

FORMULAS & TABLES

In the layout design of emergency lighting systems, low voltage load wire runs must be a significant size to limit voltage drop in accordance with the National Electric Code to 5% of the nominal. To determine the correct wire size, use the following formula and tables:

FORMULA		LINE VOLTAGE
$CM = \frac{440 \times W \times D}{V^2}$	CM = Wire Size in Circular Mills	V ² for 6V = 36
	W = Load in Watts (Emergency Light Load)	V ² for 12V = 144
	D = Distance (Battery to Load) in Feet	V ² for 24V = 576
	V = Line Voltage (V ² = V x V)	V ² for 32V = 1,024
	440 = Constant Including Factor for Allowable Voltage Drop 5%	-

After calculating the circular mills required to carry the specified load at the allowable voltage drop, refer to the chart below to determine the wire size from the corresponding circular mill size, or use the tables below.

CIRCULAR MILL SIZE	AMPERE CAPACITY	WIRE GAUGE
6,530	20	#12
10,380	25	#10
16,510	35	#8
26,250	50	#6
41,740	70	#4

This table shows the maximum length of a given low voltage circuit, assuming that the total load is concentrated at the end of the load circuit. If loads are spaced at varying positions along the circuit length wire gauge distances may be increased, which in turn may permit cost savings by the use of a smaller wire size.

TOTAL WATTS ON WIRE RUN	6V SYSTEMS				12V SYSTEMS				24V SYSTEMS			
	WIRE GAUGE MAXIMUM DISTANCE IN FEET				WIRE GAUGE MAXIMUM DISTANCE IN FEET				WIRE GAUGE MAXIMUM DISTANCE IN FEET			
	#12	#10	#8	#6	#12	#10	#8	#6	#12	#10	#8	#6
13	41	65	110	165	165	260	415	660	680	1,045	1,668	2,640
18	30	47	75	120	110	190	300	475	475	754	1,200	1,900
25	21	32	54	86	85	136	215	340	340	544	860	1,360
30	18	28	45	71	71	112	280	285	284	452	720	1,145
35	15	24	39	62	61	97	154	245	244	388	616	980
50	11	17	27	43	42	68	108	170	168	272	432	650
60	9	14	22	36	35	52	90	140	143	227	360	573
75	-	11	18	29	29	45	72	114	116	180	288	456
100	-	-	14	22	21	34	54	86	84	135	216	344
150	-	-	9	15	14	23	36	57	56	90	144	228
200	-	-	-	11	10	17	27	43	40	67	108	172
250	-	-	-	-	-	14	21	34	32	54	84	137
300	-	-	-	-	-	11	18	28	26	45	72	115
400	-	-	-	-	-	-	-	-	21	34	54	86
Constant	534	849	1,350	2,148	2,137	3,397	5,403	8,590	8,548	13,588	21,613	34,363

To calculate the maximum load on a run of known length:

Divide the length into the constant shown in the above tables.

Example: A 45 foot run of #10 wire on a 12V system can be rated as: 3397/45ft = 75W