



VOLTAGE DROP TABLES

NEC CHAPTER 9 TABLE 8 METHOD

NEC Recommends that a combined voltage drop of the feeder and branch circuit should not exceed 5%. This has a cascading effect, so the Feeder has a maximum recommended voltage drop of 3% and the branch circuit has a recommended voltage drop of 3%. Reference the below voltage tables for proper wire sizing based on voltage, load, and circuit length.

See NEC sections 210.19(A)(1) FPN 4 and 215.2(A) FPN 2 for more details.

6 VOLTS WITH A MAXIMUM VOLTAGE DROP OF 5%

| WIRE SIZE | WATTS | | | | | | | | | | | | | | | | | | | |
|-----------|-------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 4 | 6 | 8 | 10 | 12 | 13 | 16 | 18 | 20 | 24 | 25 | 28 | 35 | 44 | 50 | 75 | 100 | 150 | 200 | 250 |
| #12 | 117' | 78' | 58' | 47' | 39' | 36' | 29' | 26' | 23' | 19' | 19' | 17' | 13' | 11' | 9' | 6' | 5' | 3' | 2' | 2' |
| #10 | 186' | 124' | 93' | 74' | 62' | 57' | 46' | 41' | 37' | 31' | 30' | 27' | 21' | 17' | 15' | 10' | 7' | 5' | 4' | 3' |
| #8 | 295' | 196' | 147' | 118' | 98' | 91' | 74' | 65' | 59' | 49' | 47' | 42' | 34' | 27' | 24' | 16' | 12' | 8' | 6' | 5' |
| #6 | 458' | 305' | 229' | 183' | 153' | 141' | 115' | 102' | 92' | 76' | 73' | 65' | 52' | 42' | 37' | 24' | 18' | 12' | 9' | 7' |

9.6 VOLTS WITH A MAXIMUM VOLTAGE DROP OF 5%

| WIRE SIZE | WATTS | | | | | | | | | | | | | | | | | |
|-----------|-------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|
| | 4 | 8 | 12 | 13 | 16 | 18 | 24 | 25 | 28 | 35 | 44 | 50 | 75 | 100 | 150 | 200 | 250 | 300 |
| #12 | 298' | 149' | 99' | 92' | 75' | 66' | 50' | 48' | 43' | 34' | 27' | 24' | 16' | 12' | 8' | 6' | 5' | 4' |
| #10 | 476' | 238' | 159' | 146' | 119' | 106' | 79' | 76' | 68' | 54' | 43' | 38' | 25' | 19' | 13' | 10' | 8' | 6' |
| #8 | 754' | 377' | 251' | 232' | 188' | 168' | 126' | 121' | 108' | 86' | 69' | 60' | 40' | 30' | 20' | 15' | 12' | 10' |
| #6 | 1173' | 587' | 391' | 361' | 293' | 261' | 196' | 188' | 168' | 134' | 107' | 94' | 63' | 47' | 31' | 23' | 19' | 16' |

12 VOLTS WITH A MAXIMUM VOLTAGE DROP OF 5%

| WIRE SIZE | WATTS | | | | | | | | | | | | | | | | | |
|-----------|-------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|
| | 4 | 8 | 12 | 13 | 16 | 18 | 24 | 25 | 28 | 35 | 44 | 50 | 75 | 100 | 150 | 200 | 250 | 300 |
| #12 | 466' | 233' | 155' | 143' | 117' | 104' | 78' | 75' | 67' | 53' | 42' | 37' | 25' | 19' | 12' | 9' | 7' | 6' |
| #10 | 744' | 372' | 248' | 229' | 186' | 165' | 124' | 119' | 106' | 85' | 68' | 60' | 40' | 30' | 20' | 15' | 12' | 10' |
| #8 | 1178' | 589' | 393' | 362' | 295' | 262' | 196' | 188' | 168' | 135' | 107' | 94' | 63' | 47' | 31' | 24' | 19' | 16' |
| #6 | 1833' | 916' | 611' | 564' | 458' | 407' | 305' | 293' | 262' | 209' | 167' | 147' | 98' | 73' | 49' | 37' | 29' | 24' |

