

A GUIDE TO CONSTRUCTING, OPERATING, AND MAINTAINING HIGHWAY LIGHTING SYSTEMS

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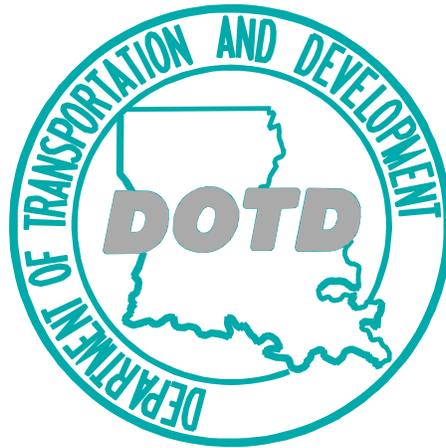


TABLE OF CONTENTS

INTRODUCTION	i
LIGHTING ON STATE HIGHWAYS	1
LIGHTING ON INTERSTATE HIGHWAYS	1
LIGHTING ON ROUNDABOUTS	2
WARRANTIES, SYSTEM LIFE, AND RENOVATIONS	2
OPERATING THE SYSTEM	2
STOCKING OF SPARE PARTS	2
MAINTENANCE OF THE SYSTEM	3
OPERATING AND MAINTENANCE COST	3
PROCEDURE FOR APPLYING FOR ROADWAY LIGHTING	4
SAMPLE RESOLUTION	5
SAMPLE ENTITY/STATE AGREEMENT	6
SAMPLE ROADWAY LIGHTING SYSTEM OPERATIONAL PLAN	13
MANAGING THE SYSTEM	13
FINANCING THE OPERATION	13
SAMPLE MAINTENANCE AGREEMENT	14
SAMPLE REPAIR REPORT	15
SAMPLE MONITORING AND INSPECTION REPORT	16
LIGHTING DESIGN STANDARDS FOR INTERSTATE ROADS AND INTERCHANGES	A

INTRODUCTION

The purpose of this guide is to provide a comprehensive source of information concerning the Department's current policies for new roadway lighting installations on State rights-of-way.

The material presented in this guide establishes uniform procedures and standards for constructing and maintaining new roadway lighting systems on state rights-of-way.

The illumination requirements are based on the industry consensus of providing maximum illumination benefits at reasonable costs. The illumination requirements in this guide are not necessary for safe driving or seeing and do not set a safety standard.

Light pole location requirements are formulated to minimize the probability of vehicular pole collision. The requirements define the limits of individual designer discretion in the routine locating of new poles. The location requirements do not set a safety standard for placement of poles.

Nothing in this guide mandates, requires, nor obligates any government agency or entity to provide roadway lighting.

The requirements of this guide are not applicable retroactively to existing lighting systems. Requirements for existing systems will continue to be governed by the original agreements and any subsequent amendments to those agreements. All new lighting agreements will incorporate the requirements of this guide.

Because of the following combined factors, unlighted roads are considered safe for traveling under varying local conditions.

1. Roadway design features including geometry, speed limits etc., are set independently of fixed roadway lighting.
2. All vehicles traveling on public roads are required to have headlights.
3. Operators are required to adjust their driving for existing local conditions.

Although the highways are designed to be safe without fixed roadway lighting, fixed roadway lighting may provide increased visibility, better obstacle recognition at higher speeds, and increased driving comfort. This is expected to result in more efficient traffic flow, greater driver security, and economic growth.

LIGHTING ON STATE HIGHWAYS

- A. The department does not normally provide fixed lighting on state highways because fixed lighting is not essential for safety.
- B. On structures (bridges etc.) in urban areas, the department may provide the necessary prerequisites (mounting bracket and anchor bolts for light poles) as part of the structure.
- C. Local political subdivisions (entity) may at their own expense, provide roadway lighting on state highway rights-of-way, provided a DOTD permit is obtained prior to installing any equipment. Application for the permit must be made to the DOTD district office. All installations on DOTD rights-of-way must conform to the requirements outlined in the LOUISIANA ADMINISTRATIVE CODE, TITLE 70, PART II, Chapter 5. The Administrative Codes can be found on the Division of Administration's web site (www.doa.la.gov): "...Average initial level of illumination shall not be less than 0.8 FC on the roadway; The ratio of average initial illumination to minimum initial illumination at any point on the roadway shall not be greater than 4:1; Luminaire mounting heights shall be 30 feet minimum..." The summary standards above are generalized. Specific design circumstances may call for variations. All illumination designs must fall within guidelines established by IES/ANSI RP-8. The design engineer is required to check for local ordinances regarding illumination standards. Where local standards differ from this guide or RP-8 the more stringent governs.
- D. Acceptable light sources for state highways are: high pressure sodium (HPS), metal halide (MH), induction, and light emitting diode (LED). The illumination requirements are the same regardless of source type. The maximum color temperature of LED and induction lights shall be 4000K.
- E. The illumination values for state highways contained in this Guide are generalized to fit a typical situation. Specific design circumstances may call for variations. All illumination designs must fall within the accepted national guidelines established by IES/ANSI RP-8 and the IES Lighting Handbook. See also AASHTO "Roadway Lighting Design Guide". The design engineer is required to check for local ordinances regarding illumination standards. Where local standards differ from this guide the more stringent governs.

