

SECTION 9 – LIGHTING AND ELECTRICAL

9.1.0	GENERAL	2
9.2.0	SITE LIGHTING REQUIREMENTS	2
9.2.1	Light Pole Locations	2
9.2.2	Standard Equipment	2
9.3.0	PHOTOMETRIC REQUIREMENTS	4
9.3.1	Minimum and Maximum Light Levels	4
9.3.2	Light Trespass	4
9.3.3	Light Pollution/Dark Skies Initiative	4
9.4.0	CONDUITS	5
9.4.1	Plaza Lighting and Electrical Conduits	5
9.4.2	Parking Lot Lighting and Electrical Conduits.....	5
9.5.0	EASEMENTS	5
9.5.1	Electric Easements	5
9.6.0	AS-BUILT PLANS.....	6
9.6.1	Final “As-Built” Plans.....	6

SECTION 9 – LIGHTING AND ELECTRICAL

9.1.0 GENERAL

The Design Criteria establish the minimum standards to be used in the design of RTD bus transit facilities. This section is intended to direct the Design Engineer in the design of lighting and electrical improvements at all RTD bus transit facilities. The procurement, construction and installation of all components required from the site transformer to their respective placement locations within the facility shall be designed, specified and shown on the appropriate design and construction drawings.

The procurement, construction and installation of all components required to the site transformer shall be the responsibility of the appropriate utility company and shall be coordinated by the Design Engineer and RTD.

9.2.0 SITE LIGHTING REQUIREMENTS

9.2.1 Light Pole Locations

The placement of lighting fixtures will be unique to each site and will be coordinated with RTD's Engineering Division. The Design Engineer shall utilize a combination of light distributions (types II, III, IV and V) to efficiently meet photometric requirements.

Passenger shelters at bus transit facilities shall be lit by "spill-light" that emanates from lighting that is placed in passenger waiting areas. Shelters shall not be lit from within.

9.2.2 Standard Equipment

In order to minimize equipment stocking requirements and to simplify the labor maintenance training and expertise, generally only one standard lighting fixture shall be used at all public bus transit facilities. The fixture shall be the Entablature, with pulse start metal halide from Kim Lighting or approved equal. Alternative fixtures may be used as required by the local authority or in conformance with surrounding transit oriented development with approval from RTD. Lighting fixtures within parking structures shall be the PGL5/6 from Kim Lighting or approved equal. Lighting fixtures shall include metal halide lamps or the 85 watt induction fluorescent (IF) lamp, as determined in coordination with RTD during the concept design phase.

The standard light pole at RTD bus transit facilities shall be steel, round, tapered with internal vibration damper. The standard light pole shall be Valmont - DS210 or approved equal. Poles used on the top tiers of parking structures shall be hinged at their bases to allow easy access to the fixtures and lamps. Poles used on the top tier of parking structures shall be hinged. Poles shall be finished to match the lighting fixture. Pole base plates shall have a minimum inside diameter to accommodate five 1" electrical conduits.

Standard parking lot lights shall be mounted on 25 foot poles with foundations that are set 3 feet above the paved parking surface. All lights poles located within landscaped areas shall be set 3 feet above the surrounding landscaped area. The site fixtures shall consistently be 28 feet above finished grade.

Standard plaza lights shall be mounted on 14 foot poles. Plaza light pole foundations shall be set level with the surrounding plaza paving. A collar shall be set at the base of the light pole, and shall be the same color as the light pole. The collar shall provide a finished look, enhance the aesthetic appearance of the area, and shall conceal possible minor plaza heaves or settlements. Caulking shall be applied at the base of the pole and its base plate to preclude infiltration and to isolate metallic surfaces from snow-melt salts and associated corrosion.

The Design Engineer shall consider the impacts of wind for the design of light poles and pole foundations and how wind varies at elevation for poles mounted on the top tier of parking structures. Light poles shall have a minimum wind speed rating of 100 mph. Steel poles, rather than aluminum poles, are required.

