STREET LIGHTING SURVEY RESULTS

Submitted to: Hi-Line Engineering, LLC

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SUMMARY

Background

The street lighting survey was undertaken as a means of understanding current practices of utilities and municipalities to provide street lighting services within their designated service areas and to determine best practices.

The Lighting Research Center (LRC) was retained as a subcontractor to Hi-Line Engineering, LLC to conduct a street lighting best practices survey. The survey was conducted of willing participants who attended the 2004 Street and Area Lighting Conference. Attendees included municipality and utility representatives, as well as outdoor lighting designers and manufacturers. This document presents the findings of the survey and analyzes the data.

Research Objectives

The research objectives for the survey were to explore:

- Safest operating voltage level and proper wiring methods.
- Illumination levels to alleviate public safety concerns.
- Types of streetlight fixtures and structures used for long service life and low maintenance.
- Selection practices of overhead versus underground service.
- Comparison of operating voltages (120, 240 or 480 volts).
- Standardization of inventory.
- Lighting efficiency with regards to energy use.
- Types of equipment used in maintenance and installation of streetlights.
- Procedures and methods used in installation and maintenance.
- Costs, on a per streetlight basis, for maintenance and installation.

Methodology

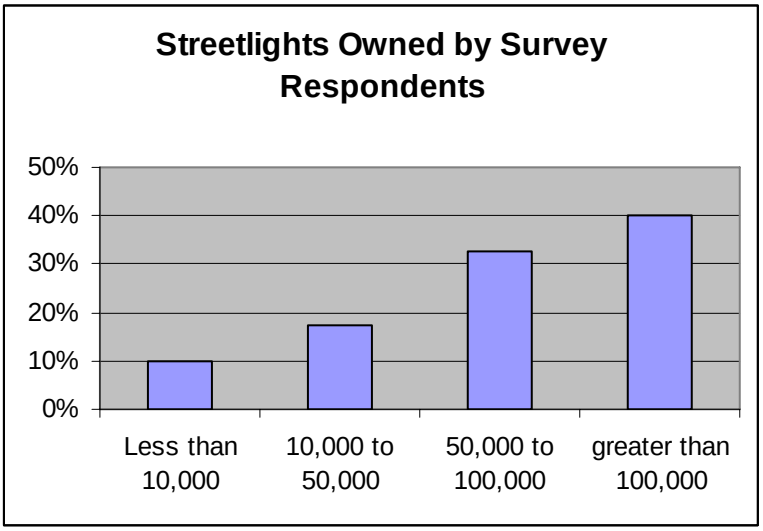
The LRC developed a surveying instrument to collect data regarding the specifications, standards, installation and maintenance practices, personnel training and record keeping of street lighting programs of selected utilities and municipalities. The survey was reviewed, amended and approved by Hi-Line Engineering, AMP-Ohio and the City of Columbus, Ohio prior to its distribution. All participants of the 2004 Street and Area Lighting Conference received a survey and instructions for its completion with the promise that the results would be made available to all who completed the survey. 50 surveys were completed. However, some of the surveys were duplicates from the same utility or municipality. There were also some surveys from street lighting manufacturers and consultants. The duplicates and non-street lighting entity surveys were not included in the data analysis. 40 surveys were available for analysis. Of the 40 surveys used not all respondents provided answers to all the questions. Conversely, some of the questions required multiple responses from the same entity.

Survey responses were placed in sub-categories based on the type of entity owning the streetlights. These sub-categories are:

- Municipalities that own streetlights – These are towns or cities that own the streetlights within their boundaries. They do not, however, own or maintain the electrical distribution system. They may own the wiring to the streetlights from some distribution point of the electrical system. On the following tables, these entities are referred to as "Municipality".
- Cooperative Utility – These are utility companies that are organized under the rural electric cooperative style. These entities own the streetlights and the electrical distribution system. On the following tables, these are referred to as "Utility – CoOp". There were insufficient responses to conduct any meaningful analysis on this class.
- Investor owned utilities – These are utility companies that own the streetlights and transmission and distribution facilities within their designated service areas. On the following tables, these are referred to as "Utility – IOU".
- Municipal utilities – These are utility companies owned by a municipality. They provide both the electric distribution system and the streetlights to the town or city they serve. On the following tables, these are referred to as "Utility – Municipal".
- Other – One entity reported itself as other. This entry refers to a municipality where some of the streetlights are owned by the municipality and others are owned by the local utility. On the following tables, this is referred to as "Non-utility, Other".

Survey Demographics

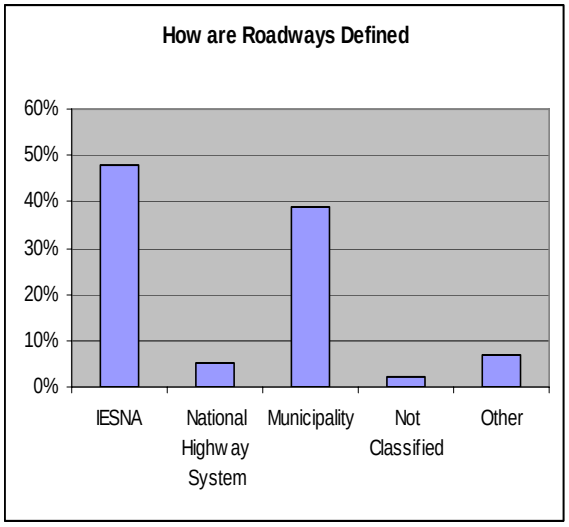
Survey respondents represented most areas of the United States. The exceptions were the northern plains and Rocky Mountain states. Most of the respondents (72%) own more than 50,000 streetlights each. The large majority (82%) of these streetlights are high pressure sodium. However, there still remains in use a substantial amount (11%) of inefficient mercury vapor streetlights.

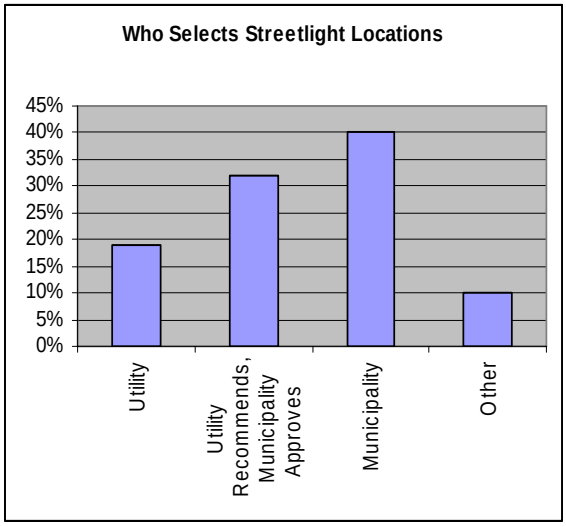


KEY FINDINGS

Specifications and Standards

To determine how many streetlights to place along a roadway, someone has to define the type of road. Survey respondents indicated they either used the Illuminating Engineering Society of North America (IESNA) definitions (48%) or the type of road is defined by the municipality (29%). After defining the roadway, choosing and/or approving the location of streetlights falls to the municipality in 72% of survey respondents' cases. In 32% of these cases, the utility recommends the location of the streetlight.

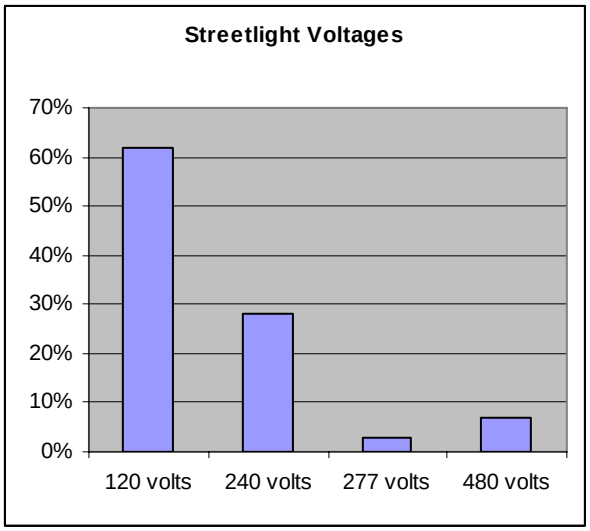


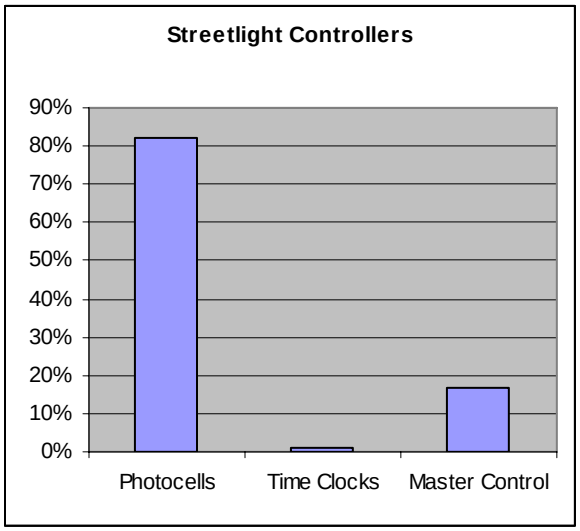


Statistically accurate information regarding illumination levels by street type was not attainable through the survey. Too few respondents indicated any design criteria for illumination levels. This may be an indication there is no set level of illuminance based on roadway type for most entities responding to the survey.