LIGHTING ON INTERSTATE HIGHWAYS

- A. When requested by the local political subdivision (entity), and where warranted under DOTD and F.H.W.A. policies, the department may design and construct the lighting system.
- B. The entity must agree to pay the federal matching funds (usually 10% of the total construction cost) for construction of the system.
- C. The entity must also agree to assume the legal liability for, and all maintenance and operating cost, associated with the system.
- D. Past maintenance performance on existing lighting systems will be considered before additional systems are provided to a political subdivision.

- E. For design guidelines see section LIGHTING DESIGN STANDARDS FOR INTERSTATE ROADS AND INTERCHANGES found at the end of this Guide.

LIGHTING ON ROUNDABOUTS

When lighting is provided for roundabouts it shall comply with IES DG-19.

INTERSTATE LIGHTING WARRANTIES, SYSTEM LIFE, AND RENOVATIONS

- A. DOTD does not warranty or guarantee the system whatsoever. The DOTD contractor guarantees all material and work for a period of one year after final acceptance of the project. Standard manufacturers' warranties may be for longer periods. Upon expiration of the contractor's warranty, the political subdivision (entity) will assume the responsibility of repairs to the system, including the correction of defects.
- B. System design life is for a minimum of 25 years; however, attainment of design life will not relieve the political subdivision of legal responsibilities for proper maintenance of the system. When alterations and changes are made to the roadway, or because of new technology, programs, and policies, the system may be considered functionally obsolete, DOTD may evaluate the system and consider it for renovation. The condition of the basic components of the system (lights, poles, foundations, and underground wiring) may be considered in the evaluation. Past maintenance performance and the availability of funding may be considered.

OPERATING THE SYSTEM

- A. The local political subdivision (entity) shall develop an operational plan for the requested lighting system. The plan must define the responsibilities for the proper monitoring, inspection, stocking of parts, replacement of lamps, repairs to electrical equipment, and repairs to and replacement of knocked down poles. The plan must include the maintenance agreements between the entity and its maintenance contractors.
- B. The entity shall be responsible for all the energy cost of the system.
- C. The entity shall monitor the system for non-operating lights on a monthly interval. A detailed inspection of system components shall be conducted yearly and should include a detailed list of defective, damaged and/or deteriorated components. Complaints by motorists, law enforcement personnel or others concerning malfunctioning lights shall be investigated as soon as practical.

STOCKING OF SPARE PARTS

- A. The local political subdivision (entity) and/or its maintenance contractors shall maintain a stock of spare parts for the system.
- B. The minimum stock of consumable* parts should be one of each item plus the following:
 - 1. One percent of each type ground mounted light pole with luminaire support arm(s), excluding poles above 50 feet.

2. Two percent of each type luminaire.
 3. Four percent of each type lamp.
 4. Two percent of the total transformer bases.
 5. Two percent of the total breakaway coupling assemblies.
- * Conduit, conductors, duct marker, junction boxes, etc. are not considered consumable.

MAINTENANCE OF THE SYSTEM

- A. The local political subdivision (entity) shall assume full responsibility for maintenance of the entire system. Louisiana Revised Statute 48:193 prohibits the state from maintaining "street lighting".
- B. Dangerous or hazardous conditions shall be remedied immediately.
- C. All necessary repairs shall be made in a timely manner.
Individual lamp failures should be repaired within 10 working days of notification. Multi-lamp failures of three or more in a row should be repaired within 5 working days of notification. Knocked down poles should be replaced within 30 days of notification. Failures affecting three or more lights should be repaired within 5 working days of notification except when underground wiring must be replaced. Replacement of underground wiring should be accomplished within 30 days. When lighting is unaffected, and there is no hazard or danger to the public, repairs should be accomplished within six months. Where parts of the system are experiencing consistent and continual failures due to unusual service conditions, the department may extend or temporarily exempt specific parts from the timely manner repair provisions until the problems can be resolved. Such requests shall be submitted to the district for consideration.
- D. Detailed inspection and maintenance records shall be maintained by the entity. The records shall include monitoring and inspection reports along with repair records. The records shall be in an organized manner and made available to DOTD upon request. See sample report forms.

OPERATING AND MAINTENANCE COST

- A. The local governing authority (entity) shall assume the operating and maintenance cost of the system. This includes all cost associated with monitoring, inspection, repairs, energy and re-lamping.
- B. The entity should consider creating an escrow or special account to ensure that adequate funds are available when needed. The contribution rate to the account should be based upon actual power company charges for energy and re-lamping plus an additional amount to cover cost associated with inspections and repairs. An amount equal to 50% of the energy and re-lamping cost should be sufficient to cover normal inspection and repairs to the system.

PROCEDURE FOR APPLYING FOR ROADWAY LIGHTING ON INTERSTATE HIGHWAYS

- A. Upon written request from the local governing entity, DOTD will investigate and determine the acceptability of including the requested roadway lighting in the construction program.
- B. If the Department determines that the requested lighting is acceptable for inclusion in the construction program, the local entity shall furnish DOTD an adopted resolution stating that they agree to pay the federal matching cost (usually 10% of the total construction cost), and assume all legal liability for, and all maintenance, energy, and other operating cost of the lighting system. A sample copy of an acceptable resolution is included in this guide.
- C. After receipt of the resolution, the project will be logged into the Interstate Lighting Program in order of date received and DOTD will prepare a formal agreement for execution by the local entity and DOTD. The agreement will define the detail requirements for obtaining, operating, and maintaining the system.
- D. The political subdivision must develop and furnish an operating and maintenance plan for the lighting system before the project is placed under contract. Samples are contained in this guide.

SAMPLE RESOLUTION

RESOLUTION No. _____ of 20__

This resolution authorizes the Mayor of _____ to enter into an agreement with the LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT obligating the City to pay 10% of the construction cost, and assume all legal liability for, and all maintenance and operating cost, of the subject lighting system.

RESOLUTION

WHEREAS, the Louisiana Department of Transportation will provide for the installation of roadway lighting at the interchange of _____ and,

WHEREAS, prior to installation of said lighting system, the City of _____ must enter into an agreement with the Louisiana Department of Transportation which obligates the City to pay 10% of the construction cost, and assume all legal liability for, and all maintenance and energy cost, of said system; and

WHEREAS, in order to proceed with the design of said roadway lighting system, the Department of Transportation and Development requires that the governing authority authorize the Mayor to execute the subject agreement on behalf of the City.

BE IT RESOLVED by the _____ City Council that Mayor _____ is hereby authorized to execute on behalf of the City of _____, an agreement with the Louisiana Department of Transportation and Development which obligates the City to pay 10% of the construction cost, and assume all legal liability for, and all maintenance and operating cost, of the subject lighting system.

BE IT FURTHER RESOLVED that if any portion or item of this resolution or the application thereof is held invalid, such invalidity shall not affect other provisions, items or applications of this resolution which can be given effect without invalid provisions, items or applications and to this end the provisions of this resolution are hereby declared severable.

BE IT FURTHER RESOLVED that all resolutions or parts thereof in conflict herewith are hereby repealed.

The forgoing motion was offered by _____
seconded by _____,
and put to a vote on this _____ day of _____, 20__

The vote was as follows:
YEAS: _____
NAYS: _____
ABSENT: _____

**STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT**

**LIGHTING AGREEMENT
STATE PROJECT NO. H. _____
FEDERAL AID PROJECT NO. H. _____**

ROUTE _____

_____ PARISH

THIS AGREEMENT, is made and executed in three original copies on this _____ day of _____, 20____, by and between the **Louisiana Department of Transportation and Development**, through its Secretary, hereinafter referred to as **DOTD**, and the (Parish/City/Town) of _____, a political subdivision of the State of Louisiana, hereinafter referred to as **Entity**.

