

Chautauqua Park Historic District Lighting Design Guidelines



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Acknowledgements

These guidelines were developed in 2017 through the collaborative efforts of the Colorado Chautauqua Association (CCA), City of Boulder, consultant team, working group and core team members, and community members. Historic photographs were provided by CCA and the Carnegie Branch Library for Local History.

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Project Goals:

- Provide context for the historic intent and use of lighting at Chautauqua;
- Identify and assess the need for lighting at Chautauqua;
- Utilize feedback from the Staff Core Team, Community Working Group, Boards, and members of the public in making recommendations;
- Provide performance-based design guidelines that are broad, direction based, to aid in the decision-making process for exterior lighting at Chautauqua.

Project Objectives:

- Determine the range of acceptable lighting approaches;
- Determine the appropriate amount of exterior lighting;
- Determine appropriate lighting levels.

DEVELOPMENT OF THE LIGHTING DESIGN GUIDELINES

The Colorado Chautauqua was founded in 1898 as an educational, artistic and cultural retreat as part of the national Chautauqua movement. In 1978, the 40-acre site was designated as a local and National Register historic district, and in 2006 it was designated as a National Historic Landmark.

In 2017, the Colorado Chautauqua Association (CCA) and the City of Boulder undertook the development of lighting design guidelines for Chautauqua, guided by the *Guiding Principles for Collaborative Place Management and Fiscal Sustainability* (2012). The development of these guidelines was led by the project team and consultants Mundus Bishop and Clanton and Associates and was informed by input from a Community Working Group, Staff Core Team, public open houses, and joint study sessions between representatives of the CCA Board of Directors and the City of Boulder Landmarks Board.

The Lighting Design Guidelines are intended to assist applicants in planning for changes to exterior lighting within the Chautauqua Park Historic District and to provide the City of Boulder's Landmarks Board and the CCA's Building and Grounds Committee with a framework for making informed decisions that will ensure lighting improvements are appropriate to the special character of the place, while providing reasonable safety, security and navigation for its stewards and users. This document provides a history of lighting within Chautauqua, an assessment of current lighting conditions, expressed needs for lighting from a variety of users, guiding principles and desired lighting qualities that were used to inform the design guidelines.

This work builds upon prior research and planning documents for the Chautauqua Park Historic District including the National Register Nomination (1978); National Historic Landmark Nomination (2006); Chautauqua Park Historic District Cultural Landscape Assessment and Plan (2004); the Chautauqua Park Historic District Design Guidelines (1989); and the Chautauqua Landscape Design Guidelines (2012). In 2012, a Master Exterior Lighting Plan (MELP) was created by the CCA to establish an exterior lighting system at Chautauqua; however this plan did not fully examine the historic context or appropriateness of lighting. It is these issues that this document seeks to fully address.

Process



In early 2017, the Staff Core Team and Community Working Group were formed. The Staff Core Team was composed of representatives from the CCA, as well as from the City's Public Works, Open Space and Mountain Parks, Parks and Recreation, Planning, Housing and Sustainability, Finance, and Communications departments. The Community Working Group was composed of representatives of Friends of Chautauqua, Historic Boulder, Inc., History Colorado, Chautauqua Cottagers, and the Sierra Club – Indian Peaks Chapter. Both groups met regularly through the process, and their input was integrated into the design guidelines. Five Joint Study Sessions between representatives of the CCA Board of Directors and the City of Boulder Landmarks Board were held over the course of the project.

Two open houses were held in tandem with the first two Joint Study Sessions. Additionally, the project team reached out to Dining Hall staff and concert-goers to gather input from different user groups. An online survey collected additional input.

The Lighting Design Guidelines were developed in four phases:

1. History of Lighting and Existing Conditions; Development of Project Goals and Draft Lighting Principles

The initial phase focused on evaluating existing conditions, researching the history of lighting at Chautauqua, assessing the appropriateness and need for lighting, developing project goals and Draft Lighting Principles.

2. Development of Lighting Areas and Desired Qualities

The second phase included the development of Draft Character Areas and Draft Desired Lighting Qualities, shaped by the Lighting Principles and feedback from the working groups, boards and community members.

3. Draft Design Guidelines

Following the development of the Lighting Principles and Desired Qualities, the consultant created specific design guidelines to aid in future decision-making related to exterior lighting within the boundaries of the historic district.

4. Finalize Design Guidelines

The last phase involved finalizing the design guidelines. The Lighting Design Guidelines were brought to the CCA Board of Directors and the Landmarks Board for adoption.

Chautauqua Lighting Design Guidelines



Study Area - Chautauqua Park Historic District

Study Area and Surroundings

The Chautauqua Historic District is located in Boulder, Colorado, at the foot of Green Mountain. It was established in 1898 as an educational, artistic and cultural retreat as part of the national chautauqua movement. The Chautauqua Historic District is one of a few remaining chautauquas in the United States. Its grounds, roads, cottages, and public buildings comprise an area of 40 acres bordered on three sides by City of Boulder Open Space and Mountain Parks. The Chautauqua Historic District is listed in the National Register of Historic Places (1978), designated as a local historic district (1978), and as a National Historic Landmark (2006). It has been in continuous operation since its founding, under the joint stewardship of the Colorado Chautauqua Association (CCA) and the City of Boulder, and retains historic integrity with its historic buildings, structures, and grounds intact.

The City of Boulder owns the land encompassing the Chautauqua Historic District and also the Auditorium, Dining Hall and Academic Hall buildings. CCA leases those three buildings and 28 acres of grounds from the City, and owns 60 cottages and two lodges, which it makes available for nightly lodging or longer term rental. CCA also owns the Community House which is made available for various public and private events and meetings. CCA holds sub-lease agreements with 40 privately-owned cottages located throughout the leasehold. CCA manages the Dining Hall, the Auditorium and Academic Hall; the City manages the public park and adjacent Open Space land. The Chautauqua Park Historic District is home to summer and, increasingly, winter residents who reside in its cottages, most of which are historic.

For purposes of this document the Chautauqua Historic District is divided into the Study Area and Context Area:

The **Study Area** (page 6) includes the CCA leasehold area, Chautauqua Green, and portions of Chautauqua Open Space. The study area includes the 40 acre parcel roughly triangular in shape that extends from Baseline Road on the north into the City of Boulder Open Space and Mountain Parks on the south.

The **Context Area** (page 8) is the transition area around the study area that influences or could be influenced by lighting within the study area. The transition area is generally defined as the neighborhoods or public lands immediately adjacent to the historic district (Baseline Road, east and west of the study area; 12th Street; and neighborhoods to the north; and the edge at Chautauqua Open Space). This area provides a context for guidelines and recommendations for the historic district but no specific guidelines are developed for this context area.

Chautauqua Lighting Design Guidelines



Context Area, Chautauqua Park Historic District.



History of Lighting at Chautauqua

Chautauqua Lighting Design Guidelines



Horse and buggy parking area, with hanging light at center background, circa 1898.



Pendant light at Wildrose Road and Academic Hall Fountain, circa 1900.

HISTORY OF LIGHTING AT CHAUTAUQUA

The Colorado Chautauqua was founded in 1898 as the Texas-Colorado Chautauqua. The founders established the property and the program with great attention to the “Chautauqua Idea:” learning for all, cultural entertainment, and leisure in a natural and inspiring setting. Chautauqua was originally established as a seasonal camp for teachers from Texas and their families, among others. At a time when primary and secondary teacher training was rudimentary or non-existent, chautauquas brought post-secondary education to millions and teacher training to thousands. Chautauquas brought prominent speakers, high culture, and popular entertainments to non-urban areas. While cities were growing more congested, chautauquas emphasized the benefits of outdoor life.¹

Its location on the eastern edge of the Rocky Mountains represents the westward spread of the movement, and today it remains the only independent assembly in continuous operation in the Western United States, with grounds always having been open and free for public enjoyment.

The setting of Boulder’s Chautauqua has remained essentially as it was in 1898. Its sites, buildings, and structures are intact, the property tells a cohesive narrative, and its grounds are open to the general public. Today, visitors experience the Colorado Chautauqua much as it was at the height of the Chautauqua Movement.² It continues to be home for summer and winter residents whom reside in its historic cottages. The Chautauqua Green is an important and popular Boulder park.

The architectural and historic significance of the Colorado Chautauqua has been recognized through local historic landmark and National Historic Landmark designation. The identified period of significance from 1898 to 1930 marks the foundation of the Colorado Chautauqua through its height and subsequent decline of the Chautauqua Movement as a whole.

History of Lighting at the Colorado Chautauqua

The introduction of electric lighting at Chautauqua in 1898 followed the development of lighting elsewhere in the city. Electric lights were first installed in downtown Boulder in 1886, through funding by private business owners, who sought to reduce the need to carry personal lanterns “to avoid falling in mud-holes or irrigation ditches.”³

1 Colorado Chautauqua NHL Registration Form, 46.

2 Colorado Chautauqua NHL Registration Form, 60.

3 Gladden, Sanford Charles. *The Early Days of Boulder, Colorado*. 1982,

Chautauqua Lighting Design Guidelines



Lighting at Dining Hall at left side of photograph, circa 1898.



Lighting outside of Mariposa Cottage (34), circa 1900.

History of Lighting at Chautauqua

In 1890, the Boulder City Council passed a motion to build 27 street lights in collaboration with the Electric Light Company. The Boulder County HERALD reported on this development in an article “Splendidly Lighted: Boulder to Have Twenty-Seven Arc Lights on the Streets,” in which they describe security as being an “important element” of the lighting installation, as well as the experiential quality of arriving to a lit town, which they considered to be impressive, grand, friendly and warm. The paper considered “the move a grand, good one.”⁴ These sources indicate that electric street lighting was viewed as mainly utilitarian in nature and also signified safety, comfort, and enjoyment of a place at night time.

