~~~~~ PROJECT NOTE ~~~~~~

ARCHITECT OF RECORD/ENGINEER OF RECORD IS RESPONSIBLE FOR REVIEWING THIS SPECIFICATION SECTION IN DETAIL FOR COORDINATION WITH THE PROJECT SCOPE OF WORK.

ALL "PROJECT NOTE" TEXT IS TO BE REMOVED FOLLOWING REVIEW OF THE CONTENT OF EACH NOTE BY THE ARCHITECT OF RECORD/ENGINEER OF RECORD.

EDIT THE DOCUMENT FOOTER TO INCLUDE THE PROJECT NAME AND NUMBER.

EDIT THE DOCUMENT HEADER TO INDICATE THE ARCHITECT OF RECORD PROJECT ISSUE" DATE. THE "CPS CONTROL" DATE SHOULD NOT BE EDITED.

ANY MODIFICATIONS TO THE TECHNICAL STANDARDS IN THIS SECTION - INCLUDING THE REMOVAL OR ADDITION OF MANUFACTURERS - MUST BE APPROVED BY CPS. REQUESTS FOR MODIFICATION ARE TO BE SUBMITTED TO THE DESIGN MANAGER DURING THE DESIGN PHASE FOR REVIEW AND APPROVAL.

~~~ END OF PROJECT NOTE ~~~~

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 GENERAL

~~~~~ PROJECT NOTE ~~~~~~

FIXTURE TYPES AND REQUIREMENTS FOR SCOPE OF PROJECT TO BE SELECTED. COORDINATE CONTROLS TECHNOLOGY WITH STANDARD LUMINAIRES. EDIT COMPONENT TYPES TO COORDINATE WITH LUMINAIRES SPECIFIED. ALL WORK SHOULD BE LED.

~~~ END OF PROJECT NOTE ~~~~

1.01 SECTION INCLUDES

A. Exterior luminaires.
B. Drivers
C. Poles and accessories.
D. Luminaire accessories.

1.02 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.
B. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals; 2013, with Editorial Revision (2022).
C. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts; 2023.
D. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2023.

E. ANSI C136.41 - For Roadway and Area Lighting Equipment— Dimming Control Between an External Locking Type Photocontrol and Ballast or Driver; 2013.
F. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2020.
G. City of Chicago Building Code - Chicago Construction Codes, Title 14B; Current Edition.
H. Chicago Electrical Code - Municipal Code of the City of Chicago, Building/Electrical Code Requirements; 2018.
I. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).
J. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
K. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
L. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
M. IES RP-8 - Recommended Practice: Lighting Roadway and Parking Facilities; 2022.
N. IES TM-15 - Technical Memorandum: Luminaire Classification System for Outdoor Luminaires; 2020.
O. NAAMM AMP 500-06 - Metal Finishes Manual; 2006.
P. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
Q. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).
R. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
S. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.
T. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
U. UL 1598 - Luminaires; Current Edition, Including All Revisions.
V. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.03 SYSTEM DESCRIPTION

A. The exterior lighting system shall include all lighting fixtures, LED modules, switches, mounting, wiring, control equipment, and accessories, whether or not they are indicated or specified, required for a complete system, as indicated in the Drawings and as specified.
B. The luminaire schedules in the Drawings indicate manufacturer, fixture design, appearance and performance desired.

1.04 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4.
B. Live Load: Single load of 500 lbs, distributed as stated in AASHTO LTS-4.
C. Ice Load: Load of 3 lbs/sq. ft. applied as stated in AASHTO LTS-4.
D. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4.
    1. Wind speed for calculating wind load for poles exceeding 50 feet in height is 110 mph.
    2. Wind speed for calculating wind load for poles 50 feet or less in height is 110 mph.

~~~~~ ***PROJECT NOTE*** ~~~~~~
SHOP DRAWING INFORMATION, PRODUCT DATA, AND EXTRA MATERIALS REQUIRED FOR
~~~~~

PROJECT SCOPE OF WORK TO BE INCLUDED IN SUBMITTALS.
~~~ END OF PROJECT NOTE ~~~~

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection. Include details that cannot be adequately represented to the satisfaction of the Architect/Engineer of Record in Product Data.
   3. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
   4. Wiring Diagrams: For power, signal, and control wiring.
   5. Photometric data, certified by the manufacturer in accordance with the recommended practices of the IES.
   6. Quantity and type of LED modules.

C. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Provide separate submittal product data/shop drawings for each fixture type clearly indicating the fixture type designation used in the Drawings and all pertinent options and accessories. Do not group similar fixture types together on a single cut sheet. Submittals that do not indicate option selection where multiple selections exist will be returned without review. Include data on features, accessories, finishes, and the following:
   1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
   2. Details of attaching luminaires and accessories.
   3. Details of installation and construction.
   4. Luminaire materials such as finish and color information.
   5. Photoelectric relays.
   6. LED Drivers: Include information as to input watts. Indicate mounting distance limitation and standard wire sizes for remote drivers. Indicate control type and range.
   7. LED modules, per luminaire tag, including life, lumen output, correlated color temperature (CCT), color rendering index (CRI) and energy-efficiency data.
   8. Materials, dimensions, accessories and finishes of poles.
   9. Photometric data based on laboratory tests of each luminaire type, complete with indicated LED modules, drivers, and accessories.
   10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
   11. Pole and support structure anchor bolt information.
   12. Manufactured pole foundations, if any.

D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.
   1. Include BUG rating information
   2. Include DLC listing status

3. Include Efficacy information

E. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a State of Illinois Registered Structural Engineer.

F. Field Quality Control Reports.
   1. Include test report indicating measured illumination levels.

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

H. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals. Include manufacturers' recommended maintenance practices for each fixture type including, but not limited to, the following:
   1. Tools required.
   2. Acceptable cleaners and recommended cleaning practices.
   3. Replacement parts list.
   4. Manufacturer service department contact information/Qualified Service Agencies.
   5. Submittal data.
   6. Operation data.
   7. Intended operation narrative.

I. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes. Submit record drawings of the actual installation within thirty (30) days of date of Preliminary Acceptance.

J. Re-Commissioning Data: Submit manual containing all information required for re-commissioning of the installations.
   1. Submit two (2) copies of manual within thirty (30) days of date of Preliminary Acceptance.
   2. Submit re-commissioning manuals in heavy-duty, 3-ring binders. Submit manuals in accordance with Section 01 78 00 - Closeout Submittals.

1.06 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Provide a manifest of all extra materials provided.
   1. LED Modules: One (1) for every one hundred (100) of each type and rating installed. Furnish at least one (1) of each type.
   2. Glass and Plastic Lenses, Covers, and Other Optical Parts: One (1) for every ten (10) of each type and rating installed. Furnish at least one (1) of each type.
   3. Drivers: One (1) for every one hundred (100) of each type and rating installed. Furnish at least one (1) of each type.
   4. Globes and Guards: One (1) for every twenty (20) of each type and rating installed. Furnish at least one (1) of each type.

1.07 QUALITY ASSURANCE

A. Comply with the City of Chicago Building Code.

B. Comply with EPA, State of Illinois, and City of Chicago regulations for proper recycling or disposal of existing lamps and ballasts removed from the Site.

C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the ANSI/IEEE 802.7 by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
G. Solid State Lighting/Luminaires:
    1. Luminous flux, luminaire efficiency and chromaticity shall be tested, measured and reported in accordance with the most current versions of IES LM-79 and IES LM-80.
    2. Chromaticity ranges for "white light" products, with various correlated color temperatures, shall be provided in accordance with ANSI/NEMA-C78.377.
    3. Drivers and power supplies shall be provided in accordance with the requirements of ANSI/NEMA-C82.SSL1, and their maximum allowable harmonic emission limits shall be in accordance with ANSI/NEMA-C82.77.
    4. Shall be provided with a U.S. Department of Energy (DOE) "Lighting Facts "label indicating their specific performance characteristics, tested and reported in accordance with the requirements of the most current version of IES LM-79.
H. Commissioning: When required for the Project, Contractor shall assign representative(s) with expertise and authority to act on its behalf. The representative(s) shall perform commissioning activities including, but not limited to, the following:
    1. Review submittals relative to exterior lighting systems being commissioned.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.
B. Store poles on decay-resistant-treated skids at least 12-inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
C. Handle poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4-inch deep. Do not apply tools to section of pole to be installed below ground line.
D. Retain factory-applied pole wrappings on metal poles until right before pole installation.
E. Deliver exterior lighting fixtures individually wrapped in factory-fabricated fiberboard type containers or equivalent.
F. Handle exterior lighting fixtures carefully to prevent breakage, denting and scoring the fixture finish. Do not install damaged lighting fixtures; replace and return damaged units to equipment manufacturer.
G. Store lighting fixtures in a clean, dry space. Store in original cartons and protect from dirt, physical damage, weather and construction traffic.

1.09 COORDINATION

A. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
B. Notify Architect/Engineer of Record of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

C. Verify locations of light fixtures indicated in Drawings and coordinate with other reference data and materials as required prior to installation to ensure locations will not interfere with underground utilities or openings. Alert Architect/Engineer of Record and Board's Representative in writing to non-standard modifications required for compliance with the Contract Documents prior to proceeding with the work.

D. Where discrepancies are found within the Contract Documents, or additional information is required, immediately contact Architect/Engineer of Record for clarifications and additional information.

E. Coordinate installation of lighting system with other trades to prevent delays in the work and to ensure the lighting fixtures and supports will not be damaged by subsequent construction operations.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Special Warranty: Submit a written warranty, beginning from date of Preliminary Acceptance, and executed by the Contractor, manufacturer, and Installer agreeing to repair or replace products or components that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within the specified warranty period. Damage due to lightning, hail, vandalism, abuse, or unauthorized repairs or alterations shall be excluded from special warranty coverage. Warranty shall include all materials and components, as well as labor and equipment required to remove existing and install new materials and components.

1. Warranty Period for LED Luminaires, including LED Modules, LED boards, chips, and Drivers: Five (5) years from date of Preliminary Acceptance.
2. Warranty Period for Metal Corrosion: Five (5) years from date of Preliminary Acceptance.
3. Warranty Period for Color Retention: Five (5) years from date of Preliminary Acceptance.
4. Warranty Period for Fuses: Two (2) years from date of Preliminary Acceptance.
5. Warranty Period for Poles: Three (3) years from date of Preliminary Acceptance. Warranty shall include pole finish.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Provide for proper recycling or disposal of existing lamps and ballasts removed from the site in accordance with EPA and State of Illinois regulations in accordance with Section 02 86 13 Hazardous and Universal Waste Management.

PART 2 PRODUCTS

2.01 LUMINAIRES

A. Manufacturers:

1. Products: Subject to compliance with requirements indicated and the design criteria specified in the Luminaire Schedule, provide one (1) of the products specified in the Luminaire Schedule.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

1. Fixtures that are aimed upward shall be listed and labeled for installation in wet locations in that position.

D. Provide products complying with Federal Energy Management Program (FEMP) requirements.

E. Unless otherwise indicated, provide complete luminaires including LED modules, LED boards, drivers, reflectors, lenses, housings and other components required to position, energize and protect the light source and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc. Components, including nuts, bolts, rivets, springs, and similar parts, to be made from corrosion resistant materials.
H. Provide luminaires listed and labeled as suitable for wet locations and outdoor service unless otherwise indicated. Provide IP ratings required by fixture schedule, in compliance with IEC 60529.
I. Light fixtures shall be listed as qualified DLC products, where applicable.

