

Downtown Lighting and Signals Upgrade

Municipality of Anchorage
Project No. 14-48

Design Framework

March 2022



Prepared for:
Municipality of Anchorage
Project Management and Engineering Department



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DESIGN FRAMEWORK

For
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Project No.: 14-48
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NOTICE TO USERS

This report reflects the thinking and design decisions at the time of publication. Changes frequently occur during the evolution of the design process, so persons who may rely on information contained in this document should check with the Municipality of Anchorage for the most current report. Contact the Project Manager, Melinda Tsu, P.E. at 907-343-8110 for this information.

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Abbreviations

ADA	Americans with Disability Act
ADP	Anchorage Downtown Partnership
AMA	American Medical Association
CBD	Central Business District
CEA	Chugach Electric Association
CCT	Correlated Color Temperature
CSMP	Core Streets Master Plan
DCM	Design Criteria Manual
DCP	Anchorage Downtown Comprehensive Plan
DID	Downtown Improvement District
DOT&PF	Alaska Department of Transportation & Public Facilities
GAI	Greater Anchorage Incorporated
HPS	High Pressure Sodium
LED	Light Emitting Diode
MASS	Municipality of Anchorage Standard Specifications
MOA	Municipality of Anchorage
NEC	National Electrical Code
NFPA	National Fire Protection Association
OSHP	Official Streets and Highways Plan
ROW	Right of Way

1 Introduction

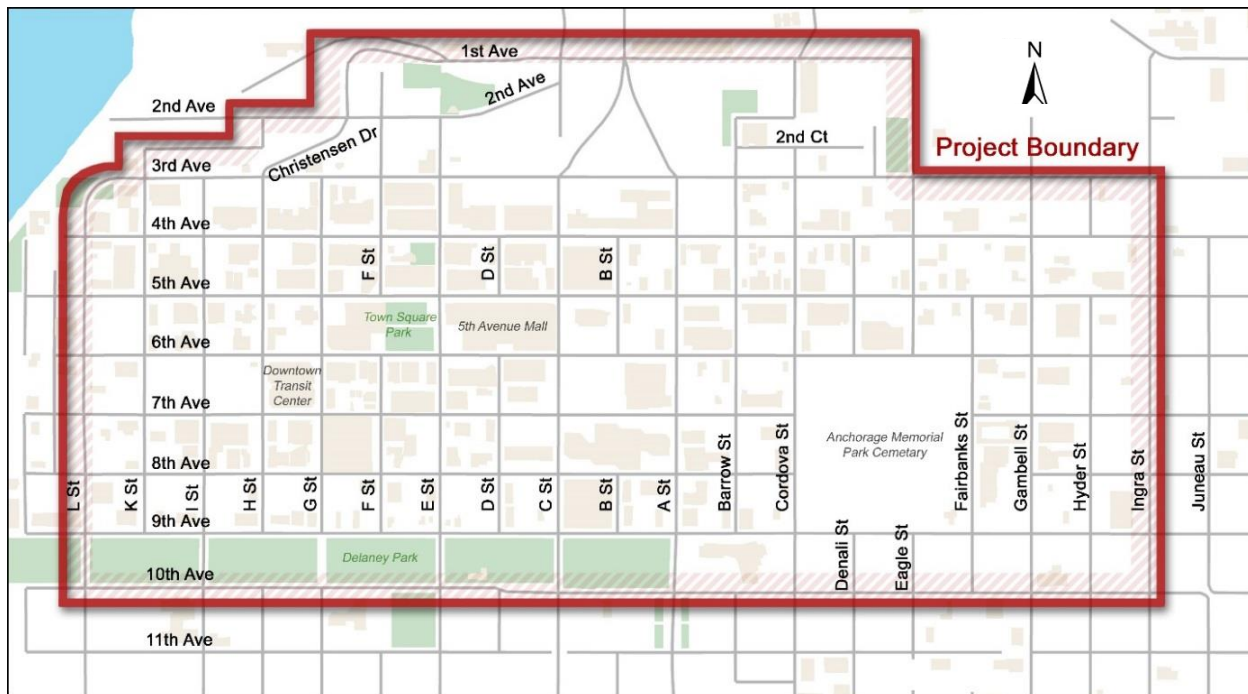


Figure 1 - Project Area Map

1.1 Background

The Municipality of Anchorage (MOA) commissioned a field evaluation and reconnaissance study of the downtown traffic signal and street lighting systems. The study area, shown in Figure 1, was bounded by 10th Avenue, Ingra Street, 1st Avenue, and L Street. These efforts found wide-spread grounding issues and substandard lighting levels, among other deficiencies.

The reconnaissance study prioritized areas and corridors for signal and lighting system reconstruction. The purpose of this document is to provide guidance to designers on those reconstruction projects to create a consistent look and feel across the downtown area, and to help ensure compliance with area plans and local standards.

