



General Lighting Design Guidelines

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1.0 Lighting Philosophy

Lighting provides a welcome dusk and nighttime atmosphere where entrances, destination points, and features are highlighted. Forecourts, plazas, and village greens are inviting, and traveled sidewalks and pedestrian promenades are lighted to provide guidance. These Guidelines and Standards help Centerra establish environmentally sensitive lighting that limits trespass and light pollution. Specifically, these Guidelines address the basic objectives of site lighting:

- Safety and Security
- Identity and Image
- Nighttime Visibility and Function
- Environmental Sensitive Lighting

1.1 Safety and Security

1.1.1 Provide safety lighting to illuminate potentially hazardous conditions such as vehicle/pedestrian intersections, crosswalks, stairs, and ramps.

1.2 Identity and Image

1.2.1 Select luminaires to reinforce District identity. Luminaire selections should not only be based upon photometric performance, but also on the aesthetic character or image desired for Centerra.

1.2.2 Specific lighting character and criteria is established for certain districts, such as the Motorplex at Centerra, Marketplace, Promenade Shops, Avenue South, in the Mixed Use Village Centers, and more. Refer to the guidelines and standards associated with those districts and to the Millennium General Development Plan (GDP) for additional information and/or exceptions to the criteria established in these general guidelines.

1.2.3 Certain developments within Centerra (including, but not limited to, major Centerra roadways and Ave South) are subject to street lighting fixture agreements on file with the City. These agreements establish the approved street lighting fixture specifications and associated maintenance

obligations applicable to the development. Where applicable, development shall comply with the provisions of the applicable agreement.

1.3 Nighttime Visibility and Function (Lighting Quality not Quantity)

- 1.3.1 Use light fixtures with discretion based upon lighting quality as opposed to quantity.
- 1.3.2 Increase contrast to increase visibility. Consider downlighting with wall wash lighting to illuminate facades, creating contrast so that objects are easier to see.
- 1.3.3 Control luminaire brightness. If a light source is very bright, everything else in the immediate surrounding area will appear relatively dark, making it harder to detect object details.
- 1.3.4 Provide shielded luminaires to prevent glare caused by uncontrolled light emitted from wall pack fixtures or floodlights.
- 1.3.5 Provide 2700K-4000K LED light source with 80 CRI

minimum designed to maximize reaction time and color recognition under low light levels.

1.4 Environmentally Sensitive Lighting

- 1.4.1 Minimize light trespass and light pollution. Use the current Illuminating Engineering Society (IES) recommended Lighting Exterior Applications as criteria to limit light pollution and light trespass.
- 1.4.2 Refer to the Millenium General Development Plan (GDP) for specific lighting policy and criteria information associated with the City of Loveland requirements.
- 1.4.3 Minimize light trespass through the careful selection, location, proper aiming, and shielding of light fixtures.
- 1.4.4 Avoid high wattage luminaires with poor visual shielding that create uncontrolled light pollution. Excessive light levels with high amounts of reflected light shall not be permitted.
- 1.4.5 Use low wattage, shielded luminaires that are properly located and aimed.

- 1.4.6 “Dark Sky” practices shall be adhered to. Lighting techniques that “uplight” buildings or landscape and shine light into the sky shall not be permitted.
- 1.4.7 Exterior lighting shall incorporate photocells, astronomical time clocks, dimming controls, occupancy sensors, and networked lighting controls where appropriate. Lighting shall automatically reduce output during periods of inactivity while maintaining required safety levels.

2.0 Exterior Lighting Design

The key to quality exterior lighting is to place light only where it is needed, without causing glare. By not wasting light, smaller LED wattages can be used to achieve superior effects. The most important result is improved visibility. Another by-product is reduced energy usage and improved maintenance. Design criteria includes basics such as lighting levels (illuminance), uniformity, and brightness balance (luminance), as well as recommendations for reducing glare, light trespass, and light pollution. Note that for all point by point illuminance plans prepared for projects at Centerra, a Light Loss Factor (LLF) of 1.0 must be used.

2.1 Open Space and Natural Areas

2.1.1 Avoid lighting Open Space and Natural Areas to preserve the natural environment and minimize light pollution.

2.2 Roadway Lighting

- 2.2.1 Provide low glare lighting at conflict zones.
- 2.2.2 Provide pedestrian lighting or roadway lights at each pedestrian crosswalk, roadway intersection, and parking lot entry, based upon the following standards:
 - Pedestrian Crossing Lights: Two light poles, maximum, or install pavement mounted pedestrian lights that are activated when pedestrians cross the road, warning motorists to stop.

Road Classification	Approximate Curb-to-Curb Width	Luminaire Style	Light Standard Description	Lamp	Approximate Light Standard Spacing
Major Arterial	45'-80' or more		Asymmetric wide beam single-head on 30' pole. BEGA 99599 or Equal	LED	Refer to Larimer County Street Lighting Regulations
Major Arterial	80' or more		Asymmetric wide beam double-head on 30' pole. BEGA 99481 or Equal	LED	Refer to Larimer County Street Lighting Regulations
Major Collector	50'-80'		Asymmetric wide beam single-head on 30' pole. BEGA 99596 or Equal	LED	Refer to Larimer County Street Lighting Regulations
Major Collector	50'		Asymmetric wide beam on 30' pole. BEGA 99479 or Equal	LED	Refer to Larimer County Street Lighting Regulations

fig. 1a Lighting Standards for Roadways

2.2.3 Provide vehicular-oriented roadway lighting, based upon the following standards:

- Roadway Pole Height: 20 - 30 feet, depending on the roadway width and adjacent land use type.
- White Light Source: Integrated LED
- Maximum Initial Lumens per Luminaire: 7,500 lumens for 20' high poles and 13,000 lumens for 30' high poles.
- Luminaires Per Pole: Two, maximum.
- Color: Matthews "chocolate-chip" #25A-1A.
- Maintained Average Horizontal Surface Illumination in Roadway: 1.5 foot-candles.
- Maintained Average Vertical Surface Illumination in Roadway: 1.5 foot-candles.
- Maintained Average Horizontal Surface Illumination at Intersection: 2.4 foot-candles.
- Maintained Average Vertical Surface Illumination at Intersection: 1.8 foot-candles.

2.2.4 Use only fully shielded luminaires that direct light downwards (IESNA full cut-off fixtures).

2.2.5 Canopy trees should not be located within 40' of a streetlight on major roadways to prevent foliage interference, clear-zone conflicts, and light obstruction.

2.3 Parking Lot (Field) Lighting

2.3.1 Provide Parking Lot Lighting, based upon the following standards:

- Parking Lot Pole Height-Parcels 5 acres or less: 20 Feet.
- Parking Lot Pole Height-Parcels larger than 5 acres: 30 Feet.
- Parking Lot Pole Height-Parcels larger than 5 acres that incorporates pedestrian light fixtures along pathways and adjacent building entrances: 35 Feet.
- White Light Source: Integrated LED
- Maximum Initial Lumens per Luminaire:

13,000 lumens (30 - 35 foot high poles); 7,500 lumens (20 foot high poles) required to meet necessary light levels.

- Type: Curvilinear head, or consistent with district design theme and as approved by the DRC.
- Luminaires Per Pole: Two, maximum.
- Color: Dark Bronze, or as approved by the DRC.

2.3.2 Use only fully shielded luminaires that direct light downwards (IESNA full cut-off fixtures).

2.3.3 Locate light fixtures within medians or on concrete pedestals. Concrete pedestals shall have a smooth top, one-inch chamfer, and coated with CDOT Class V structural coating.

2.4 Pedestrian Walkway and Path Lighting

2.4.1 Provide Pedestrian Walkway and Path Lighting, based upon the following standards:

- Walkway and Path Pole Height: 10 - 12 feet preferred, 14 feet maximum.
- Location: Along pedestrian promenades and at decision points along walkways and paths.
- White Light Source: Integrated LED
- Maximum Initial Lumens per Luminaire: 1,500 lumens.
- Color: Dark bronze, or as approved by the DRC.

2.4.2 Avoid lighting walkways and paths that are typically not used at night.

2.4.3 Light key signage at decision points to aid in navigation.

2.4.4 Light fixtures and poles should be of a style consistent with the district theme.

2.5 Stairs and Ramps

2.5.1 Incorporate recessed step lights into the stair sidewalls.

2.5.2 Shield stair step sidewall lights with louvers.

2.5.3 Provide Stair and Ramp Lighting, based upon the

following standards:

- White Light Source: Integrated LED 3000K-4000K source.
- Maximum Initial Lumens per Luminaire: 100 lumen; For wayfinding purposes only, to be supplemented with other ambient light.

