



TECHNICAL SERVICES DEPARTMENT

## BULLETIN

No. 99  
March 2010

### **Electrical Cable Type and Dimensional Considerations for Compatibility with Listed Cable Fittings (Connectors) and Box Cable Clamps**

The objective of this Bulletin is to increase awareness of the distinction between types of circular electrical cables in relation to their conductor fill, and the compatibility of cables of varying diameters with listed fittings (connectors) and box clamps. Additionally, this Bulletin offers practical guidance for selecting cable fittings and box clamps that accommodate a range of cable diameters.

A key fundamental criterion for designing an electrical branch circuit is proper selection and sizing of electrical conductors. Another fundamental is routing of electrical conductors in the circuit and providing the degrees of protection necessary for efficiency and safety in the application, and in accordance with the National Electrical Code®.

It is very common, and natural throughout the design, specification, procurement, installation and inspection of branch circuits to consistently reference conductor sizes and number of conductors (e.g. 14/2, 12/4, 10/3) when describing cable used in the circuit. This constant reference only to conductors can cause misunderstanding of important distinctions between cable constructions. In addition, dimensional variations between cable types and cables from different manufacturers can lead to misapplication of cable fittings (connectors) and box clamps depended upon to secure the cables as required at boxes and enclosures. Mechanical securement, electrical bonding and environmental sealing are among important safety considerations that could be compromised through such misapplication.

After final installation, a wiring system comprised of Armored Cable (Type AC), Metal-Clad Cable (Type MC) and even Flexible Metal Conduit (FMC) may be hard to distinguish from each other. Even at the point of procurement, AC and MC are often confused. These cable systems are not always interchangeable despite the fact that they may contain the exact size and number of electrical conductors. Their suitability as an equipment grounding conductor in accordance with NEC Section 250.118 may vary as may other permitted uses. Armored Cable is required to have an anti-short bushing assembled at the time of installation whereas this is not required for metal-clad cable (see NEMA Engineering Bulletin No. 90).

Correct specification, procurement, installation and inspection of listed fittings (connectors) or box clamps not only depend on clear identification of the appropriate cable type, but also the outside diameter of the cable, or cable diameter range. Typical listed fittings and box clamps cover a range of cable diameters. Because of the sometimes wide variation in outside diameters between cable types, and cables from different manufacturers, even those containing the same number and size of conductors, it is unreliable to select and install a fitting or box clamp on a cable using only the conductor fill as the selection criterion.

A cable fitting is typically provided with the following information:

Trade Size (example: ½ (16)) See A of Figure 1

This only refers to the knockout size in a box or enclosure to which the fitting is intended to be mechanically attached. See A of Figure 2

Diameter Range (example: 0.370 – 0.580 in.) See B of Figure 1

This is a required marking for listed cable fittings and designates the outside diameter of cable or range of diameters for which a cable fitting, or box clamp, is listed. For metal-jacketed cables, such as AC and MC, this diameter is over the armor but under any nonmetallic outer covering. A fitting that is also listed for environmental sealing on cables designed for use in wet locations, the diameter range for sealing on the cable's outer jacket may also be described. See B of Figure 2

Conductor Range (example: 14/2 – 10/3) See C of Figure 1

This marking, where provided, is for reference only. Since cable diameters can vary widely, as previously described, the listed cable diameter range for the fitting or box clamp needs to be verified with the cable before installation and at the time of inspection.

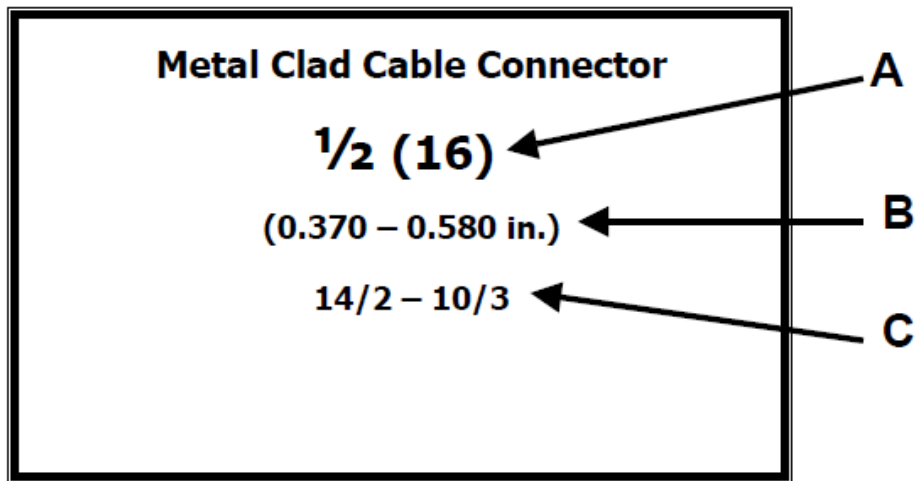
For certain cable fittings, the actual conductor range may be limited for some cables by the size of the required bushing in the throat of the fitting where the conductors exit into the box or enclosure. See C of Figure 2.

### **Sizing Connectors and Box Clamps to Cables**

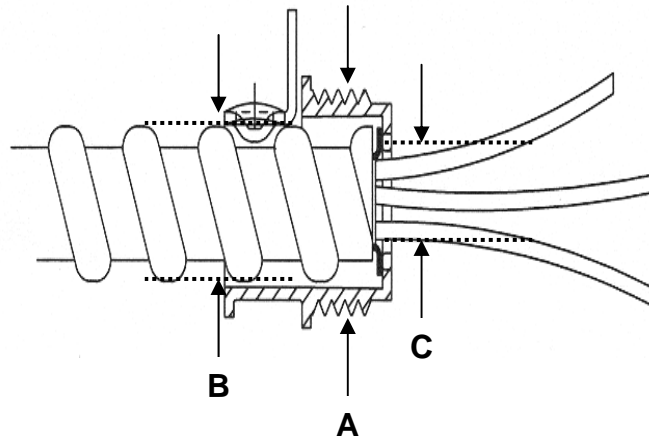
Since the diameter of cables can vary even along a continuous length, it is recommended that a connector or box clamp is chosen that accommodates the nominal over armor diameter of the cable within the mid-range of the diameters marked for the connector or clamp. This rule-of-thumb will help ensure ease of assembly and optimal performance.

### **In summary:**

A greater awareness is needed as to the important distinctions between cable types and the importance of verifying the listed cable diameter range of fittings (connectors) and box clamps in relation to the specific cable to be installed. Over-reliance on conductor size and number of conductors as the common reference for all types of cables through the design, specification, procurement, installation and inspection of electrical branch circuits alone is undependable in ensuring component compatibility and system safety.



**Figure 1**  
**Typical Cable Connector Product Label**



**Figure 2**  
**Typical Cable Connector**

**Distribution List:**

Standards and Conformity Assessment Policy Committee  
 Codes and Standards Committee  
 NEMA Technical Services Department