Lighting at Chautauqua was also regarded as adding to the beauty of the place: “There were few buildings or trees between the University and the Chautauqua grounds, and the ‘brilliant cluster’ of the lights glittered, according to one reporter, ‘like so many gems in the distance.’”⁵

The Boulder County HERALD reported in June of 1899 that the “The Chautauqua grounds were lighted up last night with arc lights for the first time this year. They looked exceedingly beautiful.”⁶ The original lighting fixtures were mounted to tall wood electrical poles and supplied lighting to key locations within the campus, including the Dining Hall, Auditorium, and parking area. The lighting poles and fixtures appear to have been utilitarian in style, and did not provide any daytime aesthetic or decorative purpose.

Historic photographs show utility poles with suspended luminaires and literature refers to arc lights at the Chautauqua. Arc lamps were astringent and brilliant, with a very high color temperature and a very small source. They were much more powerful than the contemporary incandescent lamps of the time. The lit areas directly below an arc lamp would have been very bright with distinct shadows. The wide spacing of the lights would have had very high ratios of uniformity so that spaces between lit areas would seem very dark. The surrounding context was dark, with the night sky and foothills as a background, so the contrast between illuminated and dark areas would have been very great. Photographs indicate little or no shielding to the lights, so the output was not controlled but cast an even amount of light in most directions. Overall, the original lighting at Chautauqua would have been glary and the uniformity very wide.

642-643.

4 “Splendidly Lighted: Boulder to Have Twenty-Seven Arc Lights on the Streets.” *Boulder County HERALD*, November 19, 1890.

5 Pettem, Silvia. *Chautauqua Centennial: A Hundred Years of Program*. 4.

6 *Boulder County HERALD*, June 28, 1899.



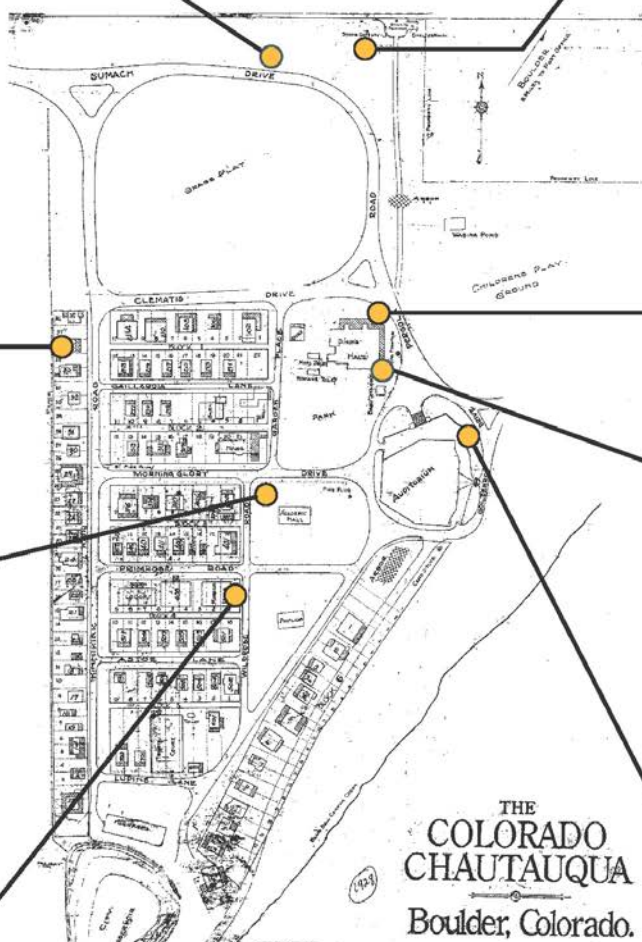
Cone shaped fixture amidst buggy parking, location approximated per 1898 period plan, 1899.



Fixture east of Kiosk, 1898.



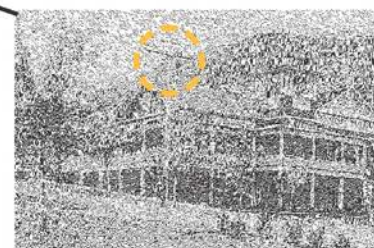
Cone shaped fixture along Kinnikinick Road, next to Mariposa Cottage (34), 1900.



Fixture on southeast side of Dining Hall, post-veranda addition, 1903.



Fixture along Wild Rose Road, next to Academic Hall fountain, date unknown.



Pendant fixture on northeast side of Dining Hall, approximate date 1911-1912.



Fixture along Wild Rose Road, just south of the intersection with Primrose Road, near Cottage 501, circa 1900.



Pendant fixture on northeast side of Auditorium, not visible in earlier photographs, approximate date 1914.

LIGHTING CHRONOLOGY

1898

Newspaper accounts confirm that there were lights and electricity to the camp since the inaugural season. Electrical poles with areas of tents are visible in 1898 historic photographs. These appear to be tall poles that provide lighting for specific areas at the interior of the campus. The fixtures appear as cone-shaped pendants. Not all poles had a light. Light fixtures appear at major points of interest and gathering (parking area, Dining Hall).

c.1900

Photograph indicates a pole with simple light fixture for area lighting on Wildrose Road. A view of the buggy parking shows a single wood pole with a simple pendant, along with other electrical poles (not all had lighting, but there were at least 2 along this road).

A series of poles line both sides of the entry drive from Baseline Road to the Dining Hall. These appear to be for electricity, but it is unconfirmed how many of them may have incorporated lighting.

A photograph from August 1900 shows a pendant light north of the Academic Hall adjacent to the Academic Hall Fountain.

1903

Photograph shows electrical poles visible at Tennis Court, within tent and cottage areas, and at edges of the campus. These poles appear to be electric poles only and likely did not provide exterior lighting to these areas.

c.1910

Photograph indicates a painted wood pole with a pendant light located between the Dining Hall and the Auditorium. Another photograph from the same time shows a pendant light on Clematis Drive. There does not appear to have been any lighting on the east side of the campus.

1911

King's Gate was built with columns, topped by open air 'lights.' There is no evidence that these had electricity or were ever lit; they were likely just decorative caps.

1914

Photograph of the Auditorium shows a pendant light on the northeast side of the building.

1918

Sanborn map indicates "lights, electrical" for the Auditorium and Dining Hall.

c.1920

Lighting was expanded in select spaces. Pendant lights changed to a hanging globe light, but lights were still located on tall electrical poles, which were unornamented and functional.

Chautauqua Lighting Design Guidelines

1940s

Repair and infrastructure improvements included winterization of many cottages, and the installation of plumbing and heating. Electrical service was upgraded and exterior lighting was replaced, including the addition of the globe lighting fixtures at the northwest entrance to the Auditorium. It is uncertain as to whether these fixtures (remaining) were viewed as decorative at the time, or simply beacons to welcome visitors to the Auditorium. Photographs show wood posts with double or singular cross bars for the electrical system, indicating that in general lighting continued to be utilitarian, with fixtures mounted to electrical poles.

1960s

Photographs indicate cobrahead lighting was installed in this period and continues to be used at Chautauqua.

1976

The Auditorium was rehabilitated, and electrical service was upgraded. Modern street lights were installed.

1998

Pedestrian-scaled, acorn shaped fixtures added at Auditorium, Dining Hall and along Clematis Drive.

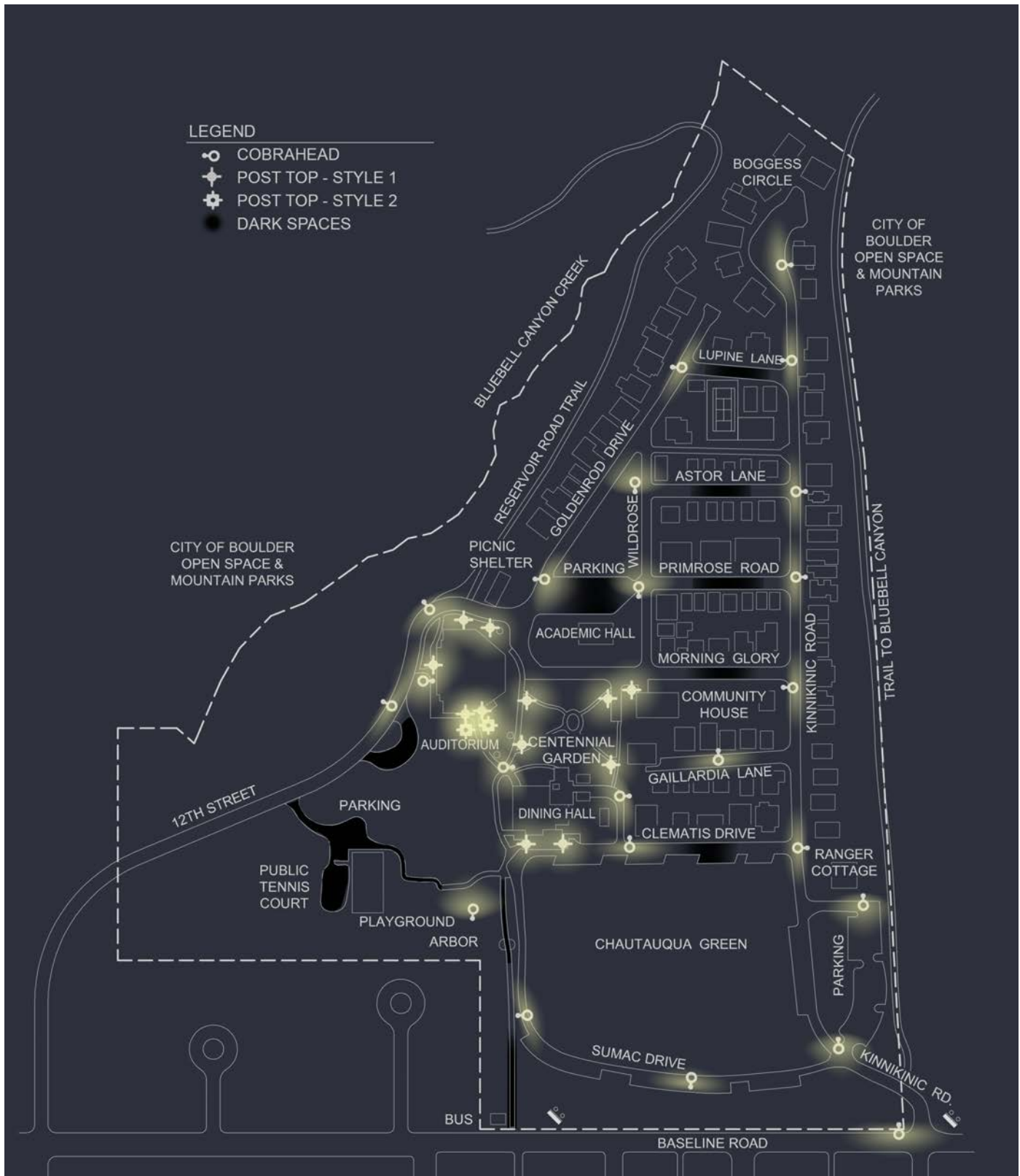
Chautauqua Park postcard. Photo courtesy of Leland Rucker and Billie Gutzell.