WITNESSETH That:

WHEREAS, DOTD proposes to construct and install a roadway lighting system at Route _____, in _____ Parish (hereinafter, sometimes referred to as the “Project”), provided that, upon completion of the system, Entity will assume ownership and all liability and responsibility for said system, including all future maintenance and operation costs thereof; and

WHEREAS, the Entity is agreeable to the installation of the roadway lighting system; and

WHEREAS, after the construction contract is complete, Entity agrees to assume ownership and all liability and responsibility for said system, including, but not limited to, all maintenance and operation and the costs thereof, to include, but not be limited to, repair, replacement and energy costs, in accordance with the provisions set forth hereinafter; and

NOW, THEREFORE, in consideration of the premises and mutual dependent covenants herein contained, the parties hereto agree as follows:

**ARTICLE I
PROJECT IDENTIFICATION**

The recitals set forth above are hereby incorporated herein and expressly made a part of this Agreement.

For purposes of identification and record keeping, State and Federal Project Numbers have been assigned to this project as follows: **State Project No. H.**_____ **and Federal Project No. H**_____.

**ARTICLE II
SCOPE OF SERVICES**

DOTD shall, at its expense, prepare complete plans and specifications for the proposed Project within the limits established in the above preamble. DOTD will construct, install and supervise the construction and/or installation of the Project.

The goal of the Project is to construct a highway lighting system at the above specified location that meets the objectives, deliverables and performance measures as determined and dictated by the Project plans and specifications for State Project No. H._____ and Federal Aid Project No. H_____, which are incorporated herein by reference.

**ARTICLE III
FUNDING/PAYMENT**

The estimated construction cost is \$_____. Entity agrees to pay to the order of DOTD, 10% of the estimated construction cost of the project, \$_____ prior to advertisement for construction.

The parties agree that the estimated project costs payable to DOTD represent the estimated amounts necessary to construct this project and that cost underruns or overruns may occur. After completion and final acceptance of the project and expiration of the forty-five (45) day lien period, final costs shall be determined. If the final calculation of costs determines that there is an overrun, then Entity shall pay its proportionate share of the amount of the overrun to DOTD immediately upon receipt of an invoice. If, however, the final calculation of costs determines that Entity overpaid DOTD, then DOTD shall reimburse Entity the proportionate share of the underrun relative to the matching funds paid by Entity not later than thirty (30) days after completion of the final estimate.

**ARTICLE IV
PRECONSTRUCTION OBLIGATIONS OF ENTITY**

Prior to the construction and installation of the lighting system, Entity shall submit to DOTD for approval a copy of its Operational Plan which covers managing, financing, inspecting, and repairing the system, all as outlined in the latest edition of the DOTD publication "A GUIDE TO CONSTRUCTING, OPERATING, AND MAINTAINING HIGHWAY LIGHTING SYSTEMS". Entity shall provide DOTD with documentation of the utility services account in Entity's name.

No later than thirty (30) days prior to advertisement of the Project, Entity shall obtain the necessary permit from DOTD for the lighting system, using the permit form attached hereto as Exhibit A. In the event of a conflict between the provisions of this Agreement

and said permit for purposes of maintenance, operation and repair of the lighting system subsequent to the transfer of ownership, the provisions of the permit shall control.

**ARTICLE V
FINAL ACCEPTANCE AND TRANSFER**

The DOTD shall be responsible for making the final inspection and Final Acceptance of the project. Before making final inspection, DOTD shall give Entity a minimum of two (2) weeks notification, so that Entity may have representatives present to participate in the final inspection. DOTD shall provide Entity with a copy of the Final Acceptance letter. Entity shall record the Final Acceptance letter in the conveyance records of the (Parish/City) of _____, and shall provide a certified copy of said recordation to DOTD project manager. Entity shall record this Agreement and provide a certified copy of said recordation to the DOTD permit section at the time of permit application.

Upon completion and Final Acceptance of the lighting system by DOTD, Entity will immediately assume ownership of the lighting system and shall be responsible for all maintenance, operation and repair of the lighting system at Entity's sole expense for as long as the right-of-way upon which the project is located remains in the State Highway System, including, but not limited to, the energizing of the system and the repair and/or replacement of any elements of the system which may malfunction or become damaged.

Entity hereby takes notice that upon issuance of the Final Acceptance the one (1) year warranty period begins, and in order to maintain the viability of said warranty, all work performed during the warranty period should be one performed by the construction contractor.

