CITY OF FORT WAYNE MASTER UPDATED: 11/16/18

SECTION 26 56 00

EXTERIOR LIGHTING

1. – GENERAL
	1. DESCRIPTION
		1. Scope:
			1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install lighting fixtures and associated controls.
		2. Section Includes:
			1. Exterior lighting fixtures.
			2. Lamps.
			3. Ballasts.
			4. Pole standards.
			5. Accessories.
		3. Coordination:
			1. Coordinate location of fixtures with piping, ductwork, openings, and other systems and equipment and locate clear of interferences.
		4. Related Sections:

NTS: List below only sections covering products, construction, and equipment specifically identified in this section and specified in another section and directly referenced in this specification. Do not list administrative and procedural division 01 sections.

* + - 1. Section 26 05 05, General Provisions for Electrical Systems.
			2. Section 26 05 53, Identification for Electrical Systems.
			3. Section 26 09 23, Lighting Control Devices.
	1. REFERENCES

NTS: Retain applicable standards and add others as required. Remove HID/Fluorescent items if not used.

* + 1. Standards referenced in this Section are:
			1. ANSI C2, Safety Code
			2. ANSI C78, Electric Lamps
			3. ANSI C78.51, Electric Lamps - LED
			4. ANSI C82.4, Ballasts for High Intensity Discharge
			5. ANSI C82.16, LED Drivers
			6. ASTM A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
			7. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
			8. ASTM B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
			9. NEC Article 410, Luminaires, Lampholders, and Lamps.
			10. National Fire Protection Association (NFPA) 70.
			11. NEMA SSL 1, Electronic Drivers for LED Devices, Arrays, or Systems.
			12. UL 773, Plug-In Locking Type Photocontrols for Use with Area Lighting
			13. UL 844, Luminaires for Use in Hazardous (Classified) Locations.
			14. UL 1029, Safety of High-Intensity- Discharge Lamp Ballasts.
			15. UL 1572, High Intensity Discharge Lighting Fixtures
			16. UL 8750, Standard for LED Equipment for Use in Lighting Products
			17. UL 8752, Standard for OLED Panels
			18. UL 8753, Standard for Field-Replaceable LED Light Engines
	1. DEFINITIONS
		1. Fixture: Complete lighting device. Fixtures include lamp or lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply.
		2. Lighting Unit: Fixture or assembly of fixtures with common support, including pole or bracket plus mounting and support accessories.
		3. Luminaire: Fixture.

NTS: Edit article “1.4” below to suit the Project. DO NOT DELETE (NOT USED) ITEMS.

* 1. SUBMITTALS
		1. Submit the following:
			1. Product Data:
				1. Manufacturer's technical information for proposed fixtures, lamps, ballasts, poles, and accessories. Arrange Product Data for fixtures in order of fixture designation. Include data on features, poles, accessories, finishes, and following:

Outline drawings indicating dimensions and principal features of fixtures and poles.

Electrical Ratings and Photometric Data: Certified results of laboratory tests for fixtures and lamps.

* + - 1. Shop Drawings:
				1. Detail nonstandard fixtures and poles and indicating dimensions, weights, method of field assembly, components, and accessories.
				2. Wiring diagrams detailing wiring for control system showing both factory-installed and field-installed wiring for specific system of this Project, and differentiating between factory-installed and field-installed wiring.
				3. Anchor-Bolt Templates: Keyed to specific poles and certified by manufacturer.
			2. Test Results:
				1. Indicate and interpret test results.
			3. Operating and Maintenance Data (O&M):
				1. Maintenance data for products to include operation and maintenance information.
				2. Submit in accordance with Section 01 78 23.
			4. Extra Materials
				1. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

Lamps: 10 lamps for every 100 of each type and rating installed. Furnish at least one of each type.

Glass and Plastic Lenses, Covers, and Other Optical Parts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.

Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.

Drivers: 1 for every 100 of each type and rating installed. Furnish at least 1 of each type.

Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

* + 1. Submit in accordance with Section 01 33 00.
	1. QUALITY ASSURANCE
		1. Comply with ANSI C2.
		2. Items provided under this section shall be listed or labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).
			1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.
			2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.
		3. Regulatory Requirements:
			1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.
			2. NEC Article 410, Luminaires, Lampholders, and Lamps.
		4. Fixtures for Hazardous Locations: Conform to UL 844. Provide units that have Factory Mutual Engineering and Research Corporation (FM) certification for indicated class and division of hazard.
	2. DELIVERY, STORAGE AND HANDLING
		1. Delivery:
			1. Upon delivery, inspect equipment for evidence of water that may have entered equipment during transit.
		2. Storage:
			1. Store lighting fixtures, controls, related materials and equipment in clean, dry location with controls for uniform temperature and humidity. Protect materials and equipment with coverings and maintain environmental controls.
			2. Store materials and equipment for easy access for inspection and identification. Keep materials and equipment off ground, using pallets, platforms, or other supports. Protect materials and equipment from corrosion and deterioration.
		3. Store poles on decay-resistant treated skids at least 12 in. (300 mm) above grade and vegetation. Support pole to prevent distortion and arrange to provide free air circulation.
		4. Fiberglass Poles: Retain factory-applied pole wrappings until just before pole installation. Handle poles with web fabric straps.
		5. Metal Poles: For poles with nonmetallic finishes, handle with web fabric straps.
		6. Remove protective wrapping on aluminum poles upon installation.
	3. WARRANTY
		1. LED Drivers and lamps shall be warranted for a minimum of 5 years as a unit.
1. – PRODUCTS
	1. MANUFACTURERS
		1. Subject to compliance with requirements, provide products by one of the following:
			1. Eaton Lighting
			2. Hubbell Lighting
			3. Lithonia Lighting
			4. Philips Lighting
	2. FIXTURES AND FIXTURE COMPONENTS
		1. Metal Parts: Free from burrs, sharp edges, and corners.
		2. Sheet Metal Components: Corrosion-resistant aluminum, except as otherwise indicated. Form and support to prevent warping and sagging.
		3. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed fixtures.
		4. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange for door opening to disconnect ballast.
		5. Exposed Hardware Material: Stainless steel.
		6. Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:
			1. White Surfaces: 85%
			2. Specular Surfaces: 83%
			3. Diffusing Specular Surfaces: 75%
		7. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
		8. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor mounting in fixture doors.
		9. Photoelectric Relays: Conform to UL 773.
			1. Contact Relays: Single throw, arranged to fail in ON position and factory set to turn light unit on at 1.5 to 3 foot-candles (16 to 32 lux) and off at 4.5 to 10 foot-candles (48 to
			2. 108 lux) with 15 sec minimum time delay.
			3. Relay Mounting: In fixture housing.
			4. Photocell shield deflector to minimize nuisance activation.

NTS: The preferred option is LED. If LED is not available or practical for specific project applications keep HID Sections below, otherwise delete.

* + 1. Light Emitting Diodes (LED)
			1. Driver shall be accessible for easy replacement.
			2. Weatherproof fixture housing shall be sealed completely against moisture and environment contaminants.
			3. 4100K temperature, Color rendering index (CRI) greater than 70.
			4. LED driver shall have power factor greater than 90% and THD less than 20%.
			5. CSA Certified to US standards for 40°C ambient.
		2. LED Fixtures:
			1. Conform to UL 8750 and UL 8752.
			2. LED fixtures shall be modular and allow for separate replacement of lamps and drivers. User serviceable LED lamps and drivers shall be replaceable from the room side.
			3. Dimmable LED fixtures shall have either a 0-10 volt, three wire dimming driver or a two-step (50%, 100%) dimming driver.
		3. LED Drivers: Electronic type, labeled as compliant with RFI requirements of FCC Title 47, Part 15, Level “A” sound rating, minimum of 0.8 power factor, and THD less than 20%.
			1. Conform to UL 8753.
			2. Certification by Electrical Testing Laboratory (ETL).
			3. Dimming Drivers shall be 0-10 volt dimming with low end dimming to 10%.
			4. Dimming drivers shall be strobe and flicker-free across the full dimming range.
			5. Voltage: 120-277 volt unless listed on fixture schedule.
			6. Conform to IEEE C62.41, Category A, for resistance to voltage surges for normal and common modes.
		4. High-Intensity-Discharge (HID) Fixtures: Conform to UL 1572.
		5. HID Ballasts: Conform to UL 1029, and ANSI C82.4. Include following features, except as otherwise indicated.
			1. Metal Halide Ballasts:
				1. Pulse start ballast.
			2. Ballast Fuses: 1 in each ungrounded supply conductor. Voltage and current ratings as recommended by ballast manufacturer.
			3. Operating Voltage: Match system voltage.
			4. Single-Lamp Ballasts: Minimum starting temperature of minus 30°C.
			5. Open circuit operation will not reduce average life.
			6. Noise: Uniformly quiet operation, with a noise rating of B or better.
		6. Auxiliary, Instant-On, Quartz System: Automatically switches quartz lamp when fixture is initially energized and when momentary power outages occur. Turns quartz lamp off automatically when HID lamp reaches approximately 60% light output. Mount control components internal to ballast and independent of incoming line voltage.
		7. Lamps: Comply with ANSI C78 series that is applicable to each type of lamp. Provide fixtures with indicated lamps of designated type, characteristics, and wattage. Where lamp is not indicated for fixture, provide medium wattage lamp recommended by manufacturer.
		8. Outdoor Fixtures: Provide each fixture to be installed outdoors with cut-off lens to reduce the fixture’s light pollution emissions.

