SECTION 260519

LOW VOLTAGE WIRES AND CABLES (100-600 VOLTS)

PART 1 GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Requirements of the following Division 26 Sections apply to this section:

1. Section 260000 Basic Electrical Requirements.
2. Section 260001 Basic Electrical Materials and Methods.

1.3 SUMMARY

A. This Section includes wires, cables, and connectors for power, lighting, signal, control and related systems rated 100 to 600 volts.

B. Related Sections: The following Sections contain requirements that relate to this section:

1. Section 260534 - Boxes and Cabinets, for connectors for Terminating Cables in boxes and other electrical enclosures.

1.4 SUBMITTALS

A. Product Data for electrical wires, cables and connectors.

B. Provide local authority approval documentation for the application within shop drawing submissions for MC cables.

1.5 QUALITY CONTROL

A. Regulatory Requirements: Comply with provisions of the following code:

B. NFPA 70 National Electrical Code.

1. Conform to applicable codes and regulations regarding toxicity of combustion products of insulating materials.

C. UL Compliance: Provide components which are listed and labeled by UL under the following standards.

1. UL Std. 1569 Metal-Clad Cable.

D. NEMA/ICEA Compliance: Provide components which comply with the following standards:

1. WC-5 Thermoplastic-Insulated Wire and Cable for

a. the Transmission and Distribution of Electrical Energy

E. IEEE Compliance: Provide components which comply with the following standard.

1. Std.82 Test procedures for Impulse Voltage Tests on Insulated

a. Conductors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wire and Cable:

a. Alflex Corp.
b. American Flexible Conduit Co.
c. Cablec Corp.
d. Carol Cable Co. Inc.
e. Cerro Wire and Cable Corp.
f. General Cable Corp.
g. Pirell Cable Corp.
h. Pyrotenax USA Corp. (for type MI).
i. Rome Cable Corp.
j. Southwire Company.
k. Triangle PWC, Inc.

2. Connectors for Wires and Cable Conductors:

a. AMP
b. Burndy Corporation
c. General Electric Co.
d. Gould, Inc.
e. Ideal Industries, Inc.
f. O-Z/Gedney Co.
g. Pyrotenx USA Corp. (for type MI).
h. Raychem Corporation
i. Square D Company
j. Thomas and Betts Corp.
k. 3M Company

2.2 WIRES AND CABLES

A. General: Provide wire and cable suitable for the temperature, conditions and location where indicated.

B. Conductors: Provide solid conductors for power and lighting circuits no. 10 AWG and smaller. Provide stranded conductors for sizes no. 8 AWG and larger.

C. Conductor Material: copper for all wires and cables.

D. Insulation: Provide insulation type in accordance with Part 3 below.

E. Color Coding:

1. 208/120 Volts

Phase	Color
A	Black
B	Red
C	Blue
Neutral	White
Ground	Green

F. Jackets: Factory-applied nylon or PVC external jacketed wires and cables for pulls in raceways over 100-feet in length, for pulls in raceways with more than three equivalent 90 deg. bends, for pulls in conduits underground or under slabs on grade, and where indicated.

2.3 CONNECTORS FOR CONDUCTORS

A. Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

PART 3 EXECUTION

3.1 INSTALLATION OF WIRES AND CABLES

A. General: Install electrical cables, wires and wiring connectors as indicated, in compliance with applicable requirements of NEC,NEMA, UL, and NECA's "Standard of Installation", and in accordance with recognized industry practices.

B. Coordinate wire/cable installation work including electrical raceway and equipment installation work, as necessary to properly interface installation of wires/cables with other work.

C. Install #12 AWG minimum for circuits 100 volts and above.

D. Increase conductor size as required due to availability. Minimum feeder conductor sizes are shown on Drawings. If increased, be responsible for associated feeder conduit size and increased ground conductor size per NEC.

E. Ground and continuously polarize systems properly throughout following the color coding specified.

F. Install UL Type UF cable with nonmetallic outer jacketing, for direct buried underground feeders.

G. Install UL Type THHN or THWN wiring in conduit, for branch circuits #10 and smaller.

H. Install UL Type XHHW or THHN wiring in conduit, for feeders and branch circuits #8 and larger.

I. Install UL TYPE XHHW or THWN wiring in conduit, for feeders and branch circuits installed outside of the building envelope, in raceway in contact with soil, or whenever raceway may be subject to moisture and/or condensation.