Entity agrees that, at any time after Final Acceptance, Entity shall be responsible for marking the field location and depth of all underground conduits and components of the lighting system within DOTD's right of way within forty-eight (48) hours, excluding weekends and holidays, of receiving written request for same from DOTD.

The party constructing the system shall provide the other party with a copy of the as-built plans indicating the location and depth of the lighting system's underground conduits and components.

**ARTICLE VI
AMENDMENTS/MODIFICATIONS**

This Agreement may be amended or modified at any time by mutual consent of the parties, provided, however, that any modification, amendment, alteration, variation, or waiver of any provision(s) of this Agreement shall be valid only when it has been reduced to writing and executed by all parties.

Any permit required by this Agreement may be modified as provided by law.

**ARTICLE VII
TERM**

This Agreement shall commence on the date first written above and shall remain in effect until all the work has been completed and accepted, all payments required to be made have been made, and all obligations and conditions contained herein have been satisfied.

**ARTICLE VIII
TERMINATION**

This Agreement may be terminated under any of the following conditions:

1. By mutual written agreement and consent of the parties hereto; or
2. By DOTD by giving thirty (30) days written notice to Entity; or
3. By Entity should it desire to cancel the Project prior to the advertisement thereof, provided any federal/state costs that have been incurred for the development of the project shall be repaid by Entity.

**ARTICLE IX
NONASSIGNABILITY**

Neither DOTD nor Entity shall assign any interest in this Agreement by assignment, transfer, or novation, without prior written consent of the other party.

**ARTICLE X
RECORD KEEPING/AUDITS**

The parties will maintain all documents, papers, file books, accounting records, appropriate financial records and other evidence related to costs incurred relative to this Agreement. All such records shall be maintained by the parties for a period of five (5) years following completion and Final Acceptance of the Project.

It is hereby agreed that the Legislative Auditor of the State of Louisiana and/or the Office of the Governor, Division of Administration auditors shall have the option of auditing all accounts of the parties that relate to this Agreement. The parties shall be audited in accordance with La. R.S. 24:513, as applicable.

**ARTICLE XI
INDEMNIFICATION/NO THIRD PARTY BENEFICIARY**

Entity shall indemnify and save harmless DOTD against any and all claims, losses, liabilities, demands, suits, causes of action, damages, and judgments of sums of money growing out of, resulting from, or by reason of any act or omission of Entity, its agents, servants, independent contractors, or employees while engaged in, about, or in connection with the discharge or performance of the terms of this Agreement or in connection with the services required or performed by Entity or resulting from the ownership, possession or control of the Project.

DOTD shall indemnify and save harmless Entity against any and all claims, losses, liabilities, demands, suits, causes of action, damages, and judgments of sums of money growing out of, resulting from, or by reason of any act or omission of DOTD, its agents, servants, independent contractors, or employees while engaged in, about, or in connection with the discharge or performance of the terms of this Agreement.

Nothing herein is intended, nor shall be deemed to create a third party beneficiary to or for any obligation by DOTD or Entity herein or to authorize any third person to have any action against DOTD or Entity arising out of this Agreement.

**ARTICLE XII
DISCRIMINATION**

The parties agree to abide by the requirements of the following as applicable: Titles VI and Title VII of the Civil Rights Act of 1964, as amended; the Equal Opportunity Act of 1972, as amended; Federal Executive Order 11246, as amended; the Rehabilitation Act of 1973, as amended; the Vietnam Era Veteran's Readjustment Assistance Act of 1974; Title IX of the Education Amendments of 1972; the Age Discrimination Act of 1975; the Americans with Disabilities Act of 1990, as amended, and Title II of the Genetic Information Nondiscrimination Act of 2008.

The parties agree not to discriminate in employment practices, and shall render services under this Agreement without regard to race, color, age, religion, gender, national origin, veteran status, genetic information, political affiliation, or disabilities.

Any act of discrimination committed by any party, or failure to comply with these statutory obligations, when applicable, shall be grounds for termination of this Agreement by the other party.

**ARTICLE XIII
LEGAL COMPLIANCE**

The parties shall comply with all federal, state, and local laws, regulations, and ordinances, including specifically, but not limited to, the Louisiana Code of Ethics (La. R.S. 42:1101, *et seq.*), in carrying out the provisions of this Agreement.