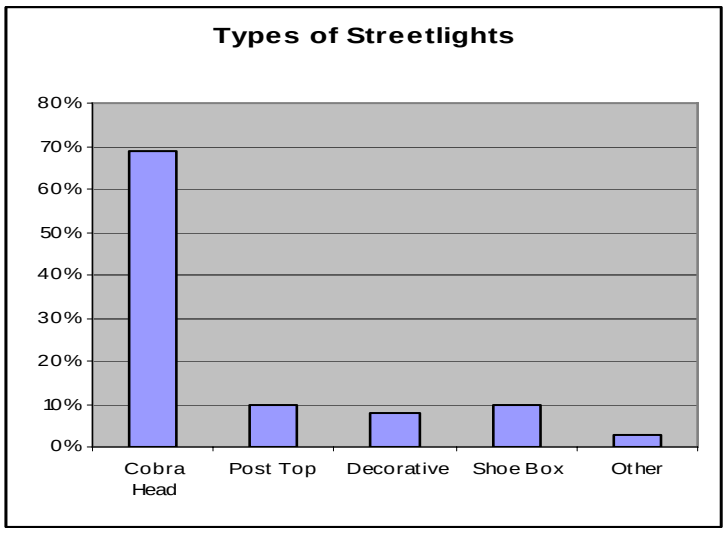
Continuous street lighting along roadways is not practiced except under certain specific conditions. Only one-third of survey respondents indicated using continuous roadway street lighting on collector or major types of roadways. Continuous roadway lighting on other types of roads was used infrequently.

The most common streetlight operating voltage was 120 volts (62%) followed by 240 volts (28%). Most entities that own streetlights (82%) use individual photocells to control the on/off function of the streetlight. The use of low mercury content lamps in streetlights is used mostly by investor owned utilities (IOUs) and municipal utilities. This is not true for municipalities that own streetlights.

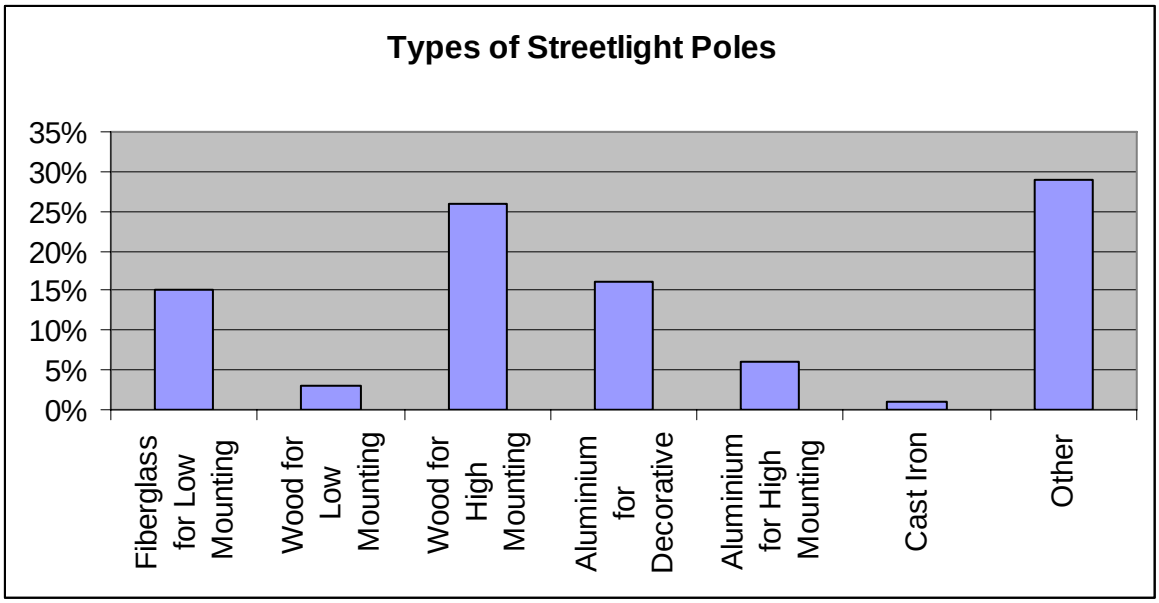




Full cutoff streetlight fixtures are now mandated in the majority of jurisdictions with the remainder of survey respondents expecting they will be mandated shortly. The most common streetlight fixture is the cobra head (69%). When respondents were asked to rank the criteria for selecting streetlight fixtures, quality was ranked ahead of cost.

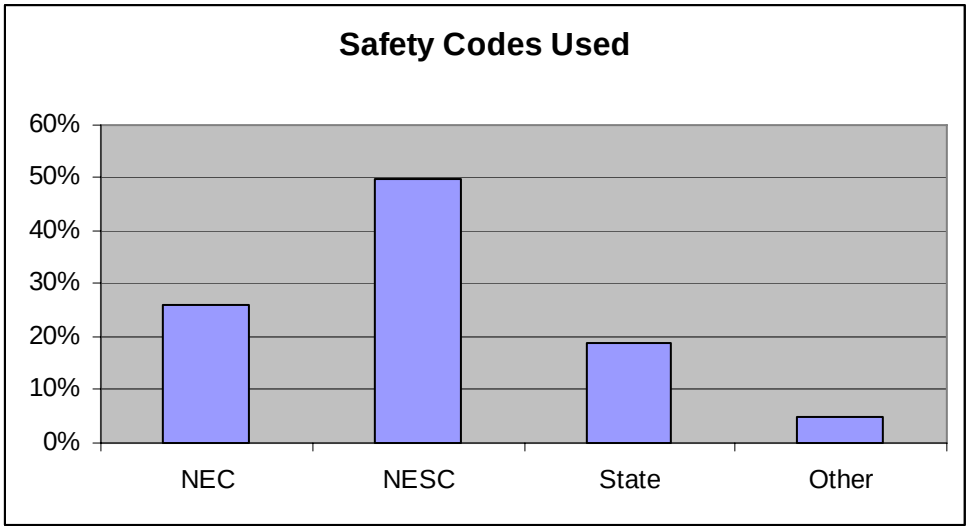


Wood is still the most popular material used for dedicated streetlight poles. Mounting heights of streetlights vary based on the location and type of street.



All survey respondents indicated they keep some type of streetlight records. Computerized records account for 62% of the records. The most popular information included within the records are streetlight location, fixture type, lamp type, lamp size, date of installation, pole type and who pays for the use of the streetlight.

Safety codes are followed in the installation of streetlights. IOUs and municipal utilities tend to follow the National Electric Safety Code while municipalities that own streetlights follow either the National Electrical Code or state mandated codes. The code that is followed sets the grounding standards that are practiced.

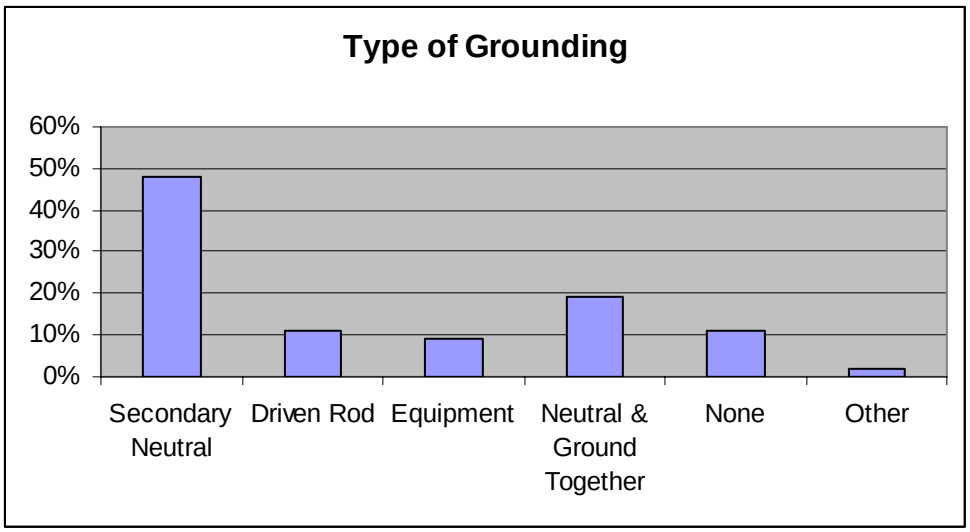


Installation Practices – Overhead Distribution

Surprisingly, the survey results indicate the use of qualified high voltage linemen (58% of respondents) to install streetlights on overhead distribution facilities. High voltage linemen are more expensive to use than other qualified individuals.

In terms of payment, if someone is charged for the installation of streetlights on overhead distribution facilities, it is normally the developer of the new development. This is especially true (83%) where the municipality owns the streetlights. However, in 40% of the cases, there are no charges for streetlight installations in overhead distribution areas.

