

## ***Electrobar HX Installation Instructions***

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### **CONDUCTOR BAR SYSTEM**

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# **Instruction Manual**



Part Number: 000-9901-R2  
December 2008  
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## **Product Warranty Information**

For information on Magnetek's product warranties by product type please visit  
[www.magnetekmh.com](http://www.magnetekmh.com).



### **WARNING**

Many tests and procedures outlined in this manual involve exposure to components that operate at potentially lethal voltage levels. To eliminate this hazard, service personnel must ensure that the incoming three-phase AC power has been disconnected, locked out and tagged.

# Chapter 1: ***DANGER, WARNING, CAUTION, and NOTE*** Statements

*DANGER, WARNING, CAUTION, and Note* statements are used throughout this manual to emphasize important and critical information. You must read these statements to help ensure safety and to prevent product damage. The statements are defined below.



## **DANGER**

*DANGER* indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.



## **WARNING**

*WARNING* indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



## **CAUTION**

*CAUTION* indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

# Chapter 2: Disconnecting Means/Overcurrent Protection

*NOTE: Magnetek recommends using the following Disconnecting Means and Overcurrent Protection guidelines as published in the 2005 National Electrical Code, copyright 2004.*

## Disconnecting Means

**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:

- (1) Be readily accessible and operable from the ground or floor level.
- (2) Be arranged to be locked in the open position.
- (3) Open all ungrounded conductors simultaneously.
- (4) 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, nor less than 75 percent of the sum of the short-time ampere rating of the motors required for any single motion.

## Overcurrent Protection

The use of 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.

- (A) **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).
- (B) **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).

(A) **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 430.52. 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.

(B) **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.

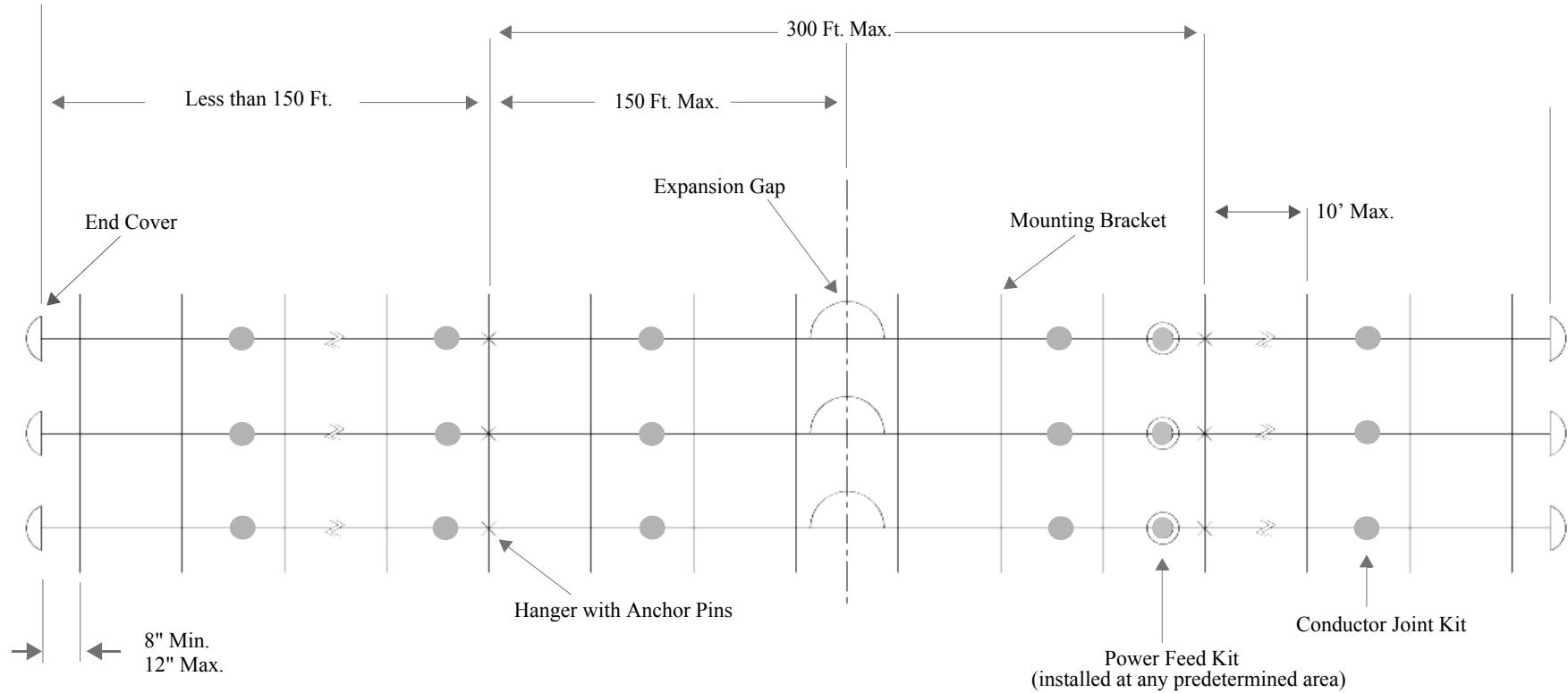
**610.43 Motor and Branch-Circuit Overload Protection.** Each motor, motor controller, and branch circuit conductor shall be protected from overload by one of the following means:

- (1) A single motor shall be considered as protected where the branch-circuit overcurrent device meets the rating requirement of Section 610.42.
- (2) Overload relay elements in each ungrounded circuit conductor, with all relay elements protected from short circuit by the branch-circuit protection.
- (3) 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 is 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.

