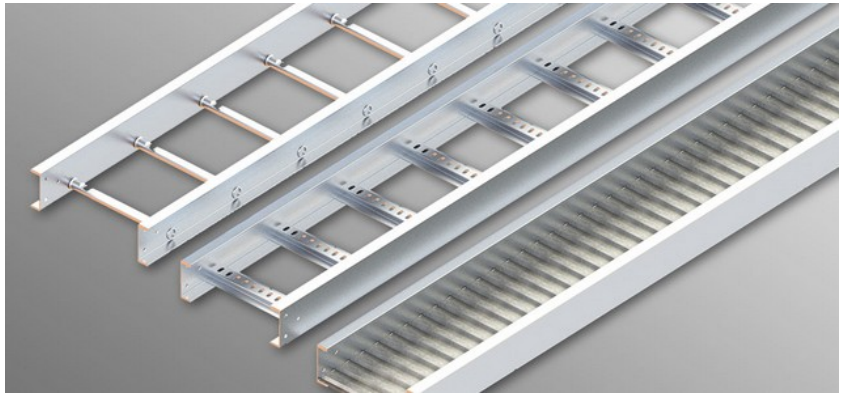
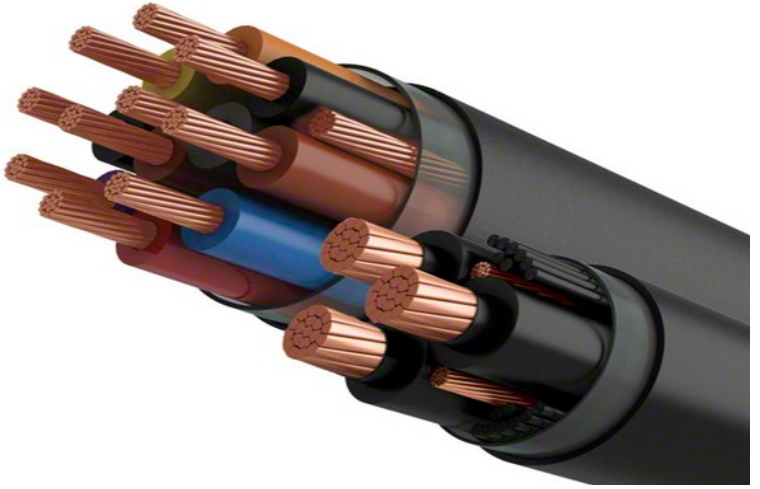
2020 NEC Article 392 Example D13

NEC Cable Tray Sizing and Conductor Ampacity
Less than 2000V





Introduction

Given Information

Tray Size Calculations NEC 392

Conductor Spacing

Conductor Ampacity

Termination Temperature Rating

Find

- The minimum ventilated ladder type cable tray size
- The copper conductor ampacity at zero spacing
- The copper conductor ampacity a 2X spacing

Given Information
Example D.13(a)

- MultiConductor Cable 4/0 and Larger
- 3 Conductor type MC cable 4/0 AWG XHHW-2
- 75 Degree C terminations, 30 Degrees C ambient temperature
- Cable OD 1.57 inches
- 12 Cables

Tray Size D.13(a)

- The sum of the 12 cable diameters is 18.84 inches.
- The minimum tray inside width is then 18.84 inches or the next size up standard size of 20 inch tray
- With 11 spaces in between cables at 1.57 inches each space
- The total space is then 11X1.57 = 17.27 inches
- The total tray width is then 18.84 + 17.27 = 36.11 inches
- https://industrialengineeringllc.com/NEC/ctray2000m.php

4/0 Multiconductor Cable Ampacity D.13(a)

- With no spacing Table 310.16 75 Degree column for XHHW-2 is 230 Amps
- With spacing Annex B Table B.2(3) free air ampacity 245 Amps

Given Information
Example D.13(b)

- MultiConductor Smaller than 4/0 AWG
- 4 Conductor type MC cable #1 AWG XHHW-2
- 75 Degree C terminations, 30 Degrees C ambient temperature
- Cable OD 1.311 inches
- 9 Cables
- No Non-linear load so neutral is NOT current carrying

Tray Size D.13(b)

- The cable area is 1.35 inches squared
- The sum of the 9 cable areas is 12.15 inches squared.
- The minimum tray inside width is then given by Table 392.22(a) Column 1 at 12 inches
- With 8 spaces in between cables at 1.311 inches each space
- The total space is then 8X1.311 = 10.5 inches
- The total tray width is then 12.15 + 10.5 = 22.64 inches or 24 inch tray.
- https://industrialengineeringllc.com/NEC/ctray2000m.php

#1 AWG Multiconductor Cable Ampacity D.13(b)

- With no spacing Table 310.16 75 Degree column for XHHW-2 is 130 Amps
- With spacing Annex B Table B.2(3) free air ampacity 138 Amps

Given Information
Example D.13(c)

- Single Conductor Cable 1/0 through 4/0 AWG
- Type 4/0 AWG THHN
- 75 Degree C terminations, 30 Degrees C ambient temperature
- Cable OD 0.642 inches
- 18 Cables

Tray Size D.13(c)

- The cable diameter is 0.642 inches
- The sum of the 9 cable diameters is 11.556 inches.
- The minimum tray inside width is then 11.556 or 12 inches standard size.
- With bundles of three and 5 spaces in between cables at 2.15XDiameter inches each space
- The total space is then 5X2.15*0.642 = 6.9 inches
- The total tray width is then 12.0 + 6.9 = 18.9 inches or 20 inch standard tray.
- https://industrialengineeringllc.com/NEC/ctray2000s.php

#4/0 AWG Single Conductor Cable Ampacity D.13(c)

- With no spacing 65% of Table 310.17 75 Degree column for THHN is 0.65X360=234 Amps
- With spacing Table 310.20 messenger ampacity 287 Amps

Given Information
Example D.13(d)

- Single Conductor 250 through 900 kcmils
- 500 kcmils THHN
- 75 Degree C terminations, 30 Degrees C ambient temperature
- Cable OD 0.95 inches
- 9 Cables

Tray Size D.13(d)

- The cable area is 0.707 inches squared
- The sum of the 9 cable areas is 6.36 inches squared.
- The minimum tray inside width is then given by Table 392.22(B)(1) Column 1 at 6 inches
- With bundles of three and 2 spaces in between cables at 2.15XD inches each space
- The total space is then 2X2.15X0.95 = 4.085 inches
- The total tray width is then 6.0 + 4.08 = 10.08 inches or 12 inch standard tray.
- https://industrialengineeringllc.com/NEC/ctray2000s.php

500 Kcmils AWG Multiconductor Cable Ampacity D.13(d)

- With no spacing 65% of Table 310.17 75 Degree column for THHN is 0.65X620=403 Amps
- With spacing Table 310.20 messenger ampacity 496 Amps

Conclusion

Tray widths are determined by the conduction diameter or the conductor area depending on the type of conductor

Conductor ampacity depends on the type of tray and the spacing of the conductors

NEC Article 392 covers cable tray installations