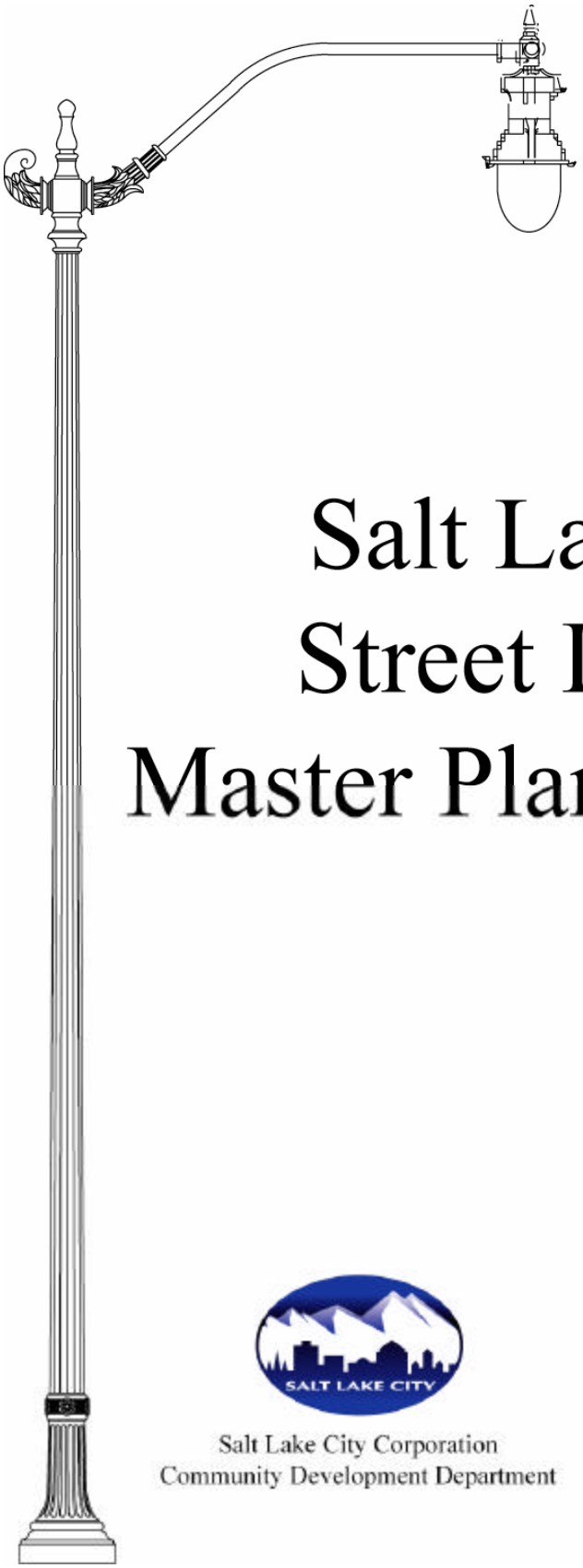
May, 2006



Salt Lake City Street Lighting Master Plan and Policy

Salt Lake City Corporation
Community Development Department

Salt Lake City
Transportation Division
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1. INTRODUCTION

Salt Lake City's history illustrates a long-standing concern for the quality and safety of the urban environment influenced by street lighting. Salt Lake City was the fifth city in the United States to have electric streetlights. By 1887, streetlights were operating on Main Street, and along First South and Second South Streets. In 1908 Salt Lake City adopted a systematic plan for locating streetlights at each intersection on long blocks and an additional light midblock, when requested.

Historically, the lighting levels for street lighting, although modified and expanded over the years, were generally based on the Illuminating Engineering Society of North America (IES) recommendations. These are widely considered as generally accepted guidelines and are currently contained in IES publication RP-8-00 Roadway Lighting. They are based on geometric, operational and environmental factors. Salt Lake City's lighting standards also take into account factors such as traffic volume, accident rates, nighttime pedestrian activity, crime prevention and neighborhood preferences.

This is an administrative master plan recognizing lighting levels required for safety and the decorative style of lighting poles and fixtures as expressed by residents and business owners during numerous outreach meetings. *The administrative policies of Salt Lake City that govern the implementation of new and replacement street lighting are shown in italics within this document.* This plan includes information on the purpose and impacts of street lighting, required lighting levels within the City, acceptable styles of fixtures and poles, a plan showing the desired lighting for each neighborhood within the City, the technically recommended implementation priority and associated aspects of street lighting such as designing with crime prevention in mind and the use of banners on street light poles.

2. PURPOSE

Lighting serves many purposes. To many people, public way lighting goals are seemingly achieved by installing brighter or additional lights. However, harmful or negative effects of lighting such as glare and reduced visibility of the night sky were often overlooked. Lighting technology has evolved tremendously in recent years. There are now more light sources, fixtures, poles and materials available. There is also much interest in the use of decorative light poles with underground wiring along with a recognition of street lighting as an important daytime as well as evening urban design element.

Addressing the environmental issues of lighting design is seen as critically important to maintaining quality of life in neighborhoods. These issues go beyond the amount of light produced and include minimizing light pollution, enhancing the urban environment during the day by use of decorative poles and fixtures and at night by the provision of pedestrian level light, deterring undesirable or illegal activities, increasing safety, restricting unwanted truant light onto private property and minimizing glare, power consumption, cost and visual impacts (day and night).

This Street Lighting Master Plan is intended to be used in a compatible manner with existing land use master plans and updated as necessary to remain compatible with them. Defining lighting design policies will help the public, developers and City officials recognize lighting-related issues that must be addressed.

All of these factors have created the need for this comprehensive street lighting master plan and policy applicable to Salt Lake City's public rights-of-way.

3. STREET LIGHTING IN A PEDESTRIAN FRIENDLY CITY

Effective street lighting illuminates the street and sidewalk to offer visibility by and of the users of the public right-of-way for the safe and comfortable interaction of drivers, bicyclists and pedestrians.

Street lighting projects should combine with other urban design elements to create a holistic and aesthetic environment for pedestrians. Effective pedestrian lighting helps people feel safe and comfortable while walking in neighborhoods and to transit stops, stores, and other destinations. To accomplish this, the daytime appearance of the light poles and fixtures and the nighttime appearance of the illumination should reflect the needs and characteristics of each neighborhood and its master plan.

Salt Lake City desires to be a pedestrian friendly city. The Summary Vision Statement of the 1998 Final Report of the Salt Lake City Futures Commission states: "Salt Lake City's transportation system is integrated and multimodal. It moves people and products efficiently into and through the city. If focuses first on pedestrians and bicyclists, second on mass transit, and third on single occupant automobiles in planning and infrastructure support." The report recommends the expansion of late-night recreational programs and the design of streets that are pedestrian friendly. It encourages walking, improvements to the transportation system that promote auto-alternate means of travel such as walking, bicycling, and the use of bus, light rail and commuter rail transit, the adoption of pedestrian- and bicycle-friendly master plans for City neighborhoods and the use of Crime Prevention through Environmental Design (CPTED) techniques to reduce crime.

Adequate lighting of sidewalks and pedestrian crossings is a significant aspect of new street lighting projects. In addition to lighting pedestrian areas, street lighting should provide reasonably uniform illumination of the full width of public travel way.

Much of the existing street lighting in the City is provided by "cobra head" streetlights at a height of between 25 feet to 30 feet. This lighting pattern is effective for the roadway, but not always effective for pedestrians due to shading by trees and the difficulty in providing uniform lighting along sidewalks. The following drawings show the impact of street light mounting height on the lighting pattern of sidewalks.

Figure 3.1 shows the uneven light levels often associated with high-mounted lighting particularly in residential areas with mature trees and long spacing between lights. While this type of lighting may be adequate for drivers because the spot light effect is supplemented by their vehicle's headlights, it is neither pedestrian-friendly nor does it encourage walking.

