to withstand abuse, such as by impact and crushing, in handling and during installation. Where intended for direct burial, without encasement in concrete, the material shall also be capable of withstanding continued loading that is likely to be encountered after installation.

355.120 Marking. Each length of RTRC shall be clearly and durably marked at least every 3 m (10 ft) as required in the first sentence of 110.21(A). The type of material shall also be included in the marking unless it is visually identifiable. For conduit recognized for use aboveground, these markings shall be permanent. For conduit limited to underground use only, these markings shall be sufficiently durable to remain legible until the material is installed. Conduit shall be permitted to be surface marked to indicate special characteristics of the material.

Informational Note: Examples of these markings include but are not limited to "limited smoke" and "sunlight resistant."

ARTICLE 356

Liquidtight Flexible Nonmetallic Conduit (LFNC)

Part I. General

356.1 Scope. This article covers the use, installation, and construction specifications for liquidtight flexible nonmetallic conduit (LFNC) and associated fittings.

356.6 Listing Requirements. LFNC and associated fittings shall be listed.

Part II. Installation

Δ **356.10 Uses Permitted.** LFNC shall be permitted to be used in exposed or concealed locations for the following purposes:

(1) Where flexibility is required for installation, operation, or maintenance.
(2) Where protection of the contained conductors is required from vapors, machine oils, liquids, or solids.
(3) For outdoor locations where listed and marked as suitable for the purpose.
(4) For direct burial where listed and marked for the purpose.
(5) Installed in lengths longer than 1.8 m (6 ft) where secured in accordance with 356.30.
(6) LFNC-B as a listed manufactured prewired assembly, metric designator 16 through 27 (trade size ½ through 1) conduit.
(7) For encasement in concrete where listed for direct burial and installed in compliance with 356.42.
(8) In locations subject to severe corrosive influences as covered in 300.6 and where subject to chemicals for which the materials are specifically approved.
(9) Conductors or cables rated at a temperature higher than the listed temperature rating of LFNC shall be permitted to be installed in LFNC, provided the conductors or cables are not operated at a temperature higher than the listed temperature rating of the LFNC.

Informational Note: Extreme cold can cause some types of nonmetallic conduits to become brittle and therefore more susceptible to damage from physical contact.

356.12 Uses Not Permitted. LFNC shall not be used as follows:

(1) Where subject to physical damage
(2) Where any combination of ambient and conductor temperatures is in excess of that for which it is listed
(3) In lengths longer than 1.8 m (6 ft), except as permitted by 356.10(5) or where a longer length is approved as essential for a required degree of flexibility
(4) In any hazardous (classified) location, except as permitted by other articles in this *Code*

356.20 Size.

Δ **(A) Minimum.** LFNC smaller than metric designator 16 (trade size ½) shall not be used unless permitted for metric designator 12 (trade size ⅜) as follows:

(1) For enclosing the leads of motors as permitted in 430.245(B)
(2) In lengths not exceeding 1.8 m (6 ft) as part of a listed assembly for tap connections to luminaires as required in 410.117(C), or for utilization equipment

(B) Maximum. LFNC larger than metric designator 103 (trade size 4) shall not be used.

Informational Note: See 300.1(C) for the metric designators and trade sizes. These are for identification purposes only and do not relate to actual dimensions.

356.22 Number of Conductors. The number of conductors shall not exceed that permitted by the percentage fill specified in Table 1, Chapter 9.

Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

Table 4 of Chapter 9 provides the usable area within the selected conduit or tubing, and Table 5 provides the required area for each conductor. Examples using these tables to calculate a conduit or tubing size are provided in the commentary following Chapter 9, Notes to Tables, Note 6.

To select the proper trade size of LFNC, see the appropriate sub-table for Article 356, Liquidtight Flexible Nonmetallic

Conduit (LFNC-A), Liquidtight Flexible Nonmetallic Conduit (LFNC-B), or Liquidtight Nonmetallic Conduit (LFNC-C), in Table 4 of Chapter 9. If the conductors are of the same wire size and insulation type, Tables C.5 and C.5(A) (LFNC-A), Tables C.6 and C.6(A) (LFNC-B), or Tables C.7 and C.7(A) (LFNC-C) in Informative Annex C can be used instead of performing the calculations.

