

**EXHIBIT 300.4** Placement of cables and raceways under metal-corrugated sheet roof decking to avoid physical damage.

cable, raceway, or box. This section prohibits cables, raceways, or boxes from being installed in the space between the metal deck and the roofing material.

Roof replacement materials are fastened in place with long screws, which penetrate the roof decking installation and could continue into cables and raceways installed below. Adequate space between the corrugated sheet metal roof deck installation and the cables and raceways below the deck will prevent future damage to the cable or raceway installation. The exception clarifies that this requirement does not apply to more robust metal raceways such as RMC and IMC.

#### See also

**410.10(F)** for similar requirements for luminaires

#### (F) Cables and Raceways Installed in Shallow Grooves.

Cable- or raceway-type wiring methods installed in a groove, to be covered by wallboard, siding, paneling, carpeting, or similar finish, shall be protected by 1.6 mm ( $\frac{1}{16}$  in.) thick steel plate, sleeve, or equivalent or by not less than 32-mm ( $1\frac{1}{4}$ -in.) free space for the full length of the groove in which the cable or raceway is installed.

*Exception No. 1: Steel plates, sleeves, or the equivalent shall not be required to protect rigid metal conduit, intermediate metal conduit, rigid PVC conduit, RTRC, or electrical metallic tubing.*

*Exception No. 2: A listed and marked steel plate less than 1.6 mm ( $\frac{1}{16}$  in.) thick that provides equal or better protection against nail or screw penetration shall be permitted.*

**(G) Fittings.** Where raceways contain 4 AWG or larger insulated circuit conductors, and these conductors enter a cabinet, a box, an enclosure, or a raceway, prior to the installation of conductors, the conductors shall be protected in accordance with any of the following:

- (1) An identified fitting providing a smoothly rounded insulating surface
- (2) A listed metal fitting that has smoothly rounded edges

- (3) Separation from the fitting or raceway using an identified insulating material that is securely fastened in place
- (4) Threaded hubs or bosses that are an integral part of a cabinet, box, enclosure, or raceway providing a smoothly rounded or flared entry for conductors

Conduit bushings constructed wholly of insulating material shall not be used to secure a fitting or raceway. The insulating fitting or insulating material shall have a temperature rating not less than the insulation temperature rating of the installed conductors.

Heavy conductors and cables tend to stress the conductor insulation at raceway terminating points. Care must be taken at raceway and cable terminations to reduce the risk of insulation failure at conductor insulation stress points. This is often done by using insulating bushings or fittings with rounded edges; however, there are multiple options to achieve the desired protection of the insulation. The temperature ratings of the insulating bushing must coordinate with the insulation of the conductor to ensure that the conductor is protected for its entire life cycle.

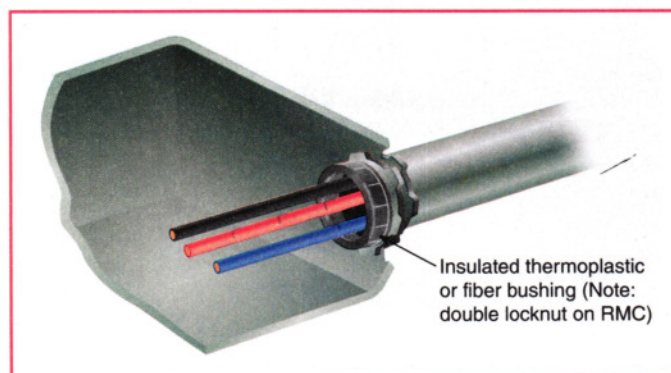
Whether provided separately or as part of a fitting, listed insulating bushings are colored black or brown to indicate a temperature rating of 150°C and any other color to indicate a rating of 90°C unless specifically marked for a higher temperature. Exhibit 300.5 shows an insulated thermoplastic or fiber bushing used to protect the conductors from chafing against a metal conduit fitting. Note the use of a double locknut, with one on the inside and one on the outside of the enclosure. The locknuts are necessary because the raceway cannot be secured by the fiber or plastic bushing.

#### See also

**342.46, 344.46, and 352.46** for further information relating to bushings

**(H) Structural Joints.** A listed expansion/deflection fitting or other approved means shall be used where a raceway crosses a structural joint intended for expansion, contraction, or deflection, used in buildings, bridges, parking garages, or other structures.

Raceways can be damaged if improperly installed in structural construction joints, leaving conductors or cables exposed.



**EXHIBIT 300.5** An insulated bushing used to protect conductors from chafing against a metal conduit fitting.