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

# Chapter 3: System Layout

## HX-Series Conductor Bar - Typical, 3-Phase System Layout



## Conductor Application and Support Spacing

System	Support Conductor Every
400 Amp	7 1/2 feet
700 Amp	
1000 Amp	10 feet
1500 Amp	

## Engineering Data

System	DC Resistance R ohms/1000 feet	AC Impedance Z ohms/1000 feet
400 Amp	.028	.066
700 Amp	.018	.052
1000 Amp	.012	.045
1500 Amp	.008	.030
All systems Coef. Thermal Expansion		.000013/IN./IN./°F

## Temperature Considerations

Operating Temperature		Installation Temperature		Set Gap Distance
Minimum	Maximum	°F	°C	Total Gap (split difference between both gaps)
00°F -18°C	100°F 38°C	0°F	-18°C	3-7/8"
		25°F	-2°C	2-7/8"
		50°F	10°C	2"
		75°F	24°C	1"
		100°F	38°C	0"
		125°F	52°C	0"
25°F -2°C	125°F 52°C	25°F	-2°C	3-7/8"
		50°F	10°C	2-7/8"
		75°F	24°C	2"
		100°F	38°C	1"
		125°F	52°C	0"
		150°F	66°C	0"
50°F 10°C	150°F 66°C	50°F	10°C	3-7/8"
		75°F	24°C	2-7/8"
		100°F	38°C	2"
		125°F	52°C	1"
		150°F	66°C	0"
		175°F	80°C	0"

## Chapter 4: Hanger Assembly

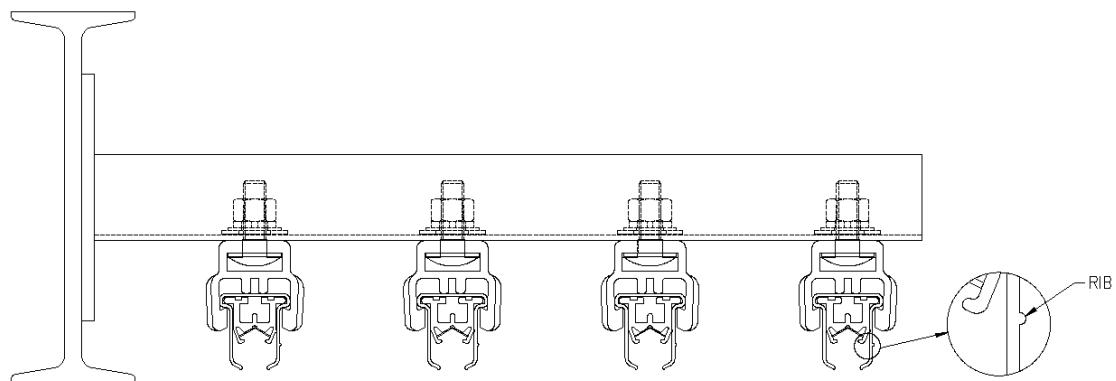
- 1.) Install the hanger clamps securely onto the mounting brackets. (We suggest installing the hangers onto the mounting brackets on the floor to simplify the installation.) Hanger clamps must be mounted straight to allow for thermal expansion of the conductor bar. Twisted hangers will restrict thermal expansion of the conductor bar.
- 2.) If using the steel clamp type hanger, leave the cross clamp bolt loose until conductors are up and in place, then tighten the cross bolts. The minimum spacing between the hangers is 4".

## Chapter 5: Mounting Brackets

- 1.) Install the mounting brackets by bolting or welding them at the required spacing as follows: 400 amp system-7'6" centers maximum; 700/1000/1500 amp systems-10' centers maximum. Mounting brackets must be level, laterally and vertically, to allow for thermal expansion of the conductor bars.

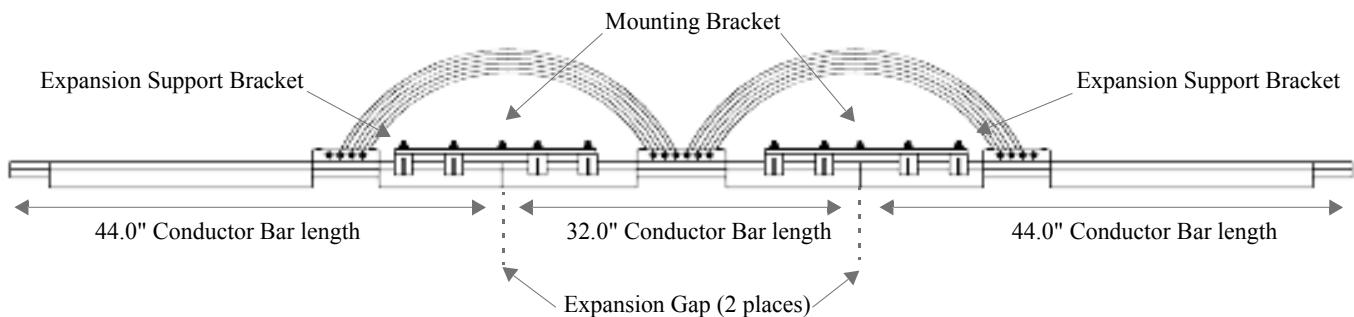
## Chapter 6: Conductors

- 1.) Install the conductor bar sections into the hanger assemblies, making sure that the rib on the outside of the insulating cover is on the same side. (All HX conductor bar has an identifying rib that runs the entire length of the insulating cover.)
- 2.) If using the steel type hangers, do not tighten the cross bolts until all of the conductor sections are in place.



## Chapter 7: Expansion Sections (See Figures 6 through 8)

- 1.) Based on a 100°F maximum temperature variation, an expansion section is required for every 300 feet of conductor run. When expansions are required, start installing the system with the expansion assembly and work away from expansion sections in both directions.
- 2.) The expansion assembly must be supported by two mounting brackets, one attached to each expansion support bracket (see below).