Existing Conditions Assessment

Chautauqua Lighting Design Guidelines



Existing Lighting, Chautauqua Park Historic District.



Gathering spaces and major building entrances are illuminated from acorn and multi-globe style luminaires on decorative poles. LED retrofit lamps are installed.



The “Acorn” style fixture in this image has potential for glare, yet the low wattage light source in it and a fairly luminous background help to balance the brightness.

EXISTING CONDITIONS ASSESSMENT

Lighting currently at Chautauqua varies in area and application. Installed and upgraded sporadically over time as technology advanced and needs were recognized there is now an eclectic mix of luminaires and poles. Concentrated at the more frequently visited destinations by the general public, the Dining Hall and Auditorium have the most instances of light fixtures and highest illumination levels. Pathlighting aids navigation erratically to some destinations which are dark, such as parking areas or exiting the park. The light sources are fairly consistent from very warm color high pressure sodium sources in the streetlights to warm color retrofit compact fluorescent (CFL) and light emitting diode (LED) lamps in pedestrian scale and building mounted luminaires. Controls are basic as the streetlighting is dusk-to-dawn operated on photocells, to local control of building mounted luminaires. These are all moderately energy efficient light sources with good life expectancy. Except for the streetlights, most of the luminaires are not Dark Sky Friendly. The Chautauqua character is partially defined by the current lighting. There are comfortably illuminated, inviting spaces and poorly or non-illuminated areas and different needs for different type areas and experiences.

Public Spaces

The brightest areas on the campus, by comparison, are created in these areas with acorn and globe style luminaires mounted on decorative fluted poles. This higher level of lighting creates a visual destination, aiding navigation. It is easy to see one’s way in these areas and there is a sense of safety. The globe light fixtures on the northwest side of the Auditorium were added in the 1940s, and the acorn pedestrian lighting was added in 1998. Some of the acorn poles have dedication placards as people have made donations for them.

Near the Auditorium and Dining Hall ambient lighting is created with these acorns and globes. Additional lighting around the Dining Hall is spill light from porch ceiling mounted and sconce luminaires.

These public buildings also have various egress luminaires at exits.

The light sources are warm compact fluorescent or LED retrofit bulbs, with good color rendering (>75 CRI)

The ambient lighting luminaires are not Dark-Sky Friendly and operate dusk to dawn every day. The Dining Hall porch lights are controlled by the porch ceiling minimizing spill into the sky.

Chautauqua Lighting Design Guidelines



Various porch lights are installed throughout the dwellings and secondary buildings. Compact fluorescent and LED retrofit lamps are generally used.



Cobra head luminaires with high pressure sodium lamps are mounted on wood poles for the majority of the street lighting.



Cobra head luminaires also provide lighting for some parking areas.

The bulbs are medium wattage gauged by their brightness and do not cause glare.

Residential

The residential area has minimal lighting from high pressure sodium cobrahead streetlights supplemented by porchlights on cottages. The streetlights are owned and maintained by Xcel and are mounted on wood utility poles. The east-west streets typically become darker at mid-block making it difficult for pedestrians to see while walking in the street. The porch lights add some visual brightness, but no illuminance in the street.

The light sources are warm, high pressure sodium in the streetlights and incandescent, compact fluorescent or LED bulbs at the cottages. While the streetlights can be mildly glary due to their high wattage, the eclectic mix of porch lights are visually interesting.

When installed correctly, the streetlights are Dark-Sky Friendly. Many porch lights have translucent diffusers and are typically not Dark-Sky Friendly.

Cottage occupants typically control the porchlights.

Parking / Vehicular

There are four off-street parking areas, none of which are illuminated consistently:

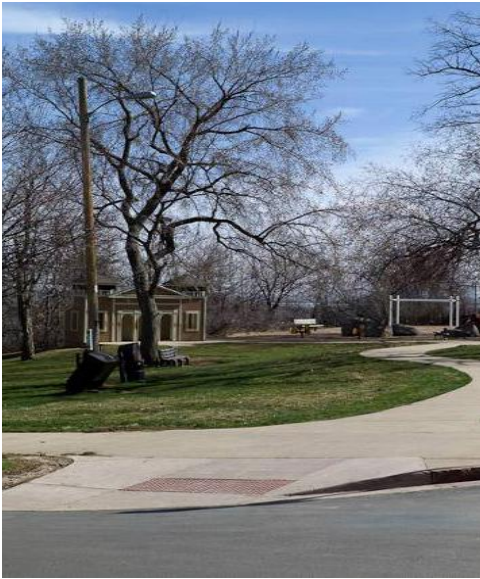
- The Academic Hall lot is lit by spill from two nearby streetlights. It is possible to find one's car, but the lighting is minimal.
- The Half-Moon lot is not lit. Light from a nearby streetlight on 12th street is shadowed by a large tree.
- The Overflow/Tennis lot has residential grade LED floodlights controlled by integral motion sensors with unreliable operation. This area is surrounded and isolated by vegetation and accessed by a winding path or steep stairway. Safety and security are both minimal here.
- The Ranger Cottage parking area is lit from a single cobrahead streetlight located at the trailhead.

Streets are lit by cobrahead luminaires at intersections and parking pull-outs on Sumac Drive which does allow navigation for pedestrians around the green.

The streetlights are warm high pressure sodium, the floodlights are cool color LED sources and can be very glary due to the low mounting height necessitating a low aiming angle.

When installed correctly, the streetlights are Dark-Sky Friendly. The floodlights are not.

Existing Conditions Assessment



Pedestrian scale lighting is typically provided for by street lighting.



At-grade uplighting in the Centennial Garden



The Chautauqua Green

The streetlights are operated dusk to dawn. The floodlights are intermittent and unreliable.

Primary Pedestrian

Primary Paths: Near the Auditorium and Dining Hall, the acorn and globe style luminaires provide adequate illumination to navigate between buildings but minimal to no lighting between the Dining Hall to the Arbor, and onto the Trolley Station/Kings Gate.

Secondary Paths: In residential areas there are no sidewalks and pedestrians use the streets to travel. The streetlights provide way-finding lighting supplemented by the porchlights.

Park

The perimeter of the Chautauqua Green, Waterwise Garden, and Centennial Garden are lit by spill from adjacent lighting, and Centennial Garden additionally has four compact fluorescent landscape uplights. They are all dark spaces and yet are comfortable due to light from outside the park areas.

The at-grade uplights at the Centennial Garden negatively impacts pedestrian visibility and experience at night. They are not Dark Sky Friendly and are a source of glare.

Open Space

These spaces are not currently illuminated and provide a dark nighttime experience. There is little light trespass or glare, depending on orientation and depth into the Open Space. Stars are readily visible.

Baseline

There are currently cobrahead style streetlights at each crosswalk. The lighting levels are adequate for pedestrian/vehicular safety at a minimal level, the single light at each crosswalk does not provide preferable three-dimensional lighting.



Needs Assessment

Chautauqua Today

The cultural and educational mission of the Chautauqua continues today through concerts, lectures, and social events. Use tends to peak during the summer, however, the Dining Hall and special events draw people to Chautauqua year-round and at various times during the day. In 2016, forty community events were held at the Community House in the evening, hosting 4,675 attendees. Numerous private events, including wedding receptions and award programs were also held.

Visitors and newcomers alike enjoy the different amenities Chautauqua has to offer. Over 40,000 people attended performances at the Auditorium in 2016 and the Dining Hall averages 3,500 customers per week. Staff and volunteers support various activities and events, often arriving earlier and staying later than the scheduled event times. Cottagers, lodging guests and hikers navigate through the historic district on a regular basis.