Where the municipality owns the streetlights or for a municipal utility, dedicated streetlight wiring is more likely to be used. Grounding of streetlights is a function of which electrical safety code is used. Municipalities, following the NEC, will tend to use a driven ground rod. Utilities, following the NESC, will normally tie the ground to the neutral conductor which is attached to a ground.

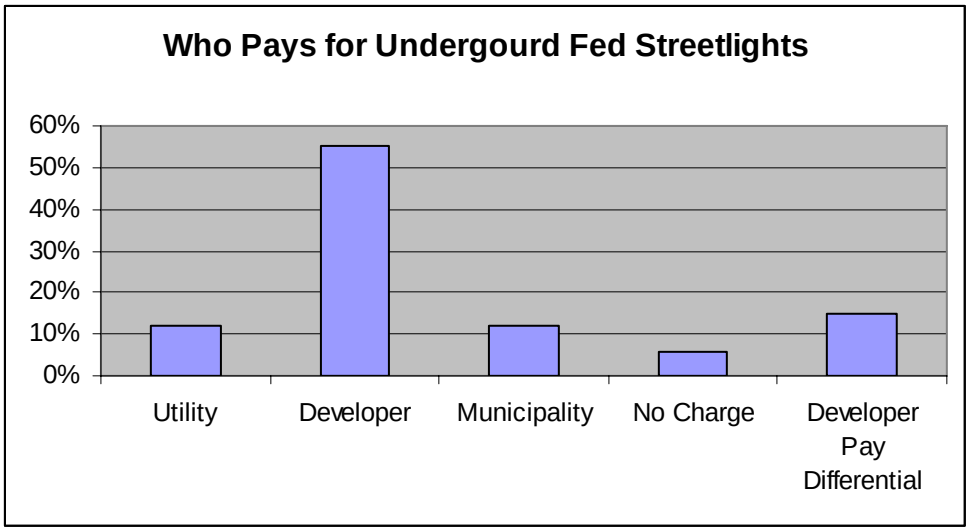


Installation Practices – Underground Distribution

Unlike overhead installation practices, the use of high voltage linemen, low voltage linemen and a mixture of both to install streetlights in underground distribution areas is fairly evenly split among survey respondents.

Municipalities that own streetlights are more likely to use conduit for streetlight wiring under all circumstances. Those utilities not using conduit in all circumstances tend to use it under paved areas and in downtown areas. The excavation for the conduit and its installation is most like done by the developer (56%) or by the utility (36%).

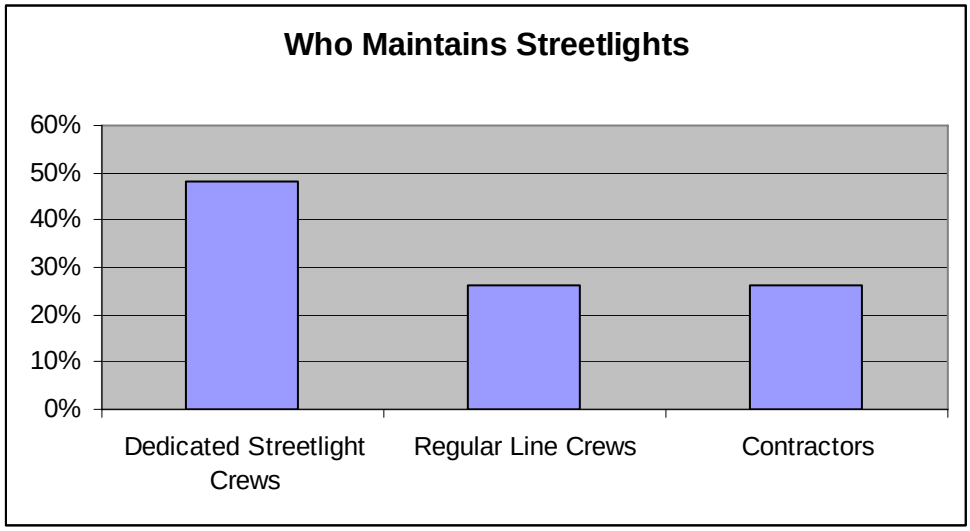
The majority of streetlight owning entities (70%) charge for the installation of streetlights on underground distribution systems in new developments. The cost is either the full price of the installation or the differential between the overhead cost and the underground cost. On existing streets, the municipality picks up the installation cost 40% of the time followed by a developer 29% of the time.



Grounding practices, similar to overhead, follow the safety code practices being followed. Those entities using ground rods are split as to the requirement for impedance to ground. Forty-two percent have no impedance requirement, 29% require an impedance less than 25 ohms and 29% require an impedance less than 50 ohms.

Maintenance Practices

Nearly half of the survey respondents (48%) report that maintenance of streetlights is performed by dedicated streetlight crews. Contractors perform this function 26% of the time and 26% of the time it is performed by regular line crews. The use of high voltage linemen to perform streetlight maintenance was reported by 50% of respondents. However, municipalities that own streetlights are more likely to use low voltage line personnel.



Group relamping is only used by 38% of the respondents. All survey respondents indicated that streetlight fixtures, poles and wiring are only replaced upon failure.

Inventories of streetlights in use are conducted by 71% of the survey respondents either as part of any group relamping or conducted as separate inventories. Streetlight outage

reporting is predominately provided by customers (55%) and by police and a dedicated person within the streetlight owning entity (21% each).

The annual maintenance cost per streetlight as reported in the survey varies greatly from a low of $10 to a high of $400. The most likely costs for entities not conducting group relamping is approximately $40.

Training

The majority of entities owning streetlights provide some type of training to their streetlight designers, installers and inspectors. This training mostly is in the form of on-the-job training. Low voltage training is provided to some of the installers.

RECOMMENDED BEST PRACTICES

The recommendations made as part of this report reflect the results of the survey. It does not include recommendations that are not supported by the survey outcome or were not part of the survey.

Specifications and Standards

- Lighting design practices need to start somewhere. The best place to start is by defining the types of roadways within a municipality and the type of lighting that each roadway will receive. It is recommended that municipalities define their roadways by using the IESNA definitions or developing their own.
- Since the municipality will pay either for the rental of streetlights from a utility or be the owner of streetlights, it is recommended that the municipality set up a procedure for approving the installation and location of any new streetlight requested.
- The practice of continuous street lighting, as defined by IESNA, should only be practiced along select sections of roadways where required for safety or aesthetics.
- The use of full cutoff streetlight fixtures is recommended. They are already mandated by most jurisdictions and all indications are they will be mandated in the remainder of jurisdictions.
- The keeping of streetlight records is essential. Periodic updating of these records through physical inventory is recommended.

Installation Practices

- Installations should be made in accordance with whichever electrical safety code the streetlight owning entity is required to follow. This includes grounding practices.
- Use of the least costly installers and maintenance personnel is recommended. This usually means the use of low voltage qualified line personnel. The use of dedicated streetlight crews with the proper equipment may also reduce costs provided there are sufficient numbers of streetlights to install and/or maintain to keep a full time crew busy.

- Charges are recommended for the added cost to install streetlights in new developments where underground electrical distribution systems exist. The added cost should be borne by the developer.

Maintenance

- Any benefits of group relamping cannot be supported by the outcome of the survey.
- Dedicated streetlight maintenance crews may be warranted if sufficient streetlights are owned by a single entity.
- The annual cost to maintain street lighting in proper order should be around $40 per streetlight owned. This is based on spot relamping only.
- It is recommended to replace streetlight fixtures, poles or wiring only upon failure.

Training

- Training of streetlight system designers, installers and inspectors is recommended to ensure proper street lighting systems are installed and maintained. At a minimum, installers should receive low voltage training.

STUDY FINDINGS

Demographic Information of Survey Respondents

Fifty surveys were completed from 40 unique streetlight serving entities. Table 1 describes the type and size of entities responding to the survey. The majority of the respondents (24) were from investor owned utilities and the majority of those owned greater than 100,000 streetlights each. There is a sufficient sampling of municipalities that own streetlights and from municipally owned utilities to segment the findings by these two subsets as well as investor owned utilities. The sample size from cooperative utilities is insufficient to develop data for this group. However, their responses are included in the findings from the total survey population.

Table 1: How many streetlight do you own?

Utility Types and Lights Owned									
Type	Count of Utilities in Group	Less than 10,000	% of group reporting less than 10,000	10,000 to 50,000	% of group reporting 10,000 to 50,000	50,000 to 100,000	% of group reporting 50,000 to 100,000	More than 100,000	% of group reporting more than 100,000
Municipality	7	1	14.3%	2	28.6%	2	28.6%	2	28.6%
Non-utility Other	1	1	100%	0	0%	0	0%	0	0%
Utility - Co-Op	2	0	0%	1	50%	1	50%	0	0%
Utility - IOU	24	1	4.2%	1	4.2%	9	37.5%	13	54.2%
Utility - Municipal	6	1	16.7%	3	50%	1	16.7%	1	16.7%
Total	40	4	10%	7	17.5%	13	32.5%	16	40%

Survey respondents represented most sections of the United States. Only the northern plains and the Rocky Mountain states were not represented.

Table 2 illustrates the type of light source used by each of the types of street lighting entities. Over 80% of streetlights use high pressure sodium regardless of the entity type. The largest difference between investor owned utilities (IOU) and municipal provided street lighting appears to be in the amount of metal halide streetlights provided by the IOUs. It is also necessary to point out there still exists large quantities of energy inefficient mercury vapor streetlights in all entity categories but more so with municipal providers (14%).

Table 2: Percent of streetlights by type of lamp.

Utility Types and Streetlight Types						
Type	**% HPS**	**% Metal Halide**	**% Mercury Vapor**	**% Incandescent**	**% Low Pressure Sodium**	**% Other**
Municipality	82%	0%	14%	1%	0%	2%
Non-utility Other	100%	0%	0%	0%	0%	0%
Utility - Co-Op	80%	5%	15%	0%	0%	0%
Utility - IOU	81%	7%	11%	0%	1%	0%
Utility - Municipal	87%	2%	12%	0%	0%	0%
Total	82.8%	4.9%	11.5%	0.1%	0.4%	0.3%

Specifications and Standards of Survey Respondents

Respondents were asked to describe how or who defines different types of streets for determining to what degree each type of street will be lighted. Table 3 depicts the findings from this inquiry. Streets are defined using either the IESNA definition guidelines (48%) or directly by some entity within the municipality (39%). This is true regardless of the type of entity providing the streetlights.

Table 3: How do you define different types of roads to determine what type & how many streetlights will be installed?

Utility Types and Highway Definitions Used											
Type	**Count of Responses in Group**	**IESNA**	**% of Group reporting IESNA**	**National Hwy Sys**	**% of Group reporting National Hwy Sys**	**Municipality**	**% of Group reporting Municipality**	**Not Classified**	**% of Group reporting Not Classified**	**Other**	**% of Group reporting "Other"**
Municipality	5	2	40%	0	0%	3	60%	0	0%	0	0%
Non-utility Other	1	0	0%	0	0%	0	0%	0	0%	1	100%
Utility - Co-Op	2	1	50%	0	0%	1	50%	0	0%	0	0%
Utility - IOU	29	14	48%	2	7%	11	38%	1	3%	1	3%
Utility - Municipal	7	4	57%	0	0%	2	29%	0	0%	1	14%
Total	44	21	48%	2	5%	17	39%	1	2%	3	7%

As table 4 illustrates, streetlight locations, in the majority of cases (72%), are determined by some entity within the municipality. In 32% of the cases, the utility recommends streetlight locations to the municipality who then approves the locations.

Table 4: Who determines the number and location of streetlights on a street?

Utility Types and Streetlight Location Determiner									
Type	Count of Responses in Group	Utility	% of Group where Utility Determines	Utility Recommends, Municipality Approves	% of Group where Utility Recommends	Municipality	% of Group where Municipality Determines	Other	% of Group responding "Other"
Municipality	7	0	0%	2	29%	4	57%	1	14%
Non-utility Other	1	0	0%	0	0%	0	0%	1	100%
Utility - Co-Op	2	0	0%	1	50%	1	50%	0	0%
Utility - IOU	45	8	18%	15	33%	18	40%	4	9%
Utility - Municipal	8	4	50%	2	25%	2	25%	0	0%
Total	63	12	19%	20	32%	25	40%	6	10%

Data regarding illuminance levels for different types of roads was inconclusive to determine current practices of utilities or municipalities. Most survey respondents (20 no response and 12 illuminance levels not determined by road type) did not provide data to this question. One respondent's data was deemed inaccurate. The remaining data is insufficient to reach any statistically accurate conclusions. This may be an indication the survey respondents do not have set illuminance levels by street type. Average values from the remaining data by type of roadway are:
Alley – 0.3 foot-candles
Local – 0.96 foot-candles
Collector – 1.0 foot-candles
Major – 1.64 foot-candles

Continuous lighting of roadways, as defined by IESNA, indicates that there is an average illuminance or luminance level and an acceptable uniformity ratio along a portion of a roadway based on the roadway type. Many streets do not require continuous lighting. The survey requested respondents to identify the types of streets where continuous lighting is used. Table 5 presents the findings on the issue of continuous lighting of roadways. Approximately one-third of all respondents indicated continuous lighting was practiced on collector and major road categories. Municipal owners of streetlights and municipal utilities also had a higher response of continuous lighting on local type roadways, 25% and 31% respectively, than IOUs at 22%.

Table 5: What type of streets are designed for continuous/uniform level of street lighting?

Utility Types and Continuous Lighting Streets

Type	Count of Responses in Group	Alley	% of responses indicating Alley	Local	% of responses indicating Local	Collector	% of responses indicating Collector	Major	% of responses indicating Major	Other	% of responses indicating "Other"
Municipality	12	1	8%	3	25%	4	33%	4	33%	0	0%
Non-utility Other	3	0	0%	1	33%	1	33%	1	33%	0	0%
Utility - Co-Op	3	0	0%	1	33%	1	33%	1	33%	0	0%
Utility - IOU	46	3	7%	10	22%	15	33%	17	37%	1	2%
Utility - Municipal	16	0	0%	5	31%	5	31%	5	31%	1	6%
Total	80	4	5%	20	25%	26	33%	28	35%	2	2%

The dominant voltage used for street lighting purposes is 120 volts (62%) followed by 240 volts (28%) as can be seen in Table 6. Very few municipalities or utilities use 480 volts for street lighting purposes. This is attributed to the distribution practices found along most streets. Secondary 120/240 wiring is common along roadways. Utilities, rather than running another set of wires at a different voltage, will tap the streetlights off the secondaries that are found on the pole already.

Table 6: At what voltage do you operate your streetlights?

Utility Types and Operating Voltage Percentages

Type	120 volts	240 volts	277 volts	480 volts
Municipality	59%	36%	0%	5%
Non-utility Other	0%	100%	0%	0%
Utility - Co-Op	70%	5%	25%	0%
Utility - IOU	65%	22%	3%	10%
Utility - Municipal	56%	42%	0%	1%
Total	62%	28%	3%	7%

There were only seven responses to the typical streetlight lamp wattages found by type of street. Similar to the illuminance levels by street type, insufficient data is present to reach any statistically accurate conclusions. Given that most respondents did not provide illuminance levels by street type, not responding to the similar question on wattage by street type could be expected. For the data that was provided the mean wattage lamp by street types are:
Alley – 70 watts
Local – 100 watts
Collector – 150 watts
Major – 250 watts

Lamps used in street lighting applications are now available with a minimum amount of mercury. These lamps have a cost premium over the standard lamps used for street lighting. As Table 7 indicates, most utilities (greater than 80%) have switched to the more ecologically acceptable low mercury lamps and the remaining utilities are considering the switch. The opposite is true for municipal owned streetlights. Most municipalities (80%), while considering a switch to the low mercury lamps, still employ the older technology.

Table 7: Do you use ecologically (low mercury) enhanced streetlight lamps? If no, would you consider using ecologically enhanced streetlight lamps even if they cost more?

Q11 - Low Mercury? Consider Low Mercury?					
Type	**Count of Responses in Group**	**Using Low Mercury**	**% Using Low Mercury**	**Considering Low Mercury**	**% Considering Low Mercury**
Municipality	5	1	20%	4	80%
Non-utility Other	1	0	0%	1	100%
Utility - Co-Op	1	1	100%	0	0%
Utility - IOU	14	11	79%	3	21%
Utility - Municipal	2	2	100%	0	0%
Total	23	15	65%	8	35%

Control of the on/off function of street lighting is performed predominately by a photocell located on each streetlight. Utilities tend to use the photocell more frequently (87% for IOUs and 83% for municipal utilities) than municipally owned street lighting (68%). Master controllers are the second most popular means of controlling streetlights (17%) although far behind photocells. Municipalities that own streetlights are more likely to use master controllers than other entities. See Table 8 for details.

Table 8: How are streetlights controlled for on/off operation?

Utility Types and Automatic Control Options			
Type	**Avg of % - Photocells**	**Avg of % - Time Clock**	**Avg of % - Master Controller**
Municipality	68%	4%	29%
Non-utility Other	20%	0%	80%
Utility - Co-Op	100%	0%	0%
Utility - IOU	87%	0%	12%
Utility - Municipal	83%	0%	17%
Total	82%	1%	17%

The cobra head style streetlight fixture represents two-thirds of all streetlights owned by the survey respondents. This is to be expected because the cost of these fixtures is relatively low compared to any other streetlight fixture. As more areas within a municipality or utility service area are receiving underground utilities, the use of post top, decorative and shoebox style streetlight fixtures are gaining popularity. For IOUs, the use of these three types of

fixtures is split rather evenly (8% for post top, 10% for decorative and 11% for shoebox). Municipalities and municipal utilities tend to favor the post top fixture over decorative or shoe box as illustrated in Table 9.

Table 9: What type of streetlight fixtures are used?