~~~~~ PROJECT NOTE ~~~~~~
REMOVE RECESSED LUMINAIRES, CONTINUOUS ROW LUMINAIRES IF NOT REQUIRED FOR PROJECT SCOPE OF WORK. NOT TYPICAL FOR EXTERIOR LIGHTING.
~~~ END OF PROJECT NOTE ~~~~

J. Recessed Luminaires:
    1. Ceiling Compatibility: Comply with NEMA LE 4.
    2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
    3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
K. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.
L. LED Luminaires:
    1. Components: UL 8750 recognized or listed as applicable.
    2. Tested in accordance with IES LM-79 and IES LM-80.
    3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
    4. Shall be provided with a U.S. Department of Energy (DOE) "Lighting Facts "label indicating their specific performance characteristics, tested and reported in accordance with the requirements of the most current version of IES LM-79.
    5. Chromaticity ranges for "white light" products, with various correlated color temperatures, shall be provided in accordance with ANSI/NEMA -C78.377.
    6. LEDs shall be binned within a maximum 3-step MacAdam Ellipse.
    7. Drivers and power supplies shall be provided in accordance with the requirements of ANSI/NEMA-C82.SSL1 and their maximum allowable harmonic emission limits shall be in accordance with ANSI/NEMA-C82.77.
M. Provide anodized aluminum for aluminum parts of exterior fixtures that are not specified as requiring a painted finish.
N. Lateral Light Distribution Patterns: Comply with IES RP-8 for parameters of lateral light distribution patterns indicated for luminaires. Comply with IES TM-15.
O. Metal Parts: Free of burrs and sharp corners and edges.
P. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

Q. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

R. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit maintenance. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect driver when door opens.

S. Exposed Hardware: Stainless steel.

T. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

U. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

V. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.

W. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

X. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
   1. Where luminaire products are not indicated to be field painted and are not indicated to match the finish process and color of pole or support materials, provide the following:
      a. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
         1) Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
         2) Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

Y. Factory-Applied Labels: Comply with UL 1598. Include recommended LED modules and drivers. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when fixture assemblies are in place.
   1. Label shall include the following LED module and driver characteristics:
      a. "USES ONLY" and include specific LED module type.
      b. CCT and CRI for all luminaires.

