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SECTION 6 – TRAFFIC ENGINEERING

6.1 GENERAL

This section covers traffic engineering standards and requirements for the following items:

- Reference standards pertaining to traffic engineering;
- Traffic Control Request Procedures;
- Traffic Control Plans for Construction;
- Signing and Pavement Markings;
- Signalization; and,
- Street Lighting.

6.2 REFERENCE STANDARDS

The design and construction of streets and roadways shall be in accordance with this section and the applicable standards and reference documents in order to maintain uniform standards for traffic elements throughout the City. The designer shall refer to City of Round Rock, Texas Department of Transportation or related standards; however, where discrepancies occur, the City of Round Rock Design and Construction Standards (DACS) shall take precedence. The Transportation Director shall make any final determinations, should there be conflicts between the DACS and other referenced standards described herein.

Refer to the bibliography for further information.

6.3 TRAFFIC CONTROL REQUEST PROCEDURES

6.3.1 Requests for Temporary Traffic Control

Any person wishing to perform any work within the public right-of-way must submit a traffic control plan and obtain the proper permit(s) prior to starting such work.

In order to ensure proper advance planning and coordination, except in emergency situations as noted in the following section, all requests for temporary traffic controls require advance notice be given to the Transportation Department. Written notification shall be given to the City for all temporary traffic control zones. The advance notification requirements depend on the type of street the activity will occupy and the duration of the activity. The following minimum advance notifications are required for all temporary traffic control zones.

In all areas of the City the following notifications requirements shall apply:

Long-term stationary - Work that occupies a location more than three (3) days. Two (2) weeks advance notice for all street types and detours;

Intermediate-term stationary - Work that occupies a location from overnight to three (3) days. Three (3) working days advance notice for Arterial and Collector streets, one (1) working day advance notice for Local streets and two (2) weeks for detours;

Short-term stationary - Daytime work that occupies a location from one (1) to twelve (12) hours. Three (3) working days advance notice for Arterial and Collector streets, one (1) working day advance notice for Local streets and two (2) weeks for detours;

Short Duration - Work that occupies a location up to one (1) hour. Three (3) working days advance notice for Arterial streets, one (1) working day advance notice for Collector and Local streets; or,

Mobile - Work that moves intermittently or continuously. Three (3) working day advance notice for all streets.

When arterial streets are to be completely closed in one or both directions, portable, changeable message signs (PCMS) shall be installed a minimum of one (1) week before the closure to provide advance warning to the public. The size, location and wording shall be determined by the Transportation Director.

For the purpose of this Section, Arterial streets are any street with striping to provide two-lanes or more of traffic in one direction or streets located in the Central Business District. Collector streets are any street connecting two (2) or more arterial streets. All other streets are considered Local streets.

6.3.2 Special Events

Special events such as festivals, run/walk, block parties, street fairs, parades, school events, or film industry production, shall be planned for and properly coordinated with the City. Proper temporary traffic control shall be provided for these events. Procedures for special events are as follows:

- a. Applicants shall make application to the City of Round Rock as required under the current City of Round Rock Code of Ordinances, using the City's Special Event Permit Application Form. Application shall be made at least 45 days prior to the event, and shall include any required traffic control plan(s) and the application fee;
- b. The City's Special Event Coordinator will distribute the application to each City Department and return any comments to the applicant. Any conditions required by the City for approval of the permit shall be noted on the permit;
- c. If the event will require a road closure, a Traffic Control Plan prepared by a Professional Engineer licensed in the State of Texas is required and shall be submitted by the applicant and approved by the Transportation Director;

- d. Once the Traffic Control Plan is approved by the Transportation Director, the City's Police Department will determine how many officers will be required for the road closures.
- e. The applicant is required to hire a Traffic Control company, approved by the City, to implement the Traffic Control Plan for the event. All traffic control devices shall be in accordance with the approved Traffic Control Plan and TMUTCD, latest edition.
- f. The applicant is responsible for all costs associated with the Traffic Control Plan, including overtime costs for the Police Officers..

The applicant shall identify the proposed location of parking areas and the number of spaces provided for the event.

The organization or individual responsible for the special event, block party, or parade shall adhere to the requirements of the applicable City of Round Rock Ordinance.

6.4 TRAFFIC CONTROL PLANS FOR CONSTRUCTION

6.4.1 General – Reference checklists as necessary

Temporary traffic control for construction activities on public right-of-way shall be in accordance with the TMUTCD and the guidelines contained within this manual.

A Traffic Control Plan (TCP) describes temporary traffic controls to be used for facilitating vehicle and pedestrian traffic through a temporary traffic control zone. The TCP may range in scope from being very detailed, to merely referencing typical drawings contained in the TMUTCD, TxDOT Standard Drawings, or specific drawings contained in the contract documents. For more complex projects, then a narrative of work shall be provided as well as phasing. The degree of detail in the TCP depends entirely on the complexity of the situation, and TCPs shall be prepared by a Professional Engineer knowledgeable about the fundamental principles of temporary traffic control and the work activities to be performed.

If a traffic setup shown on standard detail sheets does not address the traffic controls needed for a specific site, then a TCP shall be prepared that is specific to the site. A standard detail or TCP which shows the proposed method of warning, directing and guiding traffic, shall be approved by the Transportation Director, prior to installing any devices on the right-of-way. The following information shall be provided with the standard detail or TCP:

- a. Activity location, right-of-way and curb-lines, and existing traffic controls of the street sought to be closed or blocked;
- b. Areas of the street to be closed or blocked;

- c. Proposed pedestrian and vehicular detour routes;
- d. Location and type of all barricades, signals, signs, channelizing devices, pavement markings and other warning devices to be used to direct traffic; and,
- e. A schedule of construction showing each phase of work, start and completion dates for each phase, and proposed work hours.

Plans which propose to detour traffic to another roadway shall demonstrate that such impacts cannot be reasonably avoided and that impacts to the detour route have been mitigated to the extent practicable. Impacts to the detour route shall be evaluated including, without limitation, intersection level of service, traffic speed and volume in residential neighborhoods and school zones, and impacts to all modes of transportation.

All Traffic Control Plans necessary for maintenance of traffic during construction shall be prepared in accordance with the latest edition of the Texas Manual on Uniform Traffic Control, Part VI (TMUTCD) and the TxDOT Standard Drawings.

6.4.2 Time Restrictions

The Transportation Director or their designee may restrict the hours of construction, repair or other activities affecting the free flow of traffic to nights, weekends or restricted hours due to potential congestion, other construction activities, hazards to pedestrians or motorists, etc..

Daily lane closures on arterial roadways shall not be permitted during the hours of 6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m. Monday through Friday, except in emergencies or situations where it can be demonstrated that traffic flow or safety will not be adversely affected.

6.4.3 Special Requirements

The Transportation Director or their designee may require that any of the following special traffic control devices, working hours, project layout and operations be imposed on any temporary traffic control zone:

- a. The use of additional barricades, signals, signs, flaggers, police officers or other traffic control devices or safety procedures;
- b. That the activity be performed only at certain hours during the day or night or during specified days of the week, month or year;
- c. That only a specified area or not more than a specified number of traffic lanes, parking meters and/or parking lanes shall be blocked or closed at the same time or at specified times of day;

- d. That material and equipment used in the activity and materials removed from any excavation be located other than in the vehicle traffic lane of such a street; and
- e. Any other restrictions deemed necessary to ensure management of the rights-of-ways and the free flow of vehicular, bicycle and pedestrian traffic.

Any changes in the plan shall be approved by the Transportation Director, or their designated representative, in advance of the change in accordance with the Contract Documents governing the construction project.

6.4.4 Pedestrian Accommodation

Pedestrians shall be provided with a safe, convenient travel path that replicates as nearly as possible the most desirable characteristics of sidewalks. Every effort shall be made to separate pedestrian movement from both work site activity and adjacent traffic. Whenever possible, signing should be used to direct pedestrians to safe street crossings in advance of an encounter with a temporary traffic control zone. Signs should be placed at intersections so that pedestrians, particularly in high-traffic-volume areas, are not confronted with mid-block work sites that will induce them to skirt the temporary traffic control zone or make a mid-block crossing. All pedestrian passageways or routes shall comply with the requirements of an accessible route in accordance with the ADA. A covered temporary walkway shall be used in areas where pedestrians are in proximity to overhead construction.

Plans which require the closure of sidewalks or shared-use paths shall incorporate the necessary barricades, signs and other measures as needed to ensure the safety of pedestrians and bicyclists. The closure of sidewalks, bike lanes, and shared-use paths will be allowed only if impacts cannot be avoided through alternative construction methods. The detour route must be of similar width and surface type to the permanent facility, and shall meet the requirements of an accessible route in accordance with the ADA.

6.4.5 Access Requirements

Local access shall be maintained to all properties on all streets during construction and maintenance activities. The TCP shall provide for access to all sidewalks, business and residence entryways and driveways. If access cannot be maintained, the contractor, utility, department or supervisor shall notify the affected property owner, resident or tenant a minimum of one (1) week in advance of the pending work unless the work is of an emergency nature. Access shall, in all cases, be restored as soon as possible. To ensure this, the contractor or work crew shall only perform the work affecting the restricted access areas while access is not maintained.

Access to fire stations, hospitals, EMS facilities and police stations shall be maintained at all times. If work activities require some access restrictions or access cannot be maintained, the contractor or work crew shall provide a minimum of two (2) weeks notice, to the affected emergency service facility prior to commencing the work, unless the work is of an emergency nature.

Access to schools shall be maintained at all times. If work activities require access restrictions in the proximity of a school, the contractor or work crew shall provide a minimum of two (2) weeks notice, to the affected school facility prior to commencing the work. Contractor shall refer to Section 6.4.4 of this Manual for safe pedestrian accommodation for work areas in proximity of schools.

For emergencies, the contractor, utility, department or supervisor shall notify the occupant of the emergency service facility of the need to restrict their access and shall as soon as possible restore access to the property with steel plates or temporary pavement repairs.

6.4.6 Traffic Control Requirements During Construction

It is the responsibility of the permit-holder for private activities or the job supervisor for public projects to ensure that all policies, procedures and requirements set forth in this Manual and the TMUTCD are met. Each work site shall have a designated English speaking competent person responsible and available on the project site or in the immediate area to ensure compliance with the traffic control plan and the provisions of this Manual. The competent person shall be required to demonstrate sufficient training in traffic control and competency in setting traffic control devices. Training Certificates shall be provided to the Transportation Services Department prior to setting any traffic control devices. Training certificates for competent persons shall be good for four (4) years from the date of training. After such time the competent person must show that additional training or re-certification has been achieved in order to maintain competent person status. The City reserves the right to request replacement of the competent person who continually fail to demonstrate competence in setting temporary traffic controls.

Failure or refusal to comply with the provisions of this manual and/or those set by the Transportation Director or their designee shall be unlawful and grounds for suspension or revocation of the permit for the work or activity.

A permit holder or owner shall comply with each provision of this Manual, and any other rule or regulation adopted by the Transportation Director. No activity may take place in the rights-of-way without first obtaining a proper permit. All unpermitted activity in the rights-of-way will be halted, and work may not resume until a proper permit is obtained.

A permit holder or owner who repeatedly fails to comply with the following:

- 1) a permit provision;

- 2) a provision of this manual;
- 3) traffic control plans and specifications;
- 4) a traffic control device inspection report; or
- 5) commits a violation that may negatively impact a person's safety and welfare may be suspended from work for a period not to exceed four (4) work days.

A suspended permit holder or owner shall halt all worksite activity immediately upon receipt of the order from the Transportation Director or their designee. The permit holder or owner is directed to remedy any immediate hazards to public safety and welfare, and may be allowed to correct the deficiency that caused the suspension. The suspension period will not commence until all the violations are addressed to the satisfaction of the Transportation Director or their designee.

Any activity occurring within the public right-of-way, for which a valid permit cannot be produced on the site, shall be halted immediately. Work shall not resume until a permit has been produced or issued.

Notice of noncompliance shall be made on Traffic Control Device Inspection Reports and shall be issued on site to the job site supervisor, foreman or crew leader.