Figure 3.1. High-mounted Cobra Head Street Lighting

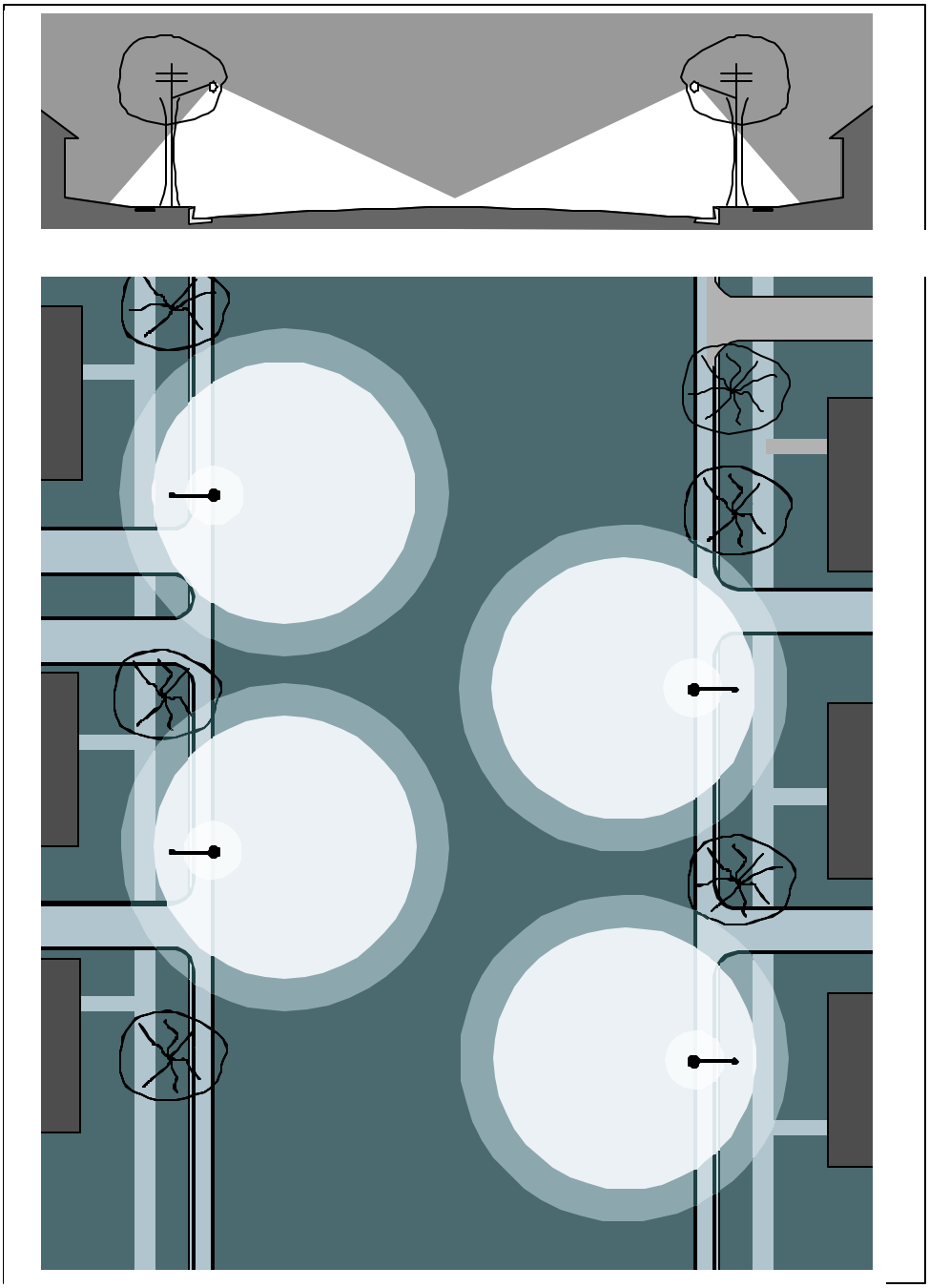


Figure 3.2 illustrates how pedestrian style streetlights with optically controlled light distribution are located below the tree line and provide a more even level of lighting that invites pedestrian activity during evening hours.

Figure 3.2. Pedestrian Style Lighting

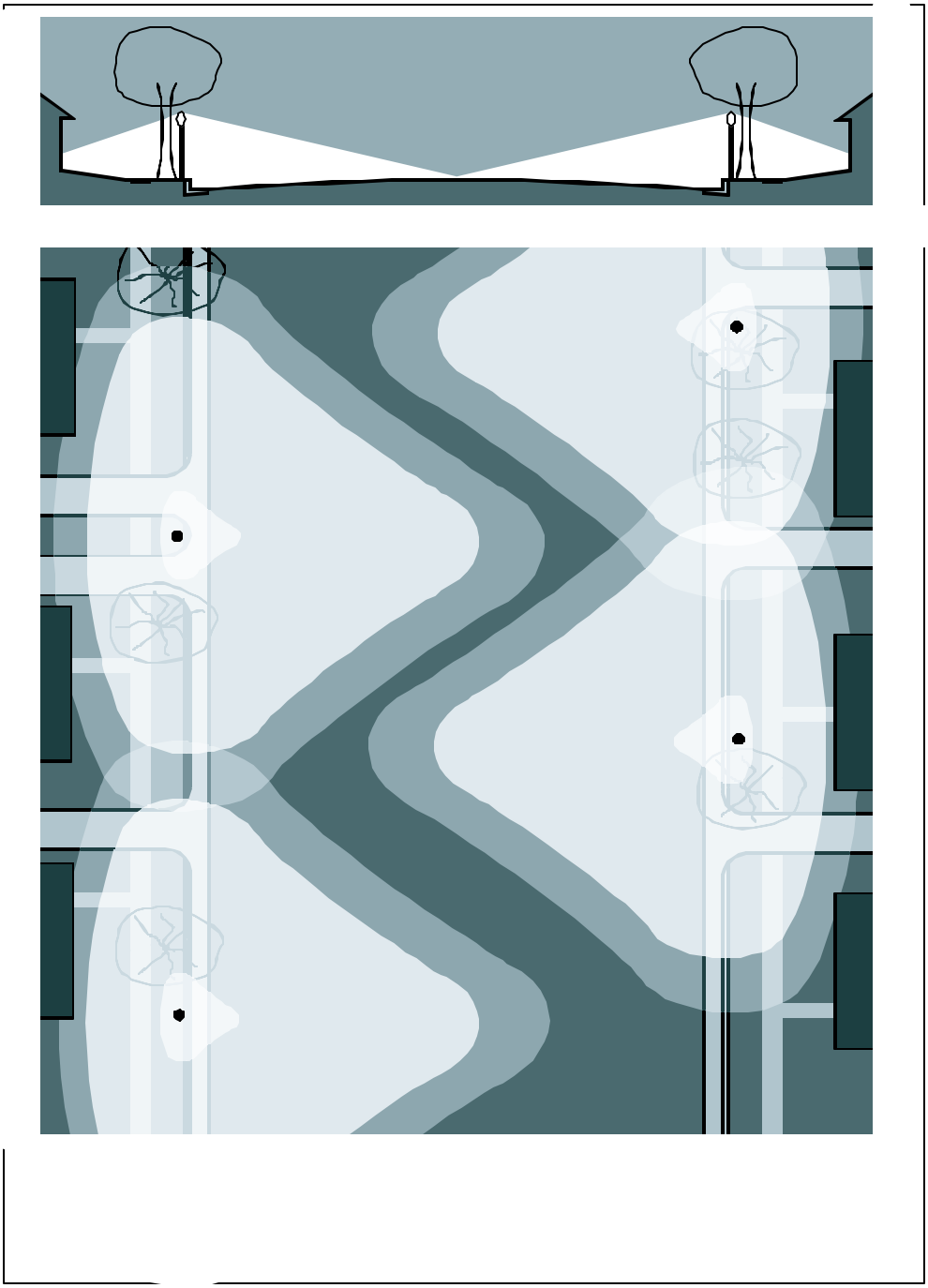
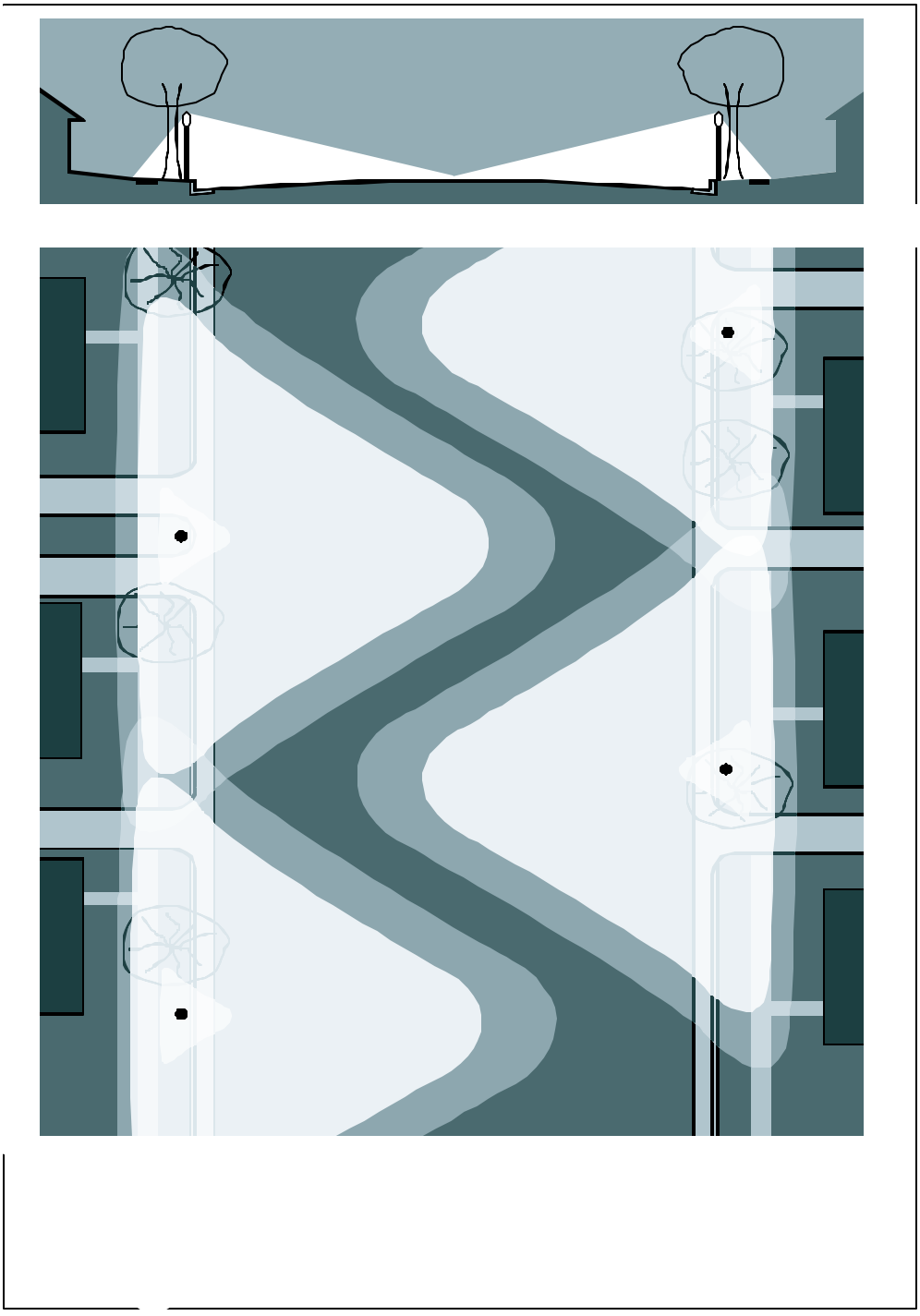