~~~~~ PROJECT NOTE ~~~~~~

EDIT COMPONENT TYPES TO COORDINATE WITH LUMINAIRES SPECIFIED. EXTERIOR BATTERIES ARE NOT TYPICAL.

~~~ END OF PROJECT NOTE ~~~~

Z. Emergency Power: Provide emergency LED power pack with back box matching housing finish where indicated or, if not indicated, where required by Architect/Engineer of Record, or Board's Representative.

2.02 BALLASTS AND DRIVERS

~~~~~ PROJECT NOTE ~~~~~~
EDIT COMPONENT TYPES TO COORDINATE WITH LUMINAIRES SPECIFIED. ALL WORK SHOULD BE LED.
~~~ END OF PROJECT NOTE ~~~~

A. Drivers - General Requirements:
   1. LED drivers shall be factory provided by the respective luminaire manufacturers, and shall be suitable for their intended use, to operate the designated LED modules listed in the Luminaire Schedule, and as specified herein, to their full light output.
   2. Comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47 CFR part 18, Non-Consumer (Class A) for EMI/RFI (conducted and radiated).
   3. Provide complete connection to LED-type luminaries through both integrally installed and remote electronic drivers.
   4. Shall be totally enclosed within a metallic enclosure, and shall be provided with integral leads color coded per ANSI C82.11, or with poke-in style wire retaining connectors.
   5. Provide identical drivers within each luminaire type.
   6. Provide UL listed and labeled drivers. Provide drivers with temperature ratings appropriate to the installation.
   7. Surge Tolerance: Capable of withstanding characteristic surges, 10,000 aic minimum.
   8. Fixtures intended to be dimmed shall have dimming driver compatible with the specified dimmer controls.
   9. Remote Drivers:
      a. Remove drivers are specifically not indicated in Drawings. Install remove drivers in a readily accessible, dry, indoor, concealed location in accordance with the manufacturer's written instructions. If an indoor location is not within wiring distance limitations, an above grade, exterior enclosure rated as NEMA 3R or 4X is allowable. Enclosures shall be lockable, with a piano hinge design.
      b. Provide ventilated metal enclosures for remove drivers furnished as loose equipment. All wiring related to remove drivers and the related LED luminaries shall be installed in conduit.
      c. Verify and comply with the remote distance limitations specified by the luminaire/driver manufacturer.

2.03 POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4.
B. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.

C. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
D. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.
E. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
   1. Materials: Shall not cause galvanic action at contact points.
   2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
   3. Anchor-Bolt Template: Plywood or steel.
F. Concrete Pole Foundations: Cast in place, not less than 24-inches in diameter, and extending above and below grade as indicated in Drawings. Install with anchor bolts to match pole-base flange. Provide raceways, grounding electrodes, and other electric work relating to the pole foundations. Refer to Section 03 30 00 - Cast-in-Place Concrete for concrete, reinforcement, and formwork.
G. Poles shall be provided with handhole, anchor bolt covers, and grounding lug.