1.2 Area Zoning, ROW, and Ownership

The project area encompasses Anchorage's central business district (CBD). Land use zoning is generally B-2, B-3, or Public Lands and Institutions. The B-2 and B-3 zones allow general commercial usage and residential development. The most significant difference between the two is B-3 requires parking, while B-2 does not. The B-3 zoning exists along the Ingra/Gambell corridor.

Right of way (ROW) widths vary throughout the CBD from 60 feet up to 100 feet. Most streets have 60 feet of right of way, which is just enough space for 4 vehicle lanes and sidewalks on both sides of the street.

MOA's online mapping shows that Alaska Department of Transportation and Public Facilities (DOT&PF) owns 5th Avenue, 6th Avenue, A Street, C Street, I Street, L Street, Gambell Street and Ingra Street. Other streets in the CBD are owned by MOA. The road owner performs summer maintenance, but winter maintenance throughout the CBD is done by MOA regardless of road ownership. In addition, the Downtown Improvement District (DID) is a local assessment district that funds sidewalk cleaning, landscape, and security patrols.

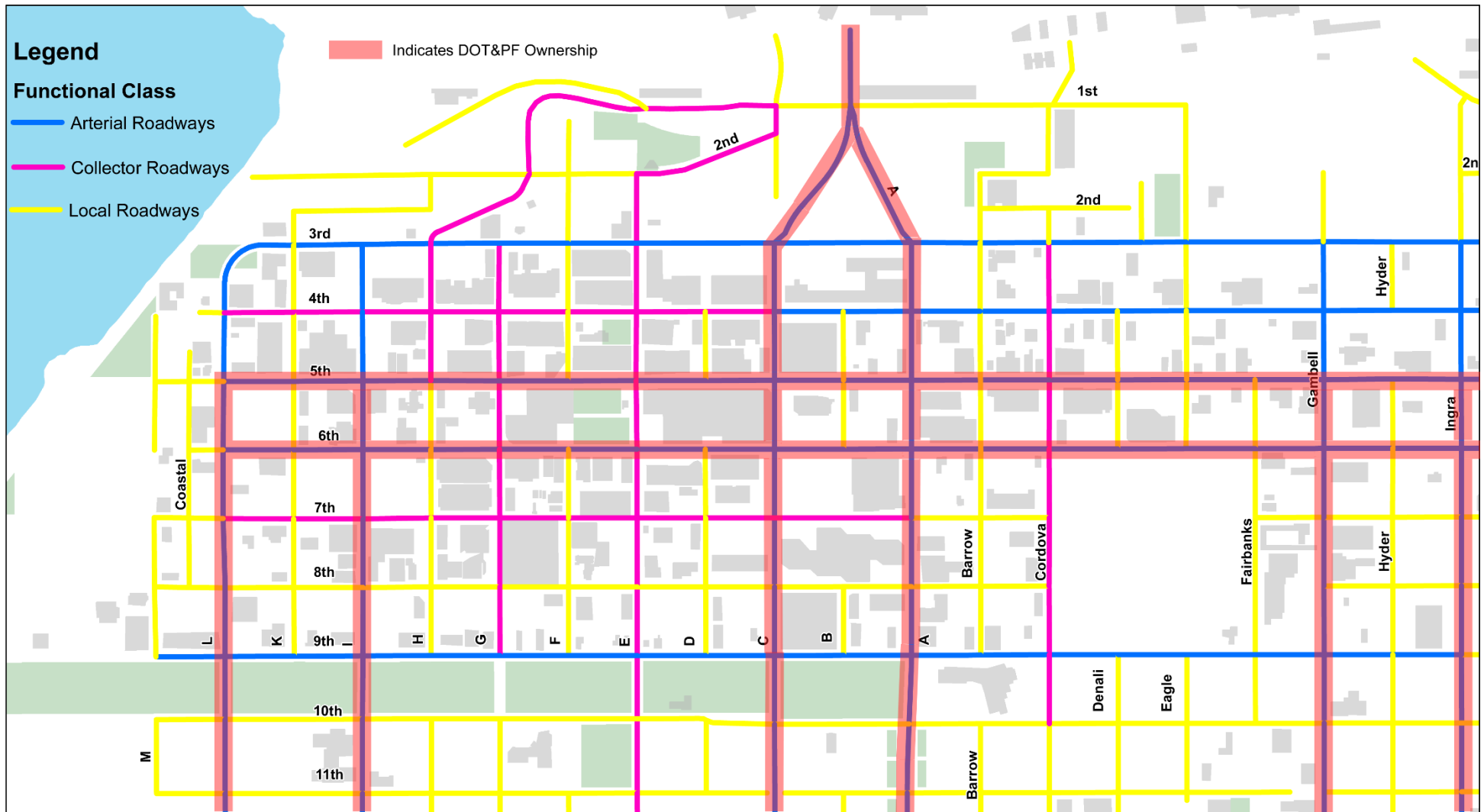
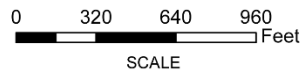


Figure 2 – CBD Functional Classification and Ownership Map

Data is from MOA Official Streets and Highways Plan (OSHP)



Prepared By:



1.3 Area Plans and Organizations

Multiple plans and organizations have been formed for the Anchorage downtown area. The planning documents and organizations help provide a foundation for the work to be completed with this project. The years of area knowledge and research contained within these assist in developing designs that are appropriate and achievable.