6.4.7 Steel Plates

Where traffic must cross trenches, the Contractor shall provide suitable bridges. For trenches less than 18 inches (18") in width, sheet steel plates having a minimum thickness of three-quarter inches ($\frac{3}{4}$ ") shall be used. For trench widths from twenty-four inches (24") to seventy-two inches (72"), sheet steel plates having a minimum thickness of one inch (1") shall be used.

The thickness of plates for trench widths exceeding seventy-two inches (72") shall be established in an analysis completed by a Licensed Professional Engineer registered in the State of Texas.

The sheet steel plating will be installed in a "surface placement" configuration with an asphalt taper on all sides. Long term stationary installations and/or plating installations in high-trafficked portions of roads/streets shall include consideration of "flush placement" of the plates (i.e. milling of the pavement surface is undertaken to insure that the top-of-plate elevations essentially match the existing elevations of adjacent pavement surfaces) to minimize the impact on vehicular traffic.

In either installation configuration, the sheet steel plates shall extend beyond the edge of the trench a minimum of eighteen inches (18") but no more than thirty inches (30") on both sides. Transition ramping shall be provided for all "surface placement" configurations by the installation of cold mix asphalt on all sides.

For safe traverse of plating installations during the term of service, the top surface of the installed plates shall be flat and free of any clips, chains, attachments, weldments or surface irregularities.

When the plate dimension in the direction of traffic flow exceeds six feet (6'), a non-skid coating, approved by the Transportation Director or their designated representative, shall be applied to the entire surface area of all plates.

Additional methods of securing plates may be required depending on field conditions. The contractor should avoid using a long series of plates that run parallel to traffic wheel paths. If allowed, the length of a series of plates that run parallel to traffic wheel paths shall not exceed thirty feet (30').

The use of steel plates shall be approved by the Transportation Director prior to construction.

6.5 SIGNING AND PAVEMENT MARKINGS

6.5.1 Signing

All signing shall be designed and installed in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD) and Standard Highway Sign Designs for Texas (SHSD), latest editions.

The construction plans for public streets shall include the following information:

- Location, size, and designation for all required signs;
- Type of sign mount;
- Sign details for non-standard signs;
- Provision for street name signs i.e. sign brackets on STOP signs;
- Standard details for applicable sign types; and,
- Quantities and specifications.

All new projects shall include standard street name signs on public streets. These must conform to the TMUTCD.

6.5.2 Pavement Markings

All pavement markings shall be designed and installed in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

The construction plans for public streets shall include the following information:

- Type of pavement marking, size, color, and alignment for each marking;
- Spacing and lane widths;
- Raised pavement markings type, color, and spacing, if used on the project;
- Detail dimensions for crosswalks, lane tapers, etc;

- Standard details for pavement markings; and,
- Quantities and specifications.

6.6 SIGNALIZATION

Traffic signal warrants will need to be satisfied prior to installation of new traffic signals and/or removal of existing traffic signals. Traffic signal warrants shall be prepared in accordance with the latest edition of Texas Manual on Uniform Traffic Control Devices (TMUTCD) and submitted to the City for approval.

Mast arm signal poles shall be used for all permanent locations. Timber pole shall be used for only temporary signal poles.

Traffic signals shall be designed and installed in accordance with the latest edition of TMUTCD and City of Round Rock standards and specifications. TxDOT signal standard and specifications may be used, where City standards and specifications are not available.

Prior to designing a traffic signal, the Applicant will schedule a pre-design meeting with the Transportation Director and City's traffic signal staff to discuss the design requirements. The items to be discussed shall include, but not be limited to, the following:

- Type of signal pole (mast arm, span wire, or special poles)
- Type of detection (loop, camera, microwave, etc)
- Signal heads and back plates (color, material, etc.)
- Type of signal controller and cabinet
- Ground box type and size
- Illumination on signal poles
- Pedestrian elements (regular, accessible, count down, etc.)
- Curb ramps (shall be ADA compliant)
- Power source and location
- Connectivity to adjacent signals (fiber optic, radio, etc.)
- Pre-emption (emergency vehicles or rail)
- Signal specifications (City, TxDOT, or both)
- Other special requirements from the City (specific signal equipment product, agreements, etc.)
- Submission requirements (number of submittals to be determined by City depending on nature and size of project, plan size: 11"x17" or full size)

The design plans will be prepared by a professional engineer with experience in signal design and will include the following construction plans as a minimum:

- Title Sheet (include project location map)
- Existing Intersection Layout (include all existing utilities)
- Proposed Intersection Layout (required if intersection is modified to include pedestrian ramps, pavement marking, signing, addition of lanes, utility, etc.)

