

DERATING

Size AWG or kcmil	Temperature Rating of Conductor [See Table 310.13(A).]						Size AWG or kcmil
	60° C (140° F) Types	75° C (167° F) Types	90° C (194° F) Types	60° C (140° F) Types	75° C (167° F) Types	90° C (194° F) Types	
	TW, UF	RHW, THHW, THW, THWN, XHHW, USE, ZW	TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW- 2, THHN, THHW, THW- 2, THWN-2, USE-2, XHH, XHHW, XHHW- 2, ZW-2	TW, UF	RHW, THHW, THW, THWN, XHHW, USE	TBS, SA, SIS, THHN, THHW, THW-2, THWN- 2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	
	Copper			Aluminum or Copper-Clad Aluminum			
18	-	-	14	-	-	-	-
16	-	-	18	-	-	-	-
14*	20	20	25	-	-	-	-
12*	25	25	30	20	20	25	12*
10*	30	35	40	25	30	35	10*
8	40	50	55	30	40	45	8
6	55	65	75	40	50	60	6
4	70	85	95	55	65	75	4
3	85	100	110	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	150	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	190	230	255	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	355	420	475	285	340	385	600
700	385	460	520	310	375	420	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	450	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	520	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	560	665	750	470	560	630	2000

DERATING

There are two requirements in the NEC for derating ampacities:

- **Ambient temperature**
- **Number of conductors in a raceway or cable.**

There are other code sections that affect the size of conductor to be used (e.g., motor circuits or continuous loads) but only the two requirements above are used to regulate ampacity to keep the conductor within its maximum temperature rating.

Derating is required for the two reasons above.

No conductor shall be used in such a manner that its operating temperature will exceed that for which it is designed.

Then, four items are mentioned that are the principal determinants of operating temperature:

- Ambient temperature
- Heat generated internally in the conductor as a result of current flow
- The rate at which generated heat dissipates from the conductor
- Adjacent current-carrying conductors.

DERATING FOR AMBIENT TEMPERATURE

All ampacity tables necessarily must use some ambient temperature as a basis and NEC Table below giving correction factors for situations where the ambient is expected to be higher or lower than 30°C (86°F).

Example: what is the ampacity of a 1/0 AWG, aluminum, type THHN conductor when the ambient temperature is 100°F?

The answer is found by taking the ampacity from the table and multiplying it by the appropriate correction factor. In this example, we would have $135 \times 0.91 = 122.85$ amperes.

Table 310.15(B)(2)(a) Ambient Temperature Correction Factors Based on 30°C (86°F)

For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities specified in the ampacity tables by the appropriate correction factor shown below.				
Ambient Temperature (°C)	Temperature Rating of Conductor			Ambient Temperature (°F)
	60°C	75°C	90°C	
10 or less	1.29	1.20	1.15	50 or less
11–15	1.22	1.15	1.12	51–59
16–20	1.15	1.11	1.08	60–68
21–25	1.08	1.05	1.04	69–77
26–30	1.00	1.00	1.00	78–86
31–35	0.91	0.94	0.96	87–95
36–40	0.82	0.88	0.91	96–104
41–45	0.71	0.82	0.87	105–113
46–50	0.58	0.75	0.82	114–122
51–55	0.41	0.67	0.76	123–131
56–60	—	0.58	0.71	132–140
61–65	—	0.47	0.65	141–149
66–70	—	0.33	0.58	150–158
71–75	—	—	0.50	159–167
76–80	—	—	0.41	168–176
81–85	—	—	0.29	177–185

DERATING FOR NUMBER OF CONDUCTORS

When the number of conductors in a raceway or cable exceeds 3, the ampacities are to be reduced by the appropriate percentage.

Example: what is the ampacity of twelve No. 12 copper THHN conductors installed in one conduit?

From Table 310-16 the ampacity (in the table) is 30 amperes. From Note 8, the derating factor for 12 conductors is 50 percent. $30 \times 0.5 = 15$ amperes per conductor.

Table 310.15(B)(3)(a) Adjustment Factors for More Than Three Current-Carrying Conductors

Number of Conductors ¹	Percent of Values in Table 310.15(B)(16) through Table 310.15(B)(19) as Adjusted for Ambient Temperature if Necessary
4-6	80
7-9	70
10-20	50
21-30	45
31-40	40
41 and above	35

¹Number of conductors is the total number of conductors in the raceway or cable, including spare conductors. The count shall be adjusted in accordance with 310.15(B)(5) and (6). The count shall not include conductors that are connected to electrical components but that cannot be simultaneously energized.

DERATING FOR BOTH AMBIENT TEMPERATURE AND NUMBER OF CONDUCTORS

When derating for both conditions is necessary, then both calculations must be made.

Example: what is the ampacity of four 1/0 THW copper conductors when the ambient temperature is expected to reach 110°F?

From Table 310-16 the ampacity is 150 amperes, derating factor for 110°F is 0.82, and derating factor from Note 8 for 4 conductors is 80 percent. $150 \times 0.82 \times 0.8 = 98.4$ amperes.