Utility Types and Streetlight Fixture Types					
Type	**Avg of % - Cobra Head**	**Avg of % - Post Top**	**Avg of % - Decorative**	**Avg of % - Shoebox**	**Other**
Municipality	74%	13%	6%	6%	0%
Non-utility Other	90%	0%	10%	0%	0%
Utility - Co-Op	60%	2%	10%	28%	0%
Utility - IOU	67%	8%	10%	11%	5%
Utility - Municipal	66%	20%	5%	9%	0%
Total	69%	10%	8%	10%	3%

Most (54%) of utilities and municipalities are now requiring full cutoff streetlight fixtures be installed. The remaining survey respondents (46%) believe full cutoff street lighting will be required soon.

Table 10: Are you required to use full cutoff streetlight fixtures?

Full Cutoff Required? Coming Soon?					
Type	**Count of Responses in Group**	**Currently Required**	**% of responses indicating Currently Required**	**Required Soon**	**% of responses indicating Required Soon**
Municipality	5	3	60%	2	40%
Utility - IOU	17	9	53%	8	47%
Utility - Municipal	2	1	50%	1	50%
Total	24	13	54%	11	46%

It appears quality of streetlight fixtures matters more in their selection process than cost, availability, aesthetics, brand name or optics to IOUs and municipalities that own streetlights. However, municipal electric utilities care more about cost followed by quality. The order of importance is quality, cost, optics, aesthetics, availability and brand.

Table 11: Prioritize the selection criteria for fixtures and manufacturers.

Utillities and the avg ranking for Selection Criteria							
Type	**Average Ranking - Quality**	**Average Ranking - Cost**	**Average Ranking - Availability**	**Average Ranking - Aesthetics**	**Average Ranking - Brand Name**	**Average Ranking - Optics**	**Average Ranking - Other**
Municipality	1.5	2.4	4.6	3.75	4.75	3.25	
Non-utility Other			1				
Utility - Co-Op	1	3	4	2	5	6	
Utility - IOU	1.35	2.26	4.17	4	4.72	3.57	2
Utility - Municipal	2	1.25	4.33	4.33	5.33	3.5	

The type of material used in dedicated streetlight poles varies greatly (see Table 12). The primary type of pole listed as other was concrete. Wood (29%), aluminum (22%), fiber glass (15%) and concrete are all used extensively. The only type of streetlight pole used in infrequent locations is cast iron. Cast iron poles are the most expensive. Today's cast aluminum poles can mimic the decorative design of cast iron at a fraction of the cost.

Table 12: What type of dedicated streetlight poles are used?

Utility Types and Averages of Streetlight Pole Percentages							
Type	**Avg Fiberglass for Low Mounting Heights**	**Avg Wood for Low Mounting Heights**	**Avg Wood for High Mounting Heights**	**Avg Aluminum for Decorative Fixtures**	**Avg Aluminum for High Mounting Heights**	**Avg Cast Iron for Decorative Fixtures**	**Other**
Municipality	0%	0%	25%	22%	9%	3%	41%
Non-utility Other	0%	0%	0%	0%	2%	0%	98%
Utility - Co-Op	38%	0%	55%	0%	0%	0%	8%
Utility - IOU	18%	5%	28%	13%	4%	1%	25%
Utility - Municipal	12%	1%	14%	33%	16%	0%	24%
Total	15%	3%	26%	16%	6%	1%	29%

Streetlight mounting heights, as depicted in Table 13, are relatively consistent across all types of street lighting entities. Overhead distribution mounting is approximately 28 feet, residential 17 feet, downtown area 24 feet and commercial 21 feet.

Table 13: What is the standard mounting height (feet)?

Utilities and Averages of Standard Pole Mounting Heights

Type	Overhead Distribution	Residential Neighborhoods	Downtown	Decorative, Commercial	Interstates
Municipality	30	16.6	26	22.4	41.67
Non-utility Other			20		40
Utility - Co-Op	22.5	16		22.5	25
Utility - IOU	27.43	16.71	23.06	21	34.77
Utility - Municipal	29.5	18.5	25.75	19	48.33
Total	27.85	16.9	23.93	21.16	37.48

Most streetlight records are computerized (63%) with a large number of entities keeping both computer and paper records (32%). IOUs and municipal utilities are more likely to keep computerized records (70% and 60% respectively) than municipalities that own streetlights (43%) as is shown in Table 14.

Table 14: How are streetlight records kept?

Utilities and Method of Keeping Streetlight Records

Type	Count of Responses in Group	Computerized	% of responses indicating Computerized	Paper	% of responses indicating Paper	Both	% of responses indicating Both
Municipality	7	3	43%	2	29%	2	29%
Non-utility Other	1	1	100%	0	0%	0	0%
Utility - Co-Op	2	1	50%	0	0%	1	50%
Utility - IOU	23	16	70%	0	0%	7	30%
Utility - Municipal	5	3	60%	0	0%	2	40%
Total	38	24	63%	2	5%	12	32%

Streetlight record keeping is depicted on Table 15. The information included on streetlight records varies by entity. All survey respondents indicated the records include the location of the streetlight. Most entities also keep records on fixture type, lamp type, lamp size, date of installation, voltage and pole type. For IOUs and municipal utility companies who rent lights to customers, the entity paying for the streetlight rental and the amount of the rental are also included in most record systems.

Table 15: What information is kept in streetlight records?

Type	Count of Responses in Group	Location	% of Responses Indicating Location records kept	Fixture Type	% of Responses indicating Fixture Type records kept
Municipality	7	7	100%	6	86%
Non-utility Other	1	1	100%	0	0%
Utility - Co-Op	2	2	100%	1	50%
Utility - IOU	24	24	100%	19	79%
Utility - Municipal	6	6	100%	6	100%

Type	Lamp Type	% of Responses indicating Lamp Type records kept	Lamp Size	% of Responses Indicating Lamp Size records kept	Maintenance	% of Responses Indicating Maintenance records kept
Municipality	6	86%	5	71%	4	57%
Non-utility Other	0	0%	0	0%	0	0%
Utility - Co-Op	1	50%	1	50%	1	50%
Utility - IOU	19	79%	23	96%	12	50%
Utility - Municipal	6	100%	6	100%	1	17%

Type	Date Initially Installed	% of Responses indicating Date Initially Installed records kept	Date Replacement Fixture Installed	% of Responses indicating Date Replacement Fixture Installed	Voltage	% of Responses indicating Voltage
Municipality	4	57%	4	57%	5	71%
Non-utility Other	0	0%	0	0%	0	0%
Utility - Co-Op	1	50%	0	0%	0	0%
Utility - IOU	19	79%	11	46%	16	67%
Utility - Municipal	5	83%	1	17%	5	83%

Type	Notes	% of Responses Indicating Notes	% of Responses indicating Light Rental Payor	Pole Type	% of Responses Indicating Pole Type
Municipality	3	43%	14%	4	57%
Non-utility Other	0	0%	0%	0	0%
Utility - Co-Op	0	0%	100%	1	50%
Utility - IOU	8	33%	79%	18	75%
Utility - Municipal	1	17%	100%	6	100%

Type	Rental Charge	% of Responses indicating Rental Charge	Special Options Installed	% of Responses indicating Special Options Installed	Other	% of Responses Indicating Other
Municipality	0	0%	1	14%	0	0%
Non-utility Other	0	0%	0	0%	0	0%
Utility - Co-Op	2	100%	0	0%	0	0%
Utility - IOU	13	54%	7	29%	2	8%
Utility - Municipal	1	17%	0	0%	0	0%

Table 16 indicates half of the respondents (50%) use the National Electrical Safety Code (NESC) when constructing streetlight facilities. IOUs (63%) and municipal utilities (56%) use NESC more so than municipal entities that own streetlights (23%). This should be expected since utilities, in general, abide by NESC for all their construction safety requirements. Because there are more responses to this survey question than there are responding organizations, it is possible the responses indicate that multiple safety codes are used within the same entity. Municipalities that own streetlights tend to use either the National Electrical Code (31%) or state safety codes (38%). However, a large percentage

(23%) also use the NESC. Again the response from municipalities is in line with the code requirements for non-utility entities.

Table 16: What safety standards are followed?

Utility Types and Safety Standards Used									
Type	Count of Responses in Group	NEC	% reporting NEC	NESC	% reporting NESC	State	% reporting State	Other	% reporting Other
Municipality	13	4	31%	3	23%	5	38%	1	8%
Non-utility Other	2	1	50%	0	0%	1	50%	0	0%
Utility - Co-Op	4	2	50%	2	50%	0	0%	0	0%
Utility - IOU	30	8	27%	19	63%	2	7%	1	3%
Utility - Municipal	9	0	0%	5	56%	3	33%	1	11%
Total	58	15	26%	29	50%	11	19%	3	5%

Installation and Installation Practices – Overhead Distribution of Survey Respondents

Surprisingly, the majority (58%) of entities responding to who installs streetlights on overhead distribution facilities indicate they use qualified high voltage linemen. (see Table 17) High voltage linemen are expensive workers to install streetlights. Only 17% of IOUs and municipal utilities use dedicated low voltage linemen, normally a lower cost worker. Municipalities who own streetlights indicated they use low voltage linemen in 50% of the cases. This is expected because high voltage lineman are normally not required within municipalities. There are also a large number of streetlight entities (22%) that use either low or high voltage linemen.

