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GENERAL

The purpose of the *Traffic Lighting Design Manual* is to assist in the lighting design of future construction and reconstruction projects on state highways. It is not intended that existing lighting systems be modified as a result of this manual. For policy practices, please refer to the *Lighting Policy and Guidelines*.

This design manual draws from several sources, which are cited in the Additional Resources Section of this Manual. This manual will address items not included in the *AASHTO Roadway Lighting Design Guide* or provide clarification on included items.

1.0 INTRODUCTION

The material herein is for information purposes only and may be used to aid new employees and those unfamiliar with ODOT traffic engineering and design practices. The Illumination Engineer is responsible for maintaining the ODOT Lighting Design Manual. Contact information is;

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1.1 Availability
This manual is a web-only document, which can be accessed and printed in its entirety from the ODOT web site:


1.2 Updates
This manual is updated continually and revisions will be made as necessary. The revised manual becomes effective on the official revision date (month/year format). All design work prior to final plans shall follow the requirements of the current version of this manual.

If you wish to receive notification of future revisions of this manual, subscribe to our e-mail notification system by e-mailing the Illumination Engineer.
2.0 STARTING THE DESIGN

Before starting the design, the following information should be gathered:

- Standards applied to the project are known
- Applicable project background information, such as roadway, bridge and signal installation, has been compiled
- Illumination project scope is defined

2.1 What Standards Will Be Used?

This question must be answered before starting the design and specifications. Investigating and gathering of applicable standards for the assigned project are essential part of successful outcome. Regardless of the jurisdiction, illumination installation is required to meet the current National Electrical Code.

2.1.1 Full ODOT Design Standards and Specifications

This is typically required for any project on the State Highway System that is outside of city limits. If ODOT will maintain and operate the illumination system, this is always the case. Full ODOT standard consists of the ODOT Lighting Policy and the ODOT Lighting Design Manual.

2.1.2 Local Agency Design Standards and Specifications

This standard applies to local agency owned and maintained illumination system on the State Highways. If the local agency will maintain and operate the illumination then local agency standards may be allowed.

2.2 Background Information to Gather

2.2.1 As-Built Drawing Archive (Filenet)

As-built plan sheets will be available from ODOT traffic or illumination designer, or electrical crew. Also, they are available from Filenet in ODOT website. There is a Traffic Plan Search Guide available on Filenet for help using the database.

2.2.2 Electronic Information

Prior to the field verification, it is good to get familiar with the project area using the available electronic sources of information, such as ODOT digital video logs and Google maps. This can help identifying issues to address during the field verification.

2.2.3 Field Verification

Field verification is a very important step in the process of designing illumination. Making a field visit during the design phase and verifying the existing conditions could save a lot of cost and pain during the construction phase of the project. It will provide the designer accurate and complete information of existing conditions. The designer may ask the electrical crew for assistance accessing certain portions of the existing illumination system.
2.3 Background Information from Others

2.3.1 Base Map and Survey Information
Illumination design requires full survey information and a geotechnical report, if new poles will be installed. Data to collect within the survey area includes:
- Underground utilities less than 10 ft. deep in project area
- Above ground utilities and wires with existing heights
- Power poles with transformers for power sources
- All pavement markings within the survey area
- Any other existing illumination within the survey area

2.3.2 Roadway Design
If the project is rebuilding or modifying the roadway, there will be a roadway base map showing the final roadway layout. It is critical that the illumination design is based on what will be built in the field. The illumination designer must communicate with the roadway designer from the start of design through final plans. The roadway designer's final product is the base for the illumination design.

2.3.3 Geotechnical Report
If new poles are proposed, then a geotechnical report is required to determine the foundation depths. As soon as the pole locations are defined, contact the Region Geo/Hydro Manager for a foundation investigation of the proposed site.

2.3.4 Utility Hook-ups
New illumination systems require a connection to a commercial power source. It may involve moving existing utilities. The illumination designer needs to coordinate with the Region Utility Specialist and Utility company when locating the power supply and requesting any new connections early in the design process.

2.4 Illumination Design Project File
The project files for illumination design should be kept in ProjectWise. It could contain all of the supporting documents, calculations and decisions related to the illumination design and construction. The items listed below, if applicable, are typically included in the files:

- Project narratives with project scope
- Photometric Data file of the luminaires
- Project plan sheets and comments log
- Calculations for:
  - Electrical Load
  - Wire size
  - Illumination light levels
  - Voltage drop
  - Typical energy usage
- Cost estimates (itemized breakdown for each bid item, total bid item cost, and anticipated item cost)
• E-mails and memos related to illumination design decisions
• Photos
• Field verification information
• Geotechnical report
• Pole submittals and shop drawings
• Manufacturer’s cut sheet and submittals of electrical materials
• Correspondence between project managers, consultants or contractors
• Existing as-builds
3.0 LIGHTING ANALYSIS

It is ODOT’s practice to provide adequate illumination levels on the roadway according to the national standards, which are listed in Chapter 17.

3.1 Standard Calculations

ODOT uses the illuminance method for light level calculation. The lighting design and its calculations shall meet the required average maintained illuminance level and average to minimum uniformity stated in national standards (See Chapter 17). The lighting analysis should include the following information:

- Provide average illuminance level in lux (fc)
- Check minimum point.
- Check maximum point.
- Check uniformity ratios.
  1) Average to minimum
  2) Maximum to minimum (10:1 or less is desirable).
- Uniformity of illumination and Mean deviation. (For engineering judgment)
- Check Veiling Luminance ratio.

Increased Illumination levels should be provided at critical decision points of the roadway. Some examples of critical decision points are:

- Gore areas - 11 to 16 lux (1.0 to 1.5 fc).
- Weaving lanes - 9 to 11 lux (0.8 to 1.0 fc) average.
- Intersections (Sum of illuminance levels of the crossing roads, or up to 1.5 times of main street illuminance).
- Underpasses (Up to 1.5 times of roadway illuminance level).

Glare and veiling luminance at critical decision points of the roadways should also be checked to satisfy design requirements (maximum of veiling luminance ratio is 30-40%).

On ODOT plans, the Average Maintained Illuminance and Average to Minimum Uniformity should be included on the first page of the illumination plans.

3.2 Optional Calculations

The luminance method for light level calculation may be used when designing illumination system for a corridor.

Check Average Maintained Luminance level with:

- Uniformity of luminance (average to minimum).
- Veiling luminance ratio (maximum to average).
4.0 ILLUMINATION PLAN

4.1 Pole Placement
Engineering analysis and judgement should be utilized to minimize the number of poles needed to meet the lighting requirements of the project. All equipment (including foundations) must be located within the right of way or permanent easements.

When working on illumination located near airports, there is the possibility of height restrictions which can have an impact on pole locations and parameters. Permitted high loads and oversized truck routes should also be considered. Check with the airport regarding flight paths and any height restrictions and with the ODOT Trucking Industry Representative regarding permitted route issues.

Always check if there is the possibility of overhead and underground utility conflicts when placing illumination poles. Conflicts with overhead and underground utilities will need to be addressed during the design phase. A minimum clearance requirement from overhead high voltage lines shall be met per OAR 437-002-0047 and other regulations. If there are any known conflicts with utilities, contact the Region Utility Specialist for assistance. Utility conflicts shall be addressed and resolved before the design is complete.

Slip base poles are meant to be installed mainly for freeway environment. The designer should investigate traffic situation and frequency of pedestrians of the project area before he or she decide to install slip base pole.

Fixed base poles should be installed outside of “clear-zone distance” required per AASHTO’s “Roadside Design Guide”.

4.2 Standard Lamps
It is ODOT’s standard to use light emitting diode (LED) lamps on all new installations that are owned and maintained by ODOT maintenance. Specifications for LED luminaires installed on “Cobrahead” style poles can be found in the Standard Specifications (00970.45 and 02926.54). When designing illumination mounted on structures other than the standard poles, the designer should coordinate with the State Illumination Engineer and maintenance to select the appropriate LED lamps.

4.3 Standard Luminaires
Standard Luminaires for ODOT projects are LED luminaires along state highways and bridges including tunnels and underpass installation, except when Region Traffic Engineer allows the use of other light sources such as high pressure sodium (HPS) or Metal Halide luminaires.

The pole spacing is established by the luminaire’s photometric performance, wattages and other parameters, such as mounting height, hang-over distance etc. These luminaire wattage and pole parameters can be determined with the lighting analysis described in Chapter 3.
The High-mast luminaire may be used for interchange lighting. The cut-off style of luminaire shall be used in these applications to control light trespass. 400 to 1000 watt high pressure sodium (HPS) lamps have been used for these applications in the past, but the designer should check with the maintaining agency to determine if LED luminaires are preferable.

