SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic-insulated wire.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.
2. Section 078413 "Penetration Firestopping" specifies materials and methods for sealing penetrations of rated walls and partitions referenced by this Section.
3. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.
4. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers, supports, and concrete bases referenced by this Section.
5. Section 260533.13 "Conduits for Electrical Systems" specifies installation of raceways referenced by this Section.
6. Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling" specifies installation of sleeves and sleeve seals referenced by this Section.
7. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs referenced by this Section.
8. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair cabling used for data circuits.

1.2 DEFINITIONS

A. NICET: National Institute for Certification in Engineering Technologies; a division of the National Society of Professional Engineers (NSPE).

1.3 ACTION SUBMITTALS

A. Product Schedule: Indicate type, use, location, and termination locations.

B. Product Data: For each type of product.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 THERMOPLASTIC-INSULATED WIRE

A. Description: Thermoplastic-insulated wire for use in accordance with Article 310 of NFPA 70.

B. UL ZLGR - Type THHN Insulated Wire:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

    a. Thermoplastic-Insulated Wire: UL CCN ZLGR, including UL 83.

2. Standard Features:

    a. Referenced Standard: Article 310 of NFPA 70.
    b. Insulation Voltage Rating: 600 V.
    c. Insulation Temperature Rating: 90 deg C.
    d. Conductor Material: Copper.
    e. Conductor Size:

        1) Minimum Conductor Size: 12 AWG.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper for feeders smaller than No. 4 AWG; copper, aluminum, or copper-clad aluminum for feeders No. 4 AWG and larger. Conductors must be stranded.

B. Branch Circuits:

1. Material: Copper.

    a. Stranded.

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3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

C. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Maintenance: NFPA 70B.
3. Electrical Safety: NFPA 70E.
4. Temporary Electric Power Work: NECA NEIS 200.
5. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
6. Work in Confined Spaces: NFPA 350.
7. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
8. Installation of Type AC and Type MC Cables: NECA NEIS 120.
9. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
2. Complete raceway installation between conductor and cable termination points prior to pulling conductors and cables.
3. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
4. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
5. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
6. Provide support for cables.

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7. Complete cable tray systems installation prior to installing conductors and cables.
8. Connections:

    a. Tighten electrical connectors and terminals in accordance with manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
    b. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

        1) Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

9. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

D. Interfaces with Other Work:

1. Identification:

    a. Identify and color-code conductors and cables.
    b. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

2. Sleeves and Sleeve Seals: Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.
3. Firestopping: Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.4 FIELD QUALITY CONTROL

A. Administrant for Electrical Power Tests and Inspections:

1. Administer and perform tests and inspections.

B. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

3. Perform each of the following visual and electrical tests:

    a. Inspect exposed sections of conductor and cable for physical damage and correct connection in accordance with the single-line diagram.
    b. Test bolted connections for high resistance using one or more of the following:

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1) A low-resistance ohmmeter.
2) Calibrated torque wrench.
3) Thermographic survey.

c. Inspect compression-applied connectors for correct cable match and indentation.
d. Inspect for correct identification.
e. Inspect cable jacket and condition.
f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.
g. Continuity test on each conductor and cable.
h. Uniform resistance of parallel conductors.

C. Nonconforming Work:

1. Wire or cable assembly will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

3.5 MAINTENANCE

A. Infrared Scanning of Splices: Two months after Substantial Completion, perform infrared scan of splices, joints, and connections in conductors 3 AWG and larger. Remove covers so splices, joints, and connections are accessible to portable scanner. Take visible light photographs at same locations and orientations as infrared scans for documentation to ensure follow-on scans match same conditions for valid comparison. Correct deficiencies determined during the scan.

1. Follow-On Infrared Scanning: Perform follow-up infrared scan of splices at 11 months after Substantial Completion.
2. Instrument: Use infrared-scanning device designed to measure temperature or to detect significant deviations from normal values. Provide documentation of device calibration.
3. Field Reports for Infrared Scanning: Prepare certified report that identifies cables splices checked and that describes scanning results. Include notation of deficiencies detected, remedial actions taken, and scanning observations after remedial action.

END OF SECTION 260519

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