24 VOLTS WITH A MAXIMUM VOLTAGE DROP OF 5%

| WIRE SIZE | WATTS | | | | | | | | | | | | | | |
|-----------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|-----|-----|--|
| | 13 | 18 | 25 | 28 | 35 | 44 | 50 | 75 | 100 | 150 | 200 | 250 | 300 | 400 | |
| #12 | 574' | 415' | 298' | 266' | 213' | 170' | 149' | 99' | 75' | 50' | 37' | 30' | 25' | 19' | |
| #10 | 915' | 661' | 476' | 425' | 340' | 270' | 238' | 159' | 119' | 79' | 60' | 48' | 40' | 30' | |
| #8 | 1450' | 1047' | 754' | 673' | 539' | 428' | 377' | 251' | 188' | 126' | 94' | 75' | 63' | 47' | |
| #6 | 2256' | 1629' | 1173' | 1047' | 838' | 667' | 587' | 391' | 293' | 196' | 147' | 117' | 98' | 73' | |

NEC CHAPTER 9 TABLE 8

| AWG | CIRCULAR MILLS | DIRECT CURRENT RESISTANCE (OHMS/KFT) | K CONSTANT |
|-----|----------------|--------------------------------------|------------|
| #12 | 6530 | 1.93 | 12.6029 |
| #10 | 10380 | 1.21 | 12.5598 |
| #8 | 16510 | 0.764 | 12.61364 |
| #6 | 26250 | 0.491 | 12.88875 |

TABLE 8 FORMULA

$$L = (CM \cdot VD) / (2 \cdot K \cdot I) = \text{length in feet}$$

CM = Circular Mills from Circular Mills Chart

VD = NOT % voltage drop, but the actual amount of voltage dropped at a given %

$$K = (CM \cdot (\text{ohms/kft} / 1000 \text{ ft})) = CM \cdot \text{ohms/ft}$$

1. Use Chapter 9 Table 8

2. Find AWG that is being used

3. Find Circular Mills

4. Find ohms/kft for AWG size

5. Divide value in part 4 by 1000

6. Multiply step 5 by Circular Mills found in step 3

I = Load Current (A)