Conductor length when expansion is closed (as shown in Figure 1) is 10 feet.  
Conductor length when expansion is completely open is 10 feet 3.90 inches

- 3.) Anchor points must be mounted 150 feet away from the gap in both directions after the expansion gap has been set. These anchor points (included with each expansion assembly) control the expansion direction. See Temperature Considerations section on page 7 for setting of the expansion gaps.

*NOTE: If anchor points are required to control expansion or to anchor conductor run, refer to Table 1: Expansion Parameters for requirements.*

**Table 1: Expansion Parameters**

Length of System	Number of Expansions	Number of Anchor Points
0 to 300 feet	0	1
301 to 600 feet	1	2
601 to 900 feet	2	3
901 to 1200 feet	3	4
<b>Note: Specific applications and/or environments may increase or decrease the number of expansions required. Please contact the factor for additional information.</b>		

## **Installation of Anchor Pins on HX-Series Conductor Bar (See Figures 9 and 10):**

- a) Drill 1/4 inch hole through conductor bar on both sides of one hanger.
- b) Insert Anchor pins centered with the hanger to anchor the conductor and control expansion

- Systems without expansions should have anchor pins at the center of run only to prevent conductor from sliding.
- Systems with one expansion section should have anchor pins located 150 feet from expansion in both directions.
- Systems with more than one expansion should have anchor pins midway of each expansion sections and mid-way between the last expansion section and the end of the runway

*NOTE: Consult Magnetek Electromotive Systems if temperature variation exceeds 100°F.*

## **Chapter 8: Joint Kit / Joint Cover (See Figures 1 through 3)**

- 1.) The joint assembly is designed to automatically align the conductor bar sections during installation. The conductor bar ends are de burred and ramped at the factory. Due to shipping and cutting of the conductors in the field, possible burrs can occur on the edge of the conductor bar/ stainless steel running surface. The conductor bar should be checked before joining together, debarred and ramped again if necessary.
- 2.) Wire brush the areas of the conductor bars to be joined and apply joint compound (anti-oxidant) on areas which are in contact with the joint plate.
- 3.) Install the joint kit, making sure the conductor is completely closed. Tighten the bolts firmly until washers are flattened. Check the joint to make sure it is even with the adjoining conductor bar and again remove any burrs. Install the joint cover over the joint assembly.

## **Chapter 9: Power Feeds (See Figures 11 through 13)**

- 1.) Install power feed kit cable lug terminals at predetermined areas. Wire brush the area of the conductor bar where the power feed lug terminals are to be located.
- 2.) Apply the joint compound (anti-oxidant) on the areas which are in contact with the cable lug terminals.
- 3.) Connect the power feed cables (not supplied by Electromotive Systems) to the power feed cable lug terminals.
- 4.) Install the power feed cover over the power feed.

## **Chapter 10: End Cover (See Figures 18 and 19)**

- 1.) Install the end covers over the exposed conductor ends. Fasten to the conductor bar with a nylon drive rivet.

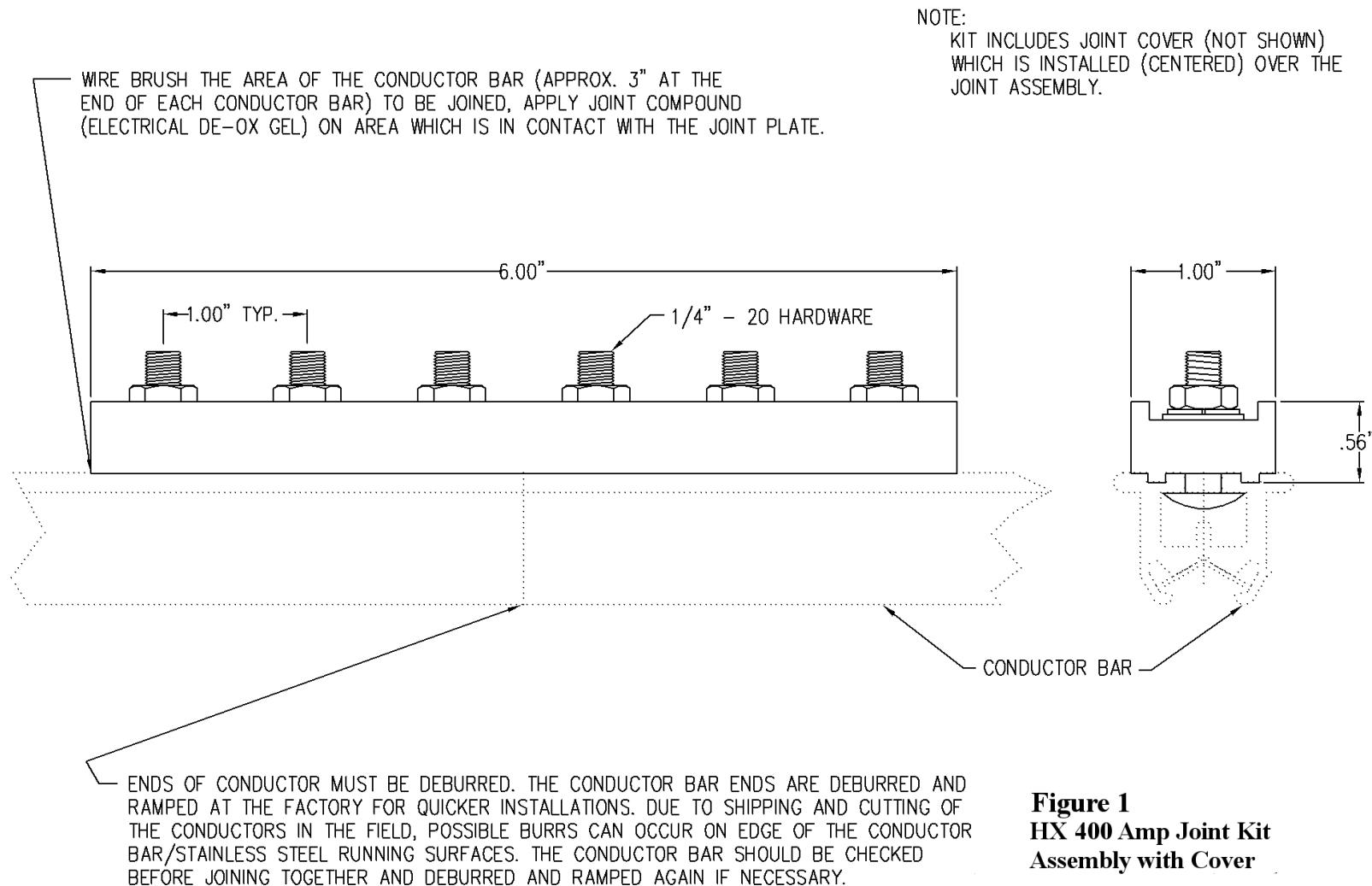
## **Chapter 11: Collector Assembly (See Figures 16 and 17)**