2.6 Feature and Landscape Lighting

2.6.1 Use fixtures to light only selected landscape features, walls, or objects.

2.6.2 Use down lighting to illuminate elements to be featured to the maximum extent possible. Up lighting may be approved by the DRC on a case by case basis if the uplight is directed toward a building wall or other feature. Vertical orientation is only allowed under roof, canopy, eave, or other similar element.

2.6.3 Use adjustable shielded luminaires to provide an even, warm wash of light across wall surfaces.

2.6.4 Conceal lighting sources from public view.

2.6.5 Mount and install luminaires to be completely protected from lawn mowers, weed eaters, and snow blowers.

2.6.6 Equip luminaires with internal louvers and shields to control glare and prevent excess spill lighting.

2.6.7 Use luminaires with high quality optics.

2.6.8 Provide Feature and Landscape Lighting, based upon the following standards:

- White Light Source: Integrated LED at 2700K-3000K.
- Maximum Initial Lumens per Luminaire: 1,500 lumens.

2.7 Non-Residential Area Lighting

2.7.1 Light storefront facades and sign bands with lighting fixtures located on buildings, oriented downwards.

2.7.2 Provide networked lighting controls capable of scheduling, occupancy sensing, and automatic

dimming to turn off storefront façade and sign bands one hour after closing. Only a minimum security light level shall remain after store closing.

2.7.3 Use shielded motion sensor lighting for loading docks, designed to illuminate only when trucks or pedestrians appear.

2.7.4 Orient all building mounted security lighting downwards, completely shielded (IESNA full cut-off designated fixtures). Unshielded wall pack lights shall not be permitted.

2.7.5 Design outdoor canopies associated with drive-up windows and service stations to sensitively integrate luminaires. All luminaires shall be fully recessed with flat lenses. Dropped, sagging, or protruding lenses shall not be permitted.

2.7.6 Floodlighting and up lighting will not be permitted. LED over 4,000 lumens shall not be permitted.

2.7.7 Facades that want downlighting, should be mounted at the top of the building facade, with a maximum of 3,000 lumens.

2.7.8 Provide full cut-off, fully shielded luminaires that direct light downwards (IESNA full cut-off fixtures).

2.7.9 Use current IES recommended practices regarding Lighting for People in Outdoor Environments and Lighting Roadway and Parking Facilities.

2.8 Retail Pedestrian Center Lighting

2.8.1 Use down wall wash lighting to accentuate buildings that frame and enclose formal open space without creating light pollution.

2.8.2 Illuminate paths, key signage, and interest points to draw attention to these features.

2.8.3 Light key signage at decision points to aid in navigation.

2.8.4 Integrate concealed or fully shielded lighting in benches and low seating walls.

2.8.5 Provide Retail Pedestrian Center Lighting, based upon the following standards:

Pedestrian Lighting

- Pedestrian Pole Height: 10 - 12 feet preferred, 16 feet maximum.
- Luminaires per Pole: Two, maximum.
- Location: Among pedestrian promenades and at key locations within plazas and courtyards.
- White Light Source: Integrated LED luminaires.
- Maximum Initial Lumens per Luminaire: 3,500 lumens

Signage Lighting

- Location: Mounted at the top of the sign, oriented downward or integrated into the sign design. Internally illuminated individual sign letters or backlit halo shall be permitted.

Major Feature Lighting

- White Light Source: LED 3000K or 4000K
- Maximum Initial Lumens per Luminaire: 1,500 lumens.

Building Façade Lighting

- White Light Source: Integrated LED 3000 K or 4000 K
- Maximum Initial Lumens per Luminaire: 2,400 lumens.
- Building/wall mounted entry sconces, downlights only.

Building Entry Lighting

- Type: Wall Sconces or Pendants.
- White Light Source: Integrated LED
- Maximum Initial Lumens per Luminaire: 1,500 lumens.
- Downlights only.

Bench and Low Seat Wall Lighting

- White Light Source: 3000K or 4000K LED strip lighting or furniture with integral illumination.
- Maximum Initial Lumens per Luminaire: 1,800 lumens.

