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| **CMGT 235 – Electrical and Mechanical Systems** | | |
| **Discussion No. 26** | **Unit 3 - Electrical Systems** | **Fall 2022** |

**Sizing Electrical Raceway**

**Proper Sizing of Conduit and Raceways**

When selecting the conduit size, it’s important to consider the following variables:

1. Number of conductors
2. Size of the conductors
3. Type of conduit

NFPA 731 Section 4.6.3.12(2) requires raceways to be sized properly in accordance with the NEC.

**2017 Edition National Electric Code (NFPA 70)**

**Article 300**

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**Article 300.17**

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In the NEC, there are two main locations used when determining the maximum number of conductors in a conduit or tubing:

**NEC Annex C** is used for determining the maximum number of conductors permitted in conduit or tubing, when all conductors in the conduit are of the same size and insulation type.

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**NEC Chapter 9** is used for combinations of conductors of different sizes or insulation types installed in the same conduit or tubing.

**Chapter 9**

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**Example 1**

What is the minimum size Schedule 40 PVC raceway required for three 500 kcmil THHN conductors, one 250 kcmil THHN conductor, and one 3 THHN conductor?

[Chapter 9, Table 5]

Step 1. 500 THHN [0.7073 in.2 x 3 wires = 2.1219 in.2]

250 THHN [0.3970 in.2 x 1 wire = 0.3970 in.2]

3 THHN [0.0973 in.2 x 1 wire = 0.0973 in.2]

Step 2. Total cross-sectional area of all conductors = 2.6162 in.2

Step 3. [Chapter 9, Table 4]

Size conduit at 40% fill (PVC schedule 40)

Trade Size 3 = allowable cross-sectional area of 2.907 in.2

**Example 2**

What size RMC nipple is required for three 3/0 THHN conductors, one 1 THHN conductor and one 6 THHN conductor?

Step 1. 3/0 THHN [0.2679 in.2 x 3 wires = 0.8037 in.2]

1 THHN [0.1562 in.2 x 1 wire = 0.1562 in.2]

6 THHN [0.0507 in.2 x 1 wire = 0.0507 in.2]

Step 2. Total cross-sectional area of all conductors = 1.0106 in.2

Step 3. [Chapter 9, Table 1, Note 4] - Size conduit at 60% fill

Trade Size 1 ¼ nipple = 0.916 in.2 (too small)

Trade Size 1 ½ nipple = 1.243 in.2  (just right)

Trade Size 2 nipple = 2.045 in.2  (larger than required)

**Example 3**

How many 8 THHN conductors can be installed in a trade size 3/4 EMT?

Annex C. Table C.1, pg. 70-714

Total of (6) 8 AWG THHN conductors in a ¾” EMT conduit

**Example 4**

How many 18 TFFN conductors can be installed in trade size ¾ LFMC?

Annex C. Table C.8, pg. 70-757

Total of (39) 18 AWG TFFN conductors in a ¾” LFMC conduit

**Example 5**

What’s the smallest trade size PVC Schedule 40 raceway that can be used for the installation of four 1/0 THHN conductors?

Annex C. Table C.11(A), pg. 70-777

1 ½” PVC Schedule 40 conduit

**Example 6**

A 200A feeder installed in Schedule 80 PVC has three 3/0 THHN conductors, one 2 THHN conductor, and one 6 THHN conductor. What size raceway is required? Chapter 9 Tables

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| QTY | GAUGE | TYPE | Cross-Section Area | |  |
| 3 | 3/0 | THHN | 3 x 0.2679 in2 = 0.8037 in2 | |  |
| 1 | 2 | THHN | 1 x 0.1158 in2 = 0.1158 in2 | |  |
| 1 | 6 | THHN | 1 x 0.0507 in2 = 0.0507 in2 | | PVC Sched. 80 |
|  |  |  | Total Cross-Section Area | 0.9702 in2 | 2” |

**Example 7**

What size EMT raceway is required for 4 wires, with insulation type THHN, and gauge of 8 AWG and 2 wires, with insulation type THW, and gauge of 4 AWG.?

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| --- | --- | --- | --- | --- | --- |
| QTY | GAUGE | TYPE | Cross-Section Area | |  |
| 4 | 8 | THHN | 4 x 0.0366 in2 = 0.1464 in2 | |  |
| 2 | 4 | THW | 2 x 0.0973 in2 = 0.1946 in2 | | EMT |
|  |  |  | Total Cross-Section Area | 0.341 in2 | 1” |