- 1.) Mount the collector assemblies on a 1" square post which is securely fastened to the moving equipment to be electrified.
- 2.) The center line of the collector post to the bottom of the conductor running surface should be 4 inches. The following alignment adjustments should be made as necessary:
  - a) The collector post should be parallel to the ground on vertical mount applications + or - 2 degrees, and perpendicular to the ground on lateral mount applications + or -2 degrees. It should be mounted at right angles to the conductor bar + or - 2 degrees.
  - b) Each collector should be mounted directly under its respective conductor bar for vertical mount systems, and adjacent on lateral mount systems.
  - c) The collector contact shoes should not be cocked at an angle, and should enter the conductor bar contact points at right

## Chapter 12: Final Inspection

- 1.) Make sure the conductor runs are straight. Adjust any hanger clamps which may be twisted.
- 2.) No HOT bare metal parts should be exposed. Make sure all joint covers are installed securely to prevent any accidental contact by personnel.
- 3.) File conductor running surface joint areas that may be uneven or not smooth.
- 4.) Run the equipment back and forth several times along the entire system length to make sure the system functions properly.
- 5.) Collector lead cables should be free, and not restrict movement of collector arms or heads either vertically or horizontally.

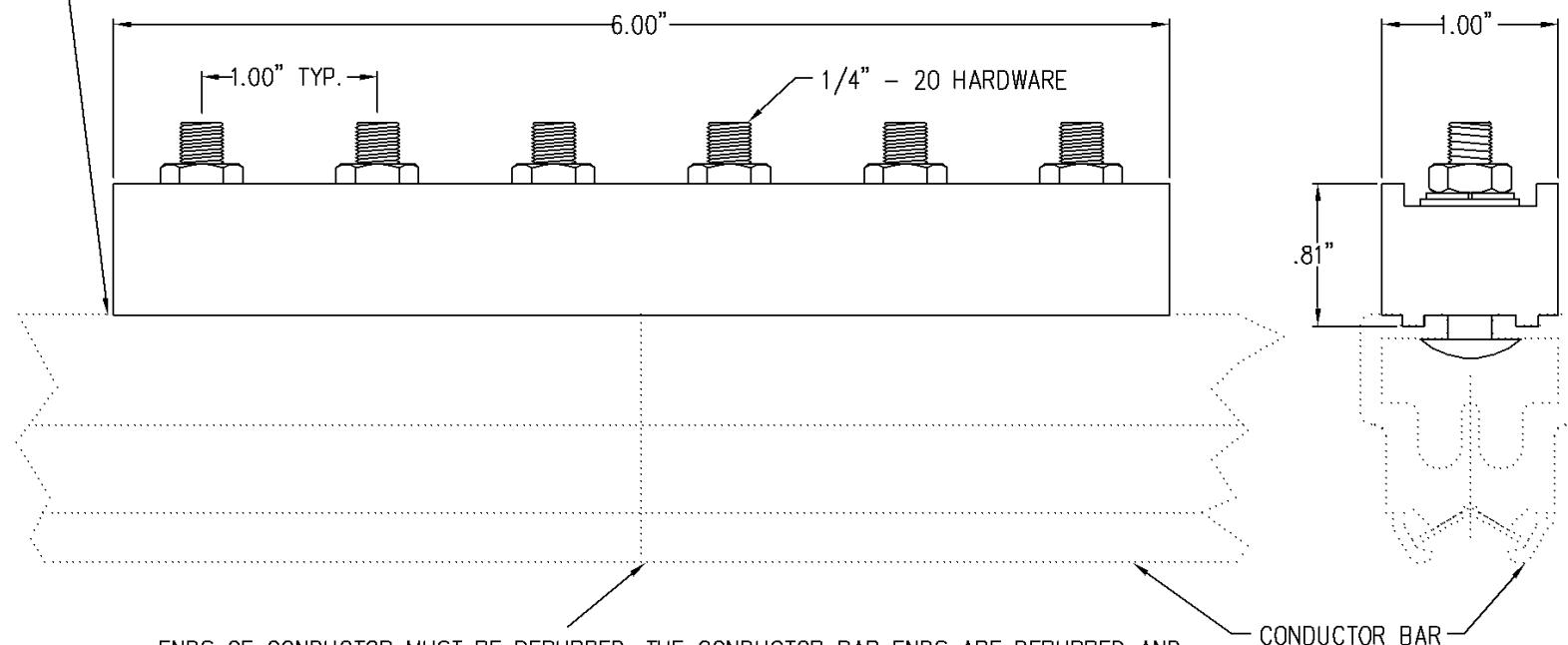
## Appendix A: Figures for Assembly



**Figure 1**  
**HX 400 Amp Joint Kit**  
**Assembly with Cover**

WIRE BRUSH THE AREA OF THE CONDUCTOR BAR (APPROX. 3" AT THE END OF EACH CONDUCTOR BAR) TO BE JOINED, APPLY JOINT COMPOUND (ELECTRICAL DE-OX GEL) ON AREA WHICH IS IN CONTACT WITH THE JOINT PLATE.