In their joint stewardship, the City of Boulder and the CCA are tasked with carefully considering changes to this special historic place. Acknowledging the increased number of evening events and the diverse set of users, including people of all ages and abilities, the design of exterior lighting should have the least amount of impact while meeting the safety, security and navigational needs that have been expressed through this process.

Needs Assessment

Input was gathered over the course of the development of the Lighting Design Guidelines through meetings, study sessions, open houses, a feedback booth, an online survey, and an evening walking tour. Participants included representatives of five city departments and CCA staff, five community groups, the Landmarks Board and CCA Board of Directors, community members, concert-goers and Dining Hall employees.

While there was a wide variety of opinions, there was general agreement in a number of areas. Namely, that a conservative approach to lighting is appropriate, that different areas of Chautauqua require specialized approaches to lighting, that the need for lighting should be clearly documented.

In terms of lighting qualities, the majority of participants considered that lighting approaches should minimize light pollution and light trespass, and provide lighting only when and where it is necessary. To that end, there were many suggestions that lights be programmed to be turned down or off when they are not needed.

Needs Assessment

Most participants indicated that lighting is needed for safety, to reduce tripping hazards, and wayfinding. While there were many people who considered lighting is not needed for security purposes, the majority of Dining Hall employees that responded to a survey expressed a desire for increased lighting between the Dining Hall and the Tennis Court Parking Lot, which they typically access late at night and early in the morning. Residents and staff reported interactions with bears and other animals across the campus after dark.

Public Spaces

Public spaces, including the Auditorium, Dining Hall and Community House, are regularly programmed for evening public use and are destinations for community members and visitors of many ages and abilities. As such, there exists a greater need for lighting than other areas. Many participants indicated that the quality of lighting (glare, spill, color temperature) could be improved at the Auditorium and Dining Hall.

Lighting at Public Spaces should facilitate navigation, and address safety concerns by illuminating tripping hazards such as stairs and curbs. In some public spaces, additional safety and wayfinding lighting may be necessary, where in other areas existing lighting may be too bright and unpleasant and may be reduced or removed.

Residential

Residential areas have a need for lighting to provide safe walking areas and pedestrian navigation at night, but residents have expressed concern that they would not like this area to be brightly illuminated. Currently, portions of the campus are difficult to navigate by pedestrians due to inconsistent lighting – glare from inappropriately sited and angled lights, in contrast to dark areas that obscure stone swales, rocks, and uneven walking surfaces that are characteristic of the historic district.

While residents may be encouraged to leave porch lights on, lighting from individual cottages is not consistent, and cannot be relied upon to adequately provide light in the residential areas.

Appropriate lighting levels are needed to facilitate safe movement for drivers and pedestrians. Pedestrian safety includes the ability to navigate in the dark with a minimization of tripping hazards. Safety issues include the need for adequate lighting at pedestrian intersections, to minimize accidents with vehicular traffic.

Parking/Vehicular Circulation

In general, participants indicated that streetlights, located at key intersections, provided adequate lighting, but that the fixtures could be improved by reducing the level of spill onto lawns and into houses and by carefully trimming vegetation that currently obscures the light source.

Improved lighting is needed along the path to the Tennis Court parking lot and at the parking lot to provide a consistent level of light to see one's car and to address security concerns of employees and volunteers that use this lot. Stairs and other tripping hazards should be adequately lit.

Primary Pedestrian

The network of sidewalks are used on a daily basis by concert-goers, Dining Hall and Colorado Music Festival employees and volunteers, residents and visitors of all ages and abilities. Lighting is needed for navigation and to reduce tripping hazards (safety). Some participants indicated that lighting was needed at the Arbor and between the King's Gate entrance at Baseline Road and the Auditorium, to address security and wayfinding concerns.

Park

The center of Chautauqua Green has historically not been lit, and there is not a need to introduce lighting there. The area should remain unlit to maintain the historic and architectural integrity of the district. Minimal light exists in the Centennial and Waterwise Gardens, which provides appropriate wayfinding.

Open Space

All participants agreed that the Open Space surrounding the historic district should remain dark, to protect wildlife, open spaces and park areas, and scenic viewsheds.

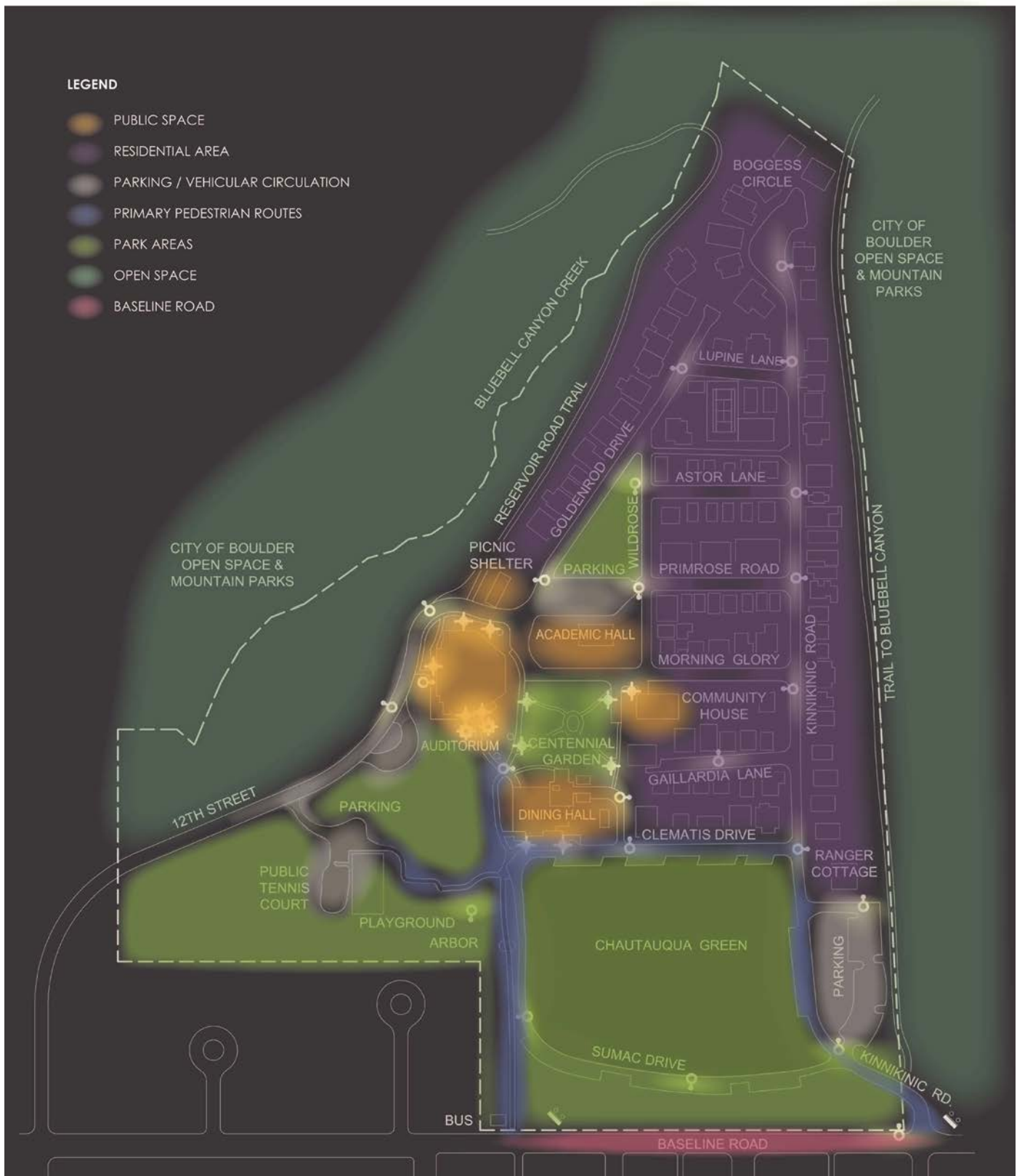
Baseline Road

Additional lighting would facilitate safer pedestrian crossings at Baseline Road. Some participants considered lighting to be needed at the bus stops and at the trolley stop.



Recommended Approaches to Lighting

Chautauqua Lighting Design Guidelines



Lighting Areas at Chautauqua, overlaid on the Existing Lighting Conditions Map.

LIGHTING PRINCIPLES

The Lighting Principles were developed through feedback from the Staff Core Team, Community Working Group, community members and board members, and inform the recommendations and lighting design guidelines.

- Preserve the camp-like character and architectural and historic integrity of the Chautauqua Park Historic District/National Historic Landmark when proposing lighting for the district or surroundings.
- Provide a dark sky environment for Chautauqua including meeting or exceeding local and national and international guidance as set forth by the International Dark-Sky Association for best practices for light level, trespass, pollution or glare.
- Achieve energy efficiency and sustainability in all new and retrofitted lighting proposals.
- Provide lighting only when and where need is clearly identified for safety, security, programming, accessibility or navigation, using the basic approach of providing a balance or consistency of light through use of light color and levels, controls, and placement of fixtures.
- Maintain dark areas within Chautauqua and surroundings to protect wildlife, open spaces and park areas, and scenic viewsheds.

LIGHTING AREAS

Seven Lighting Areas have been identified to acknowledge the variety of spaces and uses within the Chautauqua Park Historic District. In addition to the general approach to lighting, recommendations are made for each lighting area. The lighting areas are intended to be broad, illustrative and not to represent firm boundaries; some locations may fall into two lighting areas.

- 1. General** - In general, care should be taken to preserve the night sky, architectural character, views and historic integrity of the historic district by lighting areas and features only when and where need has been demonstrated. A holistic approach to lighting should be taken, and lighting should be designed to utilize Dark Sky Friendly qualities. Lighting qualities should respect the historic character of the district, with a warm light color, and minimal light spill, trespass and glare. Fixtures should be simple in design and respect the utilitarian character of the historic district's original lighting, and be of an appropriate scale and size.
- 2. Public Spaces** - Public spaces include areas of most pedestrian traffic and are most frequently visited. They are usually adjacent to, or near public buildings including the Auditorium, Dining Hall, Academic Hall, and Community House, and include the kiosks and rest room building. Lighting in public spaces should recognize the essential "camp-like" character of the historic district. Lighting in Public Spaces should be subdued while providing adequate navigation and illumination of potential tripping hazards, including steps and curbs.
- 3. Residential** - The residential area includes buildings owned and leased by the CCA and privately owned cottages south of Clematis extending to the southern edge of the historic district. A conservative approach to lighting is recommended for the residential area, and the overall sense of brightness should not be higher than the surrounding neighborhoods. Lighting should be subdued and unobtrusive while providing navigation and illumination of potential tripping hazards, including swales and curbs. Lighting should be visually comfortable, with consistency in color temperature. Street lights should be designed to only illuminate the street, with minimal light trespass onto lawns and into buildings. The goal of residential lighting is to provide pools of light that serve as wayfinding lights, rather than a uniform, consistent background.

- 4. Parking/Vehicular** - *Parking/Vehicular Circulation includes areas along major roadways and parking areas utilized primarily by visitors and staff during evening hours. These include the parking areas at the tennis court and Academic Hall, major intersections, and 12th Street between the picnic shelter and tennis court parking. This does not include parking for cottages or on-street parking. Where appropriate, lighting in parking areas should be adequate for navigation and to address safety and security concerns.*
- 5. Primary Pedestrian** - *Primary pedestrian routes are major pedestrian circulation routes, sidewalks, and pedestrian crossings. These include the route between the Auditorium and King's Gate; the route from the Dining Hall to the Tennis Court parking; King's Gate; the Arbor; the south side of Clematis Drive; and along Kinnikinic from Clematis to the Baseline entrance. Lighting along primary pedestrian routes should be visually comfortable, without glare, and should provide lighting for navigation and to illuminate tripping hazards. The use of wayfinding lighting may be appropriate to direct pedestrians to their destination with intermittent pools of light and beginning and ending points along paths.*
- 6. Park** - *Park areas include Chautauqua Green, Waterwise Garden and the Centennial Garden. The desire for lighting in the park areas is for these areas to remain dark, particularly within Chautauqua Green.*
- 7. Open Space** - *Open Space includes the perimeter of the historic district boundary which borders the City of Boulder Open Space and Mountain Parks (OSMP) land. This includes the west, south, and southeast edges and perimeter of the historic district. These areas should remain dark in order to protect wildlife and scenic viewsheds. Lighting at trails is not appropriate, and the transition areas should remain unlit with minimal light trespass from other areas.*
- 8. Baseline Road**- *Baseline Road includes the interface between the historic district and Baseline Road, including pedestrian crossings, intersections, and street parking. Within the historic district boundary, lighting may be appropriate at bus stops and at the vehicular entrance into the historic district from Baseline. While outside of the historic district boundary, these guidelines acknowledge that sufficient lighting may be necessary to facilitate safe pedestrian crossings at Baseline crosswalks and King's Gate.*



Lighting Design Guidelines

INTRODUCTION

As a local historic district, all exterior changes require review and approval through a Landmark Alteration Certificate (LAC). Proposals for exterior changes are reviewed by the CCA Building and Grounds Committee and by the City's Historic Preservation program. Lighting on the exterior of buildings, including on open porches but not screened or enclosed porches, is subject to review.

The Chautauqua Lighting Design Guidelines are intended to assist applicants as they plan changes to exterior lighting within the Chautauqua Park Historic District. The guidelines provide the City of Boulder Landmarks Board and the Colorado Chautauqua Association's Building and Grounds Committee with a framework for making consistent decisions in its review of lighting proposals.

These Lighting Design Guidelines have been developed to recognize the unique character of Chautauqua Historic District and are intended to supplement the General Design Guidelines for Boulder's Historic Districts and Individual Landmarks, which apply unless otherwise stated. Where the guidelines conflict these Lighting Design Guidelines shall prevail.

The Lighting Design Guidelines are intended to be used as an aid to appropriate design and not as a checklist of items for compliance. In some cases, unusual circumstances may allow projects to deviate.

The guidelines begin with General Guidelines that are applicable to all exterior lighting in the historic district, followed by more detailed guidance for seven identified lighting areas. The lighting areas recognize that within the historic district, there are different areas that require specialized approaches to exterior lighting.

Regulations

There are two regulations that apply to exterior lighting at Chautauqua.

City of Boulder Land Use Code 9-9-16 Outdoor Lighting ordinance controls light trespass, light pollution and glare. There are maximum light level restrictions, pole height restrictions, and control recommendations. Uniformity ratios are restricted to 15:1 which is appropriate for wayfinding lighting along a path. Otherwise, there are not minimum requirements.

City of Boulder Energy Conservation Code regulates energy use and control strategies.

Lighting proposals must meet all applicable regulations.

1.0 GENERAL LIGHTING DESIGN GUIDELINES

1.1 Improve existing lighting by modifying or removing inappropriate luminaires.

- .1 Ensure existing and new luminaires are properly installed so light is directed downwards and does not spill onto adjacent areas.
- .2 Where vegetation obscures existing light, either sensitively trim vegetation or reposition luminaires so output is not obscured.
- .3 It is appropriate to remove existing luminaires within the historic district that distract from the historic setting, obscure viewsheds, or provide a false sense of history.
- .4 Eliminate up-lighting or directional lighting that is not Dark Sky Friendly.

1.2 Approach lighting holistically to avoid incremental change that may lead to a higher overall illumination of the historic district.

- .1 In new lighting proposals, consider lighting either by building or area, taking into consideration the overall impact of existing and proposed illumination.
- .2 Ambient light from adjacent buildings and fixtures may contribute to lighting levels and should be considered when designing new lighting.
- .3 Provide a consistency of luminaire design and aesthetic within the historic district. Lighting qualities, including color temperature, should have a consistent warmth and appearance across the landscape.
- .4 Consideration should be given to users with visual impairments, and the variety of users in age and ability.

1.3 Preserve the night sky, architectural character, views, and historic integrity of the historic district by lighting areas and features only when and where need has been demonstrated.

- .1 Avoid lighting where and when it is not required, and illuminate only where need has been clearly established.
- .2 Lighting building facades, front yards, or park spaces is not appropriate.
- .3 Light spill onto adjacent properties outside of the historic district should be avoided.
- .4 Design lighting utilizing Dark Sky Friendly qualities, including the following.
 - Lights should be no brighter than necessary.
 - Fixtures should have no spill or limited spill, be Full Cut-off or have a B-U-G Rating with Uplight=0.



Figure 1. Sketch of original light fixture at Chautauqua. Character-defining features of the original light fixtures include orthogonal cross beams, a cone-shaped pendant, tapered pole and unornamented design.

Note: Figure is for illustrative purposes only.

1.4 Design lighting to facilitate navigation and address safety concerns.

- .1 New fixtures may be appropriate at destination points with points of light at the beginning and end of paths so a pedestrian may find their way.
 - Additional points of light may be appropriate where needed to further facilitate navigation and address safety concerns.
 - The greatest uniformity should not exceed 15:1.

1.5 Utilize a programmable control system to turn off lights when they are not needed and to dim the output for the time of night and occasion.

- .1 Recognize the varied use of the campus throughout the day, week and season and modify lighting times and locations as needed.
- .2 Luminaires should have addressable wireless control modules that communicate with the programmable control system.

1.6 Select new fixtures that are simple in design and respect the utilitarian character of the historic district's original lighting.

- .1 New lighting in the historic district should generally be unobtrusive and compatible with the overall historic character of the buildings, sites, and streetscapes of the historic district.
- .2 Select poles and luminaires that are neutral in design, and do not create a new aesthetic or ahistorical character.
- .3 New fixtures with components that reference, but that do not replicate, character-defining features of the original fixtures may be appropriate. Character-defining features include orthogonal cross beams, a cone-shaped pendant, tapered pole and unornamented design. *Reference Figure 1.*
- .4 Select materials, colors, and finishes that are simple and blend with the existing materials in the historic district.
- .5 Reconstruction of missing fixtures or restoration of existing features from the historic district's period of significance (1898-1930) is appropriate only if the materials and design are clearly documented.
- .6 It is not appropriate to introduce replica luminaires that mimic a time or place other than what is documented at Chautauqua, as these create a false sense of history.

1.7 Scale and size of luminaires should not overwhelm the historic setting and should be compatible with the historic buildings and landscape.

- .1 Where possible, integrate lighting into the historic setting through low mounting-level light fixtures such as directional lights mounted in unobtrusive locations, pedestrian scale pole mounted luminaires, and streetlights. Bollards may be appropriate in unobtrusive locations, such as the perimeter of parks, but are discouraged along pathways.

- .2 Provide a consistency of scale and size for luminaires throughout each lighting area, appropriate to the scale of the individual building or landscape.

1.8 Lighting qualities should respect the historic character of the district.

- .1 Light color should be warm and evoke the camp-like character of the historic district.
 - In all areas except the residential area, light sources should have a CCT of 3000K CRI; light sources in residential areas should have a CCT of 2700K CRI.
 - Across lit areas, create a balance of lighting that eliminates glare.
 - Luminaires under 900 lumen output should have a maximum B-U-G rating of G=0; Luminaires over 900 lumen output should have a maximum B-U-G rating of G=1.

1.9 Luminaires should be easy to maintain and energy efficient.

- .1 When existing lighting is replaced, select fixtures that are energy efficient, with appropriate light output as described in these guidelines.
- .2 Luminaires should have modular lighting components for replacement if failure occurs.

1.10 Sign Lighting

- .1 Entrance signs at King's Gate and Kinnikinic and select navigational signs may be illuminated to be legible. Design of sign luminaires should be simple and unornamented, with minimal visibility of the fixture.
- .2 Number of illuminated signs and illuminance levels should be kept at a minimum, to provide only enough for signage visibility.
 - Ensure that all lighting is Dark Sky Friendly with either a Full Cutoff classification or a B-U-G rating of U=0.
 - Illuminance on the face of the sign should be between 1.0 and 3.0 vertical footcandles with $\leq 4:1$ uniformity.
 - Operation should be on from dusk to close of business, or utilize an automatic on/off schedule to meet daily, weekly, and seasonal needs.
 - The lighting should not cause glare at normal viewing angles, obstruct the sign, or create daytime shadows.
 - Light sources should have a CCT of 3000K CRI and a CRI of ≥ 80 .
 - The light should be directed at the sign with minimal spill.
 - The light source should be fully shielded.

2.0 PUBLIC SPACE

Public spaces include areas of most pedestrian traffic and are most frequently visited. They are usually adjacent to, or near public buildings including the Auditorium, Dining Hall, Academic Hall, and Community House, and include the kiosks and rest room building. Lighting in public spaces should recognize the essential “camp-like” character of the historic district. Lighting in Public Spaces should be subdued while providing adequate navigation and illumination of potential tripping hazards, including steps and curbs.

2.1 In public spaces it is appropriate to light public entries to facilitate navigation.

- .1 Provide lighting at building entrances to facilitate navigation and meet code requirements for emergency egress.
- .2 Lighting should be programmed to reflect evening activities.

2.2 Lighting for aesthetic purposes only, including accent, façade, graze lighting and wall-washing, is generally not appropriate.

- .1 If aesthetic lighting is combined with providing function or navigation, it may be acceptable.
- .2 In rare cases, subdued lighting of the Auditorium and Dining Hall towers may be appropriate for very special events. The number of events should be determined on an annual basis, and used very selectively. The lights should have dimmers and be programmed to be on only immediately before, during and immediately after the event.

2.3 Where lighting of public spaces is appropriate, it should be subdued, warm, with minimal spill, glare, and light trespass.

- .1 Illuminance levels should be kept at a minimum, and should be only the minimum to provide safe navigation in areas of circulation.
 - Ensure that all lighting is Dark Sky Friendly either with a Full Cutoff classification or a B-U-G rating of U=0.
 - Ambient lighting in public areas should not exceed an average of 3.0 foot candles in a contiguous area and maintain 10:1 uniformity.
 - Operation should be on from dusk to close of business, or utilize an automatic on/off schedule to meet daily, weekly, and seasonal needs.
- .2 Lighting should have a warm color.
 - Remove existing lighting that produces harsh or bluish light.
 - Light sources should have a CCT of 3000K CRI and a CRI of ≥80.

2.4 Consider replacing non-historic lighting over time, including acorn lights and globe lights, with elements more in keeping with the historic utilitarian aesthetic.

- .1 In the interim, consider updating the acorn lights to have a consistent color temperature throughout and upgrade the fixture to be Dark Sky Friendly.

3.0 RESIDENTIAL

The residential area includes buildings owned and leased by the CCA and privately owned cottages south of Clematis extending to the southern edge of the historic district. A conservative approach to lighting is recommended for the residential area, and the overall sense of brightness should not be higher than the surrounding neighborhoods. Lighting should be subdued and unobtrusive while providing navigation and illumination of potential tripping hazards, including swales and curbs. Lighting should be visually comfortable, with consistency in color temperature. Street lights should be designed to only illuminate the street, with minimal light trespass onto lawns and into buildings. The goal of residential lighting is to provide pools of light that serve as wayfinding lights, rather than a uniform, consistent background.

3.1 Maintain a camp-like neighborhood character through a combination of porch/entry light and street lighting.

- .1 Lighting should provide a sense of safety and provide navigation to minimize tripping hazards.
- .2 Permanent landscape lighting in front yards and lighting that is visible from the public right of way is discouraged. Landscape lighting includes illumination of trees, shrubs, and other garden and landscape features. Minimal path lighting may be appropriate to illuminate tripping hazards.
- .3 Selective Dark Sky friendly landscape lighting in the backyard that is not visible from the public right of way may be appropriate.
- .4 Landscape luminaires over 500 lumen output should be Full Cutoff classification or a B-U-G rating of U=0.
- .5 Light sources should be 2700 - 3000K CRI and shielded so that the source is not visible

3.2 Porch lighting should have low light levels, with a consistent warm color and limited light trespass and glare.

- .1 To facilitate navigation and reduce the number of necessary fixtures in the district, porch lights should be located to illuminate the entry and address number, with minimal spill and light trespass
- .2 Porch lights should have 2700 - 3000K CRI light sources which should be shielded so that the source is not visible and with maximum lumen output ≤ 900 lumens.
- .3 Programmable control systems for cottage porch lights are encouraged.
- .4 Select residential fixtures that are simple and do not create a false sense of history. The style of fixtures on a residential cottage should reflect the individual character of the building.

3.3 Street lights should provide pools of light to aid navigation, with limited glare and light trespass.

- .1 When replaced, manage streetlights so they can be dimmed significantly late at night, while still providing adequate light for navigation.
- .2 Street lights in residential areas should provide light for the streets and swales, not for the cottages and lawns.
- .3 Streetlights should have consistent levels across the lighting area, 3000K CRI or warmer, Type II or III distribution and employ a House Side Shield (HSS) when in front of a cottage to minimize light trespass. Maximum lumen output ≤ 4000 , maximum B-U-G rating of B1-U0-G1 (without HSS). The luminaire should be installed plumb for Dark Sky Friendly operation with the distribution aligned with the street.

4.0 PARKING/VEHICULAR CIRCULATION

Parking/Vehicular Circulation includes areas along major roadways and parking areas utilized primarily by visitors and staff during evening hours. These include the parking areas at the tennis court and Academic Hall, major intersections, and 12th Street between the picnic shelter and tennis court parking. This does not include parking for cottages or on-street parking. Where appropriate, lighting in parking areas should be adequate for navigation and to address safety and security concerns.

4.1 Lighting in parking/vehicular areas may be appropriate to provide a sense of security and navigation.

- .1 Lighting of vehicular circulation should be limited to major intersections, and should be designed to have limited spill light outside the intersection.
- .2 Lighting may be appropriate in the following areas:
 - Select street intersections where conflicts are identified.
 - Pick-up/drop-off locations.
 - Vehicular entrances at Kinnikinic and 12th Street.
 - Parking areas at the Academic Hall; Ranger Cottage; 12th Street; and Tennis Court.

4.2 If appropriate, parking areas should be lit with low intensity lighting and have no spill light outside of the parking area.

- .1 Maximum average should be approximately 0.2 footcandles with 20:1 uniformity. Use house side shields to minimize spill light.

4.3 Lighting in parking areas should be managed according to the varied activities occurring within the historic district.

- .1 Parking area luminaires should be 3000K CRI, Type III distribution and employ a House Side Shield (HSS) to minimize spill light. Maximum B-U-G rating of B1-U0-G1 (without HSS). The luminaire should be installed plumb for Dark Sky Friendly operation with the distribution aligned with the parking area, and no higher than 20'.
- .2 Parking lot lighting controls should utilize a programmable control system to preset the high and low output levels based on time of night and occasion with motion sensors to trigger the lights between the preset levels.

5.0 PRIMARY PEDESTRIAN

Primary pedestrian routes are major pedestrian circulation routes, sidewalks, and pedestrian crossings. These include the route between the Auditorium and King's Gate; the route from the Dining Hall to the Tennis Court parking; King's Gate; the Arbor; the south side of Clematis Drive; and along Kinnikinic from Clematis to the Baseline entrance. Lighting along primary pedestrian routes should be visually comfortable, without glare, and should provide lighting for navigation and to illuminate tripping hazards. The use of wayfinding lighting may be appropriate to direct pedestrians to their destination with intermittent pools of light and beginning and ending points along paths.

5.1 Where appropriate, provide pedestrian lighting for navigation, to guide users to destinations.

- .1 Lighting should be visually comfortable without glare.
- .2 Lighting should only occur at intervals sufficient enough to provide adequate navigation, to see from one light location to another.
- .3 Where appropriate, paths may be illuminated with pedestrian scale luminaires. Pole mounted luminaires should be Type II Distribution, Dark Sky Friendly, either with a Full Cutoff classification or a B-U-G rating of U=0, and 3000K CRI.

5.2 Operation of pedestrian lighting should be programmed to meet operational needs, based upon business and event hours.

5.3 Sensitive designed lighting may be appropriate in these areas:

- Interior of the Arbor and King's Gate trolley stop, taking care to protect historic material and integrate fixtures to be minimally visible.
- The pedestrian path between the Dining Hall, Auditorium and Tennis Court Parking area, and the stairs near the Tennis Court Parking area.
- The pedestrian path from the Auditorium to King's Gate.
- Along Clematis Drive.

6.0 PARK AREAS

Park areas include Chautauqua Green, Waterwise Garden and the Centennial Garden. The desire for lighting in the park areas is for these areas to remain dark, particularly within Chautauqua Green.