Δ **356.24 Bends.**

N **(A) How Made.** Bends in conduit shall be so made that the conduit is not damaged and the internal diameter of the conduit is not effectively reduced. Bends shall be permitted to be made manually without auxiliary equipment. The radius of the curve to the centerline of any bend shall not be less than shown in Table 2, Chapter 9 using the column "Other Bends."

N **(B) Number in One Run.** The total degrees of bends in a conduit run shall not exceed 360 degrees between pull points.

• **356.28 Trimming.** All cut ends of conduit shall be trimmed inside and outside to remove rough edges.

Δ **356.30 Securing and Supporting.** LFNC shall be securely fastened and supported in accordance with one of the following:

(1) Where installed in lengths exceeding 1.8 m (6 ft), the conduit shall be securely fastened at intervals not exceeding 900 mm (3 ft) and within 300 mm (12 in.) on each side of every outlet box, junction box, cabinet, or fitting. Where used, cable ties shall be listed for the application and for securing and supporting.

Listing of cable ties for securement and support of flexible metal conduits is necessary because the standard requires markings that identify critical performance characteristics. These characteristics can affect their suitability for the conditions of use, including minimum and maximum operating temperatures and resistance to ultraviolet light for outdoor installations.

(2) Securing or supporting of the conduit shall not be required where it is fished, installed in lengths not exceeding 900 mm (3 ft) at terminals where flexibility is required, or installed in lengths not exceeding 1.8 m (6 ft) from a luminaire terminal connection for tap conductors to luminaires permitted in 410.117(C).

(3) Horizontal runs of LFNC supported by openings through framing members at intervals not exceeding 900 mm (3 ft) and securely fastened within 300 mm (12 in.) of termination points shall be permitted.

(4) Securing or supporting of LFNC shall not be required where installed in lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to a luminaire(s) or other equipment. For the purpose of 356.30, listed liquidtight flexible nonmetallic conduit fittings shall be permitted as a means of support.

356.42 Couplings and Connectors. Only fittings listed for use with LFNC shall be used. Angle connectors shall not be used for concealed raceway installations. Straight LFNC fittings are permitted for direct burial or encasement in concrete.

356.56 Splices and Taps. Splices and taps shall be made in accordance with 300.15.

Δ **356.60 Grounding.** Where equipment grounding is required, a separate grounding conductor shall be installed in the conduit.

Exception No. 1: The equipment grounding conductor shall be permitted to be run separately from the circuit conductors as permitted in 250.134, Exception No. 2, for dc circuits and 250.134, Exception No. 1, for separately run equipment grounding conductors.

Exception No. 2: The equipment grounding conductor shall not be required where the grounded conductor is used to ground equipment as permitted in 250.142.

Part III. Construction Specifications

356.100 Construction. LFNC-B as a prewired manufactured assembly shall be provided in continuous lengths capable of being shipped in a coil, reel, or carton without damage.

356.120 Marking. LFNC shall be marked at least every 600 mm (2 ft) in accordance with 110.21. The marking shall include a type designation in accordance with the definition of *Conduit, Liquidtight Flexible Nonmetallic (LFNC)* in Article 100 and the trade size. Conduit that is intended for outdoor use or direct burial shall be marked.

The type, size, and quantity of conductors used in prewired manufactured assemblies shall be identified by means of a printed tag or label attached to each end of the manufactured assembly and either the carton, coil, or reel. The enclosed conductors shall be marked in accordance with 310.8.

ARTICLE 358 Electrical Metallic Tubing (EMT)

Part I. General

358.1 Scope. This article covers the use, installation, and construction specifications for electrical metallic tubing (EMT) and associated fittings.

• **358.6 Listing Requirements.** EMT, factory elbows, and associated fittings shall be listed.