Underpass luminaires are mounted on bridge structures. When the luminaire is recessed into the box girder, underdeck style luminaire with 70-100 watt HPS has been used. When the luminaire is located on the open beam or girder type structures, pendant mount style luminaires with integral ballast have been used. When the luminaire is on a rigid frame, or overcrossing bents, the wall mount style luminaire with glare shield has been used. Again, while HPS fixtures have been used for these applications, the designer should coordinate with the maintaining agency to determine if LED luminaires is preferable.

Typically, the boxy style luminaire is used for bikeway and pedestrian paths. The recommended minimum mounting height is 30 feet (9.2 m). Lower mounting heights are subject to vandalism. Vandal resistant types of lighting installations are preferred. Since bikeway and pedestrian path lighting is generally maintained and operated by a local agency, the designer should coordinate with the maintaining local agency for their preferences.
5.0 POLES AND TOWERS

The locations of poles and towers shall be chosen to provide traffic safety using the lighting analysis. ODOT approved poles and towers should be used when installing illumination on the state highway system.

For typical “cobra-head” installations, use galvanized steel poles with slip or fixed base. Slip base steel poles can be installed within the clear zone. Fixed base poles must be outside the clear zone or behind a protective barrier.

The general recommendation for pole placement on highways is 30 ft. (9.2 m) from the edge of the travel lane where no barriers are installed. When a barrier is installed, poles should be placed 5 ft. (1.5 m) behind the face of the barrier.

Typically, a mounting height of 40 ft. (12.2 m) is used, but other mounting heights can be considered depending on the project site and results of the illumination analysis. When determining the mounting height the following factors should be considered:

- Highways in urban area.
- Controlling trespass light.
- Interference with the view of property owners (when poles located near property line between owners).
- Effecting greenhouses, mink farms, etc.
- Overhead conflict with utility lines or structure.
- Up to 50 foot mounting height can be used where required.

Illumination poles are typically surveyed into place during construction. During design, to have a realistic estimate of the attachment height and base height of the pole, a finished cross section is needed at each pole location. If the construction schedule does not allow the necessary lead time (approximately 6 months) to order the poles, the base height and attachment height may be used to pre-order the poles. The designer should coordinate with the project leader and the construction project manager if it is necessary to pre-order poles.

When installing high-mast tower illumination, galvanized steel towers are used. Traffic Section approval is required for all high mast illumination installations. Contact and coordinate with the Illumination Engineer prior to DAP design.

For lighting outside ODOT jurisdiction: check with city, county and related Utility company for their design requirements or preferences.
6.0 POWER SUPPLY

Commercial power is used to power all illumination installations. The nearest location to draw power from should be used. Power can only be tapped off of a transformer.

It is important to investigate what type of power is available and where the location of the power source is. Typically 240/480 volts single phase power is used, but 120/240 volt single phase power can be used on smaller installations. Some large projects may require 277/480 volt, three phase power. 240 or 480 three phase power may be used for tunnel lighting. If the existing power source is unacceptable or needs modifications to work, inform the Region Utility Specialist so they can work with the utility company to resolve these issues.

Sometimes the project will require moving the existing power source to a new location. If this is the case, the illumination plan sheets will need to show this.

For new installations, the wiring from the power source should enter into the service cabinet via a conduit (no aerial connections are allowed). The design and installation of the conduit and wiring from the power source to the service cabinet is according to the requirements of the power company. The plan sheets should include a reference to the conduit and wiring indicating this requirement. The contractor is responsible for installing the conduit and a pull-line from the service cabinet to the power source, and the power company is responsible for installing and terminating the wiring from the service cabinet to the power source. The cost of the power hook-up is included as an anticipated item in the project.
7.0 ENERGY DISTRIBUTION SYSTEM

Power should be distributed to the illumination system via a conduit (no aerial installations). The control cabinet should be located near the center of the system and the simplest conduit layout should be used to minimize voltage drop across the system. The minimum size conductor allowed is #10 AWG. The system voltage drop shall be under 5% per National Electrical Code (NEC). The maximum voltage drop on the distribution system is 4%. The maximum voltage drop between the utility transformer and service cabinet is 1%. The formula for voltage drop is:

\[ V_d = 2 \times A \times L \times R \]

- \( V_d \) = Voltage Drop
- 2 = Power goes out and back using two wires
- A = Load being drawn (Amperes)
- L = Distance the load is being carried (Ft)
- R = Resistance per foot of wire used (Ohms)

The load, A, is determined by dividing the total wattages of the circuit by the voltage serving the load. The distance, L, is determined by adding the distance between the poles and junction boxes. The wire size and material must be known to determine resistance per foot of wire, R. On ODOT installations, the minimum wire size is 10 AWG copper. The resistance per foot of wire for various wire types and sizes can be found in the National Electrical Code.

Junction boxes provide pull point for circuits coming from the service cabinet to the poles. A concrete junction box should be provided at each illumination pole and provide a conduit sweep into the pole with smaller conductors. Junction boxes shall be spaced a maximum of 300 ft. between junction boxes on a conduit run. The junction box size is determined by the total conduit diameter that is contained within the junction box. The lids for the illumination junction boxes should be galvanized metal or polymer concrete. The type of surface that a junction box will be installed in is also an important consideration. This determines whether a concrete apron around the junction box is needed or not. The ‘A’ in the junction box designation denotes a 12 inch wide concrete apron surrounding a precast concrete junction box. The concrete apron provides support to the fragile sides of the box. Type “A” boxes are to be used in non-paved areas where maintenance vehicles may be present. Do not use a precast concrete junction box within a travel lane or any access where it may be exposed to traffic. Placing a junction box within a travel lane or where it is exposed to traffic should be avoided at all costs. However, where it absolutely cannot be avoided, an approved cast iron junction box rated for traffic is required. Do not place junction boxes in the slope or the landing area of an ADA ramp. Junction boxes and the guidelines for general use are shown on Standard Detail DET4320.

A pad mounted control cabinet shown in Standard Drawing TM302 is the standard for new installations. The Main circuit breaker must be rated 600 volts (except for 120-volt system use circuit breaker rated 480 volts). Branch circuit breaker ratings are as follows:
1) For 120-volt system, use 277-volt rated circuit breakers.

2) For 240-volt system, use 480-volt rated circuit breakers.

3) For 480-volt system, use 480-volt rated circuit breakers.

Short circuit interrupt rating: All service equipment and circuit breakers must have equal or greater ratings than available fault currents of the system.

Provide separate circuit(s) for sign illumination, navigation lights and aviation lights. Permits are required for conduit on railroad right-of-way and such installation should be avoided due to expenses and time involved.

The photo electronic control relay is a device used for turning on luminaires based on ambient lighting conditions. It should be placed on the control cabinet. The electrical circuits with loads over 1000 watts should be controlled by lighting contactors and a main photo electronic control relay. A test switch shall be provided for daytime maintenance.

The size of each branch circuit breaker is usually 20 Amp. And maximum load on 20 amp circuit shall not exceed 16 Amp.

When designing illumination on bridge structures, it is important to coordinate with the bridge designer on all electric equipment installed on the bridge. The illumination designer will need to provide the bridge designer with the details of the distribution system design.
8.0 TEMPORARY LIGHTING

Temporary lighting may be installed to provide necessary lighting to the travelling public during construction of the project. It is important that the illumination designer coordinates with Traffic Control Plans designer to provide the adequate temporary illumination plan design. The main goal of temporary illumination system is to provide illumination for the traffic conflict area at night time. The illumination designer should work with Region Traffic and Project Manager for the need of temporary illumination.

Similar to permanent installations, a lighting analysis is completed for the designated project area using a computer program. The lighting analysis should demonstrate the following requirements are met:

- Average luminance = 8 lux (0.8 fc) minimum.
- Minimum Point = 2.0 lux (0.2 fc).
- Uniformity Ratio.
  - Average to minimum = 4:1 to 6:1.
  - Maximum to minimum = 15:1 or less.
- Critical (decision points) areas of roadway = 13.0 lux (1.2 fc).
- Maintenance Factor = (Luminaire dirt depreciation factor) times (Lamp lumen depreciation factor).
- Luminaire dirt depreciation factor.
  - New equipment = 0.95.
  - Used equipment = 0.8.
- Lamp lumen depreciation factor.
  - Temporary lighting life 1 year and less = 0.95.
  - Temporary lighting life 1 year to 2 years = 0.90.
  - Temporary lighting life over 2 years = 0.73.

The minimum amount of equipment to provide temporary illumination should be used, and all construction stages must be considered when placing the temporary poles. Pole relocations should be avoided when possible, but may be necessary if the traffic control design moves traffic significantly from stage to stage. Since the illumination system is temporary, use an aerial power distribution system unless the nature of construction requires underground distribution.

