the use of LEDs or other future energy-efficient sources for the city's street lights will be immediate for all new street light installation. For retrofit of existing street lights, the conversion will occur as part of normal maintenance activities or as funds become available to do a wholesale retrofit of a corridor. This change to using LED technology does not imply that the old HID lighting is unsafe or noncompliant nor does this change require retrofit within a certain period of time.

This chapter establishes the general criteria and minimum standards for lighting in the following situations:

- Continuous lighting of public streets for various street types and Districts
- Spot lighting of public intersections, pedestrian crossings, or other unique circumstances
- Retrofitting of existing public street lights
- Lighting of private commercial or industrial properties

10.2 City of Hilliard Public Street Lighting Policy

New Street Construction or Reconstruction. The City of Hilliard will evaluate street lighting for all new street construction or reconstruction projects along the Thoroughfare Plan street system. For streets that will incorporate curb & gutter, installation of a continuous street lighting system is recommended. For streets that will *not* incorporate curb & gutter, spot lighting of intersections, pedestrian crossings, or other unique circumstances is recommended, at a minimum. In these cases, the City of Hilliard is responsible for the design, installation, and maintenance of the street lighting system.

Existing Streets and Intersections. For existing streets or intersections that are not part of a larger street reconstruction project, lighting of intersections may be considered on a case-by-case basis. Lighting of isolated locations is dependent on location of a power source and presence of existing private utility poles. The City may request the installation of a street light on a private utility pole by the private electric utility provider in locations where no continuous light system exists or is planned in the near future. In this case, the private electric utility provider would be responsible for the design, installation, and maintenance of the lighting, and the City is billed for the electric usage.

New Pedestrian Crossings. Street lighting should be installed at all new pedestrian crossing locations. To properly light a pedestrian crossing, the lighting should be located at or before the crosswalk to avoid backlighting of pedestrians.

New Intersections at Development Entrances. As development occurs along the Thoroughfare Plan street system, street lights should be installed at the intersection of the neighborhood collector street and the Thoroughfare Plan street system if no continuous street lighting system exists at the time of development. Installation of street lighting may be considered at commercial driveways. Lighting of new intersections, whether a public street or a private commercial driveway, is the responsibility of the developer to design and install. Maintenance of these lights is dependent on location: street lights in public right-of-way on city poles are the responsibility of the City; street lights on private property are the responsibility of the private property owner/developer; street lights on private utility poles are the responsibility of the private utility.

Residential Subdivisions. Street lighting should be installed along all local residential streets within a new residential subdivision, excluding the Conservation District. In subdivisions outside the Conservation District, lighting should be provided in manner that reasonably lights the streets and pedestrian ways taking into consideration location of power sources, lot lines, and street configuration. Within the Conservation District, lighting will be at intersections and pedestrian crossings only. Design and installation of lighting within a new residential subdivision is the responsibility of the Developer. Maintenance of the lighting in these cases is the responsibility of the City after acceptance and the one-year warranty period expires. Light(s) and/or pole(s) that are damaged as part of construction activities are the sole responsibility of the Developer to repair and/or replace.

Commercial or Mixed Use Streets. On public streets serving commercial development or mixed use development that are not listed on the City's Thoroughfare Plan, a continuous street lighting should be installed; residential scale lighting may be used in this case. If the commercial or mixed use street is constructed as part of a new development, the design and installation of the lighting system is the responsibility of the Developer. Maintenance of the lighting in these cases

is the responsibility of the City after acceptance and the one-year warranty period expires. Light(s) and/or pole(s) that are damaged as part of construction activities are the sole responsibility of the Developer to repair and/or replace. In existing commercial or mixed use development, such as along streets in the Old Hilliard District, a continuous street lighting system should be designed and installed by the City as part of a street reconstruction and/or streetscape project; maintenance of the street lighting system is by the City.

10.3 General Lighting Design, Material, and Construction Requirements

The following requirements apply to all lighting installed throughout the City of Hilliard and shall be incorporated into all lighting plans as Lighting General Notes.

Design Requirements. The design and layout for street lights, underground wiring and other pertinent equipment to be used shall be in conformance with guidelines issued by the Illuminating Engineering Society of North America (IESNA), stamped by a registered professional engineer and approved by the City Engineer.

Construction & Material Specifications. All electric work performed under these specifications shall be in accordance with the latest edition of the National Electric Code (NEC), which is published by the National Fire Protection Association and is a United States standard for the safe installation of electrical wiring and equipment, and all state or local codes that may apply, including but not limited to Columbus Item 1000 and ODOT Item 625.

Coordination with Electric Utility. Metering of electricity for street lighting is not required. Street lighting designs shall be coordinated with the electrical energy supplier by the design engineer; the type of lighting, including the use of all advanced lighting technologies, shall be clearly defined in order to estimate energy use. The number and format of record plans to be submitted shall be determined by the supplier of electric energy. All service enclosures along public streets shall be pad-mounted and screened; aboveground pole or post-mounted assemblies are not permitted.

Conduit Location. Lighting conduit parallel to the street shall be located per Hilliard Standard Drawing SL-6. All other lighting conduit shall be located two (2) feet minimum off side and rear lot lines in a five (5) foot minimum easement. Minimum depth for conduit is two (2) feet. Electrical warning tape (red) shall be provided one (1) foot over top of street light cable and conduit.

Construction Submittal Requirements. The Contractor/Owner/Developer shall submit manufacturer's specification sheets to the City Engineer for approval prior to installation.

Manufacturer's specification sheets are required for the following items:

- Luminaire
- Lamps
- Pole
- Photocell
- Service Enclosure
- Pull box
- Conduit
- Cable
- Hand holes
- Controls

Spare Materials. For each new project where street light poles are installed in public right-of-way, additional poles(s), luminaire(s), and all incidental hardware, shall be provided to the City of Hilliard Service Department for maintenance purposes. The required number of spares is based on a ratio of 1 spare for each 10 new poles with a minimum of one complete assembly (pole, luminaire, and all incidental hardware) for all systems of four (4) or more poles. If fewer than 4 poles are installed, this requirement is waived. The following are the number of additional poles, luminaires, and incidental hardware that are required:

<u>Poles Installed</u>	<u>Additional Poles, Luminaires, & Hardware to be delivered to City</u>
0 – 3	0
4 – 10	1
11 - 20	2
21 - 30	3
31 - 40	4
more than 40	5

These additional “material only” items shall be clearly defined as a separate line item in the general summary or quantities. All spare equipment shall be delivered to the City of Hilliard Service Department prior to acceptance of the project. A signed itemized receipt showing the items and quantities delivered to the City shall be provided by the contractor to the inspector prior to acceptance and/or payment of materials.

Permits and/or Easements. The Contractor/Owner/Developer shall obtain all permits required by the Public Authority having jurisdiction, including a Hilliard right-of-way permit. All easements required for construction shall be secured and submitted to the City of Hilliard for recording prior to commencement of work; no work which requires an easement shall proceed until this is complete.

Construction Inspection. The City Engineer or his authorized representative shall perform inspection of the work. The City Engineer will require at least forty-eight (48) hours’ notice before any work takes place. No underground cable shall be backfilled until inspected. Failure to request the necessary inspection may result in the rejection of the work and the project.

Testing. The Contractor/Owner/Developer shall conduct Electrical Tests per COLS item 1000.18 and ODOT item 625.19.

Post-Construction Submittals. The Contractor/Owner/Developer shall provide one paper copy and one electronic (PDF) copy of the following items:

- Final “as-built” drawings for the lighting system
- An Operations & Maintenance (O&M) Manual (paper copy in a 3-ring binder) for all electrical items provided in the Project

Acceptance. Following installation of the lighting system, the Contractor/Owner/Developer shall request final inspection by the City of Hilliard Operations Division. Within one week, the final inspection will be conducted, and a final punch list will be issued. Upon completion of all punch list items, the City, or their representative, will officially accept the lighting system in writing. This date establishes the beginning of the warranty period.

Warranty. The warranty period for all lighting systems, materials, and/or other electric components is one (1) year unless otherwise extended in the plans. Any poles, luminaires or

other equipment that are damaged as part of construction activities are the sole responsibility of the Developer to repair and/or replace, independent of the status of the warranty period.

10.4 Lighting Design Criteria

The desired level and uniformity of lighting along a street is dependent on roadway characteristics (type of street, ADT) and the pedestrian environment. The table below establishes the City of Hilliard lighting design criteria for the various types of street classification and pedestrian activity classification. The purpose of using this table in lieu of a “one size fits all” approach to lighting design is to allow for flexibility and the provide appropriate light levels for different types of situations.

Street Classification	Pedestrian Activity Classification	Avg. Lumin. (fc)	Avg:Min	Max:Min	Crosswalk Min (fc)
A	High/Medium	1.0	3:1	6:1	0.5
	Low	0.6	3:1	6:1	0.3
B	High/Medium	0.8	3:1	6:1	0.5
	Low	0.4	4:1	8:1	0.3
C	High/Medium	0.5	6:1	10:1	0.3
	Low	0.3	6:1	10:1	n/a

The *street classifications* are described as follows:

Type A: Most Thoroughfare Plan streets (primarily major & minor arterials); Design ADT > 7,500 veh/day

Type B: Some Thoroughfare Plan streets (primarily network collectors) and local streets within Mixed-Use & Commercial/Industrial Districts; Design ADT between 2,000 to 16,000 veh/day

Type C: Local Residential streets; Design ADT < 2,000 veh/day

The *pedestrian activity classifications* are described as follows:

High/Medium: areas where a moderate to high level of pedestrians are expected to be on the sidewalks or crossing the streets during dark hours. Example land use types include mixed-use areas, neighborhood or downtown retail areas, apartments, schools, restaurants, and some recreational/park uses.

Low: areas where a low level of pedestrians are expected to be on the sidewalks or crossing the streets during dark hours. Example land use types include low density single family, office-only, and industrial uses.

10.5 Thoroughfare Plan Street Lighting

This section pertains to all public streets listed on the City of Hilliard Thoroughfare Plan, excluding those streets that are located within the Old Hilliard District or the Conservation District.

The importance of street lighting on safety, particularly at pedestrian crossings and at curves in the street, is well documented in studies nationwide. Because Thoroughfare Plan streets carry a larger volume of traffic at higher speeds, more stringent design criteria are established for these streets.

All new Thoroughfare Plan street lighting installations in the City of Hilliard shall be designed by a registered professional engineer with street lighting experience using roadway lighting guidelines issued by the Illuminating Engineering Society of North America (IESNA). IESNA is considered the nation's technical authority on illumination. IESNA's RP-8 provides the design basis for lighting roadways, adjacent bikeways, and pedestrian ways. RP-8 provides for flexibility in design guidance based on roadway characteristics and the pedestrian environment.

Luminaire. Luminaire shall have a dark bronze cut-off type housing with LED lights per Hilliard Standard Drawing SL-4.

Pole. Poles are aluminum, smooth, round, and tapered with a powder coated dark bronze finish. The typical nominal height is 31', including the transformer base. See Hilliard Standard Drawing SL-3.

Service Enclosure. Service enclosure shall be a 30"H x 18"W x 15" D stainless steel watertight enclosure with a dark bronze powder coated finish. See Hilliard Standard Drawing SL-5.

Pole Placement. Poles should be staggered on opposite sides of the street and shall be placed a minimum of 2' behind the back of curb on straight street sections. On non-linear sections of street, such as at curves, at intersection radii, and at roundabouts, poles shall be placed a minimum of 4' behind the back of curb. On an uncurbed street, poles should be offset an appropriate distance from the pavement edge to avoid the striking by an errant vehicle, based on the design speed of the street and the location of a roadside ditch. Poles should be offset from street trees a sufficient distance to avoid tree foliage from interfering with normal light distribution. The exact minimum spacing is dependent on the mature height and spread of the trees along the street; therefore, the landscape architect and lighting design engineer should consult early in the design process to select an appropriate tree species to be compatible with the lighting and roadside environment.

Intersection or Spot Lighting. At signalized intersection locations, street lighting may be installed on the mast arm signal supports in lieu of separate light poles. At unsignalized intersections or pedestrian crossing locations, spot lighting may be provided in a manner to appropriately light the location in accordance with the criteria listed above. To properly light a crosswalk, the lighting should be located before or at the crosswalk to illuminate the pedestrians in the crosswalk and avoid backlighting.

Hilliard Standard Construction Drawing references. Thoroughfare plan street light material specifications shall be as follows:

1. Pole Base – per Hilliard Standard Drawing SL-1 & SL-2

2. Pole – per Hilliard Standard Drawing SL-3
3. Luminaire Assembly – per Hilliard Standard Drawing SL-4
4. Service Enclosure – per Hilliard Standard Drawing SL-5
4. Conduit/Trench – per Hilliard Standard Drawing SL-6
5. Conductors – per Hilliard Standard Drawing SL-17

10.6 Local Street Lighting – Residential Subdivision (except for Conservation District)

This section pertains to the lighting of local public streets within residential subdivisions, excluding those local streets that are located within the Old Hilliard District or the Conservation District.

The City of Hilliard requires the lighting of local residential streets; however, the design criteria and placement of poles is more flexible due to the lower volume and speed of vehicular traffic.

Luminaire. Luminaire shall have a cast aluminum housing with a black satin finish with LED lights. See Hilliard Standard Drawing SL-8.

Pole.

Poles are tapered, combination fluted and smooth with an octagonal base, made of cast aluminum with a black satin ground finish. The typical nominal height is 12'-6", including the base. See Hilliard Standard Drawing SL-7 and SL-8.

Service Enclosure. Service enclosure shall be a watertight, 1 phase 3 wire 2 breaker box mounted on a pressure treated 4"x6" wood post. See Hilliard Standard Drawing SL-9.

Pole Placement. Poles should be located on both sides of the street, placed 2' minimum behind the back of curb, and a minimum of 5' from driveway aprons. Poles should be offset from street trees a sufficient distance to avoid tree foliage from interfering with normal light distribution.

Hilliard Standard Construction Drawing references. Local residential street light material specifications shall be as follows:

1. Pole Base – per Hilliard Standard Drawing SL-7
2. Pole and Luminaire Assembly – per Hilliard Standard Drawing SL-8
3. Service Enclosure – per Hilliard Standard Drawing SL-9
4. Conductors – per Hilliard Standard Drawing SL-17
5. Pull Box – per Hilliard Standard Drawing SL-11

10.7 Local Street Lighting – Commercial, Industrial, or Mixed-Use Development

This section pertains to the lighting of local public streets within commercial, industrial, or mixed-use developments, excluding those local streets that are located within the Old Hilliard District or the Conservation District.

Mixed use districts provide a variety of land uses that encourage walking and bicycling for short trips. While vehicle speeds and volumes are likely much lower than those on Thoroughfare Plan streets, a

higher volume of pedestrian activity is anticipated. Therefore, it is important that a street lighting system be designed that provides appropriate levels of lighting yet utilizing poles that are of a smaller scale.

Luminaire. Luminaire shall have a cast aluminum housing with a black satin finish with LED lights. See Hilliard Standard Drawing SL-8.

Pole. Poles are tapered, combination fluted and smooth with an octagonal base, made of cast aluminum with a black satin ground finish. The typical nominal height is 12'-6", including the base. See Hilliard Standard Drawing SL-8.

Service Enclosure. Service enclosure shall be a 30"H x 18"W x 15" D stainless steel watertight enclosure with a dark bronze powder coated finish. See Hilliard Standard Drawing SL-10.

Pole Placement. Poles should be staggered on opposite sides of the street and shall be placed a minimum of 2' behind the back of . At intersection radii, poles shall be placed a minimum of 4' behind the back of curb. On an uncurbed street, poles should be offset an appropriate distance from the pavement edge to avoid the striking by an errant vehicle, based on the design speed of the street and the location of a roadside ditch. Poles should be offset from street trees a sufficient distance to avoid tree foliage from interfering with normal light distribution. The exact minimum spacing is dependent on the mature height and spread of the trees along the street; therefore, the landscape architect and lighting design engineer should consult early in the design process to select an appropriate tree species to be compatible with the lighting and roadside environment.

Hilliard Standard Construction Drawing references. Local public commercial, industrial and mixed-use street light material specifications shall be as follows:

1. Pole Base – per Hilliard Standard Drawing SL-7
2. Pole and Luminaire Assembly – per Hilliard Standard Drawing SL-8
3. Service Enclosure – per Hilliard Standard Drawing SL-10
4. Conduit/Trench – per Hilliard Standard Drawing SL-6
5. Conductors – per Hilliard Standard Drawing SL-17

10.8 Conservation District Street Lighting

This section applies to all public streets located within the Conservation District. This district is characterized by a lower density or clustered development design. Attempts are made in the Conservation District to minimize the impact of development on the natural character of the area; therefore, lighting in this area is minimized.

Design Criteria. There is no defined lighting criterion for streets within the Conservation District except that intersections, roundabouts, and uncontrolled pedestrian crossings shall meet the minimum lighting criteria established in the table in Section 10.4.

Luminaire. Luminaire shall have a black powder coated aluminum housing mounted on a 1.5"x 3" aluminum decorative cross arm. See Hilliard Standard Drawing SL -14.

Pole. Pole shall be a 5” square aluminum tube. The nominal height of the pole located in a roundabout is 20’. The nominal height of the pole located at all other street intersections is 15’.

The nominal height of the pole located at all pedestrian crossings is 12’. See Hilliard Standard Drawing SL-13.

Service Enclosure. Service enclosure shall be a watertight, 1 phase 3 wire 2 breaker box mounted on a pressure treated 4”x6” wood post. See Hilliard Standard Drawing SL-9.

Pole Placement. Poles are placed only at intersections as follows:

- Local/Local Tee Intersection: 1 pole
- Local/Local 4-Way Intersection: 2 poles located at diagonal opposite corners
- Unsignalized Thoroughfare Plan street Intersection (Tee or 4-Way): 2 poles located at diagonal opposite corners
- Roundabout Intersections: In accordance with Chapter 8 of the *NCHRP Report 672 Roundabouts: An Informational Guide* (latest edition)
- Regional trail network crossings of a public street at an uncontrolled location (i.e. midblock or at a location where conflicting vehicular traffic is not required to stop): 2 poles located at diagonal opposite corners.

