SECTION 26 05 23

**CONTROL-VOLTAGE ELECTRICAL POWER CABLES**

**BASED ON DFD MASTER ELECTICAL SPEC DATED 03/01/21**

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

***Edit this section to reflect project requirements. Keep in mind that this section applies to cabling used in remote-control, signaling, and power-limited circuit applications and systems, such as motor control, low-voltage lighting, thermostats, PLCs, annunciators, security, intercom, sound, public address and nurse call. This section does not apply to cabling for communication and fire alarm systems.***

**PART 1 - GENERAL**

**SCOPE**

The work under this section includes furnishing and installing cabling for remote-control, signaling and power-limited circuits. Included are the following topics:

PART 1 - GENERAL

 Scope

 Related Work

 References

 Submittals

 Project Conditions

PART 2 - PRODUCTS

 General

 Remote-Control and Signaling Cable

 Wiring Connectors

PART 3 - EXECUTION

 General Wiring Methods

 Wiring Installation In Raceways

 Free-Air Cable Installation

 Wiring Connections and Terminations

 Field Quality Control

**RELATED WORK**

Applicable provisions of Division 1 govern work under this Section.

Section 26 05 33 – Raceway and Boxes for Electrical Systems.

Section 26 05 53 – Identification for Electrical Systems.

Section 01 91 01 or 01 91 02 – Commissioning Process

**REFERENCES**

NFPA 70 ‑ National Electrical Code.

**SUBMITTALS**

Submit product data: Provide for each cable assembly type.

Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency.

**PROJECT CONDITIONS**

Verify that field measurements are as shown on Drawings.

Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

**PART 2 - PRODUCTS**

***Other wire and cable types may be required for a particular project specification to accommodate high temperatures or other unusual applications. Add requirements as needed for the project.***

**GENERAL**

All wire shall be new, delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.

All conductors shall be copper.

Insulation shall have a 600 volt rating.

All conductors shall be suitable for the application intended. Conductors #12 and smaller may be solid or stranded with the following requirements or exceptions:

All conductors terminated with crimp type devices shall be stranded.

Stranded conductors shall be terminated with an approved ETL Listed type terminations or methods: e.g. stranded conductors shall not be wrapped around a terminal screw but shall be terminated with a crimp type device or in an approved back wired method.

**REMOTE-CONTROL AND SIGNALING CABLE**

Refer to Section 28 31 00 for requirements for cable to be used on fire alarm systems.

Refer to Section 27 10 00 for requirements for cable to be used on communication systems.

All other systems cabling shall meet the requirements of NEC Article 725 and the following:

Cable for Class 1 Remote-Control, Signaling and Power-Limited Circuits: 600 volt insulation, individual conductors twisted together, [shielded], and covered with an overall PVC jacket. Cable shall be Listed, temperature rated, and suitable Type (general purpose, riser or plenum) for the application as required in the National Electrical Code.

Cable for Class 2 or Class 3 Remote-Control, Signaling and Power-Limited Circuits shall be Listed, temperature rated, and suitable Type (general purpose, riser or plenum) for the application as required in the National Electrical Code.

**WIRING CONNECTORS**

Split Bolt Connectors: Not acceptable.

Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.

All wire connectors used in underground or exterior pull boxes shall be gel filled twist connectors or a connector designed for damp and wet locations.

**PART 3 - EXECUTION**

**GENERAL WIRING METHODS**

Control-voltage cables shall be installed in conduit. However, they may be installed free-air (without conduit) above accessible ceilings if the cable meets NEC requirements for the application, unless specified to be in conduit in other sections of the specifications. See requirements for free-air cable installation below.

Control cables for controlling HVAC and lighting equipment connected to emergency power shall be routed in raceway.

Do not use wire smaller than 14 AWG for control wiring greater than 60 volts, or 18 AWG for voltages less than 60 volts, all sizes subject to NEC 725 requirements.

Splice only in junction boxes.

Identify wire per section 26 05 53.

Neatly train and lace wiring inside boxes, and equipment.

**WIRING INSTALLATION IN RACEWAYS**

Pull all conductors into a raceway at the same time. Use Listed wire pulling lubricant for pulling conditions when necessary.

Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

**FREE-AIR CABLE INSTALLATION**

Cabling shall be neatly run at right angles and be kept clear of other trades work.

Cabling shall be supported at a maximum of 4-foot intervals utilizing “J-Hook” or “Bridal Ring” supports anchored to ceiling concrete, piping supports or structural steel beams. If cable sag at mid-span exceeds 12-inches, another support shall be provided. Cable supports shall be installed to maintain cable bend to larger than the minimum bend radius.

Cabling shall not be attached to or supported by existing cabling, plumbing or steam piping, ductwork, suspended ceiling supports or electrical or communications conduit. Do not place cable directly on the ceiling grid or attach cable in any manner to the ceiling grid wires.

To reduce or eliminate Electro-Magnetic Interference (EMI), the following minimum separation distances for ‘Free-Air’ cabling installations shall be adhered to:

* Twelve (12) inches from power lines of less than 5kV.
* Thirty-nine (39) inches from power lines of 5kV or greater.
* Five (5) inches from lighting fixtures.
* Thirty-nine (39) inches from transformers and motors.

A coil of 4 feet in each cable shall be placed in the ceiling at each ‘free-air’ wired device. These coils shall be secured (wire tied) at the last cable support before the cable reaches the device and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.

All cable shall be free of tension at both ends. Nylon strain relief connectors shall be provided at each device and junction box where cables enter. In cases where the cable must bear some stress, Kellum type grips may be used to spread the strain over a longer length of cable.

Cable manufacturers minimum bend radius shall be observed in all instances. Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.

All exposed vertical cable extensions to devices located below the finished ceiling shall be in conduit.

Use suitable cable fittings and connectors.

***When free-air cable installation is to be permitted in exposed ceiling areas, the A/E shall identify these areas on the plan drawings.***

When permitted in exposed ceiling areas as designated on the plan drawings, Free-Air wiring runs shall avoid areas of high traffic (i.e. aisle way), shall be run as close as possible to outlining walls and shall be a minimum of ten (10) feet above finished floor. Provide protection for exposed cables where subject to damage.

**WIRING CONNECTIONS AND TERMINATIONS**

Splice only in accessible junction boxes (except splices to low voltage occupancy sensor power packs and terminations to temperature control devices).

All splices shall be so made that they have an electrical resistance not in excess of two feet (600 mm) of the conductor.

Use solderless spring type pressure connectors with insulating covers for wire splices and taps, 10 AWG and smaller.

Thoroughly clean wires before installing lugs and connectors.

At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.

**FIELD QUALITY CONTROL**

Field inspection and testing will be performed under provisions of Section 26 05 04.

END OF SECTION