



General Lighting Design Guidelines

LIT-2 · Lighting Philosophy

LIT-2 · Exterior Lighting Design

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LIGHTING

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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 and in the Mixed Use Village Centers. 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.

1.3 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 white light sources such as metal halide, fluorescent, and inductive lamps, designed to maximize reaction time and color recognition under low light levels. High pressure sodium and mercury vapor lighting is prohibited.

1.4 Environmentally Sensitive Lighting

- 1.4.1 Minimize light trespass and light pollution. The Illuminating Engineering Society of North America (IESNA) recommended practice RP-33-99 “Lighting for Exterior Environments” shall be used 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 Utilize photocell and timers to control switching of site lighting.







Road Classification	Approximate Curb-to-Curb Width	Luminaire Style	Light Standard Description	Lamp	Approximate Light Standard Spacing
Major Arterial	80' or more		Curvilinear single-head on 30' pole. Kim Lighting CCS2143 or Equal	150W metal halide	200' between pairs (one each side of road)
Major Arterial	45'		Curvilinear single-head on 30' pole. Kim Lighting CCS2143 or Equal	150W metal halide	170' (on one side of road only)
Major Arterial	80' or more		Curvilinear double-head on 30' pole. Kim Lighting CCS2143 or Equal	150W metal halide	185' (single poles in median)
Major Collector	80'		Curvilinear single-head on 30' pole. Kim Lighting CCS2143 or Equal	150W metal halide	85' (staggered spacing)
Major Collector	50'		Curvilinear single-head on 30' pole. Kim Lighting CCS2143 or Equal	150W metal halide	85' (staggered spacing)
Major Collector	50'		Curvilinear double-head on 30' pole. Kim Lighting CCS2143 or Equal	150W metal halide	125' (single poles in median)

fig. 1a Lighting Standards for Roadways

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 lamp 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.
- 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: Metal Halide.
 - Maximum Initial Lumens per Luminaire: 12,000 lumens (20 foot high poles); 22,000 lumens (30 foot 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 designated fixtures).

2.2.5 Do not locate canopy trees within forty feet of a streetlight on an arterial or collector roadway.

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: Metal Halide.
 - Maximum Initial Lumens per Luminaire: 22,000 lumens (30 - 35 foot high poles); 12,000 lumens (20 foot high poles).
 - 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 luminaries that direct light downwards (IESNA full cut-off designated

	Minimum horizontal illuminance	Maximum Uniformity Ratio (max to min.)	Maximum average illuminance	Maximum vertical illuminance
Paths, plazas, walkways **	0.1	20:1	0.5	0.1
Bicycle parking areas	0.1	20:1	0.5	0.1
Commercial parking areas	0.5	10:1	2 foot-candles	0.2 foot-candles
Industrial, office parking areas	0.2	10:1	1 foot-candles	0.1 foot-candles
Residential parking areas	0.1	20:1	0.5 foot-candles	NA
Parking areas-schools	0.1	20:1	0.5 foot-candles	NA
Notes: * Lighting criteria is adapted from the IESNA, 8th Edition, Lighting Handbook. ** Excludes recreational trails and paths that are not typically used at night.				

fig. 2a - Parking Lot Lighting Criteria

fixtures with flat lenses).

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: Metal Halide, Compact Fluorescent.
 - Maximum Initial Lumens per Luminaire: 4,800 lumens.
 - Color: Dark bronze, or as approved by the DRC.

	Average Illuminance	Average to Minimum
Lighted Pedestrian Walkways	0.5 foot-candles	4:1

fig. 2b - Pedestrian Walkway Lighting Criteria

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 side-walls.

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: Compact Fluorescent or LED Lamps.
 - Maximum Initial Lumens per Luminaire: 1,800 lumens.

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 bulidng 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: Metal Halide or compact florescent.
 - Maximum Initial Lumens per Luminaire: 2,400 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 internal controls 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. Lamps over 2,400 lumens shall not be permitted.
- 2.7.7 Avoid vertical lamps over 5,000 lumens. Vertical lamps under 5,000 lumens shall be fully shielded from all viewing angles.
- 2.7.8 Provide full cut-off IESNA designated light fixtures for vertical lamps over 5,000 lumens.
- 2.7.9 Use current IESNA recommended practices

including “Lighting for Exterior Environments” RP-33-99 and Parking.

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, 14 feet maximum.
- Luminaires per Pole: Two, maximum.
- Location: Among pedestrian promenades and at key locations within plazas and courtyards.
- White Light Source: Metal Halide, Compact Fluorescent.
- Maximum Initial Lumens per Luminaire: Pedestrian Lighting - 4,800 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: Low glare Compact Fluorescent, Adjustable Shielded Floodlights, or PAR Metal Halide Lamps (35-watt).

- Maximum Initial Lumens per Luminaire: 2,400 lumens.

Building Façade Lighting

- White Light Source: Compact Fluorescent or PAR Metal Halide Lamps (35-watt).
- Maximum Initial Lumens per Luminaire: 2,400 lumens.
- Downlights only.

Building Entry Lighting

- Type: Wall Sconces or Pendants.
- White Light Source: Compact Fluorescent.
- Maximum Initial Lumens per Luminaire: 2,400 lumens.
- Downlights only.

Bench and Low Seat Wall Lighting

- White Light Source: Compact Fluorescent, Fiber Optics, or LED Strip Lighting.
- Maximum Initial Lumens per Luminaire: 1,800 lumens.

Wall Sconces

- Location: On walls that define the perimeter of pedestrian gathering areas.
- White Light Source: Compact Fluorescent.
- Maximum Initial Lumens per Luminaire: 1,800 lumens.
- Downlights only.

Stone Wall and Column Lighting

- White Light Source: Compact Fluorescent, Adjustable Shield Floodlights, or PAR Metal Halide Lamps (35-watt).
- Maximum Initial Lumens per Luminaire: 2,400 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: Metal Halide, Compact Fluorescent.
- Maximum Initial Lumens per Luminaire: 4,800 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: Arm-mounted full-cutoff luminaires.
- Pole Height: 15 - 18 feet.
- Location: Along street frontages.
- White Light Source: 70-watt Metal Halide recommended.
- Maximum Initial Lumens per Luminaire: 4,800 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: 70-watt Metal Halide recommended.
- Maximum Initial Lumens per Luminaire: 4,800 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: 70-watt Metal Halide recommended.
- Maximum Initial Lumens per Luminaire: 4,800 lumens.

Single Family Home Lighting

- Fixture Type: Post-top full-cutoff luminaire.
- Pole Height: 6 feet.
- Location: Along pedestrian paths.
- White Light Source: 13 - 15 watt Compact Fluorescent lamps.
- Maximum Initial Lumens per Luminaire: 925 lumens.

Garage-Mounted Lighting

- Fixture Type: Motion sensor lanterns.
- Location: Attached to the garage facade.
- White Light Source: Compact Fluorescent lamps.
- 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 ballasts rated a minimum start temperature of -5 degrees or lower for all compact florescent lamps.

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 preferred.

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 IESNA cut-off luminaries 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 Determine lighting control zones and methods

for pedestrian and parking lot lighting in order to determine if areas can be turned off during extremely low activity levels.

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, non-metal halide pedestrian lighting during low activity periods with motion sensors or time clocks.