Table 17: What are the qualification of the overhead distribution streetlight installers?

Utilities and Qualifications of Overhead Dist Installers							
Type	Count of Responses in Group	Qualified High Voltage Linemen	% of responses indicating High Voltage Linemen	Qualified Low Voltage Linemen	% of responses indicating Low Voltage Linemen	Both	% of responses indicating Both
Municipality	4	1	25%	2	50%	1	25%
Utility - Co-Op	2	2	100%	0	0%	0	0%
Utility - IOU	24	13	54%	4	17%	7	29%
Utility - Municipal	6	5	83%	1	17%	0	0%
Total	36	21	58%	7	20%	8	22%

Who pays for the installation of streetlights on overhead distribution facilities in new developments is depicted in Table 18. Overall, in 43% of the cases, the developer pays for streetlight installation. However, in 40% of the cases, there is no charge for streetlight installations. There are dramatic differences on who pays based on the type of entity that

owns the streetlights. For municipalities that own streetlights, developers pay for new streetlights 83% of the time with the municipality paying 17% of the time. In the case of IOUs, there is no charge 56% of the time and 30% of the time the developer is charged for new streetlights. Municipal utilities also favor the developer paying for new streetlights in 57% of the cases.

Table 18: Who pays for streetlights in new developments on overhead distribution poles?

Utility Type and Overhead Installation Payor							
Type	Count of Responses in Group	Developer	% reporting Developer	Municipality	% reporting Municipality	No Charge	% reporting No Charge
Municipality	6	5	83%	1	17%	0	0%
Utility - Co-Op	2	1	50%	0	0%	1	50%
Utility - IOU	27	8	30%	4	15%	15	56%
Utility - Municipal	7	4	57%	2	29%	1	14%
Total	42	18	43%	7	17%	17	40%

The issue of dedicated streetlight wiring versus streetlights served off of existing secondary distribution wires is split essentially evenly (49% vs. 51%) as indicated in Table 19. Municipalities that own streetlights and municipal utilities favor dedicated secondary wiring for streetlights (67% each) while IOUs favor serving streetlights off existing secondary distribution systems (60%).

Table 19: Are separate/dedicated secondary wiring used for streetlights on overhead distribution poles?

Utilities and Separate/Dedicated Secondary Wiring					
Type	Count of Responses in Group	Uses Separate or Dedicated Secondary Wiring	% responding Uses	Does Not Use Separate or Dedicated Secondary Wiring	% responding Does Not Use
Municipality	6	4	67%	2	33%
Utility - Co-Op	2	1	50%	1	50%
Utility - IOU	25	10	40%	15	60%
Utility - Municipal	6	4	67%	2	33%
Total	39	19	49%	20	51%

Streetlight grounding practices on overhead distribution systems vary by the type of entity owning the streetlights (see Table 20). It appears utilities favor bonding the streetlight neutral only to the secondary neutral conductor of the secondary distribution system (45% for IOUs and 83% for municipal utilities). This practice may be linked to the use of the NESC by many utilities. Twenty-one percent of IOUs responding to the survey also use a ground rod at each overhead pole and bond both the streetlight neutral conductor and the equipment

ground to the grounding rod. Municipalities that own streetlights appear to favor the NEC grounding requirements to bond to an equipment ground. Again, this may be due to their use of the NEC in their construction practices.

Table 20: What type of grounding practices are employed for streetlights on overhead distribution systems?

Type	Count of Responses in Group	Secondary Neutral	% reporting Seconday Neutral	Driven Rod	% reporting Driven Rod	Equipment	% reporting Equipment
Municipality	5	1	20%	1	20%	2	40%
Utility - Co-Op	2	1	50%	1	50%	0	0%
Utility - IOU	33	15	%	3	9%	2	6%
Utility - Municipal	6	5	83%	0	0%	0	0%
Total	46	22	48%	5	11%	4	9%

Type	Neutral and Ground Together	% reporting Neutral and Ground Together	None	% reporting None	Other	% reporting Other
Municipality	1	20%	0	0%	0	0%
Utility - Co-Op	0	0%	0	0%	0	0%
Utility - IOU	7	21%	5	15%	1	3%
Utility - Municipal	1	17%	0	0%	0	0%
Total	9	19%	5	11%	1	2%

Installation and Installation Practices –
Underground/Direct Buried Distribution of Survey Respondents

There is a consistency of responses from municipalities that own streetlights and municipal utilities as to who installs streetlights on both overhead and underground distribution systems. By comparing the responses on Table 17 (Overhead Distribution Installers) and Table 21 below, we see identical percentages for municipalities that own streetlights, 25% installed by high voltage linemen, 50% installed by low voltage linemen or splicers and 25% installed by a mixture of either high or low voltage linemen. The percentages are close to being the same for municipal utilities for both overhead and underground distribution systems. IOUs have a shift from 54% using high voltage linemen on overhead distribution systems to install streetlights to 25% on underground systems. The shift is toward using either high or low voltage personnel (29% for overhead to 42% for underground).

Table 21: What are the qualifications of the underground streetlight installers?

Utilities and Qualifications of Underground Dist Installers									
Type	Count of Responses in Group	High Voltage Cable Splicers	% of responses indicating High Voltage Cable Splicers	High Voltage Linemen	% of responses indicating High Voltage Linemen	Low Voltage Linemen/ Splicers	% of responses indicating Low Voltage Linemen/Splicers	Mixture	% of responses indicating Mixture
Municipality	4	0	0%	1	25%	2	50%	1	25%
Non-utility Other	1	0	0%	0	0%	1	100%	0	0%
Utility - Co-Op	2	0	0%	2	100%	0	0%	0	0%
Utility - IOU	24	2	8%	6	25%	5	21%	10	42%
Utility - Municipal	6	0	0%	4	67%	1	17%	1	17%
Total	37	2	5%	13	35%	9	24%	12	32%

Table 22 indicates where conduit is used for streetlight wiring in underground distribution systems. Municipalities that own streetlights have more of a tendency to use conduit all the time (50%) followed by municipal utilities at 40% and then IOUs at 25%. If not using conduit all the time, the entities have a tendency to use conduit under pavement and within downtown areas. The use of conduit for streetlight wiring in residential areas occurs only 15% of the time according to the survey respondents.

Table 22: Is conduit used for underground streetlight wiring?

Type	Count of Responses in Group	Always Underground	% reporting Always Underground	Never Underground	% reporting Never Underground
Municipality	10	5	50%	0	0%
Non-utility Other	1	1	100%	0	0%
Utility - Co-Op	3	0	0%	0	0%
Utility - IOU	36	9	25%	0	0%
Utility - Municipal	10	4	40%	0	0%
Total	60	19	32%	0	0%

Type	Under Pavement	% reporting Under Pavement	Downtown	% reporting Downtown	Residential	% reporting Residential
Municipality	1	10%	2	20%	2	20%
Non-utility Other	0	0%	0	0%	0	0%
Utility - Co-Op	1	33%	1	33%	1	33%
Utility - IOU	12	33%	10	28%	5	14%
Utility - Municipal	3	30%	2	20%	1	10%
Total	17	28%	15	25%	9	15%

The dominant response as to who is responsible for installing street lighting conduit in new developments is the developer (56%) followed by the utility (36%) according to the results of the survey as shown on Table 23 below. When the municipality owns the streetlights, the developer has the responsibility for the conduit installation 86% of the time. Municipal utilities also lean toward the developer installing the conduit (67%). IOUs are relatively evenly split between developers (47%) and the utility (41%) as to who will install the conduit.

Table 23: Who is responsible for the installation of any required conduit in new construction developments?

Utilities and New Const Conduit Install Responsibility							
Type	Count of Responses in Group	Utility	% reporting Utility	Municipality	% reporting Municipality	Developer	% reporting Developer
Municipality	7	1	14%	0	0%	6	86%
Non-utility Other	1	0	0%	0	0%	1	100%
Utility - Co-Op	2	1	50%	0	0%	1	50%
Utility - IOU	34	14	41%	4	12%	16	47%
Utility - Municipal	6	2	33%	0	0%	4	67%
Total	50	18	36%	4	8%	28	56%

The responsibility for excavation in new developments for the installation of streetlight wiring in underground distribution areas follows closely the results found for who is responsible for installing conduits in underground distribution areas as shown in Table 23. Table 24 shows the same percentages for who is responsible for excavation as is shown in Table 23 when the municipality owns the streetlights. For municipal utilities and IOUs, there is a slight shift toward the utility doing the excavation.

Table 24: Who is responsible for the excavation for the installation of streetlights and streetlight wiring in new construction developments?

