(NOTE: If step-end is not down, the bender could get wedged by the bend.)

To bend EMT coming out of a wall, remove handle and insert a close nipple. Thread a 90 degree pipe elbow onto the nipple and thread the handle into the elbow. The handle will parallel the bender center. This provides clearance to swing the handle down to make the bend.

4.3 Fittings For Use With RMC, IMC, and EMT

NOTE: See Section 6 for PVC-coated conduit

4.3.1 Size and raceway type

Before installing a fitting or a raceway support, review the packaging labels containing specific applications for which the fitting or raceway support is recommended and/or listed.

(NOTE: Do not take applications for granted. Many fitting designs look the same but may contain subtle construction differences designed to enhance performance in particular applications. Listed fittings contain required, informative markings and any specific conditions for use.)

Fittings and raceway supports shall be used only with conduit of the trade size indicated on the fitting or raceway support or its smallest unit shipping container.

4.3.2 Fittings for special applications

Threadless fittings intended for use in wet locations are marked *"Raintight"* or *"Wet locations"* on the fitting or its smallest unit shipping container. "Raintight" fitting designs that require a gasket or sealing ring installed between the fitting and a box shall be installed only with the specific component marked on the fitting's smallest unit shipping container.

(NOTE: "Raintight" or "Liquidtight" fittings are not necessarily suitable for use in applications where submersion in water is expected. "Raintight" fittings are not necessarily considered "Liquidtight." "Liquidtight" fittings are intended for use in typical wet locations but also in "wet" industrial environments which may contain machine oils and coolants.)

Rigid metal conduit and IMC fittings for use in industrial applications involving sprayed mineral oils and coolants are marked *"Liquidtight"* on the fitting or its smallest unit shipping container.

Threadless fittings intended for embedment in poured concrete are marked *"Concrete-tight"* or *"Concrete-tight when taped,"* or *"Raintight"* on the fitting's smallest unit shipping container.

(NOTE: Taping is adequate to prevent the entrance of concrete aggregate into the raceway or box. Concrete aggregate consists of cement combined with inert material such as coarse sand. When hardened, such aggregate may be abrasive and might pose a risk to abrade conductor insulation or effectively reduce the area inside the raceway. Fittings listed as "Raintight" are also "Concrete-tight".)

Expansion fittings shall be installed where significant temperature differentials are anticipated. When conduit is installed as outdoor raceway spans between buildings, attached to bridges, on rooftops, etc., where expansion and contraction would result from the direct heat of the sun coupled with significant temperature drops at night, the full coefficient of expansion shall be applied in determining the need for expansion fittings. Table 3 shows length changes for rigid metal conduit (RMC) at selected temperature differentials.

(NOTE: Where the conduit is not exposed to the direct heat of the sun, expansion fittings are not generally necessary because the coefficients of expansion for steel and common building materials are so similar.)

4.3.3 Installing fittings

4.3.3.1 Threadless fittings

Threadless fittings shall not be assembled to threaded RMC or IMC unless specifically recommended by the fitting manufacturer. Where threadless fittings are to be assembled to RMC, IMC and EMT, conduit ends shall:

a) Have squarely cut ends, free of internal and external burrs, and circular form as provided from the factory,

b) Be free from dirt or foreign matter on the surface of the conduit to be inserted into the fitting, and

c) Have the ends of the conduit or tubing assembled flush against the fitting's end stop.

Careful consideration shall be given to the torque applied to the fitting's securement means.

(NOTE: Listed fittings are tested under prescribed torque which represent normal, not excessive force. Performance is not enhanced, and can be reduced, by overtorquing the fitting's securement means.)

Set-screw type: The length of screws provided with set-screw type fittings varies. The appropriate torque for some designs is reached when the head of the screw touches a screw boss on the fitting. This cannot be universally relied upon, however. Screws on certain fitting designs, particularly larger trade sizes, can offer more than one tightening option including screwdriver (Slot, Phillips, or Robertson-square drive) and bolt head for wrench application (hex or square). Greater mechanical advantage and torque can generally be achieved with a wrench. Where both screwdriver and wrench application options are offered, torque should be limited to that which can be applied by the screwdriver.

Compression (gland) type: Generally, most compression gland nuts achieve maximum securement after hand tightening and then wrench tightening one or two additional turns.