Hilliard Standard Construction Drawing references. Conservation District street light material specifications shall be as follows:

1. Pole Base – per Hilliard Standard Drawings SL-12 and SL-15
2. Pole - per Hilliard Standard Drawing SL-13
3. Luminaire Assembly – per Hilliard Standard Drawing SL-14
3. Service Enclosure – per Hilliard Standard Drawing SL-9
4. Conductors – per Hilliard Standard Drawing SL-17

10.9 Old Hilliard District Street Lighting

This section applies to all public streets located within the Old Hilliard District.

Luminaire. Luminaire shall have a cast aluminum housing with a black satin finish with LED lights. See Hilliard Standard Drawing SL-16.

Pole. Old Hilliard poles are 5-inch diameter, fluted with an octagonal base, made of structural grade aluminum, with a textured black finish. The nominal height of the pole is 14’, including the base. See Hilliard Standard Drawing SL-13.

Service Enclosure. Service enclosure shall be a 30”H x 18”W x 15” D stainless steel watertight enclosure with a dark bronze powder coated finish. See Hilliard Standard Drawing SL-11.

Pole Placement. Poles should be located on both sides of the street and shall be placed within the buffer/furnishings zone. Poles shall be placed a minimum of 2’ behind the back of curb. At intersection radii, poles shall be placed a minimum of 4’ behind the back of curb. Poles should be

offset from street trees a sufficient distance to avoid tree foliage from interfering with normal light distribution. The exact minimum spacing is dependent on the mature height and spread of the trees along the street; therefore, the landscape architect and lighting design engineer should consult early in the design process to select an appropriate tree species to be compatible with the lighting and roadside environment.

Hilliard Standard Construction Drawing references. Old Hilliard street light material specifications shall be as follows:

1. Pole Base – per Hilliard Standard Drawing SL-16
2. Pole and Luminaire Assembly – per Hilliard Standard Drawing SL-16
3. Service Enclosure – per Hilliard Standard Drawing SL-9
4. Conduit/Trench – per Hilliard Standard Drawing SL-6
5. Conductors – per Hilliard Standard Drawing SL-17

10.10 Roundabout Lighting

Street lighting is required at all roundabouts. Roundabout lighting should be designed in accordance with Chapter 8 of *NCHRP Report 672 Roundabouts: An Informational Guide* (latest edition) in terms of design criteria and pole placement. Luminaire, pole, and material specifications shall per the type of street or district in which the roundabout is located. Pole placement at roundabouts shall be a *minimum* of 4' behind the back of curb; truck turning templates shall be used to evaluate truck tracking to ensure that poles are set back a sufficient distance based on the unique geometry of the roundabout.

Hilliard Standard Construction Drawing references. Roundabout public street light material specifications shall be as follows:

1. Typical Layout – per Hilliard Standard Drawing SL-18

10.11 Retrofit of Existing Lighting

The purpose of this section is to provide the City with a methodology for replacing existing high intensity discharge (HID) streetlights with broad spectrum (white) light streetlights, such as LED technology.

In conformity with standard lighting practice, the streetlight replacements merely replace in-kind; they are not designed to increase the lighting level of existing street lighting design standards. They are equivalent to the streetlight they replace in that they provide comparable visibility for the section of street illuminated by the existing light.

An LED replacement light is considered “equivalent” to the existing light if it can deliver an average illuminance within 10% of the existing average illuminance.

Hilliard Standard Construction Drawing references. Retrofit of public street light material specifications shall be as follows:

1. Typical Layout – per Hilliard Standard Drawing SL-19

10.12 Lighting of Private Property

Private site lighting components should be visually appealing and serve not only to illuminate the parking, drive, and walk areas but to enhance the aesthetic appearance of the City. Site lighting should be designed in a manner that focuses and directs lighting downward to minimize light pollution.

All developments with ten or more parking spaces are required to provide exterior lighting for all pedestrian walkways and vehicular use areas in accordance with Hilliard City Code. Deviation from this requirement may be approved through a variance.

Maximum Illumination at Property Lines. Lighting originating on a site shall not trespass beyond the site to exceed the following values when measured at grade, ten feet beyond the property line for the following adjacent property types:

Residential	0.3 footcandles
Multi Family	0.5 footcandles
Office/Commercial/Industrial	1.2 footcandles