Utilities and Excavation Responsibility in New Construction							
Type	Count of Responses in Group	Utility	% reporting Utility	Municipality	% reporting Municipality	Developer	% reporting Developer
Municipality	7	1	14%	0	0%	6	86%
Non-utility Other	1	0	0%	0	0%	1	100%
Utility - Co-Op	2	1	50%	0	0%	1	50%
Utility - IOU	29	15	52%	3	10%	11	38%
Utility - Municipal	7	3	43%	0	0%	4	57%
Total	46	20	43%	3	7%	23	50%

The utility is most likely (70%) to provide and install the streetlight wiring in underground distribution area (see Table 25 below). The exception to this response is where the municipality owns the streetlights. In this case, the developer of the new development is more likely to provide and install the streetlight wiring (57%) with the utility installing the wiring 43% of the time.

Table 25: Who is responsible for providing and installing the underground wiring for streetlights?

Utilities and Provide & Install Underground Wires							
Type	Count of Responses in Group	Utility	% reporting Utility	Municipality	% reporting Municipality	Developer	% reporting Developer
Municipality	7	3	43%	0	0%	4	57%
Non-utility Other	1	0	0%	0	0%	1	100%
Utility - Co-Op	2	2	100%	0	0%	0	0%
Utility - IOU	30	23	77%	3	10%	4	13%
Utility - Municipal	6	4	67%	0	0%	2	33%
Total	46	32	70%	3	6%	11	24%

Most entities (80%) that own streetlights in underground distribution areas install separate or dedicated wires to the streetlights as depicted in Table 26.

Table 26: Are separate/dedicated secondary wiring used for streetlights in underground distribution areas?

Utilities and Secondary or Dedicated Underground Wiring					
Type	Count of Responses in Group	Uses Separate or Dedicated Secondary Wiring	% responding Uses	Does Not Use Separate or Dedicated Secondary Wiring	% responding Does Not Use
Municipality	7	7	100%	0	0%
Non-utility Other	1	1	100%	0	0%
Utility - Co-Op	3	2	67%	1	33%
Utility - IOU	24	18	75%	6	25%
Utility - Municipal	6	5	83%	1	17%
Total	41	33	80%	8	20%

In new developments with underground electric distribution systems, the property developer is most likely to pay for the installation of the streetlights in total (56%) or the differential cost between overhead and underground streetlights (15%). Only for 8% of the IOUs responses are no charges assessed. In some instances (12%), the municipality pays for the

installation of streetlights in new developments in underground distribution areas. (see Table 27)

Table 27: Who pays for the installation of streetlights in new developments with underground distribution?

Utilities and Underground New Dev Installation Payor											
Type	Count of Responses in Group	Utility	% reporting Utility	Developer	% reporting Developer	Municipality	% reporting Municipality	No Charge	% reporting No Charge	Differential	% reporting Differential
Municipality	7	0	0%	6	86%	1	14%	0	0%	0	0%
Non-utility Other	1	0	0%	1	100%	0	0%	0	0%	0	0%
Utility - Co-Op	3	1	33%	1	33%	0	0%	0	0%	1	33%
Utility - IOU	36	5	14%	16	44%	5	14%	3	8%	7	19%
Utility - Municipal	5	0	0%	5	100%	0	0%	0	0%	0	0%
Total	52	6	12%	29	55%	6	12%	3	6%	8	15%

When the installation of streetlights shifts to existing streets in underground electric distribution areas, the entity responsible for costs associated with the installation of the streetlights also shifts. Municipalities are more likely to pay any installation costs associated with streetlights (40%) followed by the developer (29%).

Table 28: Who pays for the installation of streetlights on existing streets with underground distribution?

Utilities and Underground Existing Strts Install Payor											
Type	Count of Responses in Group	Utility	% reporting Utility	Developer	% reporting Developer	Municipality	% reporting Municipality	No Charge	% reporting No Charge	Differential	% reporting Differential
Municipality	6	0	0%	2	33%	4	67%	0	0%	0	0%
Non-utility Other	1	0	0%	1	100%	0	0%	0	0%	0	0%
Utility - Co-Op	4	0	0%	0	0%	2	50%	1	25%	1	25%
Utility - IOU	35	5	14%	10	29%	12	34%	3	9%	5	14%
Utility - Municipal	6	1	17%	2	33%	3	50%	0	0%	0	0%
Total	52	6	12%	15	29%	21	40%	4	7%	6	12%

Municipalities that own streetlights are most likely to use driven ground rods at each streetlight within underground distribution areas (80%). IOUs and municipal utilities are less likely to use grounding rods (38% and 50% respectively) as Table 29 illustrates. The use of ground rods may be tied to which safety code is used by the streetlight entity. Municipalities that own streetlights tend to follow the NEC while utilities tend to use NESC.

Table 29: Are driven ground rods used for streetlights in underground areas?

Utilities and Driven Ground					
Type	Count of Responses in Group	Yes	% reporting Yes	No	% reporting No
Municipality	5	4	80%	1	20%
Non-utility Other	1	0	0%	1	100%
Utility - Co-Op	2	0	0%	2	100%
Utility - IOU	21	8	38%	13	62%
Utility - Municipal	6	3	50%	3	50%
Total	35	15	43%	20	57%

For those entities that use grounding rods, the impedance to ground varies as described in Table 30. Given the small response to this question, it is difficult to imply any statistically significant conclusions.

Table 30: If driven grounds are used, what are the impedance requirements?

Utilities and Impedance of Driven Ground							
Type	Count of Responses in Group	<= 25 ohm	% reporting <= 25 ohm	<= 50 ohm	% reporting <= 50 ohm	No Req	% reporting No Req
Municipality	1	1	100%	0	0%	0	0%
Utility - IOU	5	1	20%	2	40%	2	40%
Utility - Municipal	1	0	0%	0	0%	1	100%
Total	7	2	29%	2	29%	3	42%

Table 31 indicates the number of conductors distributed to streetlights in underground distribution areas. There is no dominant answer as to how many conductors. Thirty-six percent of respondents use a two wire conductor with a hot leg and neutral, 22% use a three wire conductor with hot, neutral and ground and 42% use two hot legs and the neutral.

Table 31: When serving underground fed streetlights, how many conductors are installed between the transformer and the streetlight pole?

Utilities and No. Conductors for Underground Fed Streetlights							
Type	Count of Responses in Group	Hot Leg and Neutral	% reporting Hot Leg and Neutral	Hot Leg, Neutral and Ground	% reporting Hot Leg, Neutral and Ground	Two Hot Legs and Neutral	% reporting Two Hot Legs and Neutral
Municipality	5	0	0%	2	40%	3	60%
Utility - Co-Op	2	2	100%	0	0%	0	0%
Utility - IOU	23	8	35%	5	22%	10	43%
Utility - Municipal	6	3	50%	1	17%	2	33%
Total	36	13	36%	8	22%	15	42%

Fuses are used by most of the streetlight entities (91%) responding to the survey as shown on Table 32. The location of the fuse varies widely from the transformer or controller (23%), the hand hole or streetlight pole base (48%) to a two location scheme of the transformer and the pole base (20%). Municipalities that own streetlights and municipal utilities prefer the hand hole or the pole base (100% and 57% respectively) while IOUs have no preference.

Table 32: Where are the fuses located on underground street lighting circuits?

Utilities and Fuse Locations on Underground Circuits									
Type	Count of Responses in Group	No Fuses	% reporting No Fuses	Transformer or Controller	% reporting Transformer or Controller	Hand Hole or Pole Base	% reporting Hand Hole or Pole Base	Transformer and pole base	% reporting Transformer and pole base
Municipality	5	0	0%	0	0%	5	100%	0	0%
Non-utility Other	1	0	0%	0	0%	1	100%	0	0%
Utility - Co-Op	2	0	0%	1	50%	1	50%	0	0%
Utility - IOU	29	4	14%	8	28%	10	34%	7	24%
Utility - Municipal	7	0	0%	1	14%	4	57%	2	29%
Total	44	4	9%	10	23%	21	48%	9	20%

Street Lighting Maintenance Practices

Table 33 delineates who performs routine streetlight maintenance for the different streetlight owning entities. All entities favor the use of dedicated streetlight maintenance crews (56% for municipalities that own streetlights, 44% for IOUs and 71% for municipal utilities). IOUs are also more likely than the other street lighting entities to use contractors to maintain their streetlights (32%).

Table 33: Who performs routine maintenance on streetlights?

Utilities and Performers of Routine Maintenance							
Type	Count of Responses in Group	Dedicated Crews	% reporting Dedicated Crews	Regular Line Crews	% reporting Regular Line Crews	Contractors	% reporting Contractors
Municipality	9	5	56%	3	33%	1	11%
Non-utility Other	1	0	0%	1	100%	0	0%
Utility - Co-Op	3	1	33%	1	33%	1	33%
Utility - IOU	34	15	44%	8	24%	11	32%
Utility - Municipal	7	5	71%	1	14%	1	14%
Total	54	26	48%	14	26%	14	26%

Of the streetlight maintenance personnel used, 50% are fully qualified high voltage linemen, 39% are low voltage linemen, 9% are other and 2% have no special qualifications. Utilities, both IOUs and municipal, are more likely to use high voltage linemen (52% and 71% respectively) than are municipalities that own streetlights (14%). Municipalities that own streetlights tend to use low voltage linemen.