Figure 3.3 is a variation of Figure 3.2 showing how side shields can be placed inside light fixtures to reduce light trespass onto private property and into windows.

Figure 3.3. Pedestrian Style Lighting with Resident Side Light Shield



4. LIGHTING LEVELS AND DESIGN REQUIREMENTS

All new and replacement street lighting of City right-of-way shall meet the minimum lighting level and design standards shown in Table 4.1. These standards pertain to all new developments, installation of new lights and replacement of existing lights.

Table 4.1. Salt Lake City Minimum Roadway Lighting Design standards

Road Class	***Area Classification***	***Average Luminance L_{ave} (cd/m^2)***	***Luminance Uniformity Ratio L_{ave} to L_{min}***	***Luminance Uniformity Ratio L_{max} to L_{min}***	***Veiling Luminance Ratio L_v to L_{avg}***
Major	*Commercial*	*1.2*	*3 to 1*	*5 to 1*	*0.3 to 1*
	Intermediate	*0.9*	*3 to 1*	*5 to 1*	*0.3 to 1*
	Residential	*0.6*	*3.5 to 1*	*6 to 1*	*0.3 to 1*
Collector	*Commercial*	*0.8*	*3 to 1*	*5 to 1*	*0.4 to 1*
	Intermediate	*0.6*	*3.5 to 1*	*6 to 1*	*0.4 to 1*
	Residential	*0.4*	*4 to 1*	*8 to 1*	*0.4 to 1*
Local	*Commercial*	*0.6*	*6 to 1*	*10 to 1*	*0.4 to 1*
	Intermediate	*0.5*	*6 to 1*	*10 to 1*	*0.4 to 1*
	Residential	*0.1*	*6 to 1*	*10 to 1*	*0.4 to 1*

Notes:

1. *All new streetlights must meet, at a minimum, the "dark sky semi-cutoff" standard with the exception that all new "shoe box" or "cobra head" style streetlights must meet the "dark sky cutoff" standard. Dark Sky classifications are explained in Section 6 of this master plan.*
2. *In industrial areas, taller mounting heights and "shoe box" or "cobra head" style streetlights meeting the "dark sky cutoff" standard may be used.*
3. *Exceptions to these standards are not desirable and must be approved by the City Transportation Engineer.*

<u>Lighting in new subdivisions and developments</u>

All new subdivisions and developments are required to place utility lines underground. This includes electric power lines for street lighting in underground conduit. All costs for this work are borne by the development owner. The lighting levels, poles and fixtures used shall meet the requirements of this master plan and policy. The spacing and location of the light fixtures will be determined by an engineered lighting design and approved by the Salt Lake City Transportation Division.

Lighting along reconstructed streets

It is desirable to upgrade the lighting and/or underground conduit, if needed, at the time of street reconstruction. Desiring to minimize construction impacts to neighborhoods and overall costs, street reconstruction projects within Salt Lake City shall include the installation of underground conduit for street lighting, when practical.

New and Replacement Lighting in existing developments and as part of redevelopments

New and replacement lighting in existing developments and lighting required as part of redevelopments shall include the installation or use of existing underground conduit where practical for street light wiring and meet the illumination standards of this lighting policy at the time of design approval. It is required that the decorative poles and fixtures contained in this policy be used for new and replacement lighting unless circumstances for their use are not practical and approved by the Transportation Engineer. Previously existing lighting is to be removed as part of projects to install replacement lighting.

Lighting of Alleys and Privately Owned Streets

Only dedicated publicly-owned streets are eligible for street lighting funded by the City. Public alleys will not be lighted using City funds; however, they may be lighted by abutting property owners at their expense upon approval of the proposed lighting by the City Transportation Engineer. Privately owned streets, alleys and rights-of-way may be lighted by abutting property owners at their expense.

Pole Placement

Street light poles can represent a roadside hazard if located improperly. All new street light poles, in areas with sidewalk abutting the street curb, shall be located behind the sidewalk in a location between the sidewalk and right-of-way line. All new street light poles in areas with a planting strip between the sidewalk and curb are encouraged to be located behind the sidewalk, but may be located in the planting strip if there is a high back street curb and if there is at least 18 inches lateral clearance between the face of curb and nearest side of pole.

Exceptions to any of the above standards are not desirable and must be approved by the City Transportation Engineer.

5. LIGHT TYPES

The preceding section described the level or amount of lighting required on Salt Lake City's public rights-of-way. This section describes the type or source of light to be used. Both affect a person's ability to comprehend what is being seen.

Currently, the most popularly used light sources for street lighting are metal halide and high-pressure sodium vapor. Previously, mercury vapor, fluorescent and incandescent lighting were prevalent. A few incandescent lights still exist along city streets. Mercury vapor and fluorescent lighting are no longer available for new installations. A relatively new white light source gaining popularity is induction lighting. A number of factors are involved in determining acceptable light sources. These include color rendition, cost to purchase and cost to operate and maintain.

Color Rendition and night vision

Colors are more readily identified when seen under blue-white light sources found in the shorter wavelengths of the color spectrum than under the longer wavelengths of yellow-orange light sources. This makes metal halide, induction, mercury vapor and incandescent light sources, which more closely mimic daylight, popular from a visibility and object identification viewpoint. Color rendition is more difficult under the yellow-orange light source of sodium vapor.

Metal halide is the technological successor to the mercury vapor, fluorescent and incandescent blue-white light source lamps and offers more economical operation with a longer lamp life (burn time). It is the current lamp technology of choice among lighting design professionals. Induction lights may prove to be the successor of metal halide lights. They provide good color rendition and promise a very long lamp life which equates to reduced maintenance costs.

Ease and accuracy of color rendition translate into a more attractive night time pedestrian atmosphere. They make streets feel safer and more attractive to pedestrians. For these reasons, the Crime Prevention through Environmental Design (CPTED) process favors white-blue street lighting over yellow-orange lighting.

Purchase Costs

Purchase costs for most light types are fairly similar. The new induction lights have a higher purchase cost offset by its much longer lamp life (burn time) claimed to be up to 100,000 hours (20 years). Cost considerations are generally more important with respect to maintenance and power usage than purchase and installation.

Operating and Maintenance Costs

High-pressure sodium vapor lighting uses less electricity to operate and the bulbs have a longer lamp life than many other light sources. This makes them popular from an economical point of view despite their only moderate color rendition attributes.

The cost to operate metal halide lighting has been reducing as their popularity and availability in the lighting industry has increased.

The cost advantage of induction lights is their long life expectancy which minimizes maintenance costs. Paying for power only on these 20-year bulbs recoups the higher purchase cost of induction lights in a 3 to 6 year period.

The Future

The lighting industry is focusing its attention on white lights for good color rendition, longer lamp life and energy efficiency for economy and a broader range in the light output (size of lamps offered) for use in various situations. This bodes well for metal halide and induction lighting which will likely succeed high-pressure sodium lighting as the most commonly used light sources.

Table 5.1 summarizes the general differences in the lamp types for the most commonly used bulb sizes encountered in street lighting. A comparison of these lights to incandescent lighting is also provided. The values shown are approximate and intended for relative comparisons.

Table 5.1. LAMP TYPE COMPARISON

	Lamp Type			
Factor	**Incandescent**	**Metal Halide**	**High-Pressure Sodium**	**Induction**
Wattage	25-150	50-400	50-400	55-165
Efficiency (lumens/watt)	8-18	38-75	72-115	64-73
Lumen Maintenance (%)	90 (85)	75 (65)	90 (70)	75 (50)
Lamp Life (hours)	750-2000	10,000-20,000	18,000-24,000	100,000
Energy Use	High	Medium	Low	Low
Color Rendition	Very Good	Very Good	Moderate	Very Good

Definitions:

- Wattage - Lamp wattages most commonly used in street lighting
- Efficiency – lamp output efficiency at 50% lifetime of lamp
- Lumen Maintenance - percent of initial lamp output at 50% lifetime of lamp and at end of lamp lifetime (in parentheses)
- Lamp Life - approximate typical lifetime of lamps in hours
- Energy Use – indicator of energy costs
- Color Rendition - relative ability of average observer to accurately perceive colors under the light types shown

Acceptable light types

Only efficient light types of the blue-white spectrum shall be used for new and replacement lighting. This currently translates to metal halide and induction light types. Existing high-pressure sodium vapor and other light types will continue to be supported until it becomes necessary to replace the light fixtures.

Exceptions to any of the above standards are not desirable and must be approved by the City Transportation Engineer.

6. LIGHT CUTOFF CLASSIFICATIONS OF LIGHTING FIXTURES

The term "light pollution" is often used in describing three distinct negative effects of lighting which are light trespass, sky glow and glare. Light trespass occurs when uncontrolled light from a street light is allowed to "spill" into an area where it is unwanted such as onto private property into a building window. Sky glow is the effect of obscuring the view of the night sky as a result of light being directed upward. Glare is created when a harsh light source detrimentally reduces an individual's ability to see objects the light is meant to illuminate.

Salt Lake City experiences all three types of light pollution. Light trespass and sky glow can annoy property owners and detract from enjoyment of their property. If the street lights are more noticeable than the objects they illuminate, then the lights are likely producing glare. Glare can be discomforting and counterproductive to drivers, pedestrians and other users of the public right-of-way.

With the help of environmental groups such as Dark Skies International, the Illuminating Engineering Society of North America (IES) has developed cutoff classifications for the lighting industry which are intended to reduce these negative impacts of lighting. There are four levels of cutoff classifications: Full Cutoff, Cutoff, Semi-Cutoff and Non-Cutoff. Full Cutoff light fixtures offer the most light distribution control and provide significant mitigation to all three types of light pollution; however, there are benefits and limitations to each light cutoff classification.

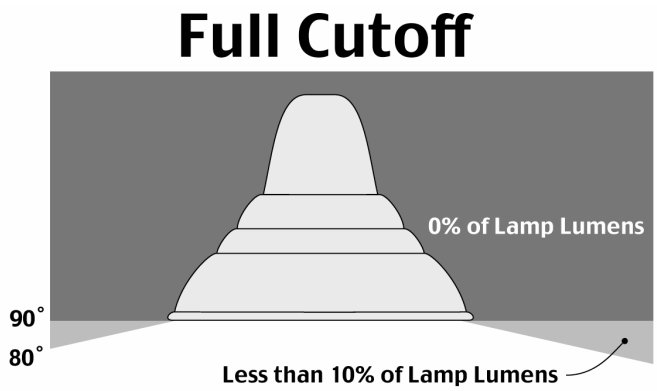
Acceptable light cut-off features

All new and replacement street lighting shall meet, at a minimum, the requirements of semi-cutoff lighting. In locations where "cobra head" or "shoe box" fixtures are used, they must meet, at a minimum, the requirements for cutoff lighting.

Exceptions to any of the above standards are not desirable and must be approved by the City Transportation Engineer.

Figures 6.1 through 6.4 describe each cutoff classification and their associated benefits and limitations.

Figure 6.1. Full Cutoff Light Fixture



No light above horizontal and less than 10 % of the produced lamp lumens shine above the 80° line.

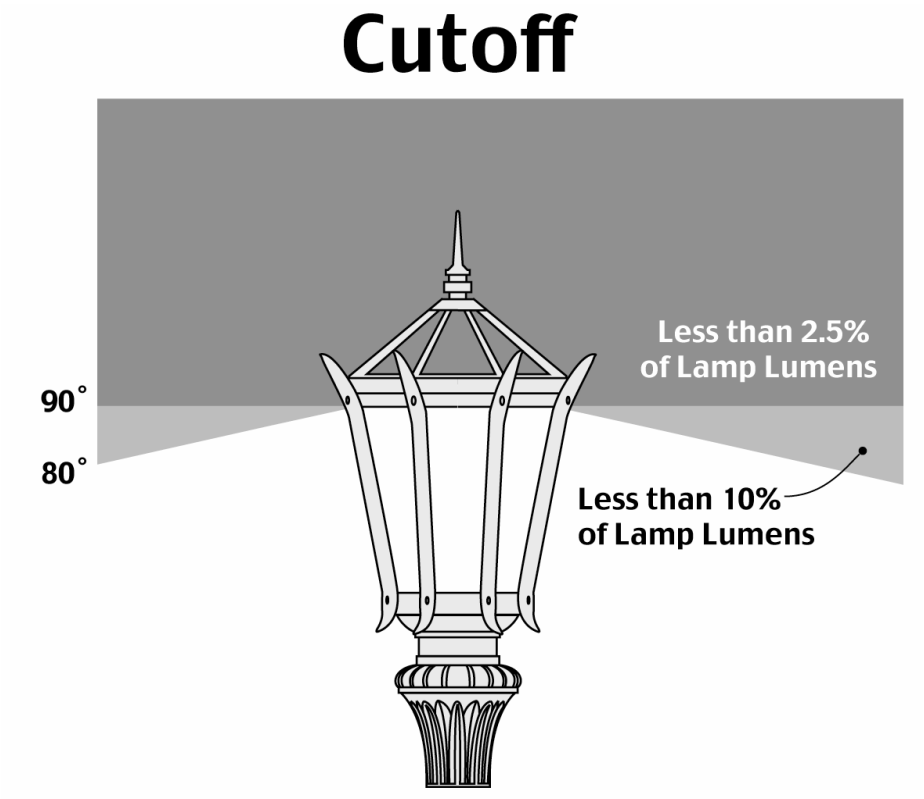
Full Cutoff benefits include:

- No direct up-lighting which is the major cause of sky glow
- Excellent light control at property lines
- Limits light trespass
- Maximum reduction of glare
- Allows greater visual access to the night sky

Full Cutoff limitations include:

- Typically reduces pole spacing (increasing pole and luminaire quantities and cost)
- Typically least cost effective of all cutoff categories
- Concentrated down-light component can result in reflected up-light and increase in sky glow
- Potential for decreased lighting level uniformity due to higher light levels directly under the pole
- Limited number of fixture styles (However, manufacturers are recognizing the importance of providing more light fixture styles meeting the full cutoff classification.)

Figure 6.2. Cutoff Light Fixture



No more then 2.5% of produced lamp lumens above the horizontal and less than 10% of the lamp lumens shine above the 80° line.

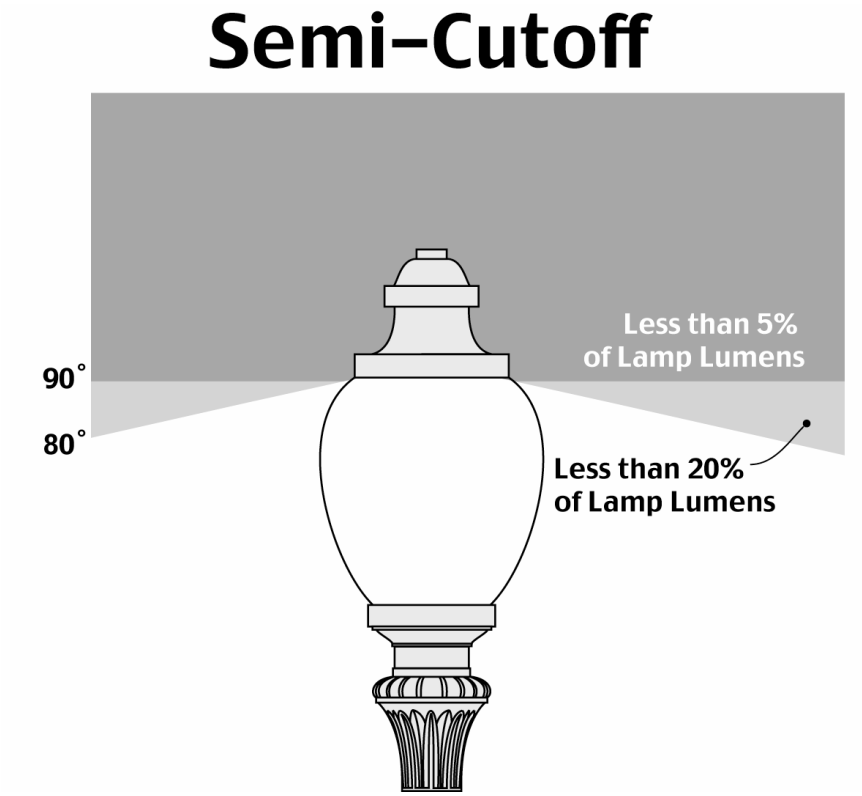
Cutoff benefits include:

- Small amount of high-angle light that can contribute to sky glow
- Limited light trespass
- Potential for increased pole spacing and lower overall power consumption compared to full cutoff
- More fixture styles available than for full cutoffs

Cutoff limitations include:

- Does allow some lighting above horizontal
- Light control at property lines is less than full cutoff
- Reflection off pavement can increase sky glow

Figure 6.3. Semi-Cutoff Light Fixture



No more then 5% of produced lamp lumens above the horizontal and less than 20% of the lamp lumens shine above the 80° line.

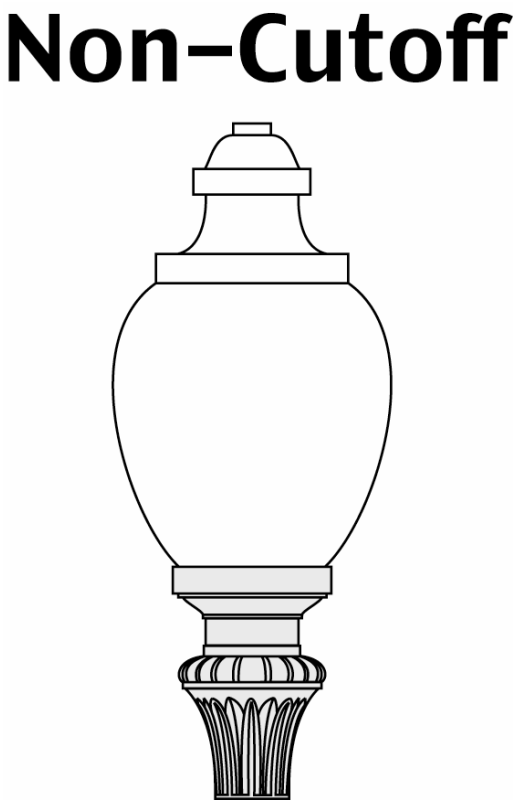
Semi-Cutoff benefits include:

- Potential for increased pole spacing and lower overall power consumption compared to cutoff
- High angle light accents taller surfaces
- Less reflective light off pavement than cutoff fixtures
- Illumination of vertical surfaces increases pedestrian security and sense of safety
- Large selection of fixtures to choose from

Semi-Cutoff limitations include:

- Allows more lighting above horizontal than cutoff fixtures
- Light trespass can be a concern in residential areas
- Increased amount of high-angle light compared to cutoff

Figure 6.4. Non-Cutoff Light Fixture



No limitation on light distribution at any angle.

Non-Cutoff benefits include:

- Potential for maximum pole spacing
- Accents taller surfaces
- Good uniformity of light distribution
- Least amount of reflective light off the pavement
- Largest selection of fixtures to choose from

Non-Cutoff limitations include:

- Greatest potential for direct lighting above horizontal (major cause of sky glow)
- No aiming of light
- Least control of light trespass
- Greatest potential for glare
- Inefficient use of energy compared to fixtures with cutoff features

7. FIXTURE AND POLE STYLES

Certain characteristics and features distinguish each commercial district and residential neighborhood from another within Salt Lake City. Lighting fixtures and poles can uniquely and distinctly enhance the appearance and complement the identity of each neighborhood and district.

Major Streets and Commercial District Streets

To insure uniform and safe lighting on major streets which by their nature carry higher speed, higher volume traffic, the light fixtures and poles identified in this chapter shall be used to provide appropriate lighting for the conditions present. Decorative poles and fixtures shall be used for new and replacement lighting on major streets whenever practical, except that cobra head fixtures on wood or steel poles may be used in industrial areas.

It is desirable to seek public input on the type of fixture and pole used for street lighting in commercial areas. The fixture and pole styles in these areas as identified in this chapter have been selected with public input and consideration of historic and planned urban design elements and land use. Decorative poles and fixtures shall be used for new and replacement lighting in commercial areas whenever practical.