Wood poles are the standard for temporary illumination. When the temporary installation is for construction which lasts over one year, treatment on the wood poles is required. Poles should be placed 30 feet (9.2 m) setback from edge of travel lane and 5 feet (1.5 m) behind face of barrier with a 6 feet (1.8 m) minimum luminaire arm (luminaire should be in front of barrier face). Setback limits may vary for urban area roadway.
9.0 PARTIAL INTERCHANGE LIGHTING

Partial Interchange Lighting design method is ODOT’s standard for interchange lighting installations. It provides roadway lighting on only the essential parts (gore points, weaving sections, and ramps) of an interchange. The recommended coverage at Ramps are as follows:

- On Ramps - Standard of two poles at merging sections. Ramps in urban or suburban areas and ramps with high truck traffic may need more coverage. Ramps with longer acceleration lanes or complex alignment may need more coverage.

- Off-Ramps - Standard of three poles to cover gore area. Ramps with complex alignment or roadside features may need additional coverage or pull through light.

- Ramp Terminals - Standard of two poles at the intersection. One pole may be sufficient in rural area or T shape intersections. A wide intersection with crosswalk or raised island and a crossroad with physical median controls or channelization may need more coverage.

If a project is considering "full interchange lighting" or “continuous lighting”, consult with State Traffic Engineer.
10.0 UNDERPASS AND TUNNEL LIGHTING

10.1 Underpass Lighting
Underpass illumination is not part of ODOT’s standard coverage. However, consideration for underpass illumination will be given in special situations. Some examples of special situations are:

- Where pedestrian and bicycle path are under a structure,
- Where merge and diverge areas are under a structure,
- When a structure is 70 ft. or more in width,
- When requested by a local jurisdiction.

Coordinate with the maintaining agency to determine what type of luminaire should be used.

10.2 Tunnel Lighting
When designing tunnel lighting, the designer should conduct a site specific engineering study on the tunnel to determine the appropriate lighting levels. The existing lighting may be replaced with an upgraded system with light levels below RP-22 design levels if there is engineering and safety justification. The daytime entrance zone light level is depending upon the brightness features within the motorist’s view on the portal approach. Utilize 2-3 light level switching to provide proper amount of lighting according to different ambient lighting conditions.

The designer should conduct research and use engineering judgement when selecting luminaire types, sizes, locations, orientations, etc. Equipment for tunnel lighting may include propriety items and a letter of public interest finding could be required.
11.0 SIGN LIGHTING

When signs are constructed with retroreflective sheeting, they are not illuminated. Check with the sign designer of the project if there is a special need.
12.0 AVIATION AND NAVIGATION LIGHTING

12.1 Navigation Lighting
When designing navigation lighting, the lighting system should be designed to the bridge lighting requirements stated in the Coast Guard permit. If a permit is not required, then provide lighting that is equal to the existing system. Navigation lighting should be on a separate circuit from any other lighting on the bridge. The designer should use engineering judgement to select equipment that is simple and requires the least amount of maintenance.

12.2 Aviation Lighting
When designing a project in or near navigable airspace, the project team should coordinate with the Federal Aviation Administration (FAA) prior to finalizing the DAP design. If it is determined that project requires installation of aviation lighting use FAA approved equipment. Some examples of equipment that could be required by FAA are obstruction lights, beacon lights, and photo electronic control.
13.0 MONTHLY SYSTEM ENERGY UTILIZATION

On ODOT plans, the monthly energy utilization of each illumination system on a project is calculated and included on the first page of the illumination plans. The formula for the Monthly System Energy Utilization is:

\[ E = W \times N \times T \]

- \( E \) = Monthly System Energy Utilization (KWH)
- \( W \) = Wattage of Lamp (KW)
- \( N \) = Number of Poles
- \( T \) = 351 hours/ month
14.0 STANDARD DRAWINGS AND DETAILS

14.1 Standard Drawings
Standard Drawings provide micro details for construction information on typical installations and are referenced by the contract plans via the illumination plans. The designer is responsible for selecting and including the appropriate standard drawings that are applicable to the project. The applicable illumination related standard drawings are listed only on the first sheet of the illumination plan set. The entire set of applicable standard drawings for the whole project is shown in the main index. It is a good idea to check the main index to ensure signal related standard drawings were listed correctly.