1.3.1 2007 Anchorage Downtown Comprehensive Plan & Core Streets Master Plan

The *2007 Anchorage Downtown Comprehensive Plan (DCP)* calls for streetscape treatments for the downtown major roadway corridors. The plan also calls for a network of high quality street environments that provide continuous, safe, and universal pedestrian access. An appendix to the *DCP*, the *Core Streets Master Plan (CSMP)*, recommends standardized light fixtures in the central business district (CBD). The “Historic District”, shown in Figure 3, is recommended to feature post-top “acorn” style fixtures, as shown in Figure 4A, and use Pantone 560C (dark forest green) colored street furniture.

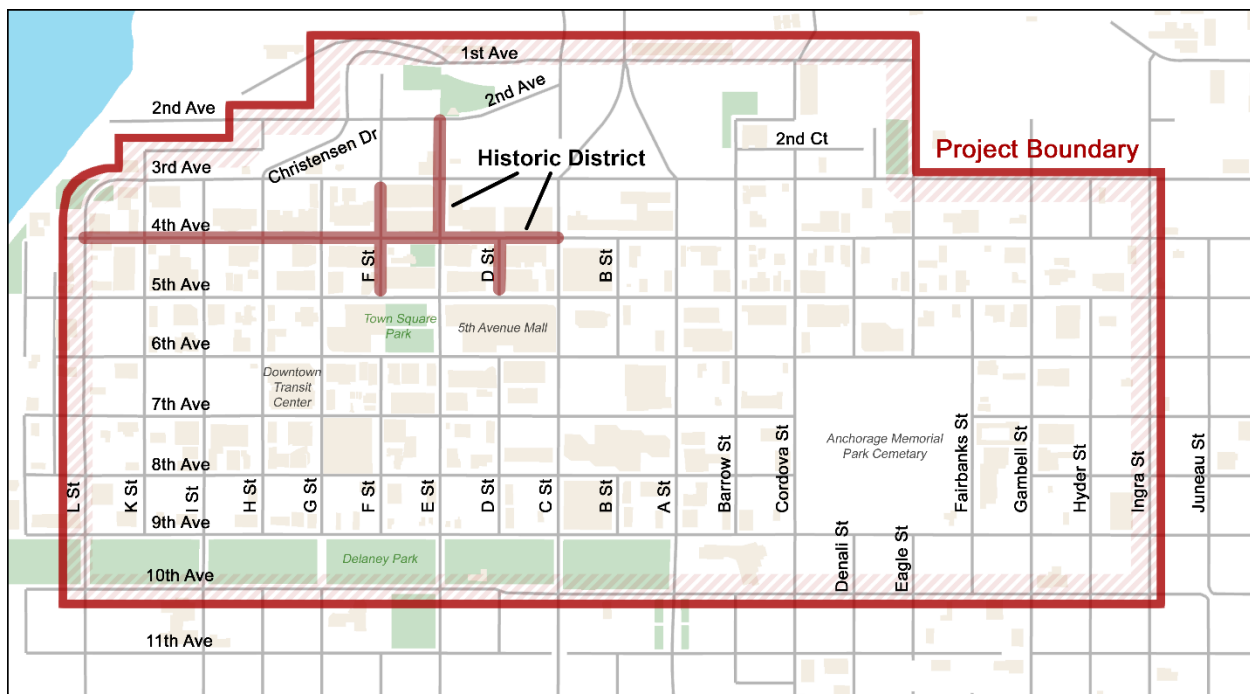


Figure 3 – Historic District Location Map

The CSMP recommendation for the rest of the CBD includes post-top mounted pedestrian light fixtures (similar to the Lumec Candela or Architectural Area Lighting Spectra fixtures) and Pantone 7545C (silver-blue) colored street furniture. The CSMP discourages the use of cobra head street lighting, and recommends that “high level” street lighting only be used at

intersections. The CSMP further recommends elevating the foundations a few inches to minimize pole base damage from maintenance activities, mounting pedestrian light fixtures 14 to 15 feet above grade, and placing the lights at least 3 feet from center of pole to the face of curb. Figure 4B depicts the pedestrian fixtures as recommended by the DCP.

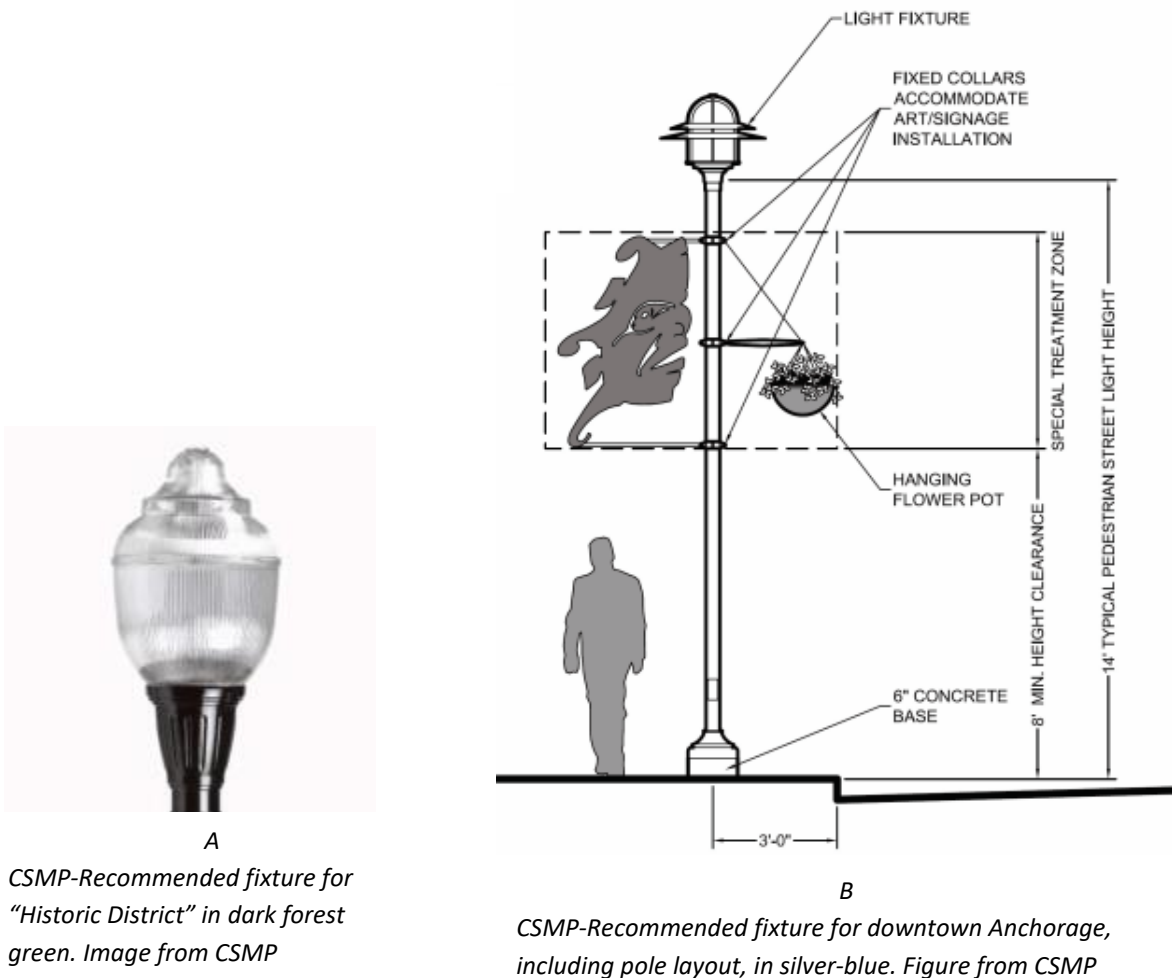


Figure 4 – CSMP Light Fixture Recommendations

1.3.2 Anchorage Downtown Partnership & Downtown Improvement District

The Anchorage Downtown Partnership, Ltd (ADP) manages the DID, which is closely coincident with the study area. The DID includes the area between 9th and 1st Avenues and between Gambell and L Streets. ADP is developing branding schemes for each of the unique areas of downtown. The branding includes features such as pole-mounted banners, signs, and public art. In addition, ADP staff perform security, maintenance, and cleaning activities throughout downtown. MOA should coordinate with ADP when developing improvements in the

downtown area to ensure streetscape improvements meet the needs of the downtown landowners and to take advantage of ADP staff's on-the-ground observations and maintenance concerns.

1.3.3 Greater Anchorage Incorporated

Greater Anchorage Incorporated (GAI) is the organization responsible for the Anchorage Fur Rendezvous festival and World Championship Sled Dog Races each winter. GAI is also working on promoting the Anchorage Mushing District, which Mayor Ethan Berkowitz created by proclamation on 4th Avenue between A Street and G Street. Improvement concepts proposed by GAI include an archway over 4th Avenue to designate the start of the downtown dog mushing events, plaques and/or banners celebrating the history of dog mushing in Anchorage and Alaska, and related street furniture. MOA approval for such improvements has not been granted at the time of this writing, but they are working on developing agreements with GAI.

2 Lighting

2.1 Levels

Lighting levels will follow Design Criteria Manual (DCM) guidance. Table 1 and Table 2 show the lighting level guidance for roadways and pedestrian facilities, respectively.

Table 1 – Roadway Lighting Levels

Road Classification	Pedestrian Level	Average Illuminance (foot-candles, min)	Uniformity (average/min, maximum)	Veiling Luminance (vmax/min, maximum)
Arterial	High	1.7	3.0	0.3
	Medium	1.3	3.0	0.3
Collector	High	1.2	4.0	0.4
	Medium	0.9	4.0	0.4
Local	High	0.9	6.0	0.4
	Medium	0.7	6.0	0.4

Intersections should be illuminated to the sum of the recommended approach street foot-candles and follow the more stringent uniformity and veiling luminance standards.

Table 2 – Pedestrian Facility Lighting Levels

Pedestrian Activity Level	Average Horizontal Illuminance (foot-candles, min)	Uniformity (average/min, maximum)	Vertical Illuminance* (foot-candles, min)
High	1.0	4.0	0.5
Medium	0.5	4.0	0.2

*Vertical Illuminance is measured 5 feet above the ground surface in both directions parallel to the main pedestrian flow.

All roads should be designed for ‘high’ pedestrian levels, which is defined as more than 100 pedestrians between 4:00 and 5:00 pm. If the current pedestrian activity does not meet the ‘high’ threshold, the lights can be dimmed to the ‘medium’ light levels. Lighting to the higher standard provides consistency in layout and flexibility to accommodate changes in usage over time.

2.2 Color of Light

Correlated Color Temperature (CCT) is a measure of the ‘color’ of the light produced by lighting fixtures. Roadway Light Emitting Diode (LED) lighting ranges from 2700K (yellow-white) to 5000k (blue-white). Yellow-white is described as being warm and similar in CCT to high pressure sodium (HPS) light fixtures which make up the majority of lights in use in downtown Anchorage.

MOA's current standard practice is to install LED light fixtures with 4000K CCT. DOT&PF has been using 3000K fixtures for lighting installations.

There are a number of factors to consider when choosing the CCT of LED lights. Aside from aesthetics, which is very subjective, efficiency, light pollution, and human health are a few of the factors and are further discussed below.

The CCT impacts the efficiency of LED light fixtures. Depending on the manufacturer, lumens produced per watt of power drops around 10 percent for each 1000K drop in CCT. For example, the specification sheet for Sternberg's Villa fixture reports 80.6 lumens per watts at 4500K, 71.9 lumens per watt for 3500K, and 63.0 lumens per watt for 2700K.

Light pollution and sky glow tend to be higher with higher CCT fixtures. Fixtures with the higher CCT typically emit more light in the 400 to 550 nanometer range, which also happens to be the range that contributes most to light pollution. However, this varies by manufacturer. The United States Department of Energy studied the issue¹ and found 2700K and 3000K fixtures to produce more sky glow than a 3900K fixture, but less than a 4100K fixture.

The American Medical Association (AMA) has reported² correlation between exposure to blue wavelengths of light and poor sleep and possibly a host of other health issues. As a result, the AMA recommends using fixtures with CCT of 3000K or less. However, as noted above in the light pollution discussion, CCT does not have a consistent correlation to light wavelength distribution.

Considering the standard practice of the MOA, the output efficiencies, and the mixed research results into the side effects of CCT, the improvements under this project should incorporate fixtures in the 3500K to 4000K range, depending on availability from the fixture manufacturers.

2.3 Fixture Style

The DCP recommends lighting downtown to consist solely of pedestrian scale decorative fixtures, as shown in Figure 5. However, at the recommended heights, these fixtures do not produce enough light to meet lighting standards for the streets and sidewalks. As a result, both street lights and pedestrian lighting will be required.

¹ *An Investigation of LED Street Lighting's Impact on Sky Glow*, 2017

² *Human and Environmental Effects of LED Community Lighting*, 2016

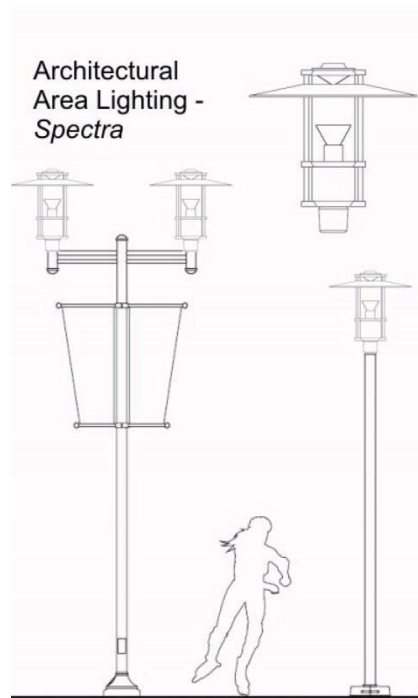


Figure from CSMP

Figure 5 – Recommended Pedestrian Scale Light Fixture

The DCM requires ‘full cutoff’ optics for light fixtures. None of the CSMP pedestrian scale fixtures meet that criteria. The Architectural Area Lighting – Spectra comes closest, because it has a closed top (see Figure 5). This is the light fixture recommended for use throughout downtown, except the historic district. Aesthetically comparable fixtures include the Sternberg Villa and Saturn Selux. Fixtures should be cylindrical with a transparent glass lens and a fairly flat metal ‘hat’, about 27 inches to 30 inches in diameter. The color of these poles and fixtures should be Pantone 7545C. If Pantone colors are not available, RAL 5014 would be an acceptable substitute.