Wall Sconces

- Location: On walls that define the perimeter of pedestrian gathering areas.
- White Light Source: Integrated LED source 3000K or 4000K
- Maximum Initial Lumens per Luminaire: 1,000 lumens
- Downlights only.

Stone Wall and Column Lighting

- White Light Source: Integrated LED source of 3000K to 4000K
- Maximum Initial Lumens per Luminaire: 1,000 lumens
- Downlights only.

2.9 Office/Employment Area Lighting

2.9.1 Provide Business Park Lighting, based upon the following standards:

- Pole Height: 14 - 16 feet.
- Location: At each parcel entrance, arranged so the light fixtures appear to create a gateway, producing a strong sense of arrival.
- White Light Source: Integrated LED
- Maximum Initial Lumens per Luminaire: 3,500 lumens.

2.9.2 Avoid building up lighting. Building up lighting shall not be permitted.

2.10 Residential Lighting

2.10.1 Provide Residential Lighting, based upon the following standards:

Single Family Street Lighting

- Fixture Type: pole top luminaires.
- Pole Height: 15 - 18 feet.
- Location: Along street frontages.
- White Light Source: Integrated LED 3000K-4000K
- Maximum Initial Lumens per Luminaire: 3,500 lumens.

Single Family Street-Side Parking Space Lighting

- Fixture Type: Post-top full-cutoff pedestrian luminaires.
- Pole Height: 10 feet.
- Location: Side street parking spaces in alleys.
- White Light Source: Integrated LED
- Maximum Initial Lumens per Luminaire: 2,500 lumens.

Multi-Family Street-Side Parking Space Lighting

- Fixture Type: Post-top full-cutoff pedestrian luminaires.
- Pole Height: 10 feet.
- Location: Along internal streets.
- White Light Source: Integrated LED
- Maximum Initial Lumens per Luminaire: 2,500 lumens.

Single Family Home Lighting

- Fixture Type: Post-top full-cutoff luminaire.
- Pole Height: 6 feet.
- Location: Along pedestrian paths.
- White Light Source: Integrated LED
- Maximum Initial Lumens per Luminaire: 925 lumens.

Garage-Mounted Lighting

- Fixture Type: Motion sensor lanterns.
- Location: Attached to the garage facade.

- White Light Source: Integrated LED
- Maximum Initial Lumens per Luminaire: 925 lumens.

2.10.2 Locate luminaires no higher than 16 feet above grade when City street trees are planted adjacent to light poles. Coordination with the City of Loveland is required.

2.10.3 Provide electronic drivers rated a minimum start temperature of -5 degrees or lower for all LED lighting.

2.11 Holiday and Temporary Lighting

During the winter holiday season, holiday lighting may be used. The intent for holiday lighting is a tasteful display using traditional lighting techniques such as strings of Christmas lights. Any lighting that is temporary in nature by means of cord and plug connection and/or not installed by the National Electric Code is defined as Holiday and Temporary Lighting. Refer to Community Association Covenants for residential holiday restrictions.

2.11.1 Use low wattage string lights, LED lights.

2.11.2 Prohibit dynamic displays such as "chasers."

2.11.3 Prohibit searchlights or other lights designed to attract attention.

2.11.4 Install and energize holiday lighting only from November 1 through January 31.

2.11.5 The Centerra DRC on a yearly basis shall consider and approve other lighting techniques.

2.12 Sports Field Lighting

2.12.1 Prohibit sports field lighting within residential areas.

2.12.2 Equip floodlights with both internal and external shielding.

- 2.12.3 Prohibit aiming angles above 60 degrees from vertical.
- 2.12.4 Incorporate IES cut-off luminaires in lieu of adjustable floodlights for tennis courts and other small area playing fields.
- 2.12.5 Control field lighting so that when fields are not in use, the sports lighting equipment is turned off. In no case shall the sports lighting be on after 11 pm.

2.13 Lighting Controls

- 2.13.1 Time clocks or motion light sensors for all LED luminaires to activate 50% or lower light level after hours or when pedestrians are not present.
- 2.13.2 Turn off art, feature, architectural, and other non-essential lighting during low activity periods.
- 2.13.3 Activate non-metal halide parking lot lighting during low activity periods with motion sensors or time clocks.
- 2.13.4 Activate low use area, LED pedestrian lighting during low activity periods with motion sensors or time clocks.