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BuildingName
The Description of the Project
P00000000 0000

SPECIFICATION DIVISION 26

NUMBER SECTION DESCRIPTION

DIVISION 26 ELECTRICAL
SECTION 265600 - EXTERIOR LIGHTING

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DIVISION 26 ELECTRICAL
SECTION 265600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 1 Specification Sections, and other applicable Specification Sections, in particular the Related Sections listed below, apply to this Section.

B. Related Sections:

1. Section 017823 - Operation and Maintenance Manual
2. Section 019100/019110 - Commissioning
3. Section 260513 - Medium, Low & Control Voltage Cables
4. Section 260526 - Grounding and Bonding for Electrical
5. Section 260533 - Electrical Materials and Methods
6. Section 260800 - Electrical Acceptance Tests

1.2 SUMMARY

A. Section Includes:

1. Provide all equipment and materials required for pedestrian (security), roadway, and parking lot outdoor lighting as shown on the Drawings.

B. Prior to construction activities, contact the Owner's Utilities Power & Lighting Shop at 734-647-2049 to coordinate project parameters.

C. Refer to the fixture schedule and details on the Drawings for information on the fixtures, poles, and accessories.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Contact MISS DIG at 1-800-482-7171 or 811 before performing any excavation work.

B. Provide barricades around open holes and trenches. Provide temporary bridges over trenches cut through major sidewalk routes. Major sidewalk routes shall not be closed to pedestrian traffic.

C. Contact the Owner's Electrical Inspectors at 734-764-2457 for inspections before backfilling excavations and before energizing circuits.

D. For maintenance or repairs to existing lighting systems, contact Utilities Power & Lighting Shop at 734-647-2049.

1.4 SUBMITTALS

A. Lighting equipment specifications and manufacturer cut sheets, including:

1. Luminaire types, descriptions, dimensions, optics, materials, finishes, and photometric data.

2. Pole or mounting support descriptions, dimensions, materials, and finishes.
3. For each luminaire, lamp type, lamp wattage, delivered lumen output, color temperature, color rendering index, and related life.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Submit marked up as-built drawings showing the actual locations of lighting poles, sleeves and junction boxes, circuit numbers for all loads, and all deviations from the design. Dimension the locations of sleeve ends, conduits, and junction boxes from a permanent building or landscape feature.

1.5 QUALITY ASSURANCE

A. Manufacturers and Products: The products and manufacturers specified in this Section establish the standard of quality for the Work. Subject to compliance with all requirements, provide specified products from the manufacturers named in Part 2.

B. Reference Standards: Products in this section shall be built, tested, and installed in compliance with the specified quality assurance standards; latest editions, unless noted otherwise.

1. IEEE C2, National Electrical Safety Code.
2. NFPA 70; National Electrical Code.
3. MDOT Standard Specifications for Construction.
4. AASHTO, American Association of State Highway and Transportation Officials
5. Aluminum Association Standards.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 WARRANTY

A. Provide a complete parts and labor warranty for a minimum of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PEDESTRIAN LIGHTING

A. Fixtures

1. Fixtures shall be Philips Lumec “New Westminster” (NW) Series only.
2. Fixtures shall be of the round globe type, suitable for mounting singly or in multiples on round, tapered aluminum poles.
3. Globes shall be 20-inch diameter with a satin clear finish with internal bead blast giving a soft diffusing lighting effect.

4. The lower half of each globe shall be guarded by a cast aluminum, 6-spoke basket that supports a 2-inch-wide horizontal aluminum band around the luminous center of the globe.
5. Fixtures shall be equipped with an electronic driver with a high power factor of 90% minimum. The driver shall have an ambient temperature operating range from minus 40 degrees F to 130 degrees F. The driver output shall provide protection from short circuits, voltage overload, and current overload. The driver shall have a nominal life of 100,000 hours. The LED source and driver shall be wired with a polarized quick disconnect plug to permit removal for maintenance.
6. Fixtures shall be equipped with 4000 degrees K LED lamps, having a nominal output of 6,000 delivered lumens for single globe fixtures, or 4,000 delivered lumens for each globe in a multiple-globe fixture, and an L70 nominal life of 70,000 hours. Lamps shall be Philips Lumileds Luxeon R only.