**ARTICLE XIV
FISCAL FUNDING**

The continuation of this Agreement is contingent upon the appropriation of funds to fulfill the requirements of the contract by the legislature. If the legislature fails to appropriate sufficient monies to provide for the continuation of the contract, or if such appropriation is reduced by the veto of the Governor or by any means provided in the appropriations act to prevent the total appropriation for the year from exceeding revenues for that year, or for any other lawful purpose, and the effect of such reduction is to provide insufficient monies for the continuation of the contract, the contract shall terminate on the date of the beginning of the first fiscal year for which funds are not appropriated.

**ARTICLE XV
SEVERABILITY**

If any term, covenant, condition, or provision of this Contract or the application thereof to any person or circumstance shall, at any time or to any extent, be invalid or unenforceable, the remainder of this Contract or the application of such term, covenant, condition or provision to persons or circumstances other than those as to which it is held invalid or unenforceable, shall not be affected thereby, and each term, covenant, condition, and provision of this Contract shall be valid and enforced to the fullest extent permitted by law.

IN WITNESS WHEREOF, the parties hereto have caused these presents to be executed by their respective officers thereunto duly authorized as of the day and year first above written.

WITNESSES:

STATE OF LOUISIANA
(Parish/City/Town) of _____

BY: _____

Typed or Printed Name

Title

Taxpayer Identification Number

DUNS Number

CFDA Number

WITNESSES:

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION
AND DEVELOPMENT

BY: _____
Secretary

RECOMMENDED FOR APPROVAL:

BY: _____
Division Head

SAMPLE ROADWAY LIGHTING SYSTEM OPERATIONAL PLAN

MANAGING THE SYSTEM

The Entity has designated the system manager to be:

Name _____

Address _____

Phone No. (____) _____ - _____

The manager will be responsible for the proper operation and maintenance of the system.

The manager will compile and submit a yearly budget to the Entity for the proper maintenance and operation of the system.

The manager will maintain the maintenance records required by DOTD. The manager will schedule the inspections and will arrange for any necessary repairs.

Manufactures' recommended maintenance requirements shall be followed for all luminaire lowering devices, both high mast and low mount.

The manager will file an updated the Operational Plan annually. When no changes have occurred in the Plan, a statement of such shall be sufficient. A copy of the updated plan or statement shall be submitted to the District Maintenance Engineer.

FINANCING THE OPERATION

The Entity has budgeted \$_____ for the operation and \$_____ for the maintenance of the system for 20____. Future budgets will reflect the actual cost history of the system along with any projected additional system costs.

SAMPLE MAINTENANCE AGREEMENT

The Entity has designated _____ as the maintenance contractor responsible for accomplishing any necessary repairs to the system.

The maintenance contractor will stock the required parts, make the necessary repairs, and maintain the repair records. Contractor shall follow manufacturer's maintenance requirements for luminaire lowering devices.

The maintenance contractor will complete the repairs and file a completed repair form along with the required invoices.

The maintenance contractor will maintain, or otherwise have ready access to, the following stock of spare parts:

1. _____ Ground mounted light poles, single ___ ft. arm.
2. _____ Ground mounted light poles, twin ___ ft. arms.
3. _____ Structure mounted light poles, single ___ ft. arm.
4. _____ Structure mounted light poles, twin ___ ft. arms.
5. _____ Low mount roadway luminaires.
6. _____ Highmast luminaires.
7. _____ Underpass luminaires.
8. _____ HPS lamps for low mount luminaires.
9. _____ HPS lamps for high mast luminaires.
10. _____ HPS lamps for underpass luminaires.
11. _____ Breakaway transformer bases.
12. _____ Breakaway coupling assemblies.
13. _____ Photo controller.
14. _____ Surge suppressor.
15. _____ Modular electrical disconnect breakaway cord set.

The maintenance contractor will perform the following

1. replace lamp within 10 days of notification.
2. replace poles within 30 days of notification.
3. replace or repair luminaire within 10 days of notification.
4. replace circuit fuses and other minor repairs within 5 working days of notification.
5. investigate, diagnose and isolate defective wiring within 5 working days of notification.
6. replace or repair underground or structure wiring within 30 days of order to proceed.

SAMPLE REPAIR REPORT

Date of reported malfunction - **12-14-2015**

Location of Malfunction - pole no **156B16 WB-I10**

Type of reported malfunction - **Pole down**

Individual reporting - **State Police**

Date repair personnel notified - **12-15-2015**

Name of repair personnel - **LOWRATE POWER & LIGHT INC.**

Findings - pole down

Cause of problem - **pole struck by vehicle**

Action taken - **removed pole, electrically sealed exposed conductors water tight and scheduled replacement for 12-20-2015**

Date that malfunction was corrected - **12-21-2015**

Amount paid for repairs - **\$750.00**

SAMPLE MONITORING AND INSPECTION REPORT

Date - **12-18-2015** Inspector - **Willie C. Problems**

Pole or Equipment	Deficiency
156B16	pole down
156B17	light out
156B18	light out
.....
.....
16010	handhole cover missing
.....
Service Pt.5	overgrown with trees
.....

Monthly monitoring should consist of a nighttime ride-through inspection. The inspection should concentrate on easily identifiable deficiencies such as non-operating lights, missing poles, etc.

The yearly inspection should consist of a more comprehensive walk-through inspection. It should concentrate on identifying some of the less obvious deficiencies. Except for lighting towers and controller cabinets, removal of covers or opening of doors should not be necessary.

The yearly inspection should include the following:

1. Inspect poles for damage to breakaway couplings or transformer bases, pole shafts, and foundations.
 Note missing handhole covers and doors, plumb of pole, and alignment of luminaire.
 Look for ground erosion or ground settlement around foundations.
2. Inspect lighting towers for corrosion and cracks near the pole base and at the joints.
 Also inspect power cords, and tower lowering device, cables and components.
3. Inspect light poles and towers for dirt, vegetation, or other debris covering any part of base or anchor bolts.
4. Inspect service controller for missing locks and hardware, indicator lights on surge suppressor for proper operation, damaged enclosure, overgrowth of weeds and vegetation, etc.
5. Inspect junction boxes for damage and missing hardware.
6. Inspect structure-mounted conduits for damage and missing hardware.

LIGHTING DESIGN STANDARDS FOR INTERSTATE ROADS AND INTERCHANGES

Acceptable light sources are high pressure sodium (HPS) and induction. The use of light emitting diode (LED) type lights is pending test results and is not yet approved for use on Interstate highways. Illumination standards remain equal regardless of the light source. Maximum color temperature shall not exceed 4000K.

The summary standards below are generalized. Specific design circumstances may call for variations. All illumination designs must fall within guidelines established by IES/ANSI RP-8. See also AASHTO "Roadway Lighting Design Guide".

The design engineer is required to check for local ordinances regarding illumination standards. Where local standards differ from this guide the more stringent governs.

If Interstate ramps include roundabouts, that portion of the illumination must comply with lighting for roundabouts. See IES "Design Guide for Roundabout Lighting" DG-19.

- A. Average maintained illumination on the roadway shall be designed for greater than 0.6 foot-candles and less than 0.8 foot-candles.
- B. Uniformity ratio shall be designed for less than or equal to 3:1.
- C. Lighting calculations shall use a maintenance factor of 0.70.
- D. Veiling Luminance Ratio (Glare) shall not exceed a 0.3:1.
- E. Where tower lighting is used, average illumination need not be considered. The design should provide for a minimum maintained illumination of 0.3 foot-candles on the roadway.
- F. Calculations shall not include the illumination contributed by the backside luminaire.
- G. Initial lamp lumens used in lighting calculations shall be as follows:
 - a. 4,000 lumens for 50 watt HPS lamps.
 - b. 6,300 lumens for 70 watt HPS lamps.
 - a. 9,500 lumens for 100 watt HPS lamps.
 - b. 15,000 lumens for 150 watt HPS lamps.
 - c. 27,000 lumens for 250 watt HPS lamps.
 - d. 48,000 lumens for 400 watt HPS lamps.
 - e. 130,000 lumens for 1000 watt HPS lamps.
- H. Mounting heights of roadway luminaires shall be 40' to 55' for poles and 100' to 150' for towers.
- I. Underpass luminaires shall be no larger than 150 watt HPS.
- J. Structure mounted poles shall be located as close as practical to bridge bents.
- K. Electrical service shall be 480/240 volts, single phase, center grounded.
- L. The lighting control system shall utilize centralized controllers as opposed to a photocell for each light.
- M. Voltage drops shall be limited to 5.0 % maximum as measured from the furthest load to the point of service.

- N. Light poles shall be located not closer than 15' from edge of traveled roadways except where poles are located behind barrier curbs, this distance may be reduced to 6'.
- O. Light poles shall be located on the inside radius of roadway curves unless protected from vehicular collision.