Residential Neighborhood Streets

It is desirable to allow each residential neighborhood to adopt a decorative street light fixture and pole for its non-major streets from an approved list of fixture and pole styles to help the community achieve and maintain its master plan goals and identity. The approved list has been generated in consideration of the public input received and having sufficient variety to allow neighborhood identity while retaining a reasonable ability to obtain and store parts and provide economic maintenance.

All street lighting poles and fixtures used within Salt Lake City must be approved by the City Transportation Engineer. The currently approved "family" of light poles and fixtures for Salt Lake City is shown in Figures 7.1 and 7.2. Lamp fixtures with optical controls and side shield option capabilities are to be used because they provide flexibility in minimizing sky glow, light trespass, glare and energy waste. In special situations, such as within historic districts or when the installation of underground wiring and decorative poles and fixtures is not practical, exceptions to the above requirements may be approved by the City Transportation Engineer.

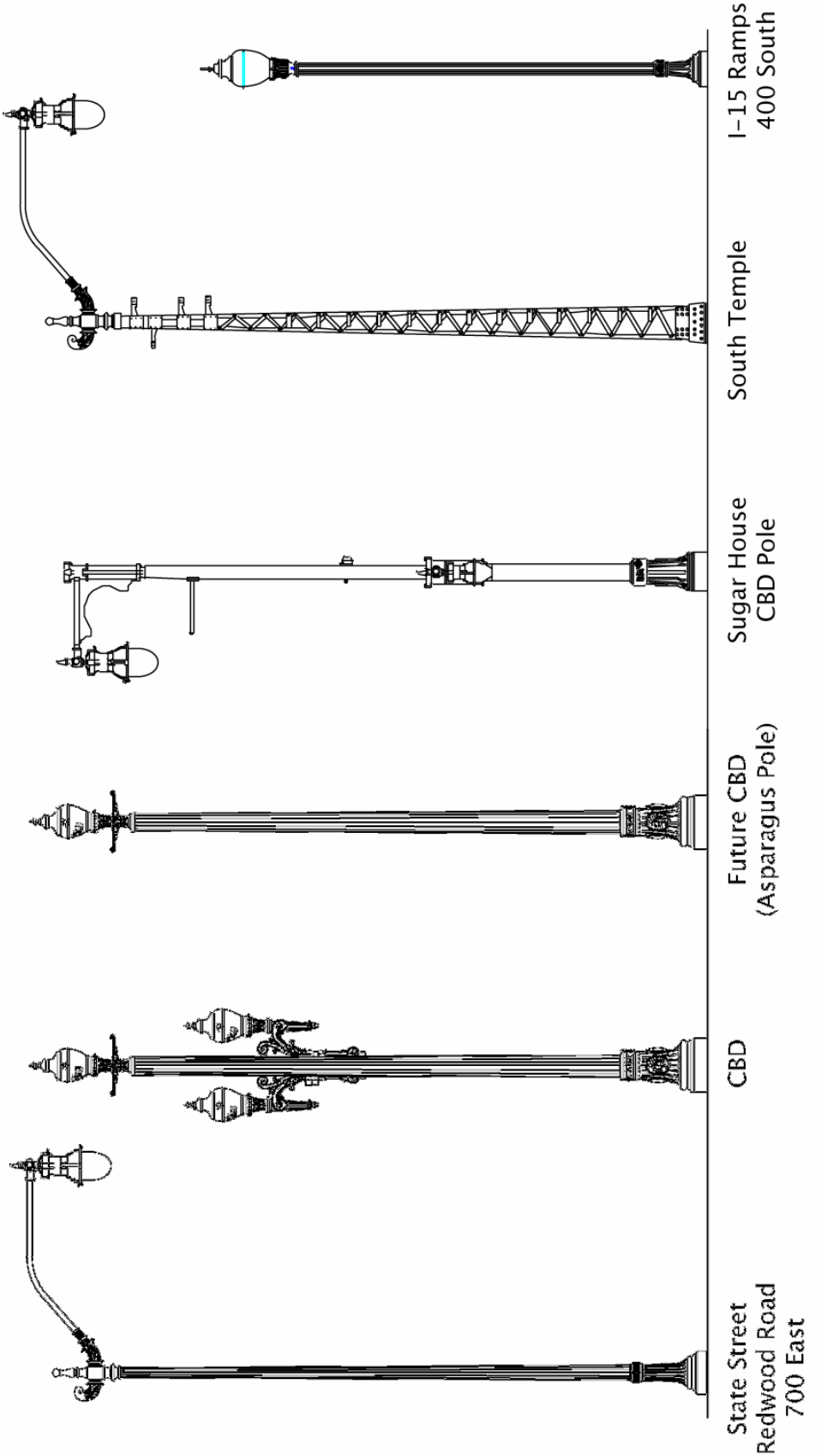


Figure 7.1, Major Street & Commercial Street Lights and Poles

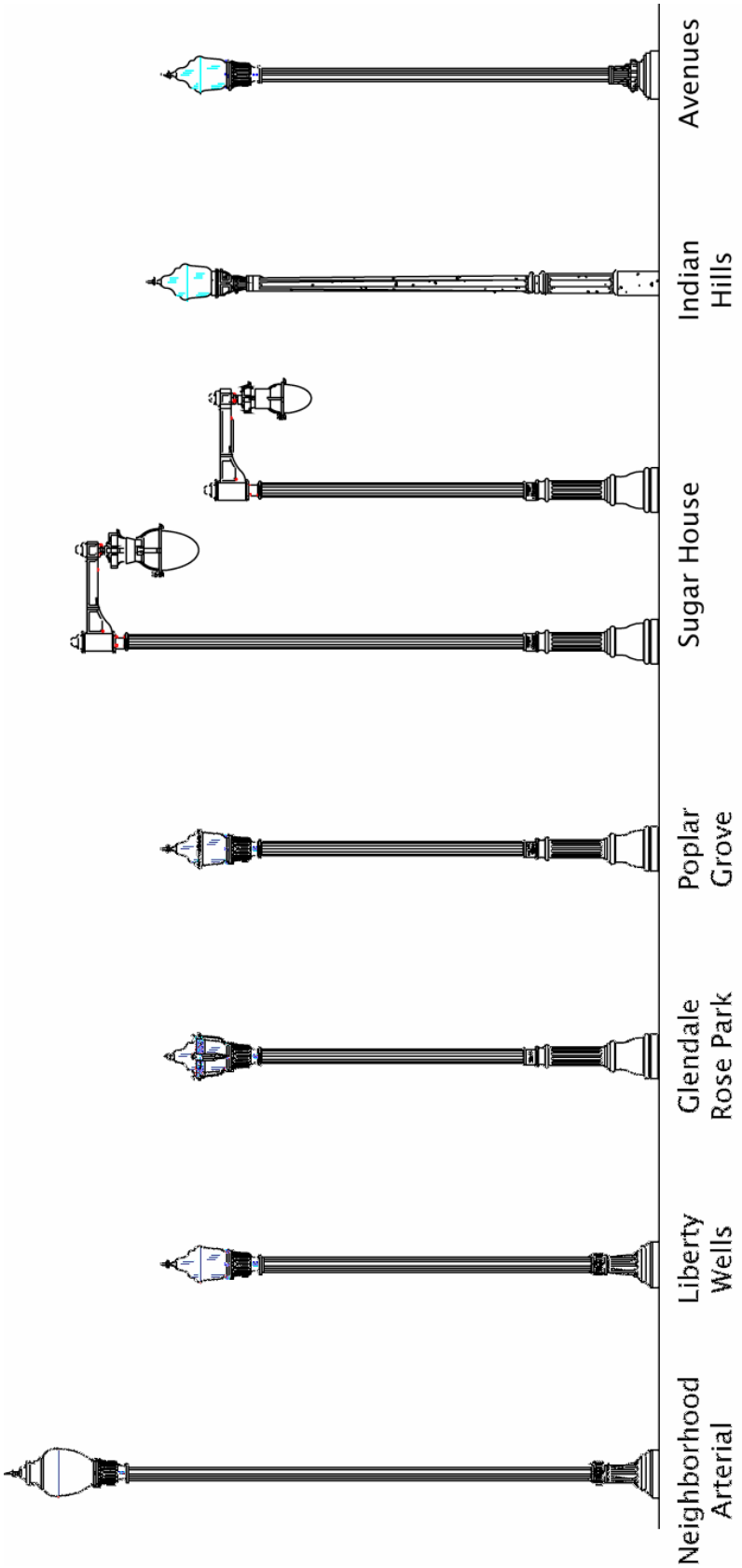


Figure 7.2. Residential Street Lights and Poles

Major streets require brighter lighting than most streets for the safety of the large volumes of vehicles and pedestrians. Business districts are well lit for the comfort of large crowds and to assure good nighttime color rendition in consideration of retailers displaying wares. Residential neighborhoods prefer lower lighting levels that focus on pedestrian ways as much as the paved streets, enhance the quality of life and walkability of neighborhoods and recognize the lower volumes and speeds of vehicles on the streets.