For the historic district the CSMP recommends the acorn style of fixture in a post-top mounting changing from the half-circle mast arm vertical mounting, as shown in Figure 6. Poles and fixtures in the historic district should be Pantone 560C. If Pantone colors are not available, RAL 6005 would be an acceptable substitute.

The acorn fixture should have no finial, and have the photocell mounted in the fitter below the lens.



Figure from CSMP

Figure 6 – Proposed and Existing Historic Fixture and Mounting

Street lights will comply with Municipality of Anchorage Standard Specifications (MASS) standards and be mounted on galvanized steel poles. Fixtures will be LED. The fixture used as the basis of design should be verified with MOA Maintenance and Operations prior to each design. Fixtures mounted on signal poles shall be the standard grey color.

All light fixtures shall include a 7-pin photocell receptacle with shorting cap. This will allow MOA to install wireless control nodes on each light fixture if such a system is adopted in the future.

2.4 Placement of Light Poles

Light poles should be placed 2.5 feet from back of curb to center of pole. This is consistent with the CSMP's recommendation to install the poles 3 feet from the face of curb. If the sidewalk width is restricted such that it affects the 36" minimum Americans with Disabilities Act (ADA) clearance for wheel chair users, poles may be placed closer to the back of curb.

2.5 Mounting

Street lights and pedestrian lights should be installed on concrete foundations that extends 4 to 6 inches above finished grade to keep anchor bolts and electrical connections away from de-icing chemicals, which are used during winter months, and corrosive runoff. The portion of the foundations in and above the finished sidewalk grade should be formed with a removable form,

all exposed edges chamfered 0.75" using chamfer strips, and finished with a smooth-rubbed or grout-cleaned finish.

Street light poles and foundations should meet MASS requirements. Downtown street lights should have fixed bases with the luminaires installed 30 feet above the road. Mast arm lengths may vary depending on street width and lighting needs. Mast arm lengths should be consistent along each corridor. Street light poles should be galvanized steel.

Pedestrian lights should be installed 16 feet above the top of the raised foundation on a 5-inch diameter poles with an 8-inch diameter shaft base. Poles should be galvanized steel. Handholes need to be at least 4-inches by 6-inches to accommodate standard fused disconnects. Poles should include two 2.5-foot long banner arms on the building side, mounted at 12.5 and 15.5 feet above the pole base plate, and a pair of 1.5-foot long planter arms parallel to the road, mounted 12 feet above the pole base plate. The banner arms should be removable. The base plate should have a round, concave, two-piece cover plate. Anchor bolts should be arranged using a bolt circle of 11.5 inches in diameter, with 0.75-inch diameter bolts and washers. Each street and pedestrian pole should include a festoon outlet with low-profile, heavy duty, corrosion resistant, while-in-use cover mounted 11 feet above the pole base plate.

Signal poles will meet MASS standards and be galvanized with no color. Light fixtures on signal poles should be installed 30 feet above the road.

3 Electrical System Components

3.1 Junction Box Lid/Frame Grounding

Bonding and grounding is an important part of any electrical system. All lid frames and some junction box lids were found to not be grounded as documented in the August 2018 Downtown Lighting and Signals Upgrade Reconnaissance Study (KE, 2018). NEC Article 250.4(A) requires bonding "...normally non-current carrying materials enclosing electric conductors...", which would include the junction box lids and frames. However, the article also states that it applies to "conductive materials that are likely to become energized...". The lids meet the requirement to be grounded. The applicability to the frames is subjective, since they have such a small area of potential exposure to cables, making them not "likely" to become energized.

Junction box lid grounding needs to follow the MOA MASS details and/or DOT&PF standard plans.

3.2 Conduit

At the request of local maintenance forces and consistent with the DCM, conduit will continue to be galvanized rigid metal.

Conduit routing and spares for traffic signal systems will follow DCM Chapter 6.

Lighting conduit crossing streets should include a spare 2-inch conduit.

3.3 Junction Box Placement

Junction boxes are required adjacent to each pole, load center, or other cabinet per the DCM and MASS. Junction boxes should not be placed in the pedestrian access route, since they tend to create discontinuities that would violate ADA standards.

For light poles, install the junction boxes on the downstream traffic side from the pole at the same offset. Junction boxes should be offset from pedestrian poles by 6 feet, as shown in **Error! Reference source not found.** During the reconnaissance study, junction boxes adjacent to light poles with hanging flower baskets exhibited significantly more corrosion than junction boxes in other locations. By offsetting the junction boxes further away from light poles with hanging baskets, the life of the junction boxes will be extended. Precise junction box location should be adjusted during design to match the sidewalk scoring and avoid any grade breaks.

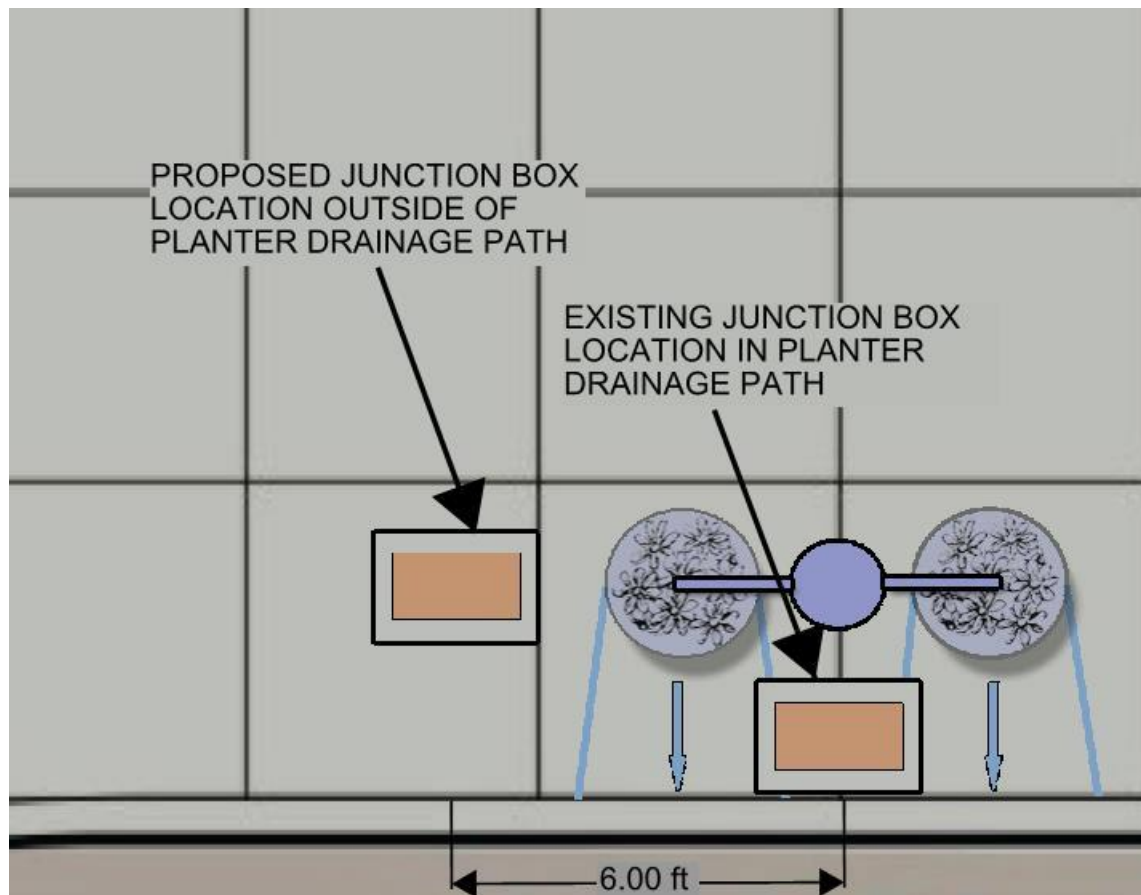


Figure 7-Proposed Junction Box Offset from Light pole

3.4 Load Centers

Chugach Electric (CEA) has assumed responsibility as the servicing utility for the project area. They must be contacted early in the design phase (ie, during the 65-percent design or earlier) to identify service needs, available service voltage and fault current data, and connect/disconnect coordination. If possible, load centers should have 120/240 volt single phase service since the festoon outlets and traffic signals will require 120 volts. If higher voltage service is provided, step-down transformers will be required at the load centers.

Power supplies for traffic signals on state-owned roads must be metered separately; and therefore, require their own load center.

Load centers should be placed so they do not: block pedestrian traffic, create sight distance hazards for motorists, block windows or doors of adjacent buildings, or create 'dead spaces' for vagrants to loiter. In general, this will result in load centers placed against buildings or in line with the light poles.

3.5 Festoon Outlets

Festoon outlets should be provided on all pedestrian light poles. Voltage drop and service load calculations should assume 180 VA load for each outlet.

4 Signal System

4.1 Poles

The standard traffic signal foundation for DOT&PF and MOA signals ranges from 36 to 48 inches with a 24-inch diameter bolt circle. The size of the foundation can conflict with the need to provide sidewalk clearances to meet ADA requirements on streets with narrow sidewalks and ROW. For a 36-inch foundation, at least 6 feet is required between the right of way and back of sidewalk to accommodate a 36-inch accessible route. Methods for accommodating signal pole foundations in narrow right of way include constructing curb bulbs, acquiring ROW, placing the pole on the opposite side of the road, and installing narrow foundations.

Curb bulbs will be feasible at most locations in the project area. However, where no other options are feasible, a 31-inch foundation detail has been evaluated and shown to work for poles with mast arms up to 45 feet long. Use of a narrow foundation will have to be evaluated by a structural engineer for each specific application.

4.2 Signal Equipment / Signal Head Placement

Signal mounted luminaires should comply with the 'street light' discussions in Section 2.

The current standard for signal heads is to install one signal head per approach lane. This is a variance from the currently approved DCM. Side-mount signals are often not used downtown due to visibility constraints and clearance to ROW and buildings. Since two signal heads are required for each approach, single lane approaches may require both signal heads to be installed overhead on the mast arm. One should be centered over the lane, while the other signal is mounted as far right as visibility allows.

Traffic controller cabinet should follow the guidance in the DCM and in the Load Center section 3.4 of this document.

5 Civil Improvements

5.1 Sidewalk Improvements

This project will necessarily disturb significant amounts of the existing sidewalk in the downtown area. Reconstructed sidewalk will need to meet ADA accessibility standards. While there are very specific requirements in these regulations, there is also a lot of flexibility in how those standards are met. As a result, the precise scope of sidewalk improvements may vary by project.

Sidewalk replacements should meet the guidance provided in the CSMP. This includes a 12-inch wide band of unscored concrete at the edge of ROW/back of sidewalk, standard broom finished concrete for the pedestrian movement zone with contraction joints spaced between 3 and 5 feet, and decorative concrete for the 'buffer zone'. The buffer zone extends from the back of curb to the back of light pole foundations, approximately 4 feet. The decorative concrete treatment may vary by area or zone and should be determined on a project by project basis. The buffer zone may have a different cross slope than the remainder of the sidewalk to help meet ADA grade requirements for the thru path but should not exceed 5 percent.

Contraction joints downtown should be narrow to minimize roughness for wheel chair users and provide a cleaner look. Detail joints to be 1/8-inch to 1/4-inch wide, with 3/8-inch profile radii. Joints shall be one quarter of the overall slab depth.

5.2 Curb Bulbs

Curb bulbs may be an effective means of adding sidewalk space where more room is needed to accommodate lighting and signal improvements. Due to parking restrictions near intersections, it is unlikely that they will negatively impact on-street parking. In addition, they have the added benefit of increasing pedestrian visibility for on-coming traffic.

Where used, curb bulbs require steel faced curb facing oncoming traffic. The curb will also need to be painted red where it tapers in and out of the parking lane. Curb radii should be designed to accommodate single unit trucks everywhere, and WB-67 trucks turning onto and off of major routes (L Street, I Street, C Street, A Street, Gambell Street, Ingra Street, 5th Avenue and 6th Avenue). Single unit trucks need to maintain lane discipline, but WB-67 can take all receiving lanes in their direction. Corners on bus routes and planned bus routes also need to accommodate city buses.

5.3 Parking

Parking within the downtown area is managed by EasyPark. They should be contacted during the preliminary design phase to identify on-street parking needs. Parking meters, where

installed, shall be 18 inches behind the face of curb. Coordinate locations with light poles, signs, and other appurtenances.

Curbs need to be painted red to designate no-parking area. This includes compound curves in and out of curb bulbs, curb transitions at driveways, and other locations consistent with Anchorage Municipal Code section 9.30.030.

Where parking stalls are marked, stalls at the end of the block or adjacent to no-parking areas should be 20 feet long. Interior stalls, bounded on both ends by other parking stalls, should be 23 feet long. If there is extra length it should be allocated to interior stalls first.

5.4 Raised Intersections/Enhanced Crosswalks

The DCP calls for raised intersections or ‘specially treated intersections’ on most of the intersections in the area bounded by 7th Avenue, G Street, 3rd Avenue, and C Street. Raised intersections do not affect signal and lighting system compliance with current standards, so should not generally be considered as part of this project. However, if the project is regrading any of these intersections (due to ADA compliance issues or to install curb bulbs), raised intersections or special intersection treatments should be installed to comply with the DCP.

5.5 Heated Sidewalks

The DCP calls for heated sidewalks in the same general area as the raised intersections (the area bounded by 7th Avenue, G Street, 3rd Avenue, and C Street). While the Downtown Lighting and Signals Upgrade will be reconstructing a lot of sidewalk, locating and constructing the mechanical systems necessary to support heated sidewalks is beyond the scope of this project. There may be opportunities for a heated sidewalk project to be constructed concurrently with the lighting and signal upgrades, but that would require separate funding, either by another project or adjacent landowner.

Note that segments of existing heated sidewalk exist throughout the downtown area. These are unmapped, and many are privately owned. During design, a walk-through during snowy weather to search out heated sidewalk systems is recommended. Existing heated sidewalk systems must be avoided or repaired if damaged by work done for this project.

6 References

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