B. Poles

1. Poles shall be of the round, tapered, aluminum type. Pole height shall be in accordance with the Lighting Fixture Schedule.
2. Poles shall be of one-piece construction with a 0.120-inch minimum wall thickness, a 5-inch diameter at the base, and a 4-inch diameter maximum at the top. Any longitudinal welds shall be ground flush and unnoticeable.
3. Poles shall include a base plate 5/8-inch minimum thick. The base plate shall be continuously welded both top and bottom (or inside and outside) to the pole base.
4. Pole base plates shall have four slots suitable for installing over four 3/4-inch diameter anchor bolts set in a 9-1/2 inch diameter bolt circle pattern.
5. Poles shall include a reinforced 2-inch by 4-1/2-inch handhole located in the base. The handhole shall include a gasketed cover plate that is firmly held in place by two 1/4”-20 stainless steel cap screws. Provide an internal ground lug, which shall be located on the handhole side of the pole.
6. Poles shall be mechanically cleaned and painted with a black polyester powder coat outside to match the light fixtures.
7. Each pole shall include a one-piece, decorative, cast aluminum base bolt cover painted to match the pole.
8. The poles shall be from the same supplier as the lighting fixtures.

C. Anchor bolts for pedestrian lighting fixtures shall be 3/4-inch diameter by 20 inches long with a 3-inch “L”, fully hot dip galvanized steel having a yield strength of 36,000 psi, each with two hot dip galvanized fender washers and hex nuts.

D. Wall-mounted

1. Fixtures shall be similar to above, Philips Lumec “New Westminster” NW-M Series only.

E. Column mounted fixture bases shall be fabricated from aluminum pipes and plates in accordance with the Drawings, and they shall be painted to match the lighting fixtures.

2.2 ROADWAY AND PARKING LOT LIGHTING

A. Fixtures

1. Fixtures shall be Lithonia Lighting DSX1 Series, McGraw-Edison Galleon II Series, or Gardco OptiForm Medium Series only. Fixtures shall be low-profile type with LED lamps, suitable for mounting singly or in pairs on round, tapered, aluminum poles. Unless noted otherwise in the Fixture Schedule, the fixtures shall have Type III Medium light distribution.
2. Fixture housings shall have a gullwing profile, nominally 32 inches long by 13 inches wide by 7 inches high. The housings shall be die-cast aluminum with integral heat sink fins.
3. Fixtures shall be equipped with an electronic driver with a power factor greater than 90 percent, THD less than 20 percent, and an expected life of 100,000 hours. Electronic drivers shall have an easily serviceable 10kV surge protection device. Provide a locking-type, 7-pin plug, in compliance with ANSI C136.41, to permit removal for maintenance. Provide a shorting cap.
4. Light engines shall consist of high-efficacy LED lamps with precision-molded acrylic lenses and rated at 4000 degrees K and a minimum of 70 CRI. The optics shall have zero uplight component. The light engines shall be modular for ease of maintenance and future light engine upgrades. Fixtures on 30'-0" poles shall have a nominal delivered lumen output of 20,000. The lumen maintenance factor shall be 0.88 minimum at 100,000 hours (tested per LM-80-08 and projected per TM-21-11).
5. The finish shall be a black, zinc-infused thermoset powder coat finish, with a minimum 2.5 mils thickness.
6. Fixture housings shall mount directly to poles with integral arms.
7. Fixtures shall be UL 1572 Listed as suitable for wet locations and shall be rated for -40 degree F minimum ambient temperature.

B. Poles

1. Provide tapered aluminum poles as follows:
   a. For 12 foot tall poles, Valmont Model 1108-30506T4L or Acuity RTA-12-8J-DMXX-DART-ABL-AB36-0-FULL-GALV.
   b. For 20 foot tall poles, Valmont Model 1908-40705T4 or Acuity RTA-20-8J-DMXX-DART-ABL-AB36-0-FULL-GALV.
   c. For 25 foot tall poles, Valmont Model 2408-45806T4 or Acuity RTA-25-8J-DMXX-DART-ABL-AB36-0-FULL-GALV, or Hapco RTA25F8B4.
   d. For 30 foot tall poles, Valmont Model 2908-45808T4 or Acuity RTA-30-8J-DMXX-DART-SPCL-TAPER-ABL-AB36-0-FULL-GALV, or Hapco RTA30F8B4.
2. Poles shall be of the round, tapered, aluminum type. Poles shall be of seamless, one-piece construction with a uniform taper of approximately 0.14 inches per foot from base to top. The poles shall be of the heights shown on the Drawings.
3. Poles shall be 6063 alloy aluminum, 0.250-inches thick, and heat treated to achieve a T6 temper, having a yield strength of 50,000 psi minimum and an ultimate tensile strength of 65,000 psi minimum.