~~~~~ PROJECT NOTE ~~~~~~
ALSO COORDINATE POLES WITH SECURITY EQUIPMENT AS APPLICABLE
~~~ END OF PROJECT NOTE ~~~~

2.04 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B429/B429M, Alloy 6063-T6 with access handhole in pole wall.
   1. Shape and Size: Per Luminaire Schedule.
   2. Mounting Provisions: Butt flange for bolted mounting on foundation.
B. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
C. Handhole: Provide handhole opening, nominal 3-inches by 5-inches, at approximately 18-inches above pole base, complete with weathertight cover and securing fastener.
D. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 26 05 26 - Grounding and Bonding for Electrical Systems listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
E. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, and then bolted together with stainless-steel bolts. Fabricated with span and rise as indicated in Drawings.
   1. Tapered oval cross section, with straight tubular end section to accommodate luminaire.
   2. Finish: Same as pole.
F. Aluminum Finish: Comply with NAAMM AMP 500-06 " for recommendations for applying and designating finishes.
   1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

2.05 POLE ACCESSORIES

A. Duplex Receptacle: Where indicated, provide a 120V, 20A receptacle in a weatherproof assembly complying with Section 26 27 23 - Indoor Service Poles for ground-fault circuit-interrupter type.
   1. Recessed, 12 inches above finished grade.
   2. Nonmetallic polycarbonate plastic or reinforced fiberglass cover, color to match pole, that when mounted results in NEMA 250, Type 3R enclosure.
   3. With cord opening.
   4. With lockable hasp and latch that complies with OSHA lockout and tag-out requirements.

B. Fusing: Provide in-line fuses at handhole in each pole for each light fixture. Shall be UL listed and labeled, single pole, 600VAC, breakaway style, in-line fuse holders, designed for field installation onto pole supported luminaires. Provide complete with fuses, sized to the specific load.

C. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

2.06 INTEGRAL PHOTOELECTRONIC CONTROLS

A. Integral, Luminaire Installed, Photocell:
   1. Where indicated, provide a photo-electronic device designed, built, and tested to provide automatic on/off control of individual luminaire, from dusk to dawn, based on ambient light level.
   2. Controls shall be UL 773A listed and fabricated to meet or exceed requirements of ANSI C136.10 or ANSI C136.41 , with integral relay contacts rated not less than 1000VA to a total load at not less than 300VAC.
   3. Provide controls with integral time delay feature to prevent false operation after momentary light flashes or light blockages.
   4. Controls shall be manufactured, or provided, by luminaire manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify that field measurements are as indicated.

D. Verify that lighting fixture back-boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with ANSI/IEEE 802.7.

E. Verify that suitable support frames are installed where required.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

3.02 PREPARATION

A. Provide extension rings to bring lighting fixture back-boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

C. Demolition: Disconnect and remove luminaires, lamps, and accessories as indicated or, if not indicated, as directed by Architect/Engineer of Record. Disconnect and remove abandoned luminaires, lamps, and accessories. Remove from Site and dispose of legally.
D. Existing Installations: Extend existing installation using materials and methods specified.
E. Existing Fixtures to Remain or be Reinstalled: Clean and repair existing luminaires to remain and those indicated to be removed and reinstalled.

3.03 INSTALLATION

A. Coordinate locations of lighting fixture back-boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install products in accordance with manufacturer's instructions.
D. Install luminaires in accordance with NECA/IESNA 501.
E. Provide required support and attachment in accordance with Section 26 05 29.
F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

