Determining the Appropriate System

The voltage drop should be calculated to determine if the amperage requirements of the system will be met at all points along the length of the conductor bar system. Determining the amperage requirements (Amps) for cranes and hoists is outlined in NEC 610.14(e).

In applications where there is only one motor, NEC requires that 100% of the motor nameplate full-load rating be used. For multiple motors on a single crane of hoist, NEC states* "The minimum circuit ampacity of the power supply conductors shall be the nameplate full-load ampere rating of the largest motor or group of motors for any single crane motion, plus 50 percent of the nameplate full-load ampere rating of the next largest motor or group of motors using that column of Table 610.14(a) that applies to the longest time-rated motor.

For multiple cranes and/or hoists supplied by a common conductor system, compute the minimum ampacity for each crane as defined in Section 610.14(e), add them together, and multiply the sum by the appropriate demand factor from Table 610.14(e)."

Table 610-14(e)

Number of Cranes or Hoists	Demand Factor
2	0.95
3	0.91
4	0.87
5	0.84
6	0.81
7	0.78

**as published in the 1996 National Electrical Code (NEC) copyright 1999.*

Variables

- Amps: Amperage demand of system (refer to NEC 610-14(e)).
- Rdc: Resistance of conductor in ohms per foot.
- Zac: Impedance of conductor in ohms per foot.
- D: Maximum distance between power feed and system pick-up points.

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Electrobar® 8-Bar Conductor Bar System

Application Guide

Technical Bulletin #: 8-BAR-2

Voltage Drop Calculation

Voltage Drop = 1.732 x Amps x (Rdc or Zac) x D (in feet)

% Drop = (Voltage Drop x 100) / 460 (Voltage)

Note: Voltage drop must be less than 3%

If the percent of drop exceeds 3%, an additional power feed may be added to shorten the distance between the power feed and the system pick-up points, or the conductor bar may be up-sized to the next highest ampacity and the voltage drop recalculated.

Voltage Drop Reference

3% Voltage Drop @ 460 Volts/3 Phase/60Hz

	Ampere Load (Amps)	Minimum Length to End	Center Feed Maximum Runway	Maximum Length Between 2 Power Feeds
90 Amp Electrobar	10	800	1600	3200
	20	400	800	1600
	30	267	534	1068
	40	200	400	800
	50	160	320	640
	60	133	266	532
	70	114	228	456
	80	100	200	400
	90	89	178	356
110 Amp Electrobar	20	500	1000	2000
	40	250	500	1000
	50	200	400	800
	60	166	333	666
	80	125	250	500
	100	100	200	400
	110	90	180	300
250 Amp Electrobar	60	1330	2260	5320
	80	1000	2000	4000
	100	800	1600	3200
	120	665	1330	2660
	150	265	530	1060
	180	495	990	1980
	200	400	800	1600
	220	182	364	728
	225	175	350	700
350 Amp Electrobar	100	938	1876	3752
	125	751	1502	3004
	150	625	1250	2500
	175	536	1072	2144
	200	469	938	1876
	225	417	834	1668
	250	375	750	1500
	275	341	682	1364
	300	312	624	1248

Consult Magnetek for Electromotive Systems Electrobar® V-Bar Systems considerations and curved system requirements.

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Electrobar® 8-Bar Conductor Bar System

Application Guide

Technical Bulletin #: 8-BAR-3

Support Spacing

Standard 8-Bar Systems	Support Every:
Horizontal Mounting Applications:	5 Feet
Vertical Mounting Applications:	4 Feet

Conductor Spacing

Systems with:	Conductor Spacing
Collectors Adjacent	1.5”
Collectors Staggered	1.5”
Expansion Sections	3.0”

Expansion Gap Settings

The actual gap setting for each ELECTROBAR expansion section is determined by the expected temperature variance and the ambient temperature at the time of installation. Set the gaps according to the following chart:

Operating Temperatures	Ambient Temperatures	Gap Width Setting
0°F to 100° F	25°F 50°F 75°F	1.50" 1.00" 0.50"
25°F to 125°F	50°F 75°F 100°F	1.50" 1.00" 0.50"
50°F to 150°F	75°F 100°F 125°F	1.50" 1.00" 0.50"

Anchoring Requirements

All systems WITHOUT Expansion Sections: At MIDPOINT or Each Conductor Run.

All systems WITH ONE (1) Expansion Section: At each end of the runway AND at MIDPOINT of each conductor run.

All systems WITH TWO (2) or More Expansion Sections: At each end of the runway AND at MIDPOINT of each conductor run AND at MIDPOINT between each expansion section.

NOTE: Two anchor hangers are provided with each Electrobar 10 foot Expansion Section.