The standard drawings that are applicable to illumination design are found in the TM300 series (illumination design) and TM600 series (traffic structures).

Standard Drawings cannot be modified by the designer. However, if a standard drawing doesn’t quite work for a particular project due to a non-typical condition, the standard drawing content can be used to create “Details” plan sheet that is then signed and sealed by the engineer of record.

An effective date is placed on each Standard Drawing. The bid date of the project will be within the range of the effective date. This assists with identifying the correct drawing for the project. The standard drawings used on this project are valid for the life of the construction.

Standard drawings are maintained by the Traffic-Roadway Section and are updated twice a year, once in January and once in July.

Each standard drawing has been signed and sealed by an ODOT Engineer of Record and are backed by engineering analysis, calculations, and/ or other justification to support the content contained within.

14.2 Standard Details
Standard Details typically contain construction installation information that:
- Is used infrequently
- Is used on non-state highway roadways
- Requires modification based on the project specific location
- Is brand new/ unproven technology that needs refinement prior to becoming a standard drawing.

Standard Details are used by the designer to create a project specific “details” plan sheet that will be included in the project contract plans set and stamped by the Engineer of Record. The Standard Details can, and should be modified by the designer to fit the unique, project specific requirements. Often there are notes to the designer in the Standard Detail containing further information on the appropriate use and modification of the Detail.
Standard Details are maintained and updated by the Traffic-Roadway Section and can be updated at any time, so the designer should always download a copy from the web site to ensure the most up-to-date detail. The Standard Details from DET4300 to DET4350 are used for illumination design.
15.0 SPECIFICATIONS, BID ITEMS, AND COST ESTIMATE

Two separate documents are needed to complete the specifications for a project:
- The Oregon Standard Specifications for Construction; and
- Project-specific Special provisions

The Oregon Standard Specifications for Construction is also known as Standard Specifications and remain static for 3 to 5 years. The Special Provisions add, modify and/or delete portions of the Oregon Standard Specifications for Construction based on project-specific needs.

The following is a list of specifications directly related to illumination
- 00950 – Removal of Electrical Systems
- 00960 – Common Provisions for Electrical Systems
- 00962 – Metal Illumination and Traffic Signal Supports
- 00970 – Highway Illumination
- 02920 – Common Electrical Materials
- 02926 – Highway Illumination Materials

15.1 Review and Approval of the Special Provisions
Special provisions that have been created by only making modifications according to the instructions that are provided within the special provision boiler plate (information in orange italics within parenthesis) do not require review and approval from the Illumination Engineer. However, the Illumination Engineer will do a courtesy review if requested.

Special provisions that have modifications that fall outside the instructions that are provided within the special provision boiler plate require review and concurrence of the Technical Expert (Illumination Engineer) and Specifications Engineer per Technical Services Bulletin TSB12-01(B).

15.2 Bid Items
Bid items are defined in the Standard Specifications and special provisions and are the means by which the contract work is paid. The specifications define the title of bid item, the unit of measurement, and what work is included in the bid item. The following sections are used:
- 00970.90 contains the list for all permanent illumination bid items
- 00950.90 contains the list for removal of electrical systems
- 00225.94 contains the list for all temporary illumination items

These bid item lists are explained in more detail below and can be found on the Specifications website. The vast majority of project work should fit within these existing, standard bid items. If the standard bid item lists do not meet the needs of the project, contact the Illumination Engineer for guidance. The solution may involve use of an existing, standard bid item or creation of a new bid item. Use of a new, unique bid item requires approval of the Illumination Engineer and Specifications Engineer.
New, unique bid items are discouraged, but sometimes necessary in illumination design.

15.2.1 Permanent Illumination Bid Items (00970.90)
The standard bid items available in the 00970.90 section of the specifications applies to permanent illumination installations:

- Pole Foundations – Lump Sum
  Includes all concrete foundations for lighting poles.

- Lighting Poles and Arms – Lump Sum
  Includes all poles and arms for lighting poles.

- Luminaires, Lamps, and Ballasts – Lump Sum

- Switching, Conduit, and Wiring – Lump Sum
  Includes all switches, conduit, cabinets, wiring, delineators, junction boxes, and other items required to construct the lighting system as specified.

- Refurbishing and Reinstalling Existing Illumination Systems – Lump Sum
  Includes all refurbishing, reinstalling, and other Work as specified and not included in the removal of existing illumination.

If illumination items such as foundations, conduit, junction boxes, or cabinets are encased within concrete bridges and retaining walls the cost will be included as part of the appropriate bridge or wall items.

15.2.2 Removal of Electrical Systems Bid Items (00950.90)
The standard bid items available in the 00950.90 section of the specifications applies to removal of illumination equipment:

- Incidental to Installation Bid Item – If the removal work meets the criteria for “Method A”, which occurs when existing electrical systems are removed and replaced with new electrical systems, no separate bid item for removal is used. The removal work is inclusive to the new electrical system bid item.

- Removal of Electrical Systems – Lump Sum
  By definition in the specifications, this bid item is used when the removal work meets the criteria for “Method B”, which occurs when existing electrical systems are removed and are not replaced with new electrical systems.

15.2.3 Temporary Illumination Bid Items (00225.94)
The standard bid items available in the 00225.94 section of the specifications applies to temporary illumination installations:
• Temporary Illumination – Lump Sum
  This bid items includes all required materials called for by the plans. The illumination designer needs to work with traffic control designer to include the amount to the project.

• Flagger Station Lighting – Lump Sum
  This bid items is used by the traffic control plans designer, not the illumination designer.

15.3 Letter of Public Interest Finding
Letters of Public Interest Finding (LPIF) are required to document why it is in the public’s interest to not follow a Code of Federal Regulation (CFR) or Oregon Statue requirement.

FHWA requires competition not only for the award of a construction contract, but also competition for the various materials and processes involved in the work. Whenever competition for materials or processes is eliminated an LPIF is required.

General examples of materials or processes that require an LPIF are:
• Proprietary or patented materials
• Sole source materials
• Agency supplied materials
• Salvaged materials
• Work performed by Agency forces

Typical Illumination items that require an LPIF are:
• LED and all other luminaires that are called out by brand name without allowing the option of “or approved equal”
• Decorative luminaires and poles that are called out by specific brand name
• Salvaged poles and cabinets

Additional guidance and instructions for developing and processing LPIF’s can be found in the LPIF Guidance Document on the OPL website. LPIF examples and templates are also included on the OPL website. LPIF’s should be submitted as early as possible, but it should be submitted and approved at least two weeks prior to PS&E submission. LPIF’s are not always approved and the project schedule could be impacted if plan changes are needed due to an LPIF not being approved.

15.4 Cost Estimate
Once the appropriate bid items are chosen a cost estimate must be completed for each bid item. The bid item estimates must be based on historical data, available industry data, manufacturer quotes and project specific research.

For ODOT illumination designers, an excel spreadsheet can be downloaded to assist in cost estimating. ODOT internal estimating tools cannot be given to external staff.
15.4.1 Anticipated Items
Anticipated items are used to provide a funding mechanism for non-biddable elements of work that may be needed to complete a project. Anticipated items should not be used for items of work that can be competitively bid. Anticipated items are included with the cost estimate.

For illumination work, power hookups are the most common anticipated item. This item should include the cost of conduit installation, trenching, and wiring from the power source to the illumination cabinet. Coordinate with the Region Utility Specialist and Utility Company to determine a reasonable cost estimate.
16.0 CONSTRUCTION SUPPORT

Once the project has been let, the illumination designer will need to provide assistance to the office administering the contract during the advertisement and construction phases. This typically consists of:

- Clarifying/interpreting information shown in the plans and specifications
- Adding, modifying or deleting information in the plans and specifications as necessary
- Providing a cost estimate for your expected amount of construction support
- Reviewing submittals
- Attending meetings as requested
- Periodic inspection of work as requested
17.0 ADDITIONAL RESOURCES

The following sources should be referenced along with this manual when designing Illumination systems.


Oregon Revised Statues, Title 59 810.010 "Road Authorities (Jurisdiction)" State of Oregon, 1999 Edition.

Federal Highway Administration Rules and Guidelines

Code of Federal Regulation – Title 23 Sub-Chapter “G”

Federal Aviation Administration’s “Obstruction Marking and Lighting” advisory circular

Federal Aviation Administration’s “Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace” advisory circular


ODOT Standard Drawings

Manufacturer’s Catalogs and Cutsheets

Local Agency Agreements, League of Oregon Cities and Association of Oregon Counties
“Guidelines and Working Agreements for Local Government Programs” (p.p. 32-33)

Local Officials Advisory Committee (local design standards)