~~~~~ PROJECT NOTE ~~~~~~
MOUNTING TYPES TO BE INCLUDED. COORDINATE WITH PROJECT REQUIREMENTS AND SCOPE OF WORK.
~~~ END OF PROJECT NOTE ~~~~

G. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
H. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
   3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet between supports.
   4. Install canopies tight to mounting surface.
   5. Unless otherwise indicated, support pendants from swivel hangers.
I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
   1. Where fixtures protrude from the wall surface, provide additional structural support within the wall framing to accommodate the extra moment force created by the fixture
J. Pole-Mounted Luminaires:
   1. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
   2. Maintain the following minimum clearances:
      a. Comply with IEEE C2.

b. Comply with utility company requirements.
   1) Fire Hydrants and Storm Drainage Piping: 60 inches.
   2) Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
c. Trees:
   1) Less than 4-inch caliper: 15 feet.
   2) Greater than 4-inch caliper: Locate outside dripline.

3. Foundation-Mounted Poles:
   a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00 - Cast-in-Place Concrete.
      1) Install anchor bolts plumb per template furnished by pole manufacturer.
      2) Position conduits to enter pole shaft.
   b. Install foundations plumb.
      1) Exposed concrete surfaces of bases for all light poles and light fixtures shall be free of voids.
   c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      1) Use anchor bolts and nuts selected for the application and approved by manufacturer.
      2) Grout void between pole base and foundation. Use non-shrink or expanding concrete grout firmly packed to fill space.
      3) Install base covers, unless otherwise indicated.
      4) Use a short piece of 1/2-inch-diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
   d. Tighten anchor bolt nuts to manufacturer's recommended torque.
   e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
   f. Install anchor base covers or anchor bolt covers as indicated.
   g. Remove all rough edges from exposed surfaces. Leave exposed surfaces smooth.
   h. Remove all exposed forming materials.
4. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.
5. Embedded Poles: Install poles plumb as indicated.
6. Grounding:
   a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
   b. Provide supplementary ground rod electrode as specified in Section 26 05 26 - Grounding and Bonding for Electrical Systems at each pole bonded to grounding system as indicated.
7. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
8. Install non-breakaway in-line fuse holders and fuses complying with Section 26 28 13 - Fuses in pole handhole or transformer base for each ungrounded conductor.
9. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 26 27 26 - Wiring Devices in designated poles.

K. Install accessories furnished with each luminaire.

L. Ground metal poles and support structures according to Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1. Install a minimum of a 3/4-inch diameter by 8-foot copper grounding electrode for each pole, unless otherwise indicated, and installed as indicated in Drawings.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

M. Raise and set poles using web fabric slings (not chain or cable).

N. Installation of Individual Ground-Mounted Luminaires: Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 30 00.

3.04 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 05 33.13 - Conduit for Electrical Systems. In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a fifty (50) percent overlap.

3.05 RACEWAYS AND BOXES

A. Plastic conduit shall be used where indicated in Drawings, in unpaved areas and lawn areas. The conduit shall be Schedule 40, UL Listed, polyvinyl chloride conduit, and not less than 1-1/2 inches in diameter.

B. Galvanized rigid conduit shall be used under buildings, within five feet of entrances to buildings, in pole foundations, under paved areas and walkways, and within 18-inches, horizontally, of exterior junction boxes.

C. Provide pull line in empty conduit and duct.

D. Comply with the additional requirements of Section 26 05 33.13 - Conduit for Electrical Systems, 26 05 33.16 - Boxes for Electrical Systems, and 26 05 33.23 - Surface Raceways for Electrical Systems.

3.06 IDENTIFICATION

A. Provide vinyl tagging with panel source and circuit number on wiring at handhole in each pole and at each exterior box.

B. Identify each exterior box with 1-1/2 inch high black letters and numbers on yellow weatherproof, pressure-sensitive adhesive vinyl on the covers. Labels shall be Brady #1530.

C. Comply with the additional requirements of Section 26 05 53 - Identification for Electrical Systems.

3.07 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy drivers as determined by Architect/Engineer of Record.

E. Measure illumination levels at night with calibrated meters to verify compliance with performance requirements. Record test results in written report to be included with submittals.

3.08 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Board. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources. Secure locking fittings in place.
B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect/Engineer of Record.

3.09 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.10 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
B. See Section 01 79 00 - Demonstration, Training and Commissioning, for additional requirements.
C. Inspect each installed fixture for damage. Replace damaged fixtures and components.
D. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
    1. Verify operation of photoelectric controls.
E. Replace fixtures that show evidence of corrosion during project warranty period.
F. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with requirements.
G. Training: Perform on-site training of Board's personnel on operation, adjustment, and maintenance of exterior lighting. Training shall last a minimum of 4 hours and at the end of the session, the Board's maintenance personnel shall be thoroughly instructed in the proper operation of the system.

3.11 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.12 COMMISSIONING AND DEMONSTRATION

A. After system checkout and adjustment, the contractor shall operate the system for the review of Architect/Engineer of Record and Board's Representative, and shall make all adjustments and modifications as required by Architect/Engineer of Record and Board's Representative.

END OF SECTION