| SIZE <i>(AWG or kcmil)</i> | CONDUCTORS | | | | | | | | | DIRECT-CIRCUIT RESISTANCE AT 75°C (167°F) | | | | | | K CONSTANT FOR FEET | | | |
|-------------------------------|-----------------|----------------|------|-----------|-------|----------|-------|-----------------|------------------|---|---------|---------|---------|----------|---------|---------------------|----------|----------|----------|
| | | | | Stranding | | Overall | | | | Copper | | | | Aluminum | | CCf | CUf | CUf | AUF |
| | Area | | Qty. | Diameter | | Diameter | | Area | | Uncoated | | Coated | | Aluminum | | Copper | | Aluminum | |
| | mm ² | Circular Mills | | mm | in. | mm | in. | mm ² | in. ² | ohm/km | ohm/kFT | ohm/km | ohm/kFT | ohm/km | ohm/kFT | Coated | Uncoated | Coated | Uncoated |
| 18 | 0.823 | 1620 | 1 | — | — | 1.02 | 0.04 | 0.823 | 0.001 | 25.5 | 7.77 | 26.5 | 8.08 | 42 | 12.8 | 13.0896 | 12.5874 | 20.736 | 20.736 |
| 18 | 0.823 | 1620 | 7 | 0.39 | 0.015 | 1.16 | 0.046 | 1.06 | 0.002 | 26.1 | 7.95 | 27.7 | 8.45 | 42.8 | 13.1 | 13.689 | 12.879 | 21.222 | 21.222 |
| 16 | 1.31 | 2580 | 1 | — | — | 1.29 | 0.051 | 1.31 | 0.002 | 16 | 4.89 | 16.7 | 5.08 | 26.4 | 8.05 | 13.1064 | 12.6162 | 20.769 | 20.769 |
| 16 | 1.31 | 2580 | 7 | 0.49 | 0.019 | 1.46 | 0.058 | 1.68 | 0.003 | 16.4 | 4.99 | 17.3 | 5.29 | 26.9 | 8.21 | 13.6482 | 12.8742 | 21.1818 | 21.1818 |
| 14 | 2.08 | 4110 | 1 | — | — | 1.63 | 0.064 | 2.08 | 0.003 | 10.1 | 3.07 | 10.4 | 3.19 | 16.6 | 5.06 | 13.1109 | 12.6177 | 20.7966 | 20.7966 |
| 14 | 2.08 | 4110 | 7 | 0.62 | 0.024 | 1.85 | 0.073 | 2.68 | 0.004 | 10.3 | 3.14 | 10.7 | 3.26 | 16.9 | 5.17 | 13.3986 | 12.9054 | 21.2487 | 21.2487 |
| 12 | 3.31 | 6530 | 1 | — | — | 2.05 | 0.081 | 3.31 | 0.005 | 6.34 | 1.93 | 6.57 | 2.01 | 10.45 | 3.18 | 13.1253 | 12.6029 | 20.7654 | 20.7654 |
| 12 | 3.31 | 6530 | 7 | 0.78 | 0.03 | 2.32 | 0.092 | 4.25 | 0.006 | 6.5 | 1.98 | 6.73 | 2.05 | 10.69 | 3.25 | 13.3865 | 12.9294 | 21.2225 | 21.2225 |
| 10 | 5.261 | 10380 | 1 | — | — | 2.588 | 0.102 | 5.26 | 0.008 | 3.984 | 1.21 | 4.148 | 1.26 | 6.561 | 2 | 13.0788 | 12.5598 | 20.76 | 20.76 |
| 10 | 5.261 | 10380 | 7 | 0.98 | 0.038 | 2.95 | 0.116 | 6.76 | 0.011 | 4.07 | 1.24 | 4.226 | 1.29 | 6.679 | 2.04 | 13.3902 | 12.8712 | 21.1752 | 21.1752 |
| 8 | 8.367 | 16510 | 1 | — | — | 3.264 | 0.128 | 8.37 | 0.013 | 2.506 | 0.764 | 2.579 | 0.786 | 4.125 | 1.26 | 12.97686 | 12.61364 | 20.8026 | 20.8026 |
| 8 | 8.367 | 16510 | 7 | 1.23 | 0.049 | 3.71 | 0.146 | 10.76 | 0.017 | 2.551 | 0.778 | 2.653 | 0.809 | 4.204 | 1.28 | 13.35659 | 12.84478 | 21.1328 | 21.1328 |
| 6 | 13.3 | 26240 | 7 | 1.56 | 0.061 | 4.67 | 0.184 | 17.09 | 0.027 | 1.608 | 0.491 | 1.671 | 0.51 | 2.652 | 0.808 | 13.3824 | 12.88384 | 21.20192 | 21.20192 |
| 4 | 21.15 | 41740 | 7 | 1.96 | 0.077 | 5.89 | 0.232 | 27.19 | 0.042 | 1.01 | 0.308 | 1.053 | 0.321 | 1.666 | 0.508 | 13.39854 | 12.85592 | 21.20392 | 21.20392 |
| 3 | 26.67 | 52620 | 7 | 2.2 | 0.087 | 6.6 | 0.26 | 34.28 | 0.053 | 0.802 | 0.245 | 0.833 | 0.254 | 1.32 | 0.403 | 13.36548 | 12.8919 | 21.20586 | 21.20586 |
| 2 | 33.62 | 66360 | 7 | 2.47 | 0.097 | 7.42 | 0.292 | 43.23 | 0.067 | 0.634 | 0.194 | 0.661 | 0.201 | 1.045 | 0.319 | 13.33836 | 12.87384 | 21.16884 | 21.16884 |
| 1 | 42.41 | 83690 | 19 | 1.69 | 0.066 | 8.43 | 0.332 | 55.8 | 0.087 | 0.505 | 0.154 | 0.524 | 0.16 | 0.829 | 0.253 | 13.3904 | 12.88826 | 21.17357 | 21.17357 |
| 1/0 | 53.49 | 105600 | 19 | 1.89 | 0.074 | 9.45 | 0.372 | 70.41 | 0.109 | 0.399 | 0.122 | 0.415 | 0.127 | 0.66 | 0.201 | 13.4112 | 12.8832 | 21.2256 | 21.2256 |
| 2/0 | 67.43 | 133100 | 19 | 2.13 | 0.084 | 10.62 | 0.418 | 88.74 | 0.137 | 0.317 | 0.0967 | 0.329 | 0.101 | 0.523 | 0.159 | 13.4431 | 12.87077 | 21.1629 | 21.1629 |
| 3/0 | 85.01 | 167800 | 19 | 2.39 | 0.094 | 11.94 | 0.47 | 111.9 | 0.173 | 0.2512 | 0.0766 | 0.261 | 0.0797 | 0.413 | 0.126 | 13.37366 | 12.85348 | 21.1428 | 21.1428 |
| 4/0 | 107.2 | 211600 | 19 | 2.68 | 0.106 | 13.41 | 0.528 | 141.1 | 0.219 | 0.1996 | 0.0608 | 0.205 | 0.0626 | 0.328 | 0.1 | 13.24616 | 12.86528 | 21.16 | 21.16 |
| 250 | 127 | 250000 | 37 | 2.09 | 0.082 | 14.61 | 0.575 | 168 | 0.26 | 0.1687 | 0.0515 | 0.1753 | 0.0535 | 0.2778 | 0.0847 | 13.375 | 12.875 | 21.175 | 21.175 |
| 300 | 152 | 300000 | 37 | 2.29 | 0.09 | 16 | 0.63 | 201 | 0.312 | 0.1409 | 0.0429 | 0.1463 | 0.0446 | 0.2318 | 0.0707 | 13.38 | 12.87 | 21.21 | 21.21 |
| 350 | 177 | 350000 | 37 | 2.47 | 0.097 | 17.3 | 0.681 | 235 | 0.364 | 0.1205 | 0.0367 | 0.1252 | 0.0382 | 0.1984 | 0.0605 | 13.37 | 12.845 | 21.175 | 21.175 |
| 400 | 203 | 400000 | 37 | 2.64 | 0.104 | 18.49 | 0.728 | 268 | 0.416 | 0.1053 | 0.0321 | 0.1084 | 0.0331 | 0.1737 | 0.0529 | 13.24 | 12.84 | 21.16 | 21.16 |
| 500 | 253 | 500000 | 37 | 2.95 | 0.116 | 20.65 | 0.813 | 336 | 0.519 | 0.0845 | 0.0258 | 0.0869 | 0.0265 | 0.1391 | 0.0424 | 13.25 | 12.9 | 21.2 | 21.2 |
| 600 | 304 | 600000 | 61 | 2.52 | 0.099 | 22.68 | 0.893 | 404 | 0.626 | 0.0704 | 0.0214 | 0.0732 | 0.0223 | 0.1159 | 0.0353 | 13.38 | 12.84 | 21.18 | 21.18 |
| 700 | 355 | 700000 | 61 | 2.72 | 0.107 | 24.49 | 0.964 | 471 | 0.73 | 0.0603 | 0.0184 | 0.0622 | 0.0189 | 0.0994 | 0.0303 | 13.23 | 12.88 | 21.21 | 21.21 |
| 750 | 380 | 750000 | 61 | 2.82 | 0.111 | 25.35 | 0.998 | 505 | 0.782 | 0.0563 | 0.0171 | 0.0579 | 0.0176 | 0.0927 | 0.0282 | 13.2 | 12.825 | 21.15 | 21.15 |
| 800 | 405 | 800000 | 61 | 2.91 | 0.114 | 26.16 | 1.03 | 538 | 0.834 | 0.0528 | 0.0161 | 0.0544 | 0.0166 | 0.0868 | 0.0265 | 13.3 | 12.9 | 21.2 | 21.2 |
| 900 | 456 | 900000 | 61 | 3.09 | 0.122 | 27.79 | 1.094 | 606 | 0.94 | 0.047 | 0.0143 | 0.0481 | 0.0147 | 0.077 | 0.0235 | 13.2 | 12.9 | 21.2 | 21.2 |
| 1000 | 507 | 1000000 | 61 | 3.25 | 0.128 | 29.26 | 1.152 | 673 | 1.042 | 0.0423 | 0.0129 | 0.0434 | 0.0132 | 0.0695 | 0.0212 | 13.2 | 12.9 | 21.2 | 21.2 |
| 1250 | 633 | 1250000 | 91 | 2.98 | 0.117 | 32.74 | 1.289 | 842 | 1.305 | 0.0338 | 0.0103 | 0.0347 | 0.0106 | 0.0554 | 0.0169 | 13.3 | 12.9 | 21.1 | 21.1 |
| 1500 | 760 | 1500000 | 91 | 3.26 | 0.128 | 35.86 | 1.412 | 1011 | 1.566 | 0.02814 | 0.00858 | 0.02814 | 0.00883 | 0.0464 | 0.0141 | 13.2 | 12.9 | 21.2 | 21.2 |
| 1750 | 887 | 1750000 | 127 | 2.98 | 0.117 | 38.76 | 1.526 | 1180 | 1.829 | 0.0241 | 0.00735 | 0.0241 | 0.00756 | 0.0397 | 0.0121 | 13.2 | 12.9 | 21.2 | 21.2 |
| 2000 | 1013 | 2000000 | 127 | 3.19 | 0.126 | 41.45 | 1.632 | 1349 | 2.092 | 0.02109 | 0.00643 | 0.02109 | 0.00662 | 0.0348 | 0.0106 | 13.2 | 12.9 | 21.2 | 21.2 |