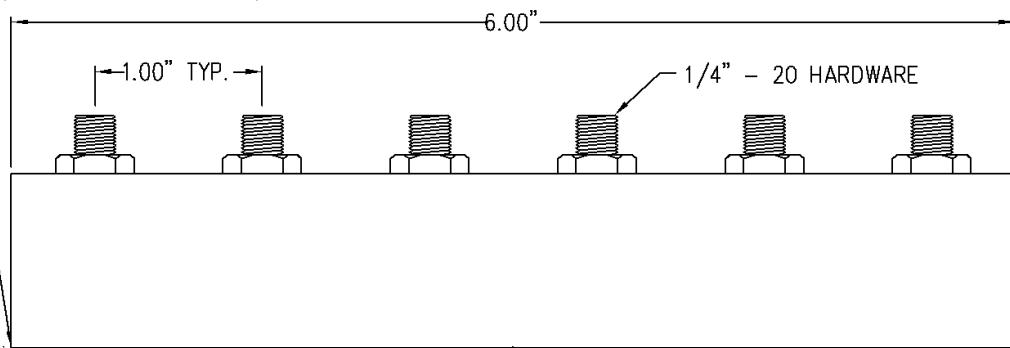
NOTE:  
KIT INCLUDES JOINT COVER (NOT SHOWN)  
WHICH IS INSTALLED (CENTERED) OVER THE JOINT ASSEMBLY.



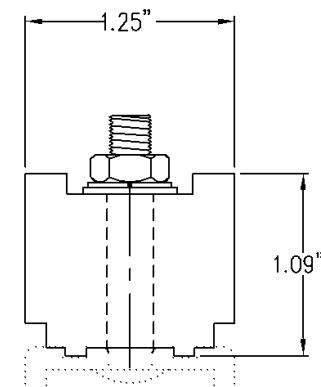
**Figure 2**  
**HX 700 Amp Joint Kit**  
**Assembly with Cover**

WIRE BRUSH THE AREA OF THE CONDUCTOR BAR (APPROX. 3" AT THE END OF EACH CONDUCTOR BAR) TO BE JOINED, APPLY JOINT COMPOUND (ELECTRICAL DE-OX GEL) ON AREA WHICH IS IN CONTACT WITH THE JOINT PLATE.

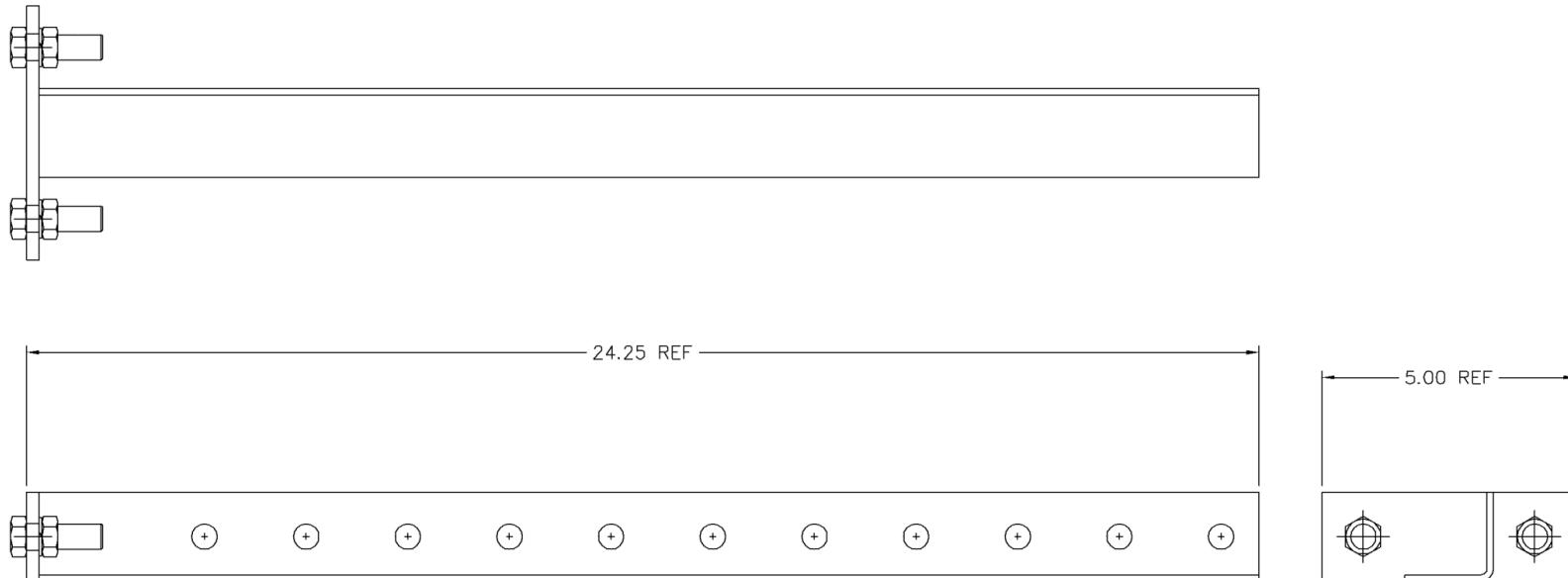
NOTE:  
KIT INCLUDES JOINT COVER (NOT SHOWN)  
WHICH IS INSTALLED (CENTERED) OVER THE  
JOINT ASSEMBLY.