4. Poles shall be rated for a continuous wind of 80 MPH plus a gust factor of 1.3 per AASHTO, an Effective Projected Area (EPA) of 20.0 minimum, and a fixture load of 400 pounds minimum.
5. Poles shall include a base plate of A356 alloy aluminum, 1-inch minimum thick, and heat treated to achieve a T6 temper, having a minimum yield strength of 36,000 psi. Base plate shall be continuously welded both top and bottom (or inside and outside) to the base of the pole.
6. Pole base plates shall have four slots suitable for installing over four 1-inch diameter anchor bolts set in an 11-inch diameter bolt circle pattern.
7. Poles shall include a reinforced 4-inch by 6-inch handhole located in the base. The handhole shall include a gasketed cover plate that is firmly held in place by two 1/4"-20 stainless steel cap screws. Provide an internal ground lug, which shall be located on the handhole side of the pole.
8. Poles shall be mechanically cleaned, and either plastic resin coated or polyester powder coated inside over their entire length. Poles shall be painted with a black polyester powder coat outside to match the specified light fixtures.
9. Each pole shall be provided with a 5/16 inch-18 tapped provision for a ground connector.

C. Anchor bolts for roadway and parking lot lighting shall be 1-inch diameter by 36-inches long with a 4-inch "L", fully hot dipped galvanized steel having a yield strength of 36,000 psi. Each bolt shall be provided with two hot dipped galvanized fender washers and hex nuts.

D. Provide Valmont Base Cover, "Dart Square – 2T" Model or equivalent by Acuity, made of A356 alloy aluminum and finished to match the pole. The cover shall be a single unit, installed in two pieces, covering all four nuts and the base plate. Pieces shall be held together and anchored to the pole base with stainless steel set screws.

2.3 BANNER ARMS

A. Banner arms shall be provided by the banner supplier and are not the responsibility of the pole supplier.

B. Banner arms shall be 6061 cast aluminum, heat treated to a T6 temper, welded to the arm base plate. Banner arm length (banner width) shall be 24 inches maximum for pedestrian light poles and 30 inches maximum for roadway light poles as indicated in the University Banner Guidelines.

1. Top banner arms for pedestrian light poles shall be Valmont "BannerSaver" Model, break-away type with self-restoring feature. The break-away/self-restoring hardware shall be welded directly to the arm base plate.
2. Top banner arms for roadway light poles shall be either Valmont non-break-away type or Valmont "BannerSaver" Model, break-away type with self-restoring feature. The non-break-away arm, or the break-away/self-restoring hardware, shall be welded directly to the arm base plate.

3. Bottom banner arms for all poles shall be Valmont "BannerSaver" Model, break-away type with self-restoring feature. The break-away/self-restoring hardware shall be welded directly to the base plate.
4. Banner arm base plates shall be anchored to the poles with adjustable aluminum compression straps or aluminum clamps, finished to match the poles. Arms and straps/clamps shall be removable without any damage to the pole or to its finish. Drilling of any holes for banner arm or hardware attachment is not allowed.
5. End caps for banner arms shall be A356 alloy aluminum, standard type, attached to the arm per manufacturer's standards.
6. Mounting heights of the bottom arms shall be 13 feet clear above the pole base on street light poles, and 6 feet 8 inches minimum clear above grade on pedestrian light poles.

2.4 CONCRETE

A. Concrete for lighting pole and emergency telephone kiosk bases shall be 6 bag minimum mix, with aggregate not exceeding 3/4 inch, 4,500 psi minimum compressive strength after 28 days, air content minimum 5 percent and maximum 7 percent.

2.5 RACEWAYS

A. Conduits indoor, in general areas, shall be electrical metallic tubing (EMT) with steel set screw fittings.

B. Conduits outdoors (except where galvanized rigid steel is shown on the drawings) shall be Schedule 40 PVC with matching fittings, UL Labeled for use with 90 degrees C cables. Acceptable manufacturers:

1. Cantex.
2. Carlon
3. National Pipe & Plastic.

C. Sleeves for underground outdoor lighting and irrigation installations shall be 6" Schedule 40 PVC, UL Labeled for use with 90 degrees C cables. Acceptable manufacturers:

1. Cantex.
2. Carlon.
3. National Pipe & Plastic.

D. Junction boxes shall be pre-cast polymer concrete or polymer foam, heavy-duty rated, one size larger than required by the NEC, bottomless, with a single piece cover engraved "UM Outside Lighting" and attached with pentahead stainless steel bolts. Provide metal barriers in junction boxes containing circuits of two different voltages or containing both power and telephone circuits. Acceptable manufacturers:

1. Carson-Brooks.
2. CDR Systems.
3. Quazite.

E. Marking tape shall be plastic, vinyl, or Mylar, 6-inches wide, red for electrical power circuits and orange for telephone circuits, and labeled to indicate the type of circuit buried below.

2.6 WIRING

A. Wire and cable for general indoor use shall be single conductor stranded copper with Type THHN insulation rated 90 degrees C, 600 volts.

B. Wire for use outdoors shall be single conductor stranded copper with Type XHHW insulation rated 90 degrees C in dry locations and 75 degrees C in wet locations, 600 volts.

2.7 TERMINATIONS

A. Connectors for splicing and terminating lighting conductors within in-grade boxes shall be Homac 3 RAB4 or RAB6 "Flood-Seals" only.

B. Connectors for terminating lighting conductors in poles shall be ILSCO UTILCO SLC4-01-L terminal blocks with ILSCO UTILCO No. R6131 boots.

C. Connectors for terminating lighting conductors in column and wall mounted fixture bases only shall be copper split bolt connectors with full tin-plating. Blackburn 1HPW for No. 3 AWG wire and 4HPW for No. 6 or No.8 AWG ground wire.

2.8 FUSING

A. Fuse holders for lighting fixtures shall be Eaton Bussmann TRON No. HEB-AA in-line, waterproof fuse holders rated 300 volts and 30 amps.

B. Fuses for lighting fixtures (unless shown otherwise on the Drawings) shall be Eaton Bussmann No. KTK-5, rated 5 amps.

2.9 CONTROLS

A. Lighting contactors shall be of the voltage and amperage shown, 3-pole, fused disconnect switch type, electrically-held, with a hand-off-auto switch and a 120 volt control power transformer. Lighting contactors located indoors shall be installed in NEMA 1 enclosures, and lighting contactors located outdoors shall be installed in NEMA 3R stainless steel enclosures with pad-lockable doors. Schneider Electric (Square D) Class 8903 only.

2.10 CIRCUIT REQUIREMENTS

A. Unless shown otherwise on the Drawings, provide circuits as follows:

1. Feed parking lot lighting, pedestrian lighting, roadway lighting, emergency telephone kiosks, illuminated signs, and parking lot electric gates and meters all from separate circuits.
2. Feed pedestrian lighting on opposite sides of a roadway or sidewalk from separate circuits.
3. Feed pedestrian, roadway, and parking lot lighting at 277 volts from a 480Y/277 volt, three-phase circuit. Feed emergency telephone kiosks, illuminated signs, and parking lot electric gates and meters at 120 volts.
4. Pedestrian and roadway lighting circuits shall consist of four No.4 AWG conductors plus a No. 8 AWG ground conductor in a 1-1/4" conduit.

5. Emergency telephone kiosk, illuminated sign, and parking lot electric gate and meter power circuits shall consist of two No. 8 AWG and one No. 8 AWG ground conductors in a 1" conduit.
6. Telecommunications conduits to emergency telephone kiosks and parking lot electric gates and meters shall be 1-1/2" minimum and shall include a nylon pull string.

B. Provide a means for expanding the outdoor lighting circuits. Stub out a spare 1-1/4" conduit from each pole base indicated by "STUB SPARE C" on the plan drawings.

2.11 CONTROL REQUIREMENTS

A. Switch the outdoor lighting with lighting contactors where shown. Lighting contactors shall be controlled by normally closed contacts of a Building Automation System DDC control panel (the preferred option whenever DDC is available), or a photocell when DDC is not available. The control circuit shall be wired to energize the lighting upon a failure of the DDC control panel or photocell. Contact the Owner's Utilities Power & Lighting Shop (734-647-2049) to coordinate connection to a DDC control panel.

B. Where specified in the Lighting Fixture Schedule, provide a photocell on top of each fixture housing.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Remove existing pole bases and associated circuiting completely when demolishing existing lighting. Direct buried wiring or underground conduit may be abandoned in place, unless shown otherwise.

B. Where sidewalk sections must be removed for installation of outdoor lighting, remove the sidewalk sections completely from joint to joint.

C. Where asphalt must be removed for installation of outdoor lighting, saw cut the asphalt in two, straight, parallel lines, with clean edges.

3.2 EXCAVATION AND BACKFILL

A. Excavate and maintain trenches according to applicable Safety and Code requirements. Protect existing features.

B. Backfill excavated trenches in accordance with the drawings. Excavated materials may be used to backfill the trench only if the backfill is sand or suitable soil that conforms to Section 312000 Earth Moving backfill material requirements and that is free of rocks and debris over 3/4 inch. Dispose of unsuitable material, clay or rocky excavated material, and replace with MDOT Class II sand.

C. Mark sleeves and conduits for their entire length with a marking tape buried 12 inches above the top of the sleeve or conduit.

D. Backfill excavated trenches in 6-inch layers and mechanically compact to 98 percent compaction.

E. Backfill and mechanically compact holes left by demolished pole bases with MDOT Class II sand or clean dirt to a depth of 6 inches below grade. Backfill the last 6 inches with topsoil.

3.3 SLEEVE INSTALLATION

A. Sleeves shall be buried at a minimum depth of 24 inches to their top. Sleeves shall extend a minimum of 12 inches beyond the pavement they pass under.

B. Sleeves shall be taped closed at both ends with duct tape.

C. Sleeve ends shall be marked with steel stakes, pipes, or conduits that are 3-feet long minimum, driven vertically down at the sleeve ends to a depth of 6 inches below grade to their top.

D. Where lighting and irrigation sleeves are installed adjacent to each other, maintain a minimum of 2 feet between them.

3.4 CONDUIT INSTALLATION

A. Conduit bends shall not be smaller than the radius of standard manufactured elbows, with a minimum bend radius of 12 inches.

B. Install conduits parallel to or at right angles to building lines and site features.

C. Locate underground conduits as close to curbs and sidewalks as possible to avoid interference with future landscaping.

D. Where conduits cannot be installed at a minimum depth of 24 inches, install rigid steel conduits or pour concrete over the conduits in accordance with the NEC.

3.5 JUNCTION BOX INSTALLATION

A. Keep the number of junction boxes to a minimum. Make splices in pole bases wherever possible.

B. Locate junction boxes in mulched areas wherever possible. The top of the junction box shall be level with the existing grade.

C. Install junction boxes on a base of pea gravel or MDOT Class II sand at least 1-foot deep.

3.6 FIXTURE AND POLE INSTALLATION

A. Locate fixture bases on centerlines where centerlines are shown on the Drawings. Install fixtures shown on the Drawings in a straight line.

B. Align pole with handhole away from the sidewalk.

C. Install poles using 2 hot dip galvanized fender washers and 2 hex head nuts on each anchor bolt so that poles can be leveled. Poles shall be plumb. The center band of pedestrian lighting fixtures shall be level.

D. Align pedestrian lighting fixtures so that one spoke of the globe basket is perpendicular to the street, sidewalk, or wall.

E. Provide adequate slack in the pole conductors so that the conductors to the luminaire can be pulled out of the handhole for maintenance. Provide terminal blocks, in-line fuse holders, and wire nuts in accordance with pole wiring details on Drawings.

3.7 GROUNDING

A. Provide a 5/8-inch minimum diameter copper-clad ground rod, 8-inch minimum length, for each light fixture pole.

B. Provide exothermic weld type ground connections or acorn clamps for concealed, underground, and concrete-encased ground connections, and for splices and taps of ground conductors.

C. Provide No. 10 AWG green insulated grounding conductors in lighting fixture poles.

3.8 CONCRETE WORK

A. Install light pole and emergency telephone kiosk concrete bases according to details. Provide specified concrete mix.

B. Exposed portions of light pole and emergency telephone kiosk concrete bases shall be free of voids and honeycombs.

C. Provide a uniform, 1-inch, 45-degree chamfer on all light pole and emergency telephone kiosk concrete bases.

3.9 ADJUSTING, CLEANING, PROTECTION

A. Restore concrete sidewalks and asphalt in accordance with the applicable Division 02 and 03 Sections.

B. Restore lawn areas to Owner's satisfaction, according to the Lawn Repair Section and the Contract Documents. Contact UM Grounds Services at 734-763-5539 to reseed holes in lawn areas.

3.10 FIELD QUALITY CONTROL

A. Outdoor Lighting Work will be inspected by Owner. Contact the U-M Code Inspection Department at 734-764-2457 before pouring concrete, backfilling excavations, and energizing circuits to arrange for inspections.

3.11 COMMISSIONING

A. Perform commissioning activities per Related Sections.

3.12 TRAINING

A. Provide a qualified service technician from the Manufacturer's staff to provide training.

B. Train Owner's maintenance personnel on equipment operation, trouble-shooting, servicing, and preventative maintenance procedures. Review the data contained in the Operating and Maintenance Manuals with Owner's personnel.

1. Provide training of 1 hour minimum.

END OF SECTION 265600