Lighting fixtures shall permit relamping and ballast replacement without the use of tools. Fixtures shall be designed so that relamping or ballast replacement can be accomplished in less than five minutes.

9.3.0 PHOTOMETRIC REQUIREMENTS

9.3.1 Minimum and Maximum Light Levels

TABLE 9A - RTD LIGHTING GUIDELINES FOR PARKING AREAS AND PEDESTRIAN PLAZA AREAS:

Area	Minimum Initial Light Level ** (horizontal illuminance in foot-candles at pavement)	Maximum Initial Light Level * (horizontal illuminance in foot-candles at pavement)	Maximum Uniformity Ratio (maximum to minimum ratio of illuminance)
Parking Areas	2.0	10.0	5 to 1
Plaza Areas	5.0	25.0	5 to 1
BRT Station/Platform Area	5.0	25.0	5 to 1
Parking Structures	5.0	25.0	5 to 1

Notes:

* - Some local municipalities have ordinances which restrict maximum lighting levels to a greater extent than what is listed here. The Design Engineer should verify the maximum lighting level allowed for a particular jurisdiction and design the lighting in accordance with the local authority.

** - Pole height restrictions by some local municipalities will require a greater than normal number of light poles to meet the minimum light level requirement within the maximum allowable uniformity ratios.

9.3.2 Light Trespass

All light poles located adjacent to property lines shall have houseside shields to restrict spill light from adjacent property. The maximum initial lighting level measured at the property line shall not exceed 0.2 foot-candles or the maximum established by the local authority.

9.3.3 Light Pollution/Dark Skies Initiative

Some local authorities have passed ordinances that restrict the type of luminaires that may be used for site lighting. Mountain and rural communities tend to be more sensitive about this issue and therefore have much more stringent requirements related to site lighting. The Design

Engineer should investigate if these restrictions exist and design the lighting accordingly. In general, luminaires with downcast cut-off light distributions will be acceptable to most local authorities.

For light-sensitive areas, provisions can also be negotiated that will require/allow RTD to turn off up to half of the parking lot lights after the last bus serving the site has left for the night. The plaza lights are not to be included in this arrangement, but shall remain on during all hours of darkness.

9.4.0 CONDUITS

9.4.1 Plaza Lighting and Electrical Conduits

Conduit shall be provided to and from the mechanical room of the Drivers Relief Station (DRS) building, where the site electrical panel will be located.

Plaza lighting fixtures shall be linked with a minimum of three 1-inch conduit.

9.4.2 Parking Lot Lighting and Electrical Conduits

Parking lot lighting fixtures shall be connected with a minimum of three 1-inch conduit.

When security equipment is proposed to be located on a light pole, 2 additional 1-inch conduits (clearly marked "security conduit" shall be installed with pull strings. Those security conduits shall run from the hand hole on the light pole, through the light pole base, to a pull-box nearby. Two 2-inch conduits (clearly labeled "security conduit" shall be run between pull boxes, and connect to the security room of the DRS (or another approved location, if the site will have a separate security building).

9.5.0 EASEMENTS

9.5.1 Electric Easements

Whenever possible, exclusive electrical easements for other entities should be avoided. Non-exclusive, existing utility easements should be utilized where possible. Should an easement be required for the electrical service or transformer for another entity, it will require the approval of RTD's Board of Directors.

During the design process, the Design Engineer shall coordinate service needs with Xcel, or other power providers for the proposed improvements.

Easements and license agreements are issued through RTD's Real Property Division. These items shall be coordinated with RTD to ensure obtaining, issuing and recording the appropriate documents.

9.6.0 AS-BUILT PLANS

9.6.1 Final "As-Built" Plans

Since RTD typically bids the lighting components of bus transit facilities as a "lump sum" item, "as-built" plan requirements shall be emphasized in the design plans and technical specifications.