NTS: REMOVE SECTIONS AS REQUIRED IF 26 09 23 IS INCLUDED. Coordinate time switch requirements with Plant staff.

* + 1. Time Switch:
			1. Type: Astronomic dial time switch with day‑omitting device.
			2. Products and Manufacturers: Provide of one of the following:
				1. Z Series by Tork Time Controls, Inc.
				2. Or equal.
			3. Timing Motor: Heavy-duty, synchronous, self‑starting, high torque, 120-volt or 277-volt, 60 Hertz, as shown on the Drawings.
			4. Capacity: 40 amps per pole at 277 volts.
			5. Dial: 24-hour rotation, with gear to provide one revolution per year that automatically raises the “ON” and “OFF” settings each day according to seasonal changes of sunset and sunrise.
			6. Reserve Power: Spring driven reserve sufficient to operate time switch contacts for not less than 30 hours after power failure. On restoration of power, time switch shall transfer to synchronous motor drive and automatically rewind reserve.
		2. Lighting Contactor and Controls:
			1. Provide a lighting contactor and control system for control of each area where shown on the Drawings.
			2. Product and Manufacturer: Provide products of one of the following:
				1. Square D Company.
				2. Siemens.
				3. Eaton.
				4. Or equal.
			3. System shall include:
				1. Enclosure sized as required, complete with input control fuse and screw type terminal blocks rated 300-volt, 20-amp quantity for all circuits, unless indicated otherwise on the Drawings.
				2. Single coil, electrically-operated, mechanically-held contactor. Contactor shall be rated 30-amp, 600-volt, with 120-volt operating coil, unless indicated otherwise on the Drawings. Number of poles shall be as shown on the Drawings. Provide multiple contactors when necessary.
				3. Where lighting contactors are controlled by photocell, provide a 120-volt, two-pole control relay, enclosure mounted to convert the two-wire photocell control to three-wire control required by contactor. Control shall include a cover mounted on-off-auto selector switch for “manual” or “auto” selection of operation. In “auto” position, contactor shall respond to photocell.
				4. Enclosure: As required for area classification per Section 26 05 05, General Provisions for Electrical Systems.
				5. Identify panel in compliance with Section 26 05 53, Identification for Electrical Systems.
	1. FIXTURE SUPPORT COMPONENTS
		1. Pole-Mounted Fixtures: Conform to AASHTO LTS-3.
		2. Wind-load strength of total support assembly, including pole, arms, appurtenances, base, and anchorage, is adequate to carry itself plus fixtures indicated at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 100 mi./h (160 km/h) with gust factor of 1.3.
		3. Arm, Bracket, and Tenon Mount Materials: Match poles' finish.
		4. Mountings, Fastenings, and Appurtenances: Corrosion-resistant items compatible with support components. Use materials that will not cause galvanic action at contact points. Use mountings that correctly position luminaire to provide indicated light distribution.

NTS: Insert at (--1--) below type of pole shaft. Options include Fluted, Straight, and Tapered.

* + 1. Pole Shafts: (--1--)

NTS: Edit paragraphs “F” and “G” below to suit project.

NTS: Insert at (--1--) the steel finish. Options include hot-dipped galvanized, iron-oxide primed, factory finish, and galvanized.

* + 1. Steel Poles: Provide square steel poles having minimum 11-gauge steel with minimum yield strength of 48000 psi and (--1--) steel poles shall comply with ASTM A123 and A153.
		2. Aluminum Poles: ASTM B209 (ASTM B209M), 5052-H34 alloy. Provide access handhole in pole wall.
		3. Pole Bases: Anchor type with galvanized steel hold-down or anchor bolts, leveling nuts, and bolt covers. Height exposed above grade shall be between 12” to 30” based upon installation location.
		4. Metal Pole Grounding Provisions: Welded 1/2 in. (12 mm) threaded lug, accessible through handhole.
		5. Pole-Top Tenons: Fabricated to support fixture or fixtures and brackets indicated and securely fastened to pole top.
		6. Concrete for Pole Foundations:
			1. Comply with Section 03 30 00.
			2. Use 3000 psig strength, 28 day concrete.
		7. Aluminum Mast Arms: Tapered oval arms continuously welded to pole attachment plate with span and rise as indicated.
		8. Metal Pole Brackets: Designed to match pole metal. Provide cantilever brackets without underbrace, in sizes and styles indicated, with straight tubular end section to accommodate fixture.

NTS: Consult with Owner on the color of the fixture finish. Standard color is dark bronze.

* 1. FINISHES
		1. Metal Parts: Manufacturer's standard finish, except as otherwise indicated, applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and similar defects.
		2. Other Parts: Manufacturer's standard finish, except as otherwise indicated.
1. – EXECUTION
	1. TEMPORARY LIGHTING
		1. New lighting fixtures **SHALL NOT** be used for temporary lighting.
	2. INSTALLATION
		1. General:
			1. Fixture mounting heights and locations indicated on the Drawings are approximate and are subject to revision in the field where necessary to clear conflicts and obstructions.
			2. Mounting Heights: Mounting heights or elevations are to bottom of fixture or to centerline of device.
			3. Install fixtures in accordance with Laws and Regulations, the Contract Documents, and manufacturer instructions and recommendations.
			4. Mount fixtures so that sufficient access is available for ready and safe maintenance.
			5. Securely fasten equipment to walls or other surfaces on which equipment is mounted.
		2. Suspended Fixtures:
			1. Pendant-mount using manufacturer’s recommended diameter conduit stems.
			2. Ground to outlet box.
			3. Attach mounting to building structure with expansion anchors.
			4. Fixtures shall not be dependent on the outlet box cover screws for support.
		3. Surface Mounted Fixtures:
			1. Attach to appropriate outlet box.
			2. Attach to surface using fasteners and sealing washers when mounting fixture in damp or wet locations.
		4. Boxes and Fixtures:
			1. For units mounted against masonry or concrete walls, provide suitable 1/4‑inch spacers to prevent mounting back of box directly against wall.
			2. Bolt units rigidly to building with expansion anchors, toggle bolts, hangers, or Unistrut.
			3. Do not install boxes with open conduit holes.
			4. Cable each circuit and identify with tag.
		5. Set units plumb, square, level, and secure according to manufacturer's written instructions and approved submittals.
		6. Concrete Foundations: Construct according to Section 03 30 00.
			1. Comply with details and manufacturer's recommendations for reinforcing, anchor bolts, nuts, and washers. Verify anchor-bolt templates by comparing with actual pole bases furnished.
			2. Finish: Trowel and rub smooth parts exposed to view.
		7. Pole Installation: Use web fabric slings (not chain or cable) to raise and set poles.
		8. Fixture Attachment: Fasten to indicated structural supports.
		9. Fixture Attachment with Adjustable Features or Aiming: Attach fixtures and supports to allow aiming for indicated light distribution.
		10. Lamp fixtures with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.
	3. GROUNDING
		1. Ground fixtures and metal poles according to Section 26 05 26.
			1. Poles: Install 10 ft (3 m) driven ground rod at each pole.
			2. Nonmetallic Poles: Ground metallic components of lighting unit and foundations. Connect fixtures to grounding system with No. 6 AWG conductor.
	4. FIELD QUALITY CONTROL
		1. Inspect each installed unit for damage. Replace damaged fixtures and components.
		2. Tests and Observations:
			1. Give advance notice of dates and times for field tests.
			2. Provide instruments to make and record test results.
			3. Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source. Include following:
				1. Photometric Tests: Measure light intensities at night at locations where specific illumination performance is indicated. Use photometers with calibration referenced to National Institute of Standards and Technology (NIST) standards.
				2. Check for intensity of illumination.
				3. Check for uniformity of illumination.
				4. Check for excessively noisy ballasts.
				5. Prepare written report of tests indicating actual illumination results.
			4. Replace or repair damaged and malfunctioning units, make necessary adjustments, and retest. Repeat procedure until units operate properly.
	5. ADJUSTING AND CLEANING
		* 1. Clean units after installation. Use methods and materials recommended by manufacturer.
			2. Adjust aimable fixtures to provide required light intensities.

NTS: Fixture schedule shall be on the Construction Drawings.

+ + END OF SECTION + +