To identify the appropriate lighting for each street within the City, input was provided by community councils, citizens, downtown property and business owners and City planning and technical staff. This master plan incorporates the continuance of the lighting plan developed more than fifteen years ago for the downtown business area and that has been implemented since that time as lighting projects, major land use developments, transit improvements and road rebuild projects have occurred. Community councils and residents have expressed a desire for decorative poles at low mounting height with underground wiring that provides pedestrian scale lighting and a sense of neighborhood identity. Each community council within Salt Lake City was asked to identify their preference should the lighting along their residential neighborhood streets be replaced with decorative poles and fixtures. This has resulted in an approved "family" of decorative light poles and fixtures that provides the opportunity to mix and match pole and fixture styles to create unique lighting systems for each neighborhood while achieving the economy of stocking and maintaining a reasonable number of pole and fixture types.

Major Streets and Commercial District Lighting

The lighting pole and fixture styles identified for Salt Lake City's major streets and commercial districts are shown in Table 7.1.

Table 7.1. Major Streets and Commercial District Street Light Fixtures and Poles

Lighting Area	Pole Style	Light Fixture Style
Downtown	Cactus	Washington
Sugar House	Salem	Tear Drop
Trolley Square	Cactus	Washington
900 East & 900 South (9^{th} & 9^{th})	DB 9	SLA 16
Gateway	Cactus	Cactus
2200 West - North Temple to north City limits	North Yorkshire	Acorn
Redwood Road - 2100 South to 2300 North	Salem	Tear Drop
900 West - 2100 South to I-15	North Yorkshire	Acorn

Table 7.1. (cont.) Major Streets and Commercial District Street Light Fixtures and Poles

Lighting Area	Pole Style	Light Fixture Style
700 North/600 North - 300 West to 2200 West	North Yorkshire	Acorn
North Temple – State to 2200 West	North Yorkshire	Acorn
400 South/500 South/Foothill - Redwood Road to I-80	North Yorkshire	Acorn
Beck Street - I-15 to 100 North	Salem	Tear Drop
Main Street - 500 South to 2100 South	North Yorkshire	Acorn
State Street - 200 North to 2100 South	Salem	Tear Drop
700 East - South Temple to south City limits	Salem	Tear Drop
South Temple - State Street to Wolcott	Lattice Poles	Tear Drop
2100 South	Salem	Triple Tear Drop Sugar House Light
500 West – South Temple to 400 South	North Yorkshire	Acorn
1300 South – I-15 to State Street	Salem	Tear Drop

Residential Neighborhood Street Lighting

The decorative pole and fixture styles selected by community councils for their neighborhoods are shown in Table 7. 2.

Table 7.2. Residential Neighborhood Street Light Fixtures and Poles

Lighting Area	Pole Style	Light Fixture Style
Westpointe	Charleston	Grandville w/ribs and band
Jordan Meadows	Charleston	Grandville
Rose Park	Charleston	Grandville w/ribs and band
Fairpark	Charleston	Grandville
Poplar Grove	Charleston	Grandville w/ band
Glendale	Charleston	Grandville w/ribs and band
Foothill	North York Shire	Grandville
Capital Hill	Wadsworth	Grandville
Marmalade Hill	Wadsworth	Grandville
Ensign Downs	Wadsworth	Grandville
Upper Avenues	Wadsworth	Grandville
Avenues	Wadsworth	Grandville
Federal Heights	North York Shire	Grandville
Central	North York Shire	Grandville
East Central	North York Shire	Grandville
Liberty Park	North York Shire	Grandville
University Park	Concrete	Grandville w/ribs and band
College Avenues	Concrete	Grandville w/ribs and band
Sugar House	Private light style	Tear Drop
Highland Park	North York Shire	Grandville
East Bench	North York Shire	Grandville

8. LIGHTING PROGRAMS

Salt Lake City offers four lighting programs.

Traffic Safety Lighting (local streets)

On local streets, the City provides a light at intersections for pedestrian and traffic safety. Under this program, optional midblock lights at approximately 300 foot spacing are also provided if the majority of property owners within 150 feet of the proposed light location concur in having the optional light. The City funds 100% of the cost for Traffic Safety Lighting.

Continuous Lighting Systems (major streets)

Along major streets, the City provides a brighter level and more uniform dispersion of lighting for traveler safety. These are streets with high traffic volumes and speed limits as well as more pedestrians. There are typically 6 to 8 lights per block face. The City funds 100% of the cost for Continuous Lighting.

Special Improvement District (SID) Lighting

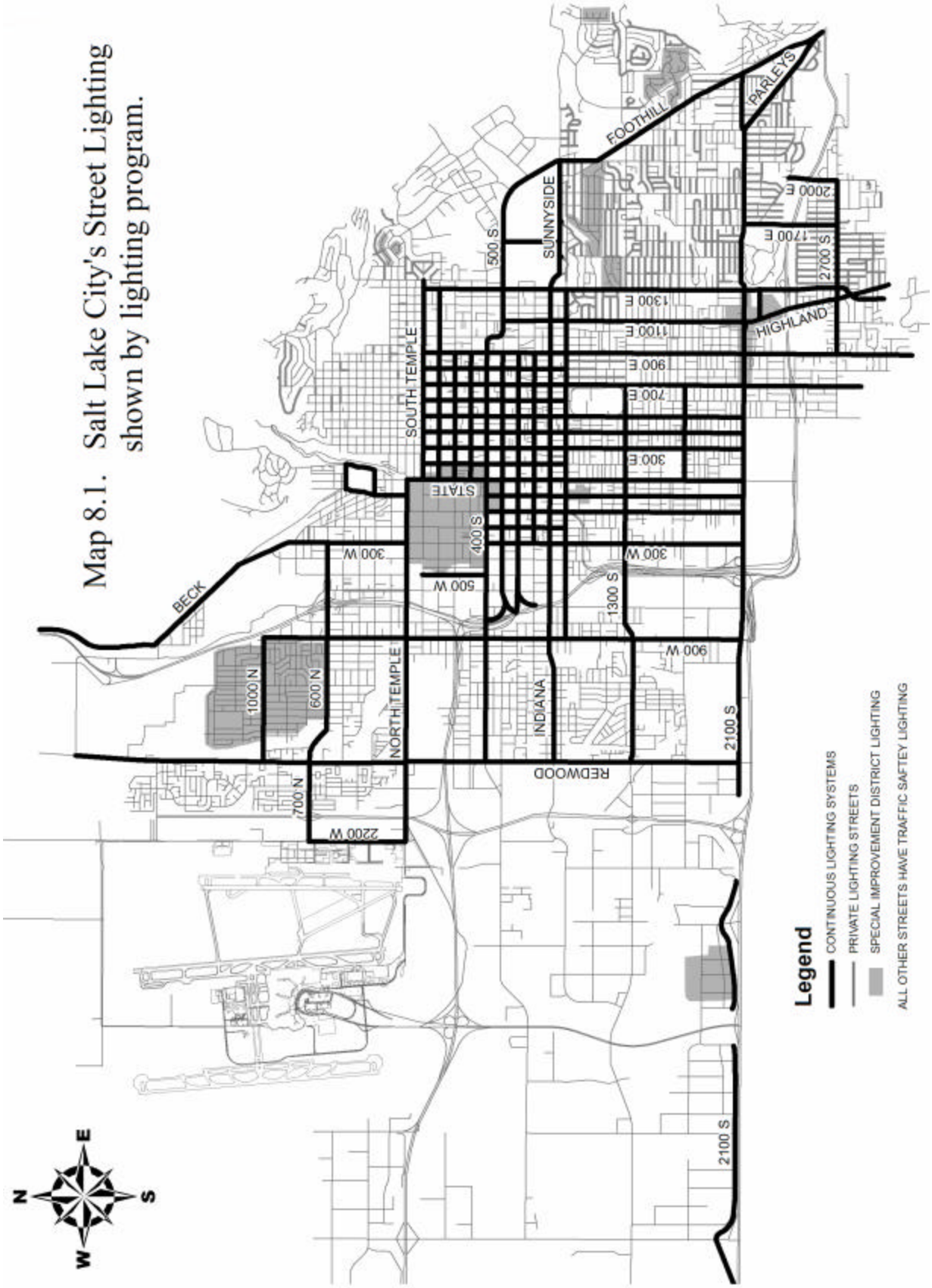
Additional and/or decorative lighting in residential and commercial areas is offered via special improvement districts wherein abutting property owners agree to pay the capital cost for new or replacement SID lighting plus 75% of the ongoing operating and maintenance costs of the lights. The City pays 25% of the operation and maintenance cost which represents the approximate cost of lighting that the City would typically provide under either the Traffic Safety Lighting Program or Continuous Lighting Program.