- Proposed Signal Layout
- Street name signs, signal phasing diagram, signs on mast arms and push buttons
- Wiring diagram
- Conductor conduit schedule
- Signal elevation sheet
- Signal interconnect details, if required
- Signal foundation design and details
- Signal general notes
- Signal quantities
- Signal standards (include all applicable standards)
- Traffic control plans, if required

6.7 STREET LIGHTING

Street lights in the City of Round Rock are typically owned and operated by Oncor Electric Delivery. Confirm utility company service areas prior to start of design.

The Developer of a new street within the City shall furnish and install street lighting along all streets including cul-de-sacs and at all intersections. The street lighting construction requirements shall be in conformance with the City of Round Rock Design and Construction Standards (DACs) and Oncor Electric Delivery Standard Details and Specifications, available from Oncor.

Provide new, unused materials. Luminaires, foundations, ground boxes, and conduit materials and installation methods shall comply with the applicable articles of the National Electrical Code (NEC), CORR DACs, Oncor, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL), and the American Association of the State Highway and Transportation Officials (AASHTO) criteria.

An illumination plan for all streets within the Plat shall be filed with the Construction Plans. The plan shall show the proposed location of the street lights and any electrical facilities, including service locations, within the street ROW or public utility easements. The illumination plans shall include a photometric layout and appropriate calculations to demonstrate that the design criteria in this section have been met. See example photometric layouts at the end of this section.

The street lighting facilities shall be complete and operational prior to acceptance of the Public Improvements.

The proposed streetlight design shall be as approved by the Transportation Director, the Transportation Engineer, and Oncor Electric Delivery or other electric utility company, if not Oncor.

Streetlights shall be provided at or near intersections and at or near the end of cul-de-sacs. Luminaires shall be provided as part of the traffic signal pole assembly for signalized intersections.

The clear distance measured from the back of curb to the face of the pole/face of drill shaft foundation shall be as detailed in the City of Round Rock Standard Construction Details.

The City must obtain the approval of TxDOT for all lighting systems to be installed on state facilities. Such installations must be in accordance with municipal maintenance agreements and TxDOT CAD Standards and Specifications. Any agreement between the City and TxDOT for lighting must be accompanied by an ordinance, passed by City Council.

All poles shall be identical along an entire continuous street or throughout a subdivision with public roadways.

The City is in the process of converting to LED luminaires. LED fixtures shall be equivalent to high pressure sodium (HPS) bulbs.

Basis of Design:

Street light wattage and spacing for the roadway classifications are summarized below and shall be used as the basis of design. The photometric analysis and layout shall be submitted and approved by the Transportation Director prior to finalizing the street lighting design.

Table 6-1: Street Lighting Spacing and Heights			
Road Classification ⁽¹⁾	Wattage	Luminaire Height (ft)	Maximum Spacing Allowed
Local	100	25	300
Collector	150	30	300
Arterial	250	30	250
Notes: 1. See Transportation Criteria Manual and Transportation Master Plan for additional information.			

Street Illumination Requirements:

All illumination shall be designed in accordance with the latest requirements of the Illuminating Engineering Society of North America: “American National Standards Practice for Roadway Lighting”.

The following table provides the minimum design criteria for illumination and uniformity ratio for all streets:

Table 6-2: Street Lighting Design Criteria

Roadway Classification (1)	RESIDENTIAL		COMMERCIAL/ INDUSTRIAL	
	Minimum Maintained Foot-Candles	Uniformity Average to Minimum	Minimum Maintained Foot-Candles	Uniformity Average to Minimum
Local	0.2	6:1	0.6	3:1
Collector	0.4	4:1	0.9	3:1
Arterial	0.6	4:1	1.2	3:1

Notes:

1. See Transportation Criteria Manual and Transportation Master Plan for additional information.
2. Commercial/Industrial – characterized by heavy vehicular and pedestrian traffic and heavy demand for parking during peak periods. This includes densely developed apartment areas, hospitals, civic facilities, and neighborhood recreational centers. Residential – includes residential development, or a mixture of residential and commercial characterized by few pedestrians and low parking demand at night. This includes single family homes, townhouses, small apartments, and regional parks.

EXAMPLE PHOTOMETRIC LAYOUT
Two Lane Local Street With Parking

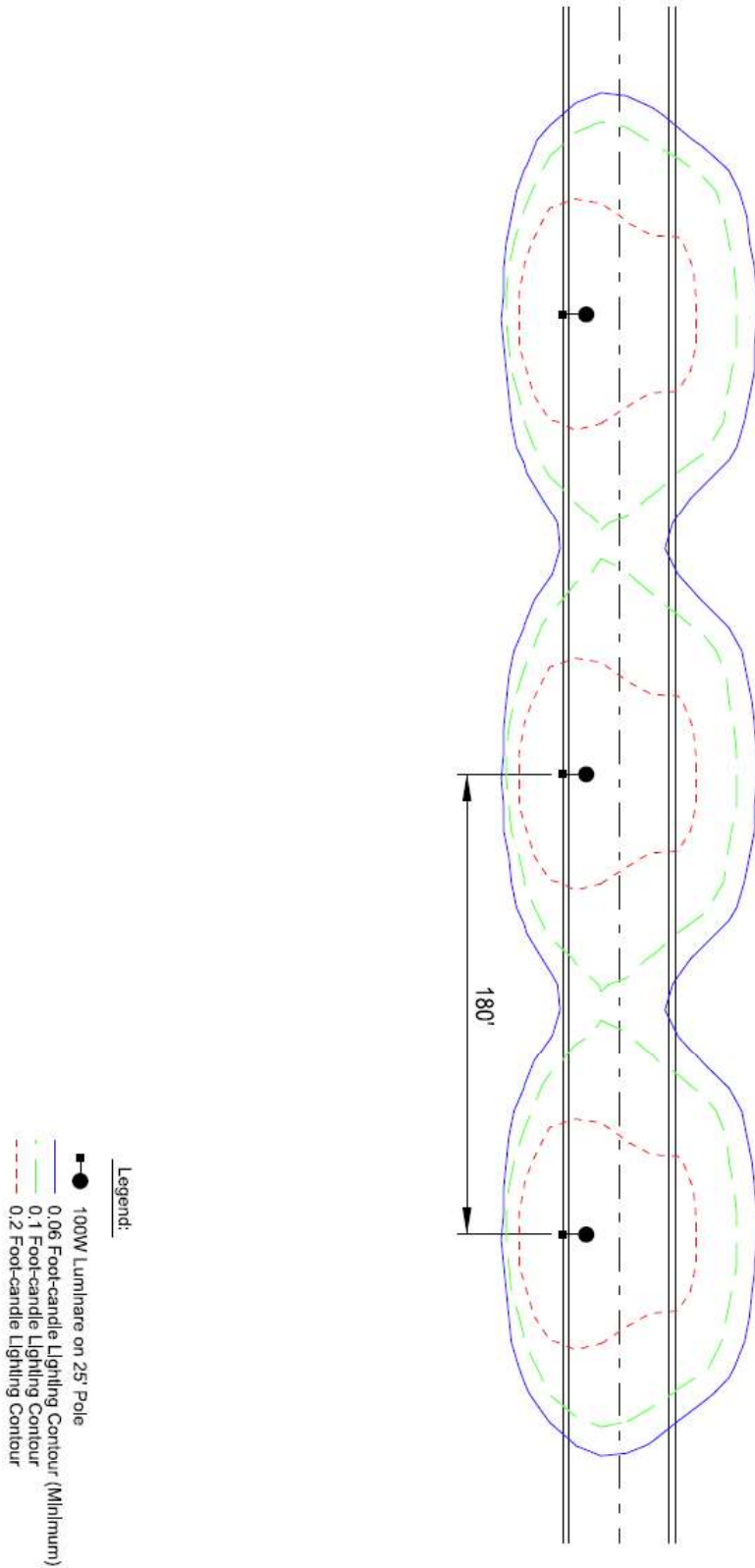


Figure 6-1: Example Photometric Layout – Local Roadway

EXAMPLE PHOTOMETRIC LAYOUT
 Three Lane Collector with Off-Street
 Shared Path and Parallel Parking

