Appendix II - Voltage Drop Calculations

Proper selection of conductor and covers for Conductix-Wampfler conductor systems is simple, requiring only the ampacity, voltage and ambient conditions.

The method for determining the rating for cranes and hoists is completely outlined in NEC 640-14(e). Further reference to the Code is made where applicable.

I. For a single crane, simply use the nameplate full load ampere rating of the largest motor or group of motors for any one function plus half the rating of the next largest motor or motor groups.

Hoist = 65A x 1 = 65.0
Bridge = 27A x .5 = 13.5
Total 78.5A

For multiple cranes, use the same method for each crane, add the results and multiply by the demand factor shown in table 610-14(e) NEC Book. Examples with data taken from motor nameplates - all are 460V, 3-phase, 60 Hz.

Crane #1
Hoist = 65A x 1 = 65.0
Bridge = 27A x .5 = 13.5
Total 78.5A

Crane #2
Hoist = 52A x 1 = 52.0
Bridge = 14A x .5 = 7.0
Total 59.0A

Total of #1 + #2 137.5 x .195 = 130.0A

II. When the motor ampere ratings are unknown, a good approximation may be made using the nominal horse power ratings of the motors, converting them to full load amperes per NEC table 430-150; then proceed as above. If the motors are not three-phase, applicable tables 430-137 through 430-149 must be used.

A few examples from the tables are:

Full-Load Current (Three-Phase Alternating-Current Motors)

HP	230V	460V	575V
10	28	14	11
15	42	21	17
20	54	27	22
25	68	34	27
30	80	40	32
40	104	52	41
50	130	65	52
60	154	77	62
75	192	96	77
100	248	124	99
125	312	156	125
150	360	180	144
200	480	240	192

Full-Load Current in Amperes, Direct-Current Motors
Armature Voltage Rating (Direct-Current)

HP	240V	HP	240V
10	38	60	206
15	55	75	255
20	72		
25	89		
		100	341
30	106	125	425
40	140	150	506
50	173	200	675

Voltage Drop

Voltage drop is the difference between the voltage at the feed point and the voltage at the extreme end. It is usually expressed as a percentage of the supply voltage and can be calculated as shown below.

Voltage drop increases in direct proportion to the length of the conductors. The CMAA specifications limit total voltage drops to 3% on runways and 2% on bridge conductors. Since power feeds are usually located at the mid-point of a system, the effective length is the distance from power feed to the end of the runway. On longer systems it may be necessary to provide additional feed points.

Voltage Drop per 100 Feet of Run Per 100A of Current

Conductor	3-Phase 60 Hz	D.C.
Stainless Steel 40A	16.0	18.5
Galvanized Steel 90A	12.1	13.9
Galvanized Steel 110A	9.6	11.1
Stainless Clad Copper 250A	5.7	6.6
Copper Steel Laminate 250A	5.5	6.4
Rolled Copper 350A	5.2	6.0
Solid Copper 500A	5.9	6.8

3% at Max Amps and Length from Power feed			
Bar	**Amps**	**480V**	**240V**
SS	40	102’	51’
Galv	90	99’	49’
Galv	110	130’	65’
SS / CU	250	287’	144’
CU / Galv	250	287’	144’
Rolled Cu	350	296’	148’
Solid Cu	500	381’	191’

3% of 480V = 14.4
2% of 240V = 7.2
2% of 180V = 9.6
2% of 240V = 4.8