Table 34: What are the qualifications of personnel maintaining the streetlights?

Utilities and Qualifications of Maintenance Personnel									
Type	Count of Responses in Group	HV Linemen	% reporting HV Linemen	LV Linemen	% reporting LV Linemen	Other	% reporting Other	No Special Qualification	% reporting No Special Qualification
Municipality	7	1	14%	4	57%	2	29%	0	0%
Non-utility Other	1	0	0%	0	0%	1	100%	0	0%
Utility - Co-Op	2	2	100%	0	0%	0	0%	0	0%
Utility - IOU	27	14	52%	11	41%	1	4%	1	4%
Utility - Municipal	7	5	71%	2	29%	0	0%	0	0%
Total	44	22	50%	17	39%	4	9%	1	2%

Table 35 indicates most streetlight entities do not perform group relamping, 62% - no vs. 38% - yes. Municipalities that own streetlights are more likely to group relamp than the other entities. The average group relamping cycle is 4.1 years. It does not differ greatly from the average replacement cycle of those entities that report they do not group relamp.

Table 35: Is group relamping performed? If group relamping, what is the interval between relamping?

Utilities and Group Relamping							
Type	Count of Responses in Group	Yes	% reporting Yes	No	% reporting No	Avg Interval Reported by those responding "Yes"	Avg Interval Reported by those responding "No"
Municipality	8	4	50%	4	50%	4	4
Non-utility Other	1	1	100%	0	0%	6	
Utility - Co-Op	2	0	0%	2	100%		
Utility - IOU	25	10	40%	15	60%	4	4.5
Utility - Municipal	6	1	17%	5	83%	3	
Total	42	16	38%	26	62%	4.1	4.3

A secondary method of examining the question of group relamping is by the number of streetlights owned rather than the type of entity owning the streetlights. The low (less than

10,000 streetlights) number of streetlights owned group appears to group relamp more so that the other size entities.

Table 35A

Streetlights Owned and Group Relamping							
Number of Streetlights	Count of Responses in Group	Yes	% reporting Yes	No	% reporting No	Avg Interval Reported by those responding "Yes"	Avg Interval Reported by those responding "No"
Less than 10,000	4	2	50%	2	50%	5	
10,000 to 50,000	8	1	12%	7	88%	4	4
50,000 to 100,000	13	6	46%	7	54%	3.5	4
More than 100,000	17	7	41%	10	59%	4.33	5
Total	42	16	38%	26	62%	4.1	4.3

Most entities that own streetlights conduct an inventory either at the time of group relamping (16%) or as a separate activity (55%). Only 29% do not conduct any type of inventory of installed streetlights. (see Table 36 below) However, IOUs are more likely to conduct inventories of installed streetlights (83%) than are either municipalities that own streetlights (50%) or municipal utilities (60%).

Table 36: Is inventorying of streetlight conducted periodically?

Utilities and Streetlight Inventory Practices							
Type	Count of Responses in Group	Part of Group Relamping	% reporting Part of Group Relamping	Conducted Separately	% reporting Conducted Separately	No Inventory	% reporting No Inventory
Municipality	6	1	17%	2	33%	3	50%
Non-utility Other	1	0	0%	0	0%	1	100%
Utility - Co-Op	2	0	0%	1	50%	1	50%
Utility - IOU	24	5	21%	15	62%	4	17%
Utility - Municipal	5	0	0%	3	60%	2	40%
Total	38	6	16%	21	55%	11	29%

The majority (79%) of streetlight owning entities responding to the survey, as depicted in Table 37, do not inspect streetlight wiring for deterioration, shorts or wear. However, 50% of municipalities that own streetlights do inspect their streetlight wiring. Of the entities that do inspect wiring, the average frequency is 6.67 years.

Table 37: Is regular inspection of streetlight wiring for deterioration, shorts or wear performed?

Type	Count of Responses in Group	Yes	% reporting Yes	No	% reporting No	Avg Frequency Reported by those responding "Yes"
Municipality	6	3	50%	3	50%	5
Non-utility Other	1	0	0%	1	100%	
Utility - Co-Op	2	0	0%	2	100%	
Utility - IOU	24	4	17%	20	83%	7.5
Utility - Municipal	6	1	17%	5	83%	
Total	39	8	21%	31	79%	6.67

Given the number of responses to the question of who reports streetlight outages, it is obvious that many streetlight owning entities have multiple groups reporting outages. The most frequent group that reports streetlight outages are the general public at 55%. Police and people within the streetlight owning entity at 21% each also play key roles in reporting streetlight outages.

Table 38: What is the primary method for streetlight outage reporting?

Utilities and Primary Method of Outage Reports									
Type	Count of Responses in Group	Customers Report Outages	% reporting Customers Report Outages	Police Report Outages	% reporting Police Report Outages	Dedicated Person Reports Outages	% reporting Dedicated Person Reports Outages	Other	% reporting Other
Municipality	13	7	54%	2	15%	4	31%	0	0%
Non-utility Other	1	1	100%	0	0%	0	0%	0	0%
Utility - Co-Op	2	2	100%	0	0%	0	0%	0	0%
Utility - IOU	44	23	52%	11	25%	8	18%	2	5%
Utility - Municipal	11	6	55%	2	18%	3	27%	0	0%
Total	71	39	55%	15	21%	15	21%	2	3%

Survey respondents reported only replacing streetlight fixtures, poles and wiring upon failure of the asset. (see Table 39 below)

Table 39: How often are streetlight fixtures, poles and wiring replaced?

Utilities and Fixture, Pole & Wiring Replacemer			
Type	**Number Reporting Replaced on Fixture Failure Only**	**Number Reporting Replaced on Pole Failure Only**	**Number Reporting Replaced on Wiring Failure Only**
Municipality	6	6	6
Non-utility Other	1	1	1
Utility - Co-Op	2	2	2
Utility - IOU	24	23	23
Utility - Municipal	6	6	6
Total	39	38	38

The annual cost to maintain streetlights on a per streetlight basis is depicted on Table 40 below. There was a wide range of costs per streetlight per year reported in the survey with municipalities that own streetlights reporting a higher cost than the utilities. An expected cost might be in the $40 range based on spot relamping with a fully qualified high voltage lineman and replacement every four years.

Table 40: What is the cost for maintenance per streetlight per year?

Utilities and Cost for Maintenance per Streetlight per Yr			
Type	**Range-Low**	**Range-High**	**Average**
Municipality	$85	$400	$260.50
Utility - IOU	$10	$50	$27
Utility - Municipal	$25	$382	$203.50

Training

There is some kind of training provided to most people involved in the design of streetlight systems. However, the majority of the training (57%) is on the job. Some street lighting owning entities (23%) provide classroom training in addition to on the job training.

Table 41: What type of training is given to the people designing streetlight systems?

Utilities and Streetlight System Designer Training									
Type	Count of Responses in Group	None	% reporting None	On The Job	% reporting On The Job	Classroom	% reporting Classroom	Other	% reporting Other
Municipality	9	0	0%	6	67%	2	22%	1	11%
Non-utility Other	1	0	0%	1	100%	0	0%	0	0%
Utility - Co-Op	2	0	0%	1	50%	0	0%	1	50%
Utility - IOU	30	2	7%	16	53%	7	23%	5	17%
Utility - Municipal	7	0	0%	4	57%	2	29%	1	14%
Total	49	2	4%	28	57%	11	23%	8	16%

Installers of street lighting equipment also receive some type of training. Thirty-seven percent receive low voltage training and another 37% receive special training on the installation of streetlight equipment.

Table 42: What type of training is given to people installing streetlights?

Utilities and Streetlight Installer Training									
Type	Count of Responses in Group	None	% reporting None	Low Voltage	% reporting Low Voltage	Special Correct Install Training	% reporting Special Correct Install Training	Other	% reporting Other
Municipality	5	0	0%	2	40%	2	40%	1	20%
Non-utility Other	1	0	0%	0	0%	0	0%	1	100%
Utility - Co-Op	2	0	0%	0	0%	0	0%	2	100%
Utility - IOU	24	2	8%	11	46%	9	38%	2	8%
Utility - Municipal	6	1	17%	1	17%	3	50%	1	17%
Total	38	3	8%	14	37%	14	37%	7	18%

The number of responses to the question regarding streetlight inspectors indicates some of the streetlight owners do not have dedicated streetlight inspectors. Fifty-five percent of those that do have inspectors do provide some type of formal training. (see Table 43 below)

Table 43: What type of training is given to inspectors of streetlight systems?

Utilities and Dedicated Inspector Training							
Type	**Count of Responses in Group**	**None**	**% reporting None**	**Some**	**% reporting Some**	**Other**	**% reporting Other**
Municipality	4	0	0%	3	75%	1	25%
Utility - IOU	13	5	38%	7	54%	1	8%
Utility - Municipal	3	2	67%	1	33%	0	0%
Total	20	7	35%	11	55%	2	10%