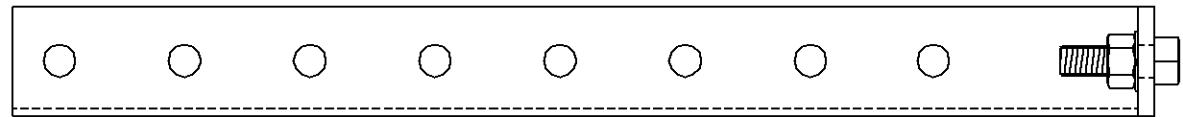
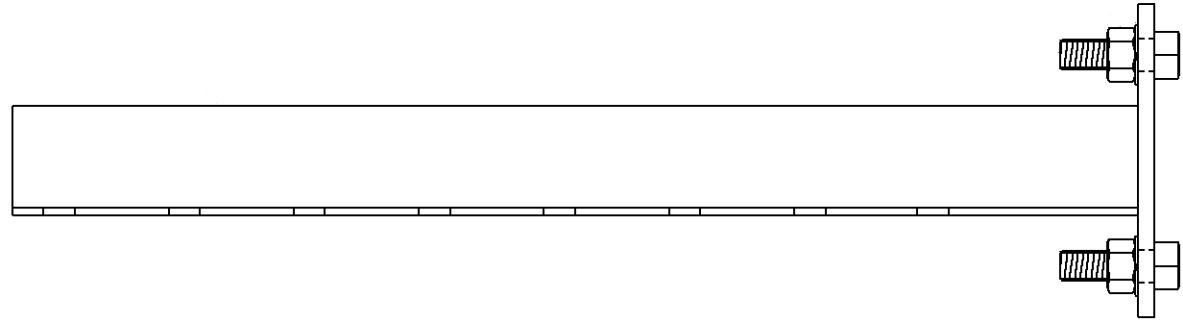
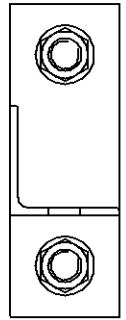
ENDS OF CONDUCTOR MUST BE DEBURBED. THE CONDUCTOR BAR ENDS ARE DEBURBED AND RAMPED AT THE FACTORY FOR QUICKER INSTALLATIONS. DUE TO SHIPPING AND CUTTING OF THE CONDUCTORS IN THE FIELD, POSSIBLE BURRS CAN OCCUR ON EDGE OF THE CONDUCTOR BAR/STAINLESS STEEL RUNNING SURFACES. THE CONDUCTOR BAR SHOULD BE CHECKED BEFORE JOINING TOGETHER AND DEBURBED AND RAMPED AGAIN IF NECESSARY.



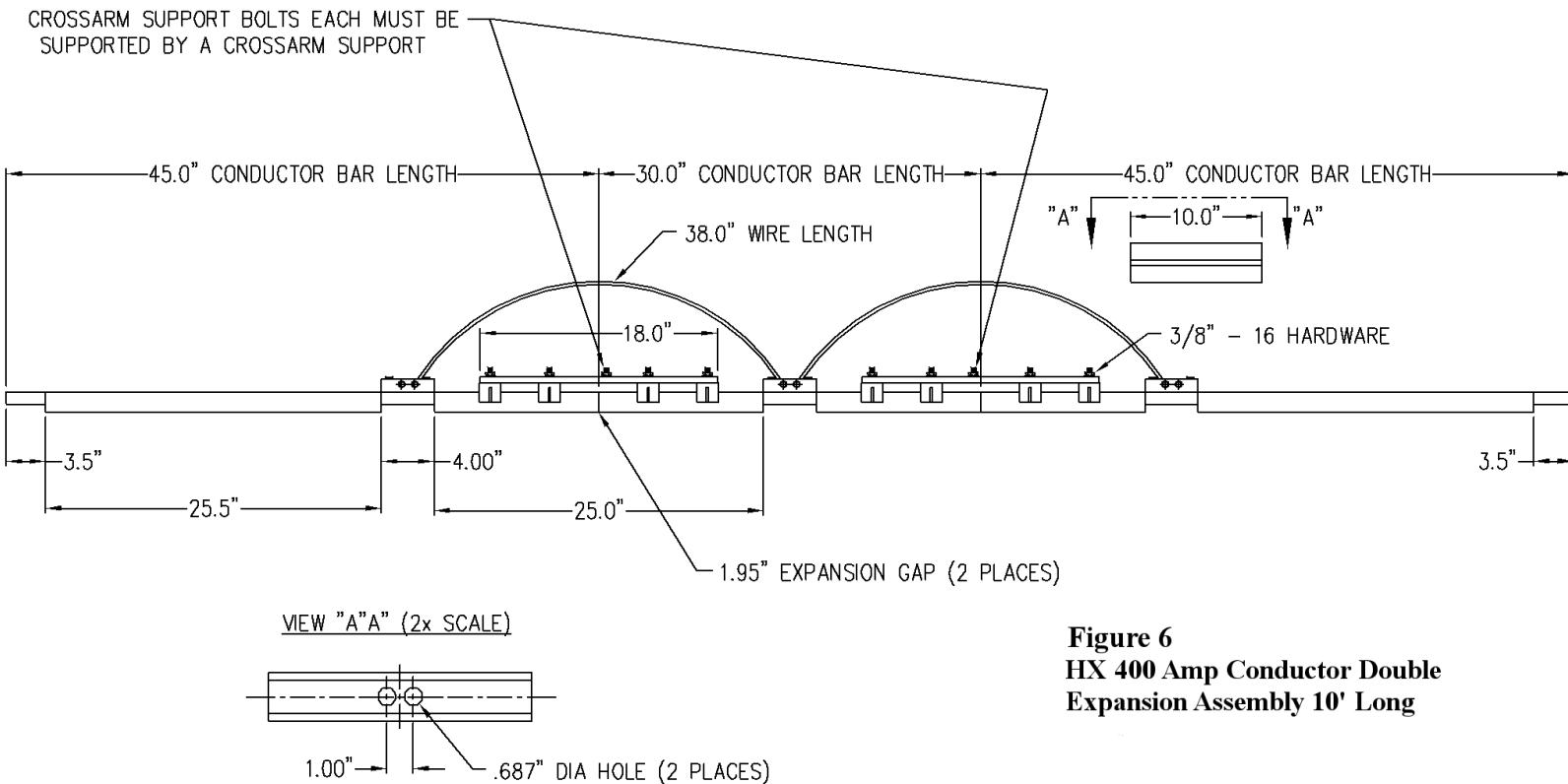
**Figure 3**  
**HX 1000 Amp Joint Kit**  
**Assembly with cover**