Prior to embedment in poured concrete, all threadless fittings, including those marked "Concrete-tight,"

Table 3: Expansion Characteristics of Rigid Metal Conduit (RMC)

Coefficient of Thermal Expansion = 6.5×10^{-6} in/in/°F

Temperature Change in Degrees F	Length Change in Inches per 100 feet of Steel Conduit	Temperature Change in Degrees F	Length Change in Inches per 100 feet of Steel Conduit	Temperature Change in Degrees F	Length Change in Inches per 100 feet of Steel Conduit	Temperature Change in Degrees F	Length Change in Inches per 100 feet of Steel Conduit
5	0.04	55	0.44	105	0.84	155	1.26
10	0.08	60	0.48	110	0.90	160	1.30
15	0.12	65	0.52	115	0.94	165	1.34
20	0.16	70	0.56	120	0.98	170	1.38
25	0.20	75	0.60	125	1.02	175	1.42
30	0.24	80	0.64	130	1.06	180	1.46
35	0.28	85	0.68	135	1.10	185	1.50
40	0.32	90	0.72	140	1.14	190	1.54
45	0.36	95	0.76	145	1.18	195	1.58
50	0.40	100	0.82	150	1.22	200	1.62

shall be taped adequately to prevent the entrance of concrete aggregate where they will be embedded more than 24 inches or where the pour area will be subjected to a concrete vibrator. Tape shall be applied after the fitting is assembled and secured to the conduit.

4.3.3.2 Threaded fittings
Threaded joints, both fitting to conduit and fitting to threaded integral box entries, shall be made up wrenchtight. *(NOTE: Avoid excessive force. Generally a force equivalent to handtight plus one full turn with an appropriate tool is recommended. This should assure engagement of at least three full threads.)*

Conduit bodies generally have an integral bushing to provide a smooth surface for conductors when pulled. This bushing is often mistaken for a conduit end stop. It is not necessary that the conduit be inserted flush against this bushing to assure a secure joint.

4.3.4 Attachment to boxes and support

Prior to assembly to a box or enclosure or a threadless coupling, RMC, IMC and EMT shall be supported at intervals required by the NEC, or more frequently, using raceway supports intended for the purpose secured by hardware acceptable to the local jurisdiction.

(NOTE: The variability of mounting surfaces, expected loads, and application environments will determine the appropriate support options and securement hardware. Project specifications normally calculate requirements based on ***minimum*** *spacing intervals given in the NEC. Closer support intervals than are required by the NEC are an acceptable option to heavier supports and mounting hardware* ***in some applications.****)*

Properly align the raceway, fittings, and knockouts to provide secure mechanical and electrical connections. Allow sufficient conduit length to complete engagement of the conduit and fittings at joints and entries.

Conduit bushings shall not be used to secure threaded RMC or IMC to a box or enclosure. A locknut shall always be assembled between a conduit bushing and the inside of the box or enclosure.

EMT connectors are permitted to be assembled into threaded entries of boxes, conduit bodies or internally threaded fittings having tapered threads (NPT). EMT fittings designed to NEMA FB 1 *"Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies,"* have straight threads (NPS). Threaded openings where these fittings are intended to be used are permitted to have either tapered (NPT) or straight (NPS) threads. Care should be taken to insure that the threaded entry will accommodate a minimum of 3 full engaged threads.

Where a locknut is provided with a fitting as the means of securement to a box or enclosure, the locknut is to be secured by hand tightening to the enclosure plus $^1/_4$ turn using an appropriate tool.

(NOTE: While securing the locknut, take care to avoid excessive pressure where gripping the body of the fitting is necessary.)

Do not rely upon locknuts to penetrate nonconductive coatings on enclosures. Such coatings shall be removed *in the locknut area* prior to raceway assembly to assure a continuous ground path is achieved. Touch up bare area after fitting assembly as needed.

Verification of installation
After the raceway is fully installed and supported, and prior to installing conductors in the raceway, all fittings and locknuts shall be re-examined for secureness *(see 5.5)*.

4.4 Support of Raceways

Support and securely fasten all raceways in place in accordance with NEC requirements.

4.4.1 Follow all Code requirements for spacing of supports and frequency of securing RMC, IMC and EMT. The requirement to securely fasten raceways within the specified distance from each "termination point" includes, but is not limited to, outlet and junction boxes, device boxes, cabinets, and conduit bodies. Each raceway shall be so secured. Do not omit any supports.