J. Pull conductors simultaneously where more than one is being installed in same raceway.

K. Use of pulling compound or lubricant is to be avoided unless absolutely necessary; compound used must not deteriorate conductor or insulation and be one of the following:

1. Ideal-Aqua-Gel
2. Polywater
3. Yellow 77

L. Use pulling means including fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceway.

M. Install exposed cable, parallel and perpendicular to surfaces, or exposed structural members, and follow surface contours, where possible.

N. Provide conductors of the same size from the protective device to the last load.

O. Make conductor length identical for parallel feeders.

P. Install wiring in conduits buried in plaster or in poured concrete after the encasing medium is set and dry and then only after conduits have been swabbed out.

Q. Support conductor in vertical raceways. One cable support shall be provided at the top or as close to the top as practical, plus a support for each additional interval of spacing per table 300-19a of the NEC.

R. Provide slack wire for all future connections with ends of wires taped and blank box covers installed.

S. Do not bend cables, either permanently or temporarily during installation to radii less than that recommended by the manufacturer.

T. Use conductors with 90 degree C insulation when wiring is within seven feet of passing over or attached to the following:

1. Heat producing equipment.

U. Keep conductor splices to a minimum.

V. Splices, Taps and Terminations

1. Make splices and taps in wiring #10 AWG and smaller mechanically and electrically Secure with mechanical pressure type splicing devices as manufactured by 3M Company, Buchanan, Panduit, or approved equal.
2. Make splices and taps of conductors #8 AWG or larger and all splices in more terminal boxes using compression connectors requiring the use of compression tools for securing the conductors in the connectors. Termination of conductors at all distribution equipment, except transformers, shall be made using mechanical lugs. Connectors shall be of high conductivity corrosion-resistant material and have actual contact area that shall provide at least the current carrying capacity of the wire or cable. For conductors #1/0 and larger, connector lugs shall be of the two-hole type. Connector lugs shall be bolted to bussing using Belleville washers in combination with flat washers and nuts. Compression connectors shall be as manufactured by Thomas and Betts, Burndy, or approved equal.
3. Provide insulated connectors for splices and taps with a self-fusing rubber insulating tape that is non-corrosive to the connector and the conductor. Insulation tape shall have a minimum of 350 volts per mil dielectric strength. Friction or vinyl tape shall be applied directly over rubber insulating tape equal to 3M switch 88 type.

W. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening valves. Where manufacturer's torquing requirements are not indicated, tighten connector and terminals to comply with tightening torques specified in UL Std. 486A and B.

3.2 EQUIPMENT CONNECTIONS

A. Follow homerun circuit numbers shown on Drawings in connecting circuits to panelboards. In the event that field observation shows that the indicated circuit numbers are not connected to the corresponding panel overcurrent device, make all corrections necessary. Each branch circuit homerun containing two or more circuits with a common neutral shall be connected to the circuit breaker or switch in a three or four-wire branch circuit panelboard so that no two of the circuits will be fed from the same phase.

B. Provide all wiring to and between motors, starters, line voltage (120-600 volt) control devices, disconnect switches and other related electrical equipment, except where such items are factory wired.

C. Terminate power wiring for elevator systems at the respective controller, and be in compliance with the manufacturer's approved shop drawings.

D. Provide power and all wiring connections to the control devices for electrically operated overhead doors, door operators and control devices which will be provided under another division.

3.3 MAXIMUM BRANCH CIRCUIT LENGTHS

A. The following indicates maximum installed length a circuit can have and still maintain an adequate voltage level at the last point of use. If the circuit length exceeds the length listed, used the next largest wire size. Multiple circuit runs in the same raceway shall have all conductors sized the same based on worst case circuit lengths. Double length is required for distance between 3 way switches.

1. Circuit Length (in feet)

Wire Size	120V.	2 Wire 277V.	1 Phase, 208V		3 Phase 208V
12	90	150	60		75
10	80	150	70		80
8	80	175	65	150	75
6	95	200	80	180	90

3.4 WIRE AND CABLE MARKING

A. Provide wire number labels (Brady or equal) at source, control, and device terminations corresponding to schematics or circuits used.

3.5 WIRING METHODS

A. The following wiring methods shall not be used:

1. Non-metallic sheathed cable.
2. AC cable.
3. Aluminum wire and cable.

3.6 FIELD QUALITY CONTROL

A. Prior to energization of circuitry, check installed wires and cables with megohm meter to determine insulation resistance levels to ensure requirements are fulfilled.

B. Prior to energization, test wires and cables for electrical continuity and for short-circuits.

C. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

END OF SECTION 260519