Private Lighting (residential areas)

Under the private lighting program, residents purchase, install, operate, maintain and own decorative lights that are placed in the park strip of the public right-of-way. Each streetlight has underground wiring that is connected to the electrical service in the home of the owner of the streetlight. Each light owner signs a revocable permit issued by the City that is recorded with the property. The permit allows the light to be placed on public property and stipulates that the homeowner is responsible for operating and maintaining the light at the property owner's expense. Each neighborhood works with the City Transportation Division on a design that provides adequate lighting. This includes the type of pole, fixture, size and type of light and the spacing and location of poles. Once a plan is approved, the neighborhood arranges for installation of the lights. All costs of this program are the responsibility of the neighborhood. Since the program's inception, the City has made the Matching Grant Fund available to property owners to apply for up to 50% of the capital cost of private lighting. The City makes an annual budgeting decision on the amount of funding available in the Matching Grant Fund.

Map 8.1 shows the locations where each of the above described lighting programs are deployed.

Map 8.1. Salt Lake City's Street Lighting shown by lighting program.



9. USING CRIME PREVENTION IN STREET LIGHTING DESIGN (CPTED)

In the planning, designing and building of the physical environment, especially in public spaces, it is essential that the principles and standards of Crime Prevention Through Environmental Design (CPTED) be given both fair and ample consideration. The proper design and effective use of the built environment can lead to a reduction in the fear of crime and the incidence of crime, and to an improvement in quality of life. Street lighting is very much a part of the physical environment and must be afforded the same level of CPTED assessment as any other aspect of public space.

Poor street lighting is not the main contributing factor in nighttime crime in public spaces. The lack of people socializing and using the public space contributes to an environment that may actually encourage crime, regardless of the level of lighting. It is important to note that lighting does decrease fear of crime, making public spaces more attractive for the community, thus promoting a process of greater legitimate use and socializing. Light does not prevent crime. People prevent crime. Lighting is an amenity that encourages interaction of people in public spaces, increasing natural surveillance.

In CPTED, *natural surveillance* is defined as: "The organization of physical features, activities, and people in such a way as to maximize visibility. The placement of windows, doors, common areas; the alignment of sidewalks and paths; the locations and levels of lighting; and the proper design and size of open spaces can contribute to natural surveillance opportunities." If a person wants to pursue any illegal activity, good natural surveillance enhanced by proper lighting will discourage the activity.

Street lighting that is well designed and properly maintained will do the following:

- Improve the appearance of the public space.
- Encourage people to interact.
- Contribute to a positive sense of safety and security.

The following are some general guidelines for lighting in public spaces:

- Public spaces must be well lighted for pedestrians.
- The light type and lighting level must not hinder recognition of people; a good measure is being able to identify faces 50 feet away.
- Consistency is essential.
- Glare and shadows must be eliminated to the maximum extent possible
- Blind spots, entrapment locations, and hidden areas need adequate lighting.
- In most cases, the best approach is to use more lights with lower wattage than a few lights with higher wattage.

Many aspects of the built environment, including lighting, must be assessed using the situational approach. The CPTED approach is to ask questions, from every possible angle, to determine if all possibilities are being considered.

The following questions can serve as a guide in determining proper lighting design or identifying deficiencies:

1. Are public spaces lighted to the minimum standard brightness?
2. Is lighting consistent, with little or no glare, shadows or contrasts?
3. Is reflectivity considered in designing the lighting?
4. Does the lighting adequately illuminate pedestrian spaces and possible entrapment areas?
5. Are grade change entrances well lit?
6. Are lights and vegetation compatible?
7. Are light fixtures located to avoid accidental knockdown?
8. Are light fixtures protected from vandalism?
9. Do the users, or residents, in the surrounding area participate and exhibit good ownership efforts?
10. Is maintenance adequate to insure clean fixtures and replacement of broken or burned out bulbs?
11. Are there other physical features that need improvement so that lighting can be effective?
12. Is there regular, on-going surveillance of the area by the community, contributing to ownership and reporting of deficiencies in lighting?
13. Are landscaping elements chosen and maintained so as not to restrict lighting?
14. Are nighttime corridors properly illuminated to eliminate hiding or entrapment areas?
15. Are sightlines and natural surveillance considered in designing lighting for designated nighttime corridors or activity generators?
16. Are movement predictor routes identified and adequately lighted?
17. Are signs, maps, house/building numbers, and other way-finding devices well illuminated?
18. Are the different seasons considered in designing lighting levels?

It is the policy of the Salt Lake City Transportation Division to support the use of Crime Prevention Through Environmental Design principles in the design and operation of street lighting within Salt Lake City.

10. BANNERS

Neighborhoods throughout the City may request approval to place banners on street light poles to provide a sense of community spirit and identity. Banners are also used to promote traffic calming. This master plan supports these uses of banners on street light poles.

An 18-foot high or taller pole will accommodate a 6' tall banner; however, shorter banner sizes may be necessary on neighborhood streets where shorter poles exist. Street light poles must be rated for wind load based on the desired banner size before approval to hang banners will be granted. In neighborhoods where light poles cannot accommodate banners, separate banner poles may need to be used.

Neighborhoods interested in receiving approval to hang banners for neighborhood community spirit and identity purposes must petition the City in accordance with the August 21, 2003 Executive Order: Authorizing the Placement of Street Banners in the Public Way, copies of which can be obtained at the Salt Lake City Transportation Division, 349 South 200 East, Suite 450. The cost associated with producing, hanging and removing these banners is borne by the organization requesting approval.

It is the policy of the Salt Lake City Transportation Division to support the use of banners on street light poles to enhance a sense of community and contribute to traffic calming.

11. STREET TREES AND LIGHTING COMPATIBILITY

It is desired that street lighting and trees located within or near the public rights-of-way be compatible. Both add character to neighborhoods and are highly desirable urban elements of livable communities.

Street lighting powered from underground wiring eliminates the need for tree pruning around wires. Likewise, locating street lights such that the current and future tree canopy does not significantly conflict with the desired lighting dispersion precludes the need for pruning. At the same time, care must be taken to maintain reasonably similar spacing between lights in order to maintain the desired uniformity of lighting levels along the streets and sidewalks.

It is the policy of the Salt Lake City Transportation Division to coordinate the location of new street lights with the Salt Lake City Forester and, in turn, coordinate on the planting of new trees such that both are compatible in providing desired benefits to the neighborhood.

12. ACKNOWEDGMENTS

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