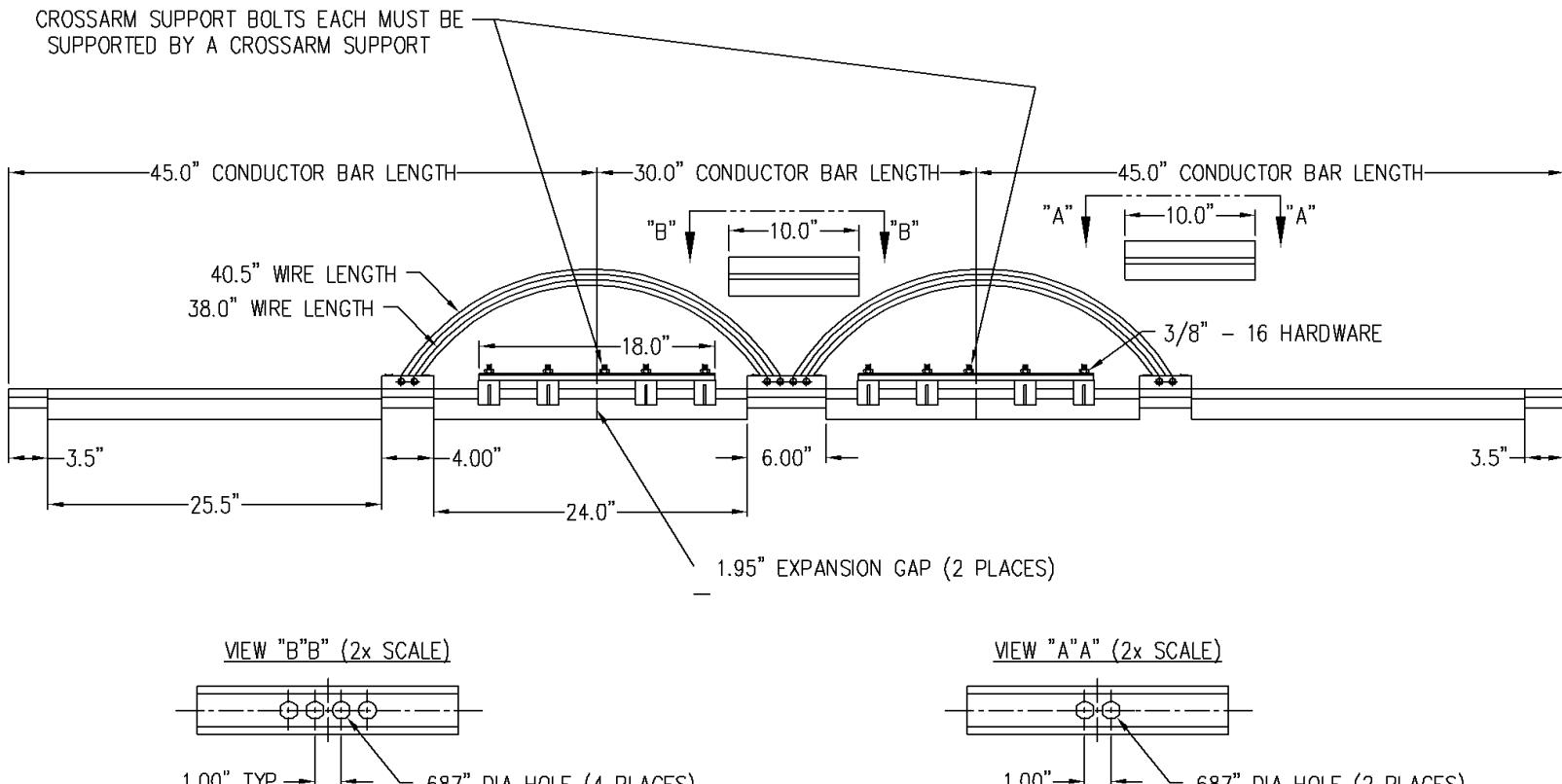
**Figure 4**  
**HX Conductor Mounting Bracket 24"**



**Figure 5**  
**HX Mounting Bracket 18" with hardware**

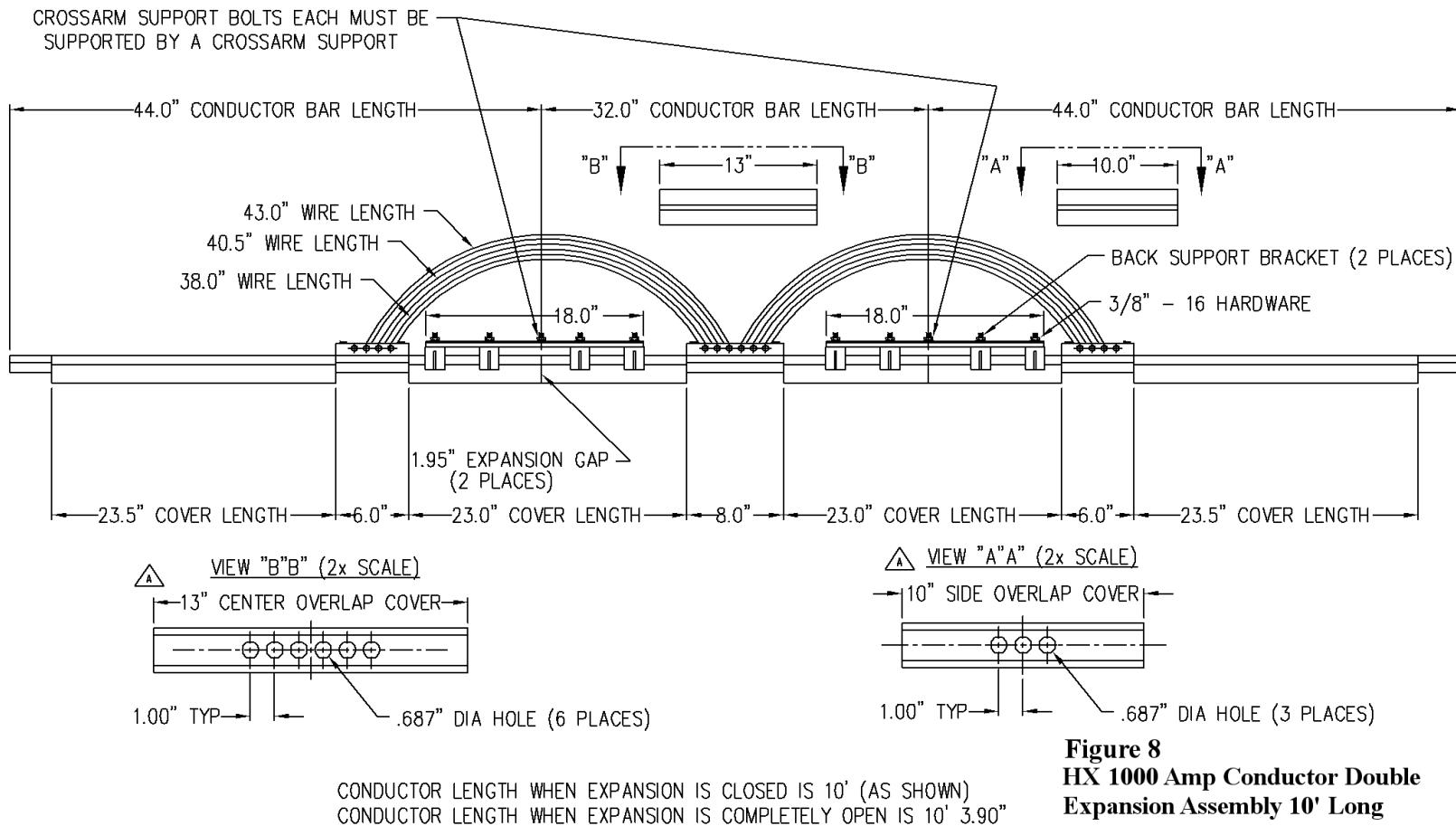


**Figure 6**  
**HX 400 Amp Conductor Double Expansion Assembly 10" Long**

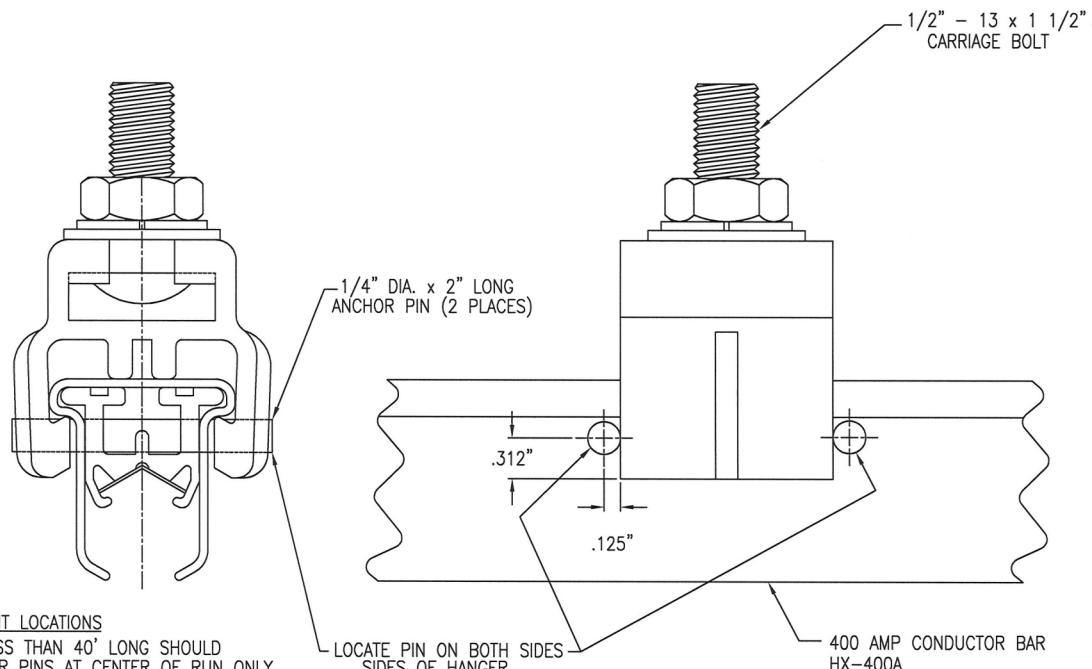


CONDUCTOR LENGTH WHEN EXPANSION IS CLOSED IS 10' (AS SHOWN)  
 CONDUCTOR LENGTH WHEN EXPANSION IS COMPLETELY OPEN IS 10' 3.90"

**Figure 7**  
**HX 700 Amp Conductor Double Expansion Assembly 10' Long**



**Figure 8**  
**HX 1000 Amp Conductor Double Expansion Assembly 10' Long**

