

# Transmission & Distribution Material & Installation Specification

## Minimum Standards

These rules and standards are based on and intended to comply with the latest and most complete versions of:

The Columbus City Code

The City of Columbus-

"Construction and Material Standards"

The Division of Power-

"Street Lighting Specifications"

"Street Lighting Material Installation Specifications"

"Material Specifications"

"System Modules"

When an existing system or component owned by the City of Columbus, Division of Power, must be replaced either totally or in part, then the replacement of such system or component shall comply with these standards as written, amended, and published. For reasons of safety and economy, this compliance shall be deemed to be a requirement of the replacement process.

When either the system or component fails because of a defect contained therein, an accident, or an act of God, then any replacement thereof shall comply with the then current published standards.

### **I. Definitions**

Area Tap Line: Part of distribution circuit with less than 20% of the load.

American Wire Gauge: A scale for measuring wire size.

Customer Tap: Part of distribution circuit feeding a single customer.

Distribution Circuit: A circuit that originates at a substation or a recloser on the distribution line and serves one or more customer, 35 kV and below.

DOP Inventory: This refers to the master inventory number for all components and materials used by the Division of Power.

Duct: Duct or conduit is a kind of tubing or pipe commonly made of plastic, concrete, or metal, used to hold and protect electrical cables. Often it is used in parallel groups or "banks". Cable in duct must be de-rated to account for limited cooling ability.

Ground rod: These are steel rods, with a 10-mil copper clad, driven from 10 feet to a depth as required into the ground for electrical grounding purpose as specified in TDMIS-1607. For safety of personnel and equipment, it is required that all equipment be earth grounded, especially for lightning surges and major equipment failures, per National Electric Code, Section 250.

Insulator: This refers to ceramic, glass, plastic, silicon rubber and/or fiberglass devices to support and isolate electrical equipment from contact to other wires and metal. The term is also descriptive of materials such as rubber and plastic tape, and poured compounds also used to isolate electrical parts.

KCM/MCM: This is the abbreviation for thousands of circular mils, which is a measure of cross section area of a wire.

Material Specification: The Division of Power has a master list of specifications for all electrical components, systems, and materials.

Primary Cable: Conductor cable used at higher voltages for long distance transmission of electrical power between major sources and distribution stations, also used for distribution circuits (7.2/14.4/69/138 kV).

Secondary Cable: 600 volts and below.

Surge: Any sudden excessive current or voltage is called a surge. They can be due to switching heavy loads or faults and lightning.

Terminator: This is a device and system for terminating a cable and preserving its mechanical and electrical strength. Larger units are called Potheads.

Trunk Line: Part of a distribution circuit carrying over 20% of the load.

Vault/Manhole: This is a housing of concrete to hold and protect a transformer or switch. Often it contains cable splices and terminations.

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DRAWN BY: AEC	DATE: 01/01/2018	TDMIS-1602
APPROVED: <i>Karl Spruce</i>		
	SHEET 1 of 4	

**II. Construction material use**

In each case below the minimum size and type of device or material is being specified. All wire is medium hard drawn copper unless otherwise specified.

Underground construction

A. Underground secondary cable

- 1. #1/0 AWG stranded copper 600V 3/C with #2 Stranded copper 170 AMPS \*  
(Yellow & black, DOP #19950)
- 2. 250 MCM XHHW 600V (DOP #19962) 290 AMPS \*
- 3. 350 MCM XHHW 600V (DOP #19966) 350 AMPS \*
- 4. 500 MCM XHHW 600V (DOP #19969) 430 AMPS \*

\* Amperage taken from 2017 National Electric Code Books, Table #310.15, plus or minus 5 AMPS.

B. Street light cable

- 1. #4 AWG copper, 5 kV "airport" cable (DOP #20091) 110 AMPS \*

\* Amperage taken from 2007 National Electric Code Books, Table #310.77, plus or minus 5 AMPS.

C. Primary Cable:

Distribution circuit:

- 1. 750 KCM copper, 3-phase (DOP #19978 "A" Ph; 19979 "B" Ph; 19980 "C" Ph) with 500 KCM copper, 600 Volt neutral (DOP #19969) 545 AMPS \*
- 2. 500 KCM copper, (DOP #19972 "A" Ph; 19973 "B" Ph; 19974 "C" Ph) with 350 KCM copper, 600 Volt neutral (DOP #19966), DOP #19971 - Quadruplex, DOP #19970 - Triplex 450 AMPS\*

- 3. Trunk lines: Triplex cable, 350 KCM copper (DOP #19968) 375 AMPS\*
- 4. Area tap: #2/0 copper (DOP #19955 - triplex, #50397 - Quadruplex) 225 AMPS \*
- 5. Customer tap: #1 copper (DOP #19946 - triplex, #50396 - Quadruplex) 170 AMPS \*

\* Amperage taken from 2017 National Electric Code Books, Table #310.60, plus or minus 5 AMPS.

D. Terminators:

- a. Transmission substation circuits: Cold shrink, skirted silicone-rubber, termination kits.
- b. Area taps and customer taps: Heat shrink or cold shrink, skirted, silicone-rubber termination kits.
- c. Elbows, 200-amp load break.

E. SF-6 Switches: Shall have two 600 AMP ways for loop feed through and equal to the number of circuit entrances plus one spare, rated 600 amps, fault rating 40,000 amperes AIC.

F. Surge arrester:

- a. On 7.2 kV circuit use 9 kV surge arresters, MOV, Vari-gap type, (DOP #20367 - riser pole, #20369 - other)
- b. On 14.4 kV circuit use 12 kV surge arresters, MOV, Vari-gap type, (DOP #20374 - riser pole, #20371 - other)

G. Primary duct (for new system construction)

- a. Four inch I.D., schedule 40 PVC for underground residential distribution type installation (concrete encased under paved areas).
- b. Five inch I.D., schedule 40 PVC (concrete encased).

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DRAWN BY: AEC	DATE: 01/01/2018	TDMIS-1602
APPROVED: <i>[Signature]</i>		
	SHEET 2 of 4	

c. Six inch I.D., (used only on 69 kV), Schedule 40 PVC (concrete encased in all applications).

d. Underground hazard tape: The underground hazard tape shall be 3" wide red plastic with black legend "CAUTION ELECTRIC LINE BURED BELOW". The tape shall be manufactured by T&B Panduit or approved equal.

H. Spare ducts: Duct banks shall be installed in multiples to form symmetrical banks with a minimum of 30% of the ducts being spare (rounded up to the nearest whole duct and forming a square or rectangular arrangement). The configuration and use of ducts shall be chosen to give the least amount of current de-rating.

I. Transformer/Switch vaults: Shall be constructed per DOP drawing TDMIS-1014 and part DOP #21150. (ADA compliant)

J. Manholes: Shall be per DOP drawing TDMIS-1015 and part DOP #22071. (ADA compliant)

K. Ground rod: shall be 5/8 inch diameter by 10 feet length copperweld (DOP #20341) or length required to achieved 25Ω or resistance or less, per National Electric Code Books, Section 250.

L. Street lighting cable: shall be 5 kV "airport" style, #4 AWG copper (DOP #20091)

M. Street lighting conduit under pavement: Shall be 2 inch schedule 40 PVC, concrete encased or 3 inch galvanized ridge under pavement.

N. Splices:

a. Primary: compressed lug, and taped.

b. Secondary: compressed lug, hot/cold shrink.

Overhead construction

A. Overhead secondary conductor

1. #4/0 triplex, 1-phase service, trunk line (DOP #19960) 262 AMPS \*

2. #4/0 quadruplex, 3-phase service, (DOP #19961) 262 AMPS \*

3. #2/0 triplex, 1-phase service, area tap (DOP #19954) 193 AMPS \*

4. #2/0 quadruplex, 3-phase service, (DOP #19956) 193 AMPS \*

5. #2 triplex, 1-phase service drop (DOP #20098) 123 AMPS \*

\* Amperage taken from 2017 National Electric Code Books, Table #310.15, plus or minus 5 AMPS.

B. Street lighting conductor

1. #2 ACSR, 1/C weatherproof, pignut (DOP #20094) 170 AMPS \*

2. #6 ACSR, duplex, (DOP #20085) 100 AMPS\*

\* Amperage taken from 2017 National Electric Code Books, Table #310.15, plus or minus 5 AMPS.

C. Overhead primary conductor

Distribution circuit

1. #4/0 AWG MHD copper bare\*\* (DOP #19958) 440 AMPS\*

2. 336 Hendrix cable\*\* (DOP #19965) 490 AMPS\*

3. 336 ACSR bare\*\* (DOP #19963) 465 AMPS\*

4. 556 Hendrix cable\*\* (DOP #19967) 680 AMPS\*

5. 556 ACSR Bare\*\* (DOP #19975) 650 AMPS\*

6. #2/0 AWG MGD copper bare, trunk line\*\* (DOP #19951) 330 AMPS\*

7. #2 STR AWG MHD copper bare, area tap\*\* (DOP #20095) 210 AMPS\*

\* Amperage taken from 2017 National Electric Code Books, Table #310.15, plus or minus 5 AMPS.

CITY OF COLUMBUS DEPT. OF PUBLIC UTILITIES – DIVISION OF POWER MINIMUM STANDARDS		
DRAWN BY: AEC	DATE: 01/01/2018	TDMIS-1602
APPROVED: <i>[Signature]</i>		
	SHEET 3 of 4	

\*\* Neutral conductor to be same size as primary conductor

- D. Street Lighting poles: shall be 35 foot, Class V (DOP #19320)
- E. Distribution poles: shall be 45 foot, Class III (DOP #19321)
- F. Ground rods: shall be 5/8 inch diameter by 10 feet length copperweld iron (DOP #20341) or length required to achieved 25Ω resistance or less.
- G. Surge arresters:
  - a. On 7.2 kV circuit riser pole use 9 kV surge arresters, MOV type, (DOP #20369)
  - b. On 14.9 kV circuit riser pole use 12 kV surge arresters, MOV type, (DOP #20374)
  - c. On 69 kV circuit use 57 kV surge arresters, station class, (DOP #20378)
  - d. On 138 KV circuit use 109 kV surge arresters, station class, (DOP #20379)
- H. Insulators:
  - a. On 7.2 kV circuits use 15 kV class pin insulators, (DOP #20256)
  - b. On 14.4 kV circuits use 15 kV class pin insulators, (DOP #20256)
  - c. On 69 kV circuits use 138 kV class line post insulators, (DOP #20253)

Section 1. That the rules known as the "City of Columbus, Division of Electricity, Minimum Electrical Standards (1991)", as set forth herein, be and are hereby adopted for the City of Columbus. These rules and standards shall prevail and apply to all electrical work done by and for the City of Columbus, Division of Power, from this time forth.

Section 2. That the existing Minimum Electrical Standards as set forth as Rules and Regulations on page 1689 of the October 15, 1988 City Bulletin are hereby repealed.

Section 3. That for the reasons stated in the preamble hereto, which is hereby made a part hereof, this ordinance is hereby declared to be an emergency measure and shall take

effect and be in force from an after its passage and approval by the Mayor or ten days after passage if the Mayor neither approves nor vetoes the same.

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	SHEET 4 of 4	