6.1 Park areas should remain dark within the interior of the space.

- .1 It is appropriate to remove existing up-lighting or directional lighting that is not Dark Sky Friendly or produces glare.
- .2 Preserve the character of a dark night sky; it is not appropriate to introduce new fixtures within the interior space of the Chautauqua Green.
- .3 New lighting is discouraged in the Waterwise Garden.
- .4 It may be appropriate to provide lighting within the Centennial Garden for pedestrian navigation. Existing lighting may remain but should be upgraded to meet these design guidelines.

6.2 In some cases, it may be appropriate to provide adequate lighting for vehicular safety and navigation at the perimeter of park areas.

6.3 In general, American flags on permanent flag poles should be taken down at night or illuminated to meet the U.S. Flag Code.

- .1 If a direct light is desired, use only a single well shielded adjustable spotlight, located as close to the base of the flagpole as possible; Maximum output of the spotlight should not exceed 3500 lumens and be 3000K CCT and ≥ 80 CRI.

7.0 OPEN SPACE

Open Space includes the perimeter of the historic district boundary which borders the City of Boulder Open Space and Mountain Parks (OSMP) land. This includes the west, south, and southeast edges and perimeter of the historic district. These areas should remain dark in order to protect wildlife and scenic viewsheds. Lighting at trails is not appropriate, and the transition areas should remain unlit with minimal light trespass from other areas.

7.1 The interface with the Open Space and Mountain Parks should remain unlit with minimal light trespass from other areas in the historic district.

7.2 Efforts to minimize or eliminate spill light and light trespass should be employed when lighting adjacent areas.

- .1 Pole mounted luminaires should be oriented into the adjacent area and away from Open Space. House side shields should be used.

7.3 Allow minimal lighting at the Ranger Cottage and parking for OSMP evening events.

- .1 Porch lighting at the Ranger Cottage and parking area lighting meeting 4.0 Parking/Vehicular Circulation, may be appropriate immediately before, during and immediately after an event. Design these lights to be subdued and only illuminate the immediate area, with no spill light into the adjacent Open Space.

8.0 8.0 BASELINE ROAD

Baseline Road includes the interface between the historic district and Baseline Road, including pedestrian crossings, intersections, and street parking. Within the historic district boundary, lighting may be appropriate at bus stops and at the vehicular entrance into the historic district from Baseline. While outside of the historic district boundary, these guidelines acknowledge that sufficient lighting may be necessary to facilitate safe pedestrian crossings at Baseline crosswalks and King's Gate.

8.1 Baseline Road should have sufficient lighting to provide safe pedestrian crossing and vehicular access.

- .1 When upgraded, the streetlights should maintain the current nominal height, 3000K CRI, Type III distribution and employ a House Side Shield (HSS) when in front of a residence to minimize light trespass.
 - Maximum lumen output ≤ 4000 , maximum B-U-G rating of B1-U0-G1 (without HSS).
 - The luminaire should be installed plumb for Dark Sky Friendly operation with the distribution aligned with the street.

8.2 It may be appropriate to locate streetlights at vehicular and pedestrian conflict points.

- .1 Adequate lighting may be necessary at intersections along primary streets, at King's Gate, and the Baseline / Kinnikinic entrance to the historic district.
- .2 A single streetlight before or at a crosswalk that meets minimum lighting requirements may be appropriate. Using two streetlights, each one a half-mounting height before the crosswalk in the direction of oncoming traffic, provides maximum pedestrian visibility.



Glossary

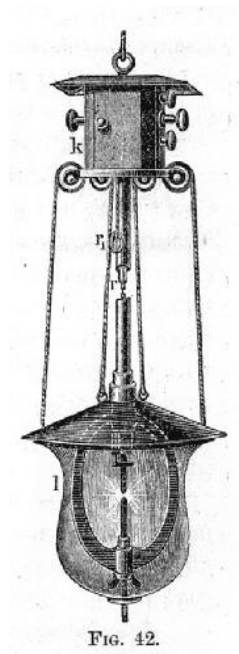


Figure G.1. Arc Lamp Illustration
www.uh.edu/enginesep1330.htm

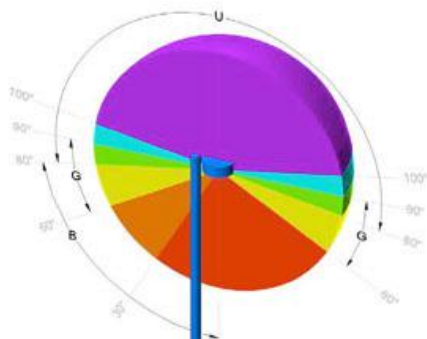


Figure G.2.A BUG Rating diagram

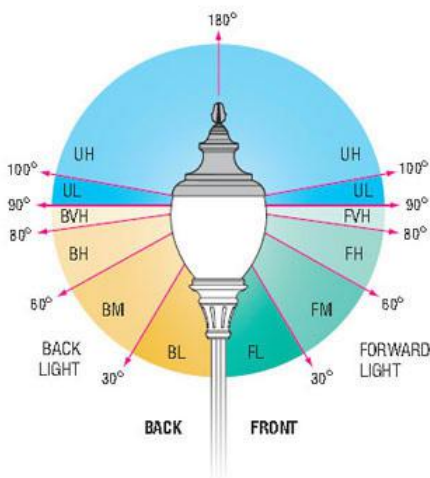


Figure G.2.B. BUG Rating Diagram

Arc Lamp: A lamp that produces light by an electric arc between carbon electrodes in air. It was widely used starting in the 1870s for street lighting, this image is a typical 19th-century arc light. See Figure G.1.

Ambient Lighting: Light that serves as general illumination for a space for basic visual recognition and travel through that space.

Architectural Lighting: Lighting techniques using the structure of a form to create visible luminance. Fixtures may be integrated into the design of the building or structure itself or light may be cast upon it. Techniques may include:

Accent Lighting: Precise lighting used to highlight a specific object or building detail.

Facade Lighting: The illumination of the exterior of a building.

Graze Lighting: Casting light in a parallel plane to a surface to reveal the texture of that surface.

Wall Washing: Uniformly illuminating a vertical planer surface with an even wash of light creating a luminous background.

Brightness: The extent to which an object is judged to emit more or less light. The perceived brightness of an object can change depending on whether it is seen against a light or dark background due to contrast. Perceived light from an object may be directly from a light source or reflected off the object's surface.

B-U-G Rating: A rating based on the lighting output in Backlight, Uplight and Glare zones. (Supersedes cutoff classifications). See Figure G.2.A and G.2.B.

Color Rendering Index (CRI): A measurement, on a scale of 1 to 100, used to describe the ability of a light source to render all colors accurately.

Color Temperature (CCT): A measure in degrees Kelvin ($^{\circ}\text{K}$) of light's warmth or coolness. Lamps with a CCT of less than 3200 $^{\circ}\text{K}$ are yellowish-white and considered warm. Lamps with a CCT greater than 4000 $^{\circ}\text{K}$ are bluish-white and considered cool. Often referred to as CCT (correlated color temperature). Describes the overall color appearance of a light source. See Figure G.5.

Cutoff Classification: Classification for controlling stray light. See Figure G.6.



Figure G.3. The “Cobrahead” style street-light in this image is designed with a flat lens and does not emit light above a horizontal plane at the lens, it is FullCutoff. If it is mounted tilted up then that classification is compromised.



Figure G.4. The “Acorn” style fixture in this image has potential for glare, yet the low wattage light source in it and a fairly luminous background help to balance the brightness.

Dark-Sky Friendly: Lighting efforts to minimize the harmful effects of light pollution.

- Only be on when needed
- Only light the area that needs it
- Be no brighter than necessary
- Minimize blue light emissions
- Be fully shielded (pointing downward), FullCutoff or B-U-G Rating = B_-U0-G_

Footcandle, FC: The unit of illuminance when the foot is taken as the unit of length. The illuminance on a surface one square foot in area on which there is a uniformly distributed flux of one lumen, or the illuminance produced on a surface, all points of which are at a distance of one foot from a directionally uniform point source of one candela.

Fully Shielded Fixture:

1. A fixture that allows no emission above a horizontal plane through the fixture (for Dark-Sky).
2. An opaque shield restriction the view of a light source.
3. A translucent diffuser obscuring the view of a light source.

High Pressure Sodium (HPS): A type of high intensity discharge lamp with high efficiency (± 100 lumens/watt), warm color temperature ($\pm 2000K$), and low color rendering (± 20 CRI).

House Side Shield (HSS): A shield which cuts off direct light through high horizontal angles behind a pole on which a luminaire is mounted. This can also be achieved with LED luminaires with spill light control distributions. Normally used to minimize light trespass into residences, this option on many luminaires can be used wherever spill light is desired to be controlled.

Glare: An interference with visual perception caused by an uncomfortably bright light source or reflection within a person’s field of view; a form of visual noise. A light within the field of vision that is brighter than the brightness to which the eyes are adapted.

Disability Glare: Glare resulting in reduced visual performance and visibility. It is often accompanied by discomfort.

Discomfort Glare: Glare that produces discomfort, but does not necessarily diminish visual performance. See Figure G.4.

Illuminance: Light on a surface or object. Sometimes called “illumination.” Unit is footcandle or lux.

Light Pollution: Any adverse effect of generated light. Examples include light into the night sky creating sky-glow and obscuring the view of stars.

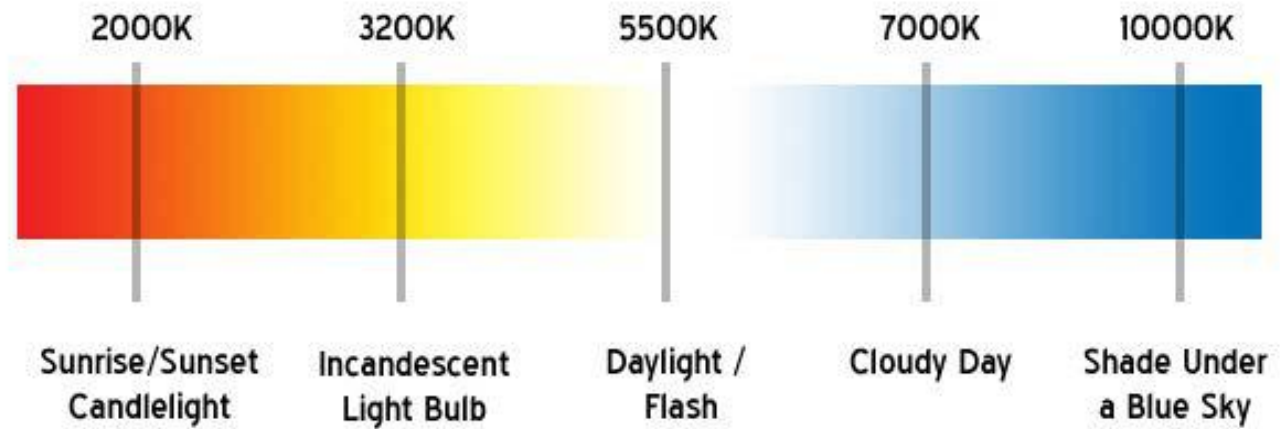


Figure G.5. Color Temperature Spectrum (K = Kelvin Temperature Rating)

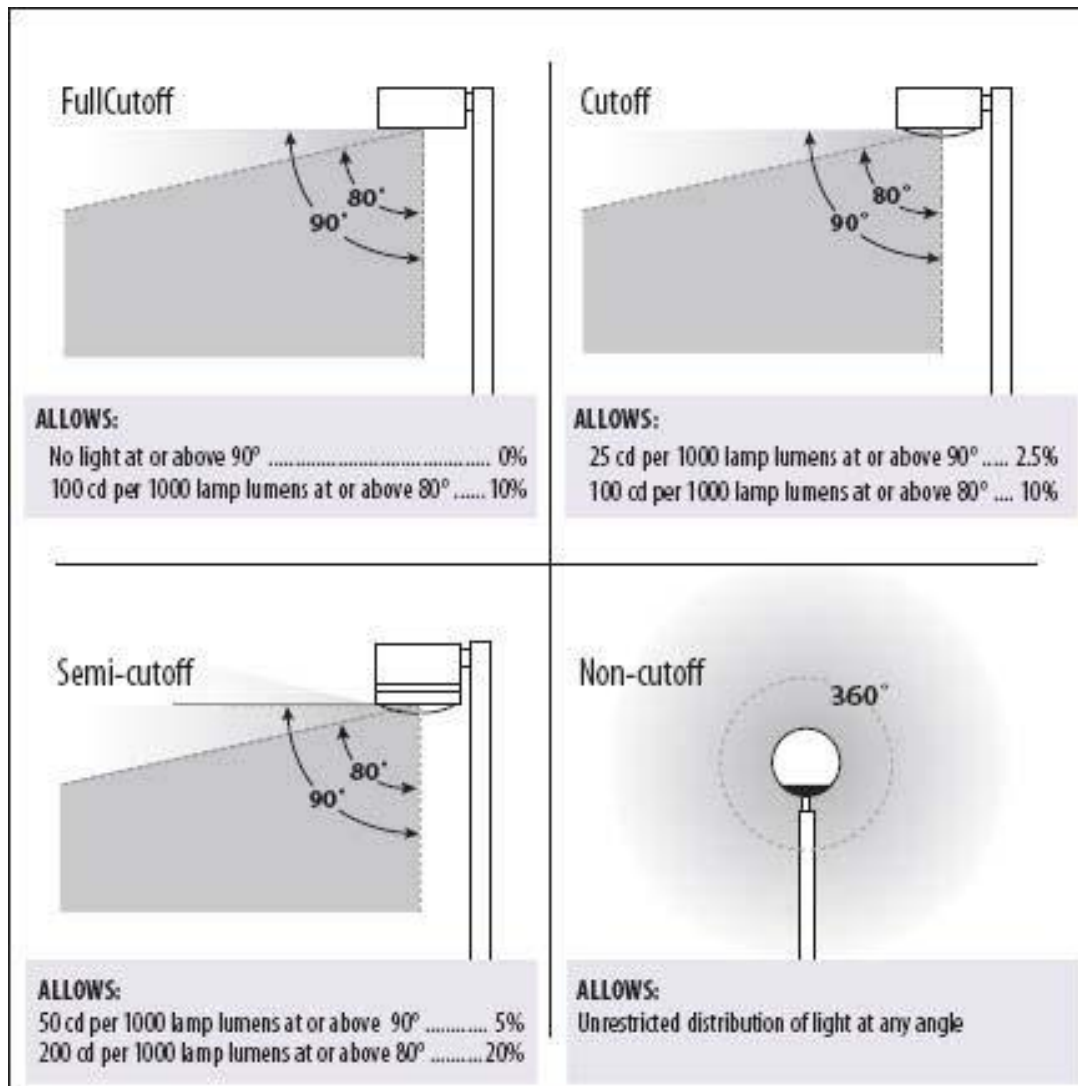
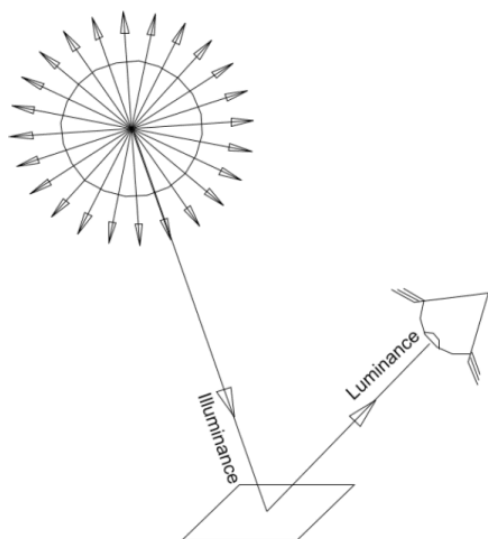


Figure G.6. Cutoff Classifications



Luminance is what gets into your eye

Figure G.7. Luminance diagram

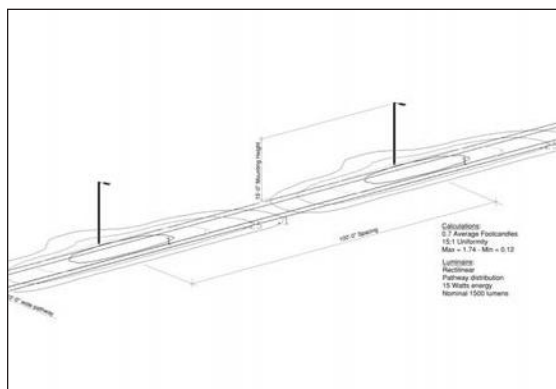
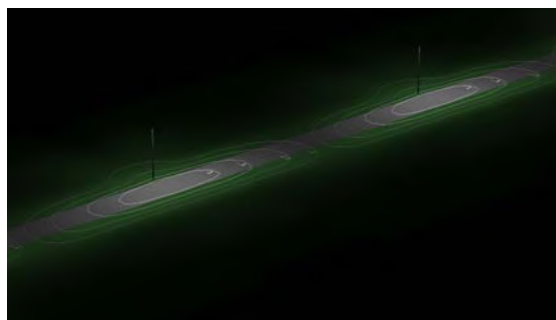


Figure G.8. Pathway with 100' on center pedestrian poles at $\approx 15:1$ uniformity.

Light Trespass: Light falling where it is not wanted or needed. Examples include streetlighting into a residential window or residential lighting spilling into a natural area with nocturnal wildlife.

Lumen: The unit of luminous flux, or light, emitted from a source.

Luminaire: A complete light fixture with source, mounting, shielding and housing.

Luminance: The light given off a surface or object, whether produced or reflected. *See Figure G.7.*

Navigation: The method of determining one's way to a destination and moving from point to point.

Pathway Lighting: The illumination of a pedestrian route. There are two basic approaches to lighting a pathway:

Continuous: Even lighting having good uniformity from beginning to end creating an uninterrupted corridor of illumination. Uniformity ratios should not exceed 10:1.

Wayfinding: Points of light at the beginning and end of a Pathway with low light levels in-between so that a pedestrian may find their way even through the darker areas, a lighting aid for navigation. Additional points of light may be supplemented at possible points of conflict or around curves limiting visibility, etc. Wide uniformity in the light levels. The greatest uniformity should be 15:1 (conforms to Boulder Lighting Ordinance).

Safety Lighting: Illumination providing visibility of surroundings to detect hazards such as uneven walkways, steps, or other threats.

Security Lighting: Illumination to deter threats and increase the sense of safety.

Three-Dimensional Lighting: Illuminating an object or person from more than one location to reveal the full form through height, width, and depth.

Two-Dimensional Lighting: Illuminating an object or person from a single location to create a silhouette or halo effect.

Uniformity: The ratio between the darkest point and brightest point. The lower the ratio the more uniform the lighting. *See Figure G.8*