Type NM-B and Type MC in Residential Installation

by Paul W. Abernathy, CMECP® and Encore Wire Corporation

Can Metal-Clad Cable be used in Residential Construction?

There have been many questions regarding the use of *Metal-Clad Cable* in various occupancies as an alternative to *Nonmetallic-Sheathed Cable*, such as in residential dwelling applications. With those questions also came additional discussions regarding the bonding of the metallic sheathing (armor) and the overall compliance with the *National Electrical Code [NEC]*. In this article we will attempt to answer all those questions.

Metal-Clad Cable [Type MC Cable], just as Nonmetallic-Sheathed Cable [Type NM-B], are UL/ANSI Listed wiring methods being utilized in all scopes of building wiring as permitted by the *NEC*. In fact, nothing within the *NEC* prohibits the use of *Type MC* in residential dwellings just like *Type NM-B*.

While *Type NM-B* is typically limited to Four (4) stories [Five (5) stories if sprinkled] depending on the type of construction being utilized, such as wood framed construction, this is not an issue for *Type MC Cable* which has been well utilized in many mid-rise and high-rise buildings for decades. *Type MC Cable* is well suited for any Residential, Commercial, and Industrial applications provided it is installed in accordance with *Article 330* of the *NEC*.

Focusing on residential applications, *Type MC Cable,* and the nonmetallic device boxes for a moment. The NEC permits Type MC Cable to be utilized in any application where *Type NM-B* is also permitted, such as all residential installations, such as single-family or multifamily dwellings. However, the usual question that comes up is about the device boxes being used. Can it be Plastic, Metal, or Both?

The easy answer is to always use a metal outlet or device box with armored cables, but let us address the harder question first, which is the one most installers ask. The use of Nonmetallic Boxes with *Type MC Cable*.

Nonmetallic Outlet Boxes, also referred to as PVC (Plastic) outlet or device boxes, with incorporated internal cable clamping systems, are listed, labeled, and identified for use only with nonmetallic-sheathed cables per UL Guide QCMZ. So, the installer could not “cut their own knock-out (hole)” into the device box and install a *Type MC Cable*. So, what PVC (Plastic) device boxes with no clamps?

There are indeed Nonmetallic Outlet Boxes with ½” and ¾” knock-outs available but they are designed for use with *Rigid Nonmetallic Raceways [Rigid PVC]* or *Electrical Nonmetallic Tubing [ENT].* When these types of outlet boxes are encountered, they will state the wiring methods permitted to be used with them.

The next question would be, is there anything within the *NEC* that would permit a metal armored cable, such as *Type MC*, to be connected to a nonmetallic box? Yes, but we must examine the *NEC* to fully understand what is permitted.

“314.3 Nonmetallic Boxes.

Nonmetallic boxes shall be permitted only with open wiring on insulators, concealed knob-and-tube wiring,

cabled wiring methods with entirely nonmetallic sheaths, flexible cords, and nonmetallic raceways.

Exception No. 1: Where internal bonding means are provided between all entries, nonmetallic boxes shall be permitted to be used with metal raceways or metal-armored cables.

Exception No. 2: Where integral bonding means with a provision for attaching an equipment bonding jumper inside the box are provided between all threaded entries in nonmetallic boxes listed for the purpose, nonmetallic boxes shall be permitted to be used with metal raceways or metal-armored cables."

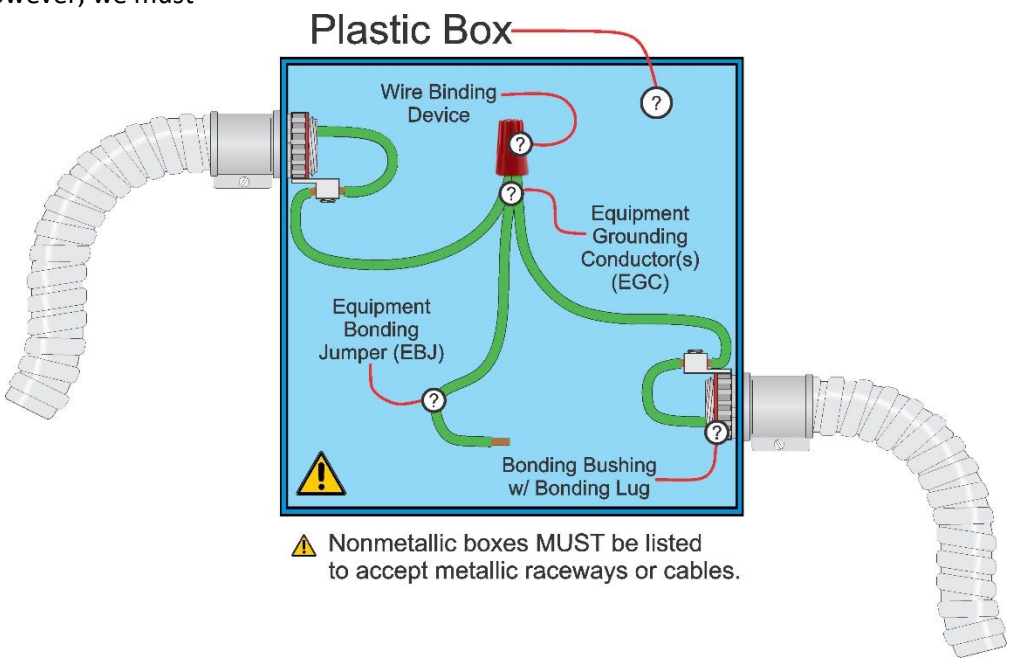
At first glance it appears that nonmetallic boxes can only be used with entirely nonmetallic sheaths, such as Type NM-B and UF-B, and nonmetallic raceways, such as Rigid PVC or ENT as previously discussed. However, we must look at the "EXCEPTIONS" to the general rule to fully understand what is and what is not being permitted, and of course here is where it can get tricky for those unsavvy in the *NEC*.

In our case (See Image), Exception # 1 says that if the installer chooses to install *Type MC Cable* to a nonmetallic box, that is NOT limited to use with *Type NM-B* and *Type UF-B or Type ENT*, the installer shall provide some form of internal bonding means, such as a bonding bushing with a bonding jumper(s), to ensure that all the equipment grounding conductors within the nonmetallic box remain connected together and mutually bonded to the armor. This would also apply to the use of any "Smart Ground" *Type MC* products as well since the armor is being used as an equipment grounding conductor.

As for Exception # 2 that is for manufacturers who build a specific integral means within the nonmetallic box itself for interconnection of equipment bonding jumpers (or equipment grounding conductors), such as those we see in swimming pool boxes, which are typically nonmetallic.

As a Codes and Standards recommendation, when it comes to using *Type MC Cable*, the best practice is to always use metallic boxes and appropriately UL/ANSI listed fittings (connectors). The armor is bonded to the metal fitting and ultimately connection to the metal box which completes the bonding requirements for these products. Once the equipment grounding conductor is attached (terminated) to the metal box, inside the box itself, the process is complete.

Hope this helps answer any of those questions on the use of Metal-Clad Cable in Residential installations as well as the use with both nonmetallic boxes and metallic boxes with armored products for a code compliant, reliable, and ultimately safe installation.



Article and Illustrations by: