permanent ladder and have headroom at all points less than 900 mm (3 ft), the wiring shall be permitted to be installed on the edges of rafters or joists facing the attic or roof space.

394.30 Securing and Supporting.

(A) Supporting. Conductors shall be rigidly supported on noncombustible, nonabsorbent insulating materials and shall not contact any other objects. Supports shall be installed as follows:

(1) Within 150 mm (6 in.) of each side of each tap or splice, and
(2) At intervals not exceeding 1.4 m (4½ ft).

Where it is impracticable to provide supports, conductors shall be permitted to be fished through hollow spaces in dry locations, provided each conductor is individually enclosed in flexible nonmetallic tubing that is in continuous lengths between supports, between boxes, or between a support and a box.

(B) Securing. Where solid knobs are used, conductors shall be securely tied thereto by tie wires having insulation equivalent to that of the conductor.

394.42 Devices. Switches shall comply with 404.4 and 404.10(B).

394.56 Splices and Taps. Splices shall be soldered unless approved splicing devices are used. In-line or strain splices shall not be used.

Part III. Construction Specifications

Δ **394.104 Conductors.** Conductors shall be of a type identified in Table 310.4(1).

ARTICLE 395

Δ Outdoor Overhead Conductors over 1000 Volts

395.1 Scope. This article covers the use and installation for outdoor overhead conductors over 1000 volts, nominal.

This article is performance based. It provides the objectives for compliance, rather than prescriptive requirements. These objectives can be met through existing consensus standards for installation of overhead conductors, such as ANSI/IEEE C2, *National Electrical Safety Code (NESC®)*.

• **395.10 Uses Permitted.** Outdoor overhead conductors over 1000 volts, nominal, shall be permitted only for systems rated over 1000 volts, nominal, as follows:

(1) Outdoors in free air
(2) For service conductors, feeders, or branch circuits

Informational Note: See IEEE C2, *National Electrical Safety Code*, and ANSI/IEEE 3001.2, *Recommended Practice for Evaluating the Electrical Service Requirements of Industrial and Commercial Power Systems*, for additional information on outdoor overhead conductors over 1000 volts.

395.30 Support.

(A) Conductors. Documentation of the engineered design by a licensed professional engineer engaged primarily in the design of such systems for the spacing between conductors shall be available upon request of the authority having jurisdiction and shall include consideration of the following:

(1) Applied voltage
(2) Conductor size
(3) Distance between support structures
(4) Type of structure
(5) Wind/ice loading
(6) Surge protection

(B) Structures. Structures of wood, metal, or concrete, or combinations of those materials, shall be provided for support of overhead conductors over 1000 volts, nominal. Documentation of the engineered design by a licensed professional engineer engaged primarily in the design of such systems and the installation of each support structure shall be available upon request of the authority having jurisdiction and shall include consideration of the following:

(1) Soil conditions
(2) Foundations and structure settings
(3) Weight of all supported conductors and equipment
(4) Weather loading and other conditions such as, but not limited to, ice, wind, temperature, and lightning
(5) Angle where change of direction occurs
(6) Spans between adjacent structures
(7) Effect of dead-end structures
(8) Strength of guy wires and guy anchors
(9) Structure size and material(s)
(10) Hardware

(C) Insulators. Insulators used to support conductors shall be rated for all of the following:

(1) Applied phase-to-phase voltage
(2) Mechanical strength required for each individual installation
(3) Impulse withstand BIL in accordance with Table 490.24(a)

Informational Note: See 395.30(A), (B), and (C), which are not all-inclusive lists.

ARTICLE 396

Messenger-Supported Wiring

Part I. General

396.1 Scope. This article covers the use, installation, and construction specifications for messenger-supported wiring.

•

For many years, messenger-supported wiring systems have been used in industrial installations as well as to supply services for commercial and residential installations.

See also

225.6(A) and **(B)** for references to messenger-supported wiring

Part II. Installation

396.10 Uses Permitted.

(A) Cable Types. The cable types in Table 396.10(A) shall be permitted to be installed in messenger-supported wiring under the conditions described in the article or section referenced for each.

Δ *TABLE 396.10(A) Cable Types*

Cable Type	Section	Article
Medium-voltage cable		315
Metal-clad cable		330
Mineral-insulated, metal-sheathed cable		332
Multiconductor service-entrance cable		338
Multiconductor underground feeder and branch-circuit cable		340
Other factory-assembled, multiconductor control, signal, or power cables that are identified for the use		
Power and control tray cable		336
Power-limited tray cable	Table 722.135(B), 722.135(C), and 722.179(A)(6)	

(B) In Industrial Establishments. In industrial establishments only, where conditions of maintenance and supervision ensure that only qualified persons service the installed messenger-supported wiring, the following shall be permitted:

(1) Any of the conductor types shown in Table 310.4(1) or Table 310.4(2)
(2) MV cable

Where exposed to weather, conductors shall be listed for use in wet locations. Where exposed to direct rays of the sun, conductors or cables shall be sunlight resistant.

Some of the triplex and quadruplex cables used by utilities as service-drop cable do not use conductors recognized in Table 310.4(1) and do not meet the requirements of Article 310.

See also

310.15(B) and **Table 310.20** or two or three single-insulated conductors supported on a messenger wire

310.15(C) and **Table B.2(3)** in Informative Annex B for ampacities of conductors for other cable types

(C) Hazardous (Classified) Locations. Messenger-supported wiring shall be permitted to be used in hazardous (classified) locations where the contained cables and messenger-supported wiring are specifically permitted by other articles in this *Code*.

396.12 Uses Not Permitted. Messenger-supported wiring shall not be used in hoistways or where subject to physical damage.

396.30 Messenger.

(A) Support. The messenger shall be supported at dead ends and at intermediate locations so as to eliminate tension on the conductors. The conductors shall not be permitted to come into contact with the messenger supports or any structural members, walls, or pipes.

(B) Neutral Conductor. Where the messenger is used as a neutral conductor, it shall comply with the requirements of 225.4, 250.184(A), 250.184(B)(7), and 250.187(B).

(C) Equipment Grounding Conductor. Where the messenger is used as an equipment grounding conductor, it shall comply with the requirements of 250.32(B), 250.118, 250.184(B)(8), and 250.187(D).

396.56 Conductor Splices and Taps. Conductor splices and taps made and insulated by approved methods shall be permitted in messenger-supported wiring.

396.60 Grounding. The messenger shall be grounded as required by 250.80 and 250.86 for enclosure grounding.

ARTICLE 398 Open Wiring on Insulators

Part I. General

398.1 Scope. This article covers the use, installation, and construction specifications of open wiring on insulators.

Open wiring on insulators is an exposed wiring method that is not permitted to be concealed by the building structure or finish. It is permitted indoors or outdoors, in dry or wet locations, and where subject to corrosive vapors, provided the insulation choice from Table 310.4(1) is suitable for use in a corrosive environment.

This wiring method is not permitted for temporary lighting and power circuits on construction sites but is permitted for lighting and power circuits in agricultural buildings (see 547.20). It may also be used for services (see 230.43).

See also

Tables 310.17 and **310.19** for ampacities of conductors

Part II. Installation

398.10 Uses Permitted. Open wiring on insulators shall be permitted only for industrial or agricultural establishments on systems of 1000 volts, nominal, or less, as follows: