

Table B.310.5 {Detail 2 - One Circuit, 1-1/c in Each of Three Ducts}

0-2000 Volt Cable, Ambient Earth Temperature = 20 Deg C, Earth Thermal resistivity = 60, 90 or 120, Concrete Thermal resistivity (RHO) = 85, Load Factor = 50% or 100%, Conductor Temperature = 75C (167F).

Size (AWG or kcmil)	3 Electrical Ducts (Fig. B-310-2, Detail 2)																		
	Types RHW, THHW, THW THWN, XHHW, USE																		
	COPPER						ALUMINUM OR COPPER-CLAD ALUMINUM												
	NEC			AmpCalc			% Deviation			NEC			AmpCalc			% Deviation			
	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	
	60	90	120	60	90	120	60	90	120		60	90	120	60	90	120	60	90	120
	LF	LF	LF	LF	LF	LF	LF	LF	LF		LF	LF	LF	LF	LF	LF	LF	LF	LF
	50	100	100	50	100	100	50	100	100		50	100	100	50	100	100	50	100	100
250	410	344	327	408.9	343.7	327.1	-0.3%	-0.1%	0.0%	250	320	269	256	319.0	268.2	255.2	-0.3%	-0.3%	-0.3%
350	503	418	396	501.4	416.7	395.5	-0.3%	-0.3%	-0.1%	350	393	327	310	391.8	325.6	309.0	-0.3%	-0.4%	-0.3%
500	624	511	484	621.8	510.1	482.8	-0.4%	-0.2%	-0.2%	500	489	401	379	487.1	399.6	378.2	-0.4%	-0.3%	-0.2%
750	794	640	603	790.5	638.1	601.9	-0.4%	-0.3%	-0.2%	750	626	505	475	623.3	503.1	474.5	-0.4%	-0.4%	-0.1%
1000	936	745	700	931.8	742.9	699.0	-0.4%	-0.3%	-0.1%	1000	744	593	557	740.8	590.6	555.7	-0.4%	-0.4%	-0.2%
1250	1055	832	781	1050.1	829.6	779.2	-0.5%	-0.3%	-0.2%	1250	848	668	627	843.0	666.0	625.4	-0.6%	-0.3%	-0.3%
1500	1160	907	849	1153.9	904.0	847.7	-0.5%	-0.3%	-0.2%	1500	941	736	689	935.9	733.2	687.5	-0.5%	-0.4%	-0.2%
1750	1250	970	907	1244.6	967.9	906.3	-0.4%	-0.2%	-0.1%	1750	1026	796	745	1020.1	793.3	742.8	-0.6%	-0.3%	-0.3%
2000	1332	1027	959	1324.4	1023.3	957.0	-0.6%	-0.4%	-0.2%	2000	1103	850	794	1096.5	847.2	792.3	-0.6%	-0.3%	-0.2%
	Average Deviation =			-0.4%	-0.3%	-0.1%					Average Deviation =			-0.5%	-0.4%	-0.2%			

AmpCalc References:

AmpCalc Library = IEERUB_1, AmpCalc Volume = IEERUB1, 1 kV non-shielded, Duct library = NEC_PVC, 5" duct.

NEC ampacities obtained from "NFPA 70, National Electric Code, 2002 Edition", © 2002, National Fire Protection Association, Inc.

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Table B.310.5 {Detail 3 - Two Circuits, 1-1/c in Each of Six Ducts}

0-2000 Volt Cable, Ambient Earth Temperature = 20 Deg C, Earth Thermal resistivity = 60, 90 or 120, Concrete Thermal resistivity (RHO) = 85, Load Factor = 50% or 100%, Conductor Temperature = 75C (167F).

Size (AWG or kcmil)	6 Electrical Ducts (Fig. B-310-2, Detail 3)																		
	Types RHW, THHW, THW THWN, XHHW, USE																		
	COPPER						ALUMINUM OR COPPER-CLAD ALUMINUM												
	NEC			AmpCalc			% Deviation			NEC			AmpCalc			% Deviation			
	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	
	60	90	120	60	90	120	60	90	120		60	90	120	60	90	120	60	90	120
	LF	LF	LF	LF	LF	LF	LF	LF	LF		LF	LF	LF	LF	LF	LF	LF	LF	LF
	50	100	100	50	100	100	50	100	100		50	100	100	50	100	100	50	100	100
250	386	295	275	386.0	294.1	274.1	0.0%	-0.3%	-0.3%	250	302	230	214	301.2	229.4	213.9	-0.3%	-0.3%	0.0%
350	472	355	330	471.4	354.0	329.2	-0.1%	-0.3%	-0.2%	350	369	277	258	368.3	276.5	257.2	-0.2%	-0.2%	-0.3%
500	583	431	400	581.7	429.8	398.6	-0.2%	-0.3%	-0.3%	500	457	337	313	455.7	336.7	312.2	-0.3%	-0.1%	-0.3%
750	736	534	494	735.1	532.7	492.5	-0.1%	-0.2%	-0.3%	750	581	421	389	579.4	420.0	388.2	-0.3%	-0.2%	-0.2%
1000	864	617	570	862.4	616.2	568.3	-0.2%	-0.1%	-0.3%	1000	687	491	453	685.4	489.7	451.7	-0.2%	-0.3%	-0.3%
1250	970	686	632	968.7	684.9	630.7	-0.1%	-0.2%	-0.2%	1250	779	551	508	777.3	549.6	506.0	-0.2%	-0.3%	-0.4%
1500	1063	744	685	1061.2	743.3	683.5	-0.2%	-0.1%	-0.2%	1500	863	604	556	860.2	602.5	554.0	-0.3%	-0.2%	-0.4%
1750	1142	793	729	1141.5	793.1	728.4	0.0%	0.0%	-0.1%	1750	937	651	598	935.0	649.6	596.6	-0.2%	-0.2%	-0.2%
2000	1213	836	768	1211.9	836.0	767.0	-0.1%	0.0%	-0.1%	2000	1005	693	636	1002.7	691.7	634.6	-0.2%	-0.2%	-0.2%
	Average Deviation =			-0.1%	-0.2%	-0.2%					Average Deviation =			-0.2%	-0.2%	-0.3%			

AmpCalc References:

AmpCalc Library = IEERUB_1, AmpCalc Volume = IEERUB1, 1 kV non-shielded, Duct library = NEC_PVC, 5" duct.

NEC ampacities obtained from "NFPA 70, National Electric Code, 2002 Edition", © 2002, National Fire Protection Association, Inc.

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Table B.310.5 {Detail 4 - Three Circuits, 1-1/c in Each of Nine Ducts}

0-2000 Volt Cable, Ambient Earth Temperature = 20 Deg C, Earth Thermal resistivity = 60, 90 or 120, Concrete Thermal resistivity (RHO) = 85, Load Factor = 50% or 100%, Conductor Temperature = 75C (167F).

Size (AWG or kcmil)	9 Electrical Ducts (Fig. B-310-2, Detail 4)																		
	Types RHW, THHW, THW THWN, XHHW, USE																		
	COPPER						ALUMINUM OR COPPER-CLAD ALUMINUM												
	NEC			AmpCalc			% Deviation			NEC			AmpCalc			% Deviation			
	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	
	60	90	120	60	90	120	60	90	120					60	90	120	60	90	120
	LF	LF	LF	LF	LF	LF	LF	LF	LF					LF	LF	LF	LF	LF	LF
	50	100	100	50	100	100	50	100	100					50	100	100	50	100	100
250	369	270	252	366.0	263.1	244.4	-0.8%	-2.6%	-3.0%	250	288	211	197	285.6	205.3	190.7	-0.8%	-2.7%	-3.2%
350	446	322	299	445.4	315.5	292.4	-0.1%	-2.0%	-2.2%	350	350	252	235	347.9	246.5	228.4	-0.6%	-2.2%	-2.8%
500	545	387	360	547.4	381.5	352.8	0.4%	-1.4%	-2.0%	500	430	305	284	428.8	298.8	276.3	-0.3%	-2.0%	-2.7%
750	674	469	434	688.3	470.5	434.0	2.1%	0.3%	0.0%	750	538	375	347	542.5	370.9	342.1	0.8%	-1.1%	-1.4%
1000	776	533	493	804.5	542.4	499.4	3.7%	1.8%	1.3%	1000	629	432	399	639.4	431.1	396.9	1.7%	-0.2%	-0.5%
1250	854	581	536	901.1	601.4	553.0	5.5%	3.5%	3.2%	1250	703	478	441	723.0	482.6	443.7	2.8%	1.0%	0.6%
1500	918	619	571	984.6	651.3	598.2	7.3%	5.2%	4.8%	1500	767	517	477	798.2	528.0	485.0	4.1%	2.1%	1.7%
1750	975	651	599	1056.8	693.7	636.6	8.4%	6.6%	6.3%	1750	823	550	507	865.6	568.2	521.4	5.2%	3.3%	2.8%
2000	1030	683	628	1119.7	730.1	669.5	8.7%	6.9%	6.6%	2000	877	581	535	926.5	604.1	553.9	5.6%	4.0%	3.5%
	Average Deviation =			3.9%	2.0%	1.7%					Average Deviation =			2.1%	0.2%	-0.2%			

* See the information on page 4 & 5 regarding the above nine duct system ampacity values.

AmpCalc References:

AmpCalc Library = IEERUB_1, AmpCalc Volume = IEERUB1, 1 kV non-shielded, Duct library = NEC_PVC, 5" duct.

NEC ampacities obtained from "NFPA 70, National Electric Code, 2002 Edition", © 2002, National Fire Protection Association, Inc.
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For the larger conductors over 500 kcmil in the nine duct NEC Detail 4 arrangement, AmpCalc calculates ampacities from 1% to 8.7% higher than listed in the NEC table. Unlike all the other NEC tables, the ampacity values for the Detail 4 nine duct system were not obtained from IEEE Standard S-135, IPCEA P-46-426 and the source of these values is not documented. There is a nine duct system in the S-135 standard, but it is a circular arrangement rather than the NEC 3 x 3 row and column configuration. The following table compares AmpCalc results to the S-135 ampacities for the S-135 circular arrangement. Note the results are very close. **Also see next page...**

{S-135 Nine Duct Circular Configuration - Three Circuits, 1-1/c in Each of Nine Ducts}

1000 Volt Cable, Ambient Earth Temperature = 20 Deg C, Earth Thermal resistivity = 60, 90 or 120, Concrete Thermal resistivity (RHO) = 85, Load Factor = 50% or 100%, Conductor Temperature = 75C (167F).

Size (AWG or kcmil)	9 Electrical Ducts (S-135 Page VIII, Figure 4)																			
	COPPER						ALUMINUM													
	S-135			AmpCalc			% Deviation			S-135			AmpCalc			% Deviation				
	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO	RHO		
	60	90	120	60	90	120	60	90	120		60	90	120	60	90	120	60	90	120	
	LF	LF	LF	LF	LF	LF	LF	LF	LF		LF	LF	LF	LF	LF	LF	LF	LF	LF	
	50	100	100	50	100	100	50	100	100		50	100	100	50	100	100	50	100	100	
250	373	273	255	372.1	272.2	253.3	-0.2%	-0.3%	-0.7%		250	291	213	199	290.4	212.4	197.6	-0.2%	-0.3%	-0.7%
350	455	328	305	453.3	326.8	303.3	-0.4%	-0.4%	-0.6%		350	355	256	239	354.2	255.3	237.0	-0.2%	-0.3%	-0.8%
500	559	397	369	557.8	395.6	366.4	-0.2%	-0.4%	-0.7%		500	438	311	289	437.0	309.9	287.0	-0.2%	-0.4%	-0.7%
750	704	490	454	702.5	488.7	451.3	-0.2%	-0.3%	-0.6%		750	555	387	358	553.7	385.2	355.8	-0.2%	-0.5%	-0.6%
1000	824	566	523	822.1	563.9	519.8	-0.2%	-0.4%	-0.6%		1000	655	450	416	653.3	448.1	413.1	-0.3%	-0.4%	-0.7%
1250	923	628	579	921.7	625.8	576.0	-0.1%	-0.4%	-0.5%		1250	742	504	465	739.4	502.0	462.1	-0.4%	-0.4%	-0.6%
1500	1009	680	627	1008.0	678.1	623.5	-0.1%	-0.3%	-0.6%		1500	819	552	509	816.9	549.6	505.3	-0.3%	-0.4%	-0.7%
1750	1083	723	666	1082.7	722.7	663.8	0.0%	0.0%	-0.3%		1750	889	594	547	886.7	591.9	543.6	-0.3%	-0.4%	-0.6%
2000	1149	762	701	1148.0	761.1	698.5	-0.1%	-0.1%	-0.4%		2000	952	631	581	949.6	629.6	577.8	-0.3%	-0.2%	-0.6%
	Average Deviation =			-0.2%	-0.3%	-0.5%					Average Deviation =			-0.3%	-0.4%	-0.7%				

AmpCalc References:

AmpCalc Library = IEERUB_1, AmpCalc Volume = IEERUB1, 1 kV non-shielded, Duct library = NEC_PVC, 5" duct.

S-135 ampacities obtained from IEEE S-135, IPCEA P-46-426, "IEEE-IPCEA Power Cable Ampacities", © 1962, IPCEA.
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The NEC values for the larger conductors of the nine duct case seem to be excessively conservative. The graph on the following page plots ampacities for several different cases in per unit of the ampacity of a 250 kcmil conductor. The yellow line is for the NEC 9 duct arrangement. The derate for only a 50% increase in system cables, (6 ducts to 9 ducts - pink line to yellow line), is much greater than for an 100% increase in system cables, (3 ducts to 6 ducts - blue line to pink line.)