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Power Feed Wire/Connection

Power feed cables must be sized to meet the ampere demands of the conductor bar and be connected to the power feed assembly by using a properly sized connector. See below for Minimum Feed Cable Size for each conductor amperage rating. Reference NEC Table 610.14 for minimum cable sizing.

Conductor Bar	Minimum Feed Cable Size
90Amp	4 AWG
110 Amp	2 AWG
250 Amp	#3/0
350 Amp	250 MCM

Note: Check local electrical codes for any additional specifications and/or restrictions.
Note: Power feed cables must be supported from the top to prevent vertical loading on the conductor bar.

Disconnecting Means / Overcurrent Protection**

Disconnecting Means

2.1.(a): **610.31 Runway Conductor Disconnecting Means.** A disconnecting means, having a continuous ampere rating not less than that computed in sections 610.14(e) and (f), shall be provided between the runway contact conductors and the power supply. Such disconnecting means shall consist of a motor circuit switch, circuit breaker, or molded case switch.

This disconnecting means shall:

2.1.(a).(i): Be readily accessible and operable from the ground or floor level.

2.1.(a).(ii): Be arranged to be locked in the open position.

2.1.(a).(iii): Open all ungrounded conductors simultaneously.

2.1.(a).(iv): Be placed within view of the crane or hoist, and the runway contact conductors.

610.32 Disconnecting Means for Crane and Monorail Hoists. A motor circuit switch or circuit breaker, arranged to be locked in the open position, shall be provided in the leads from the runway contact conductors or other power supply on all cranes and monorail hoists. Where disconnecting means is not readily accessible from the crane or monorail hoist operating station, means shall be provided at the operating station to open the power circuit to all motors of the crane or monorail hoists.

610.33 Rating of Disconnecting Means. The continuous ampere rating of the switch or circuit breaker, required by Section 610.32, shall not be less than 50 percent of the combined short-time ampere rating of the motors, or less than 75 percent of the sum of the short-time ampere rating of the motors required for any single motion.

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Overcurrent Protection

The use of the overcurrent protection shall be provided in accordance with NEC Standard 610.41 through 610.43. Excerpts from 2005 National Electrical Code, copyright 2004.

610.41 Feeders, Runway Conductors:

2.5.(a).(i): **Single Feeder.** The runway supply conductors and main contact conductors of a crane or monorail shall be protected by an overcurrent device(s) that shall not be greater than the largest rating or setting of any branch circuit protective device, plus the sum of the nameplate ratings of all the other loads with application of the demand factors from Table 610.14(e).

2.5.(a).(ii.): **More Than One Feeder Circuit.** Where more than one feeder circuit is installed to supply runway conductors, each feeder circuit shall be sized and protected in compliance with 610.41(A).

610.42 Branch-Circuit, Short Circuit Ground Fault Protection. Branch circuits shall be protected in accordance with 610.42(A). Branch-circuit taps, where made, shall comply with 610.42(B).

2.6.(a).(i): **Fuse or Circuit Breaker Rating.** Crane, hoist, and monorail hoist motor branch circuits shall be protected by fuses or inverse-time circuit breakers having a rating in accordance with Table 430-152. Where two or more motors operate a single motion, the sum of their nameplate current ratings shall be considered as that of a single motor.

2.6.(a).(ii): **Taps.**

(1) Multiple Motors. Where two or more motors are connected to the same branch circuit, each tap conductor to an individual motor shall have an ampacity not less than one-third that of the branch circuit. Each motor shall be protected from overload according to 610.43.

(2) Control Circuits. Where taps to control circuits originate on the load side of a branch-circuit protective device, each tap and piece of equipment shall be protected in accordance with 430.72.

(3) Brake Coils. Taps without separate overcurrent protection shall be permitted to brake coils.

610.43 Motor and Branch-Circuit Overload Protection. Each motor, motor controller, and branch-circuit conductor shall be protected from overload by one of the following means:

2.7.(a): A single motor shall be considered as protected where the branch-circuit overcurrent device meets the rating requirement of Section 610.42.

2.7.(a).(i): Overload relay elements in each ungrounded circuit conductor, with all relay elements protected from short circuit by the branch-circuit protection.

2.7.(a).(ii): Thermal sensing devices, sensitive to motor temperature or to temperature and current, that are thermally in contact with the motor winding(s). A hoist or trolley shall be considered to be protected if the sensing device is connected in the hoist's upper limit switch circuit so as to prevent further hoisting during an overload condition of either motor.

Note: Please reference the National Electric Code (NEC) for exemptions or additional information on disconnecting means and overcurrent protection.

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