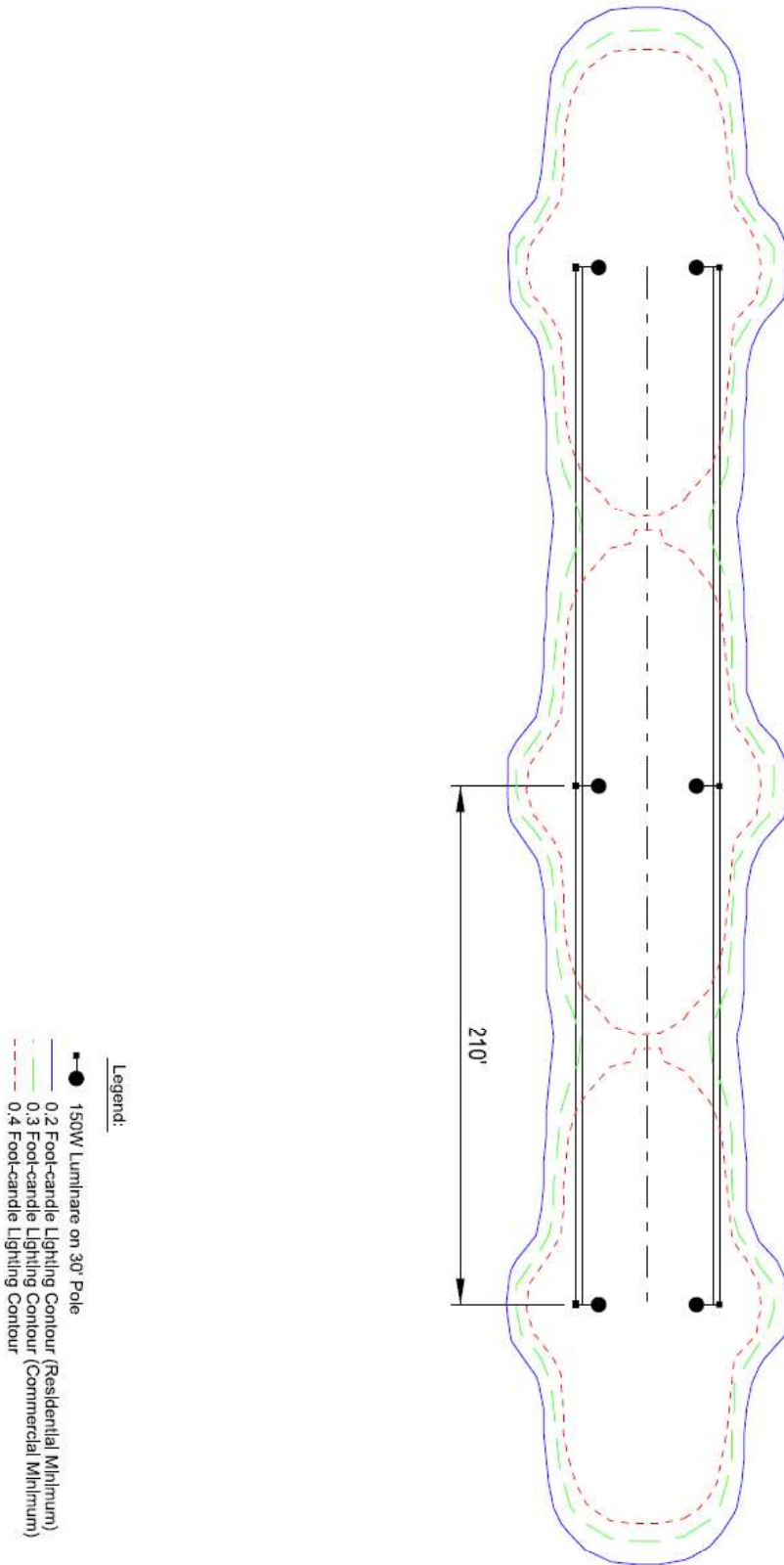


Figure 6-2: Example Photometric Layout – Collector Roadway

EXAMPLE PHOTOMETRIC LAYOUT
 Six Lane Arterial with Off-Street
 Shared Path

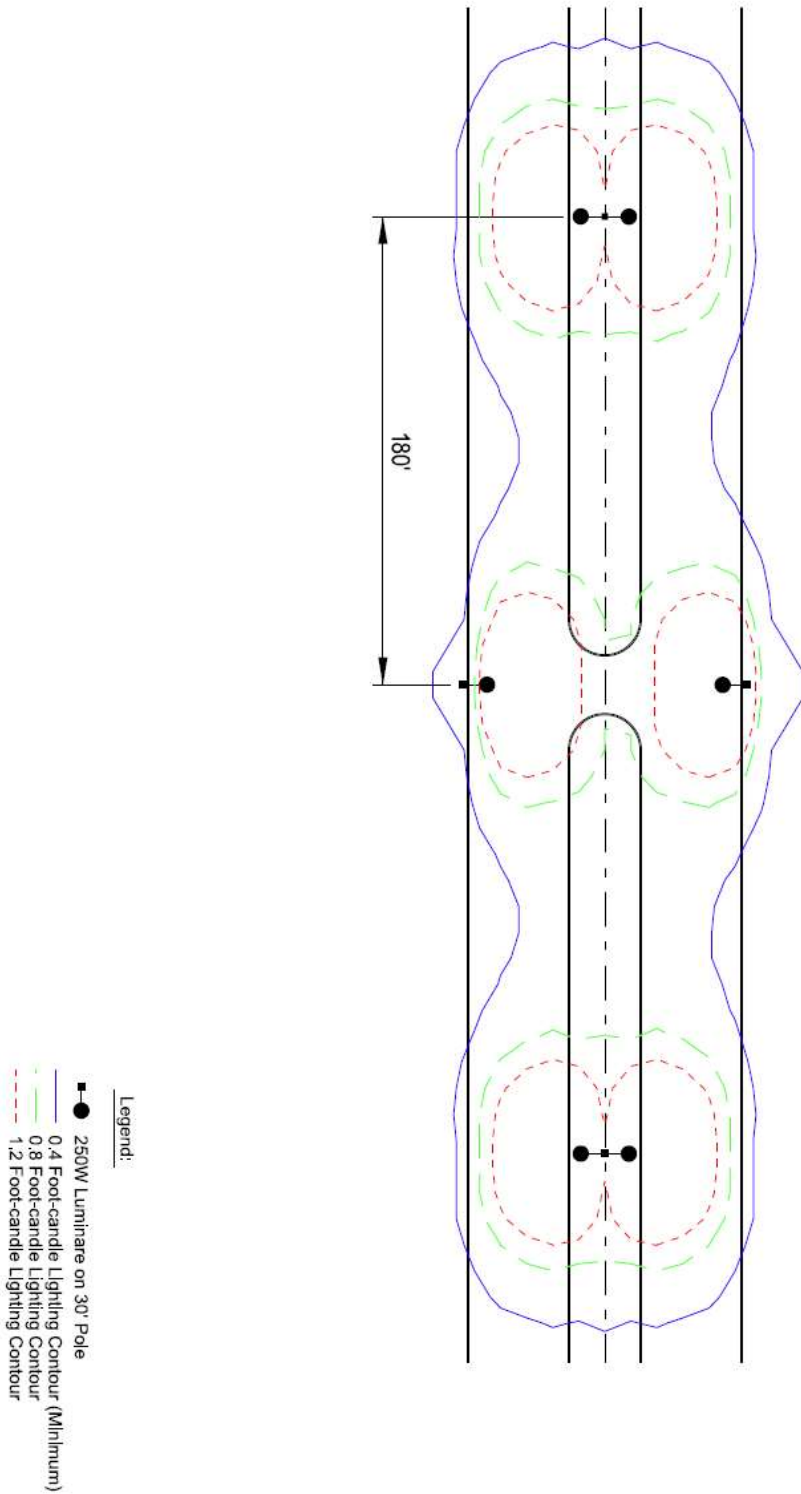


Figure 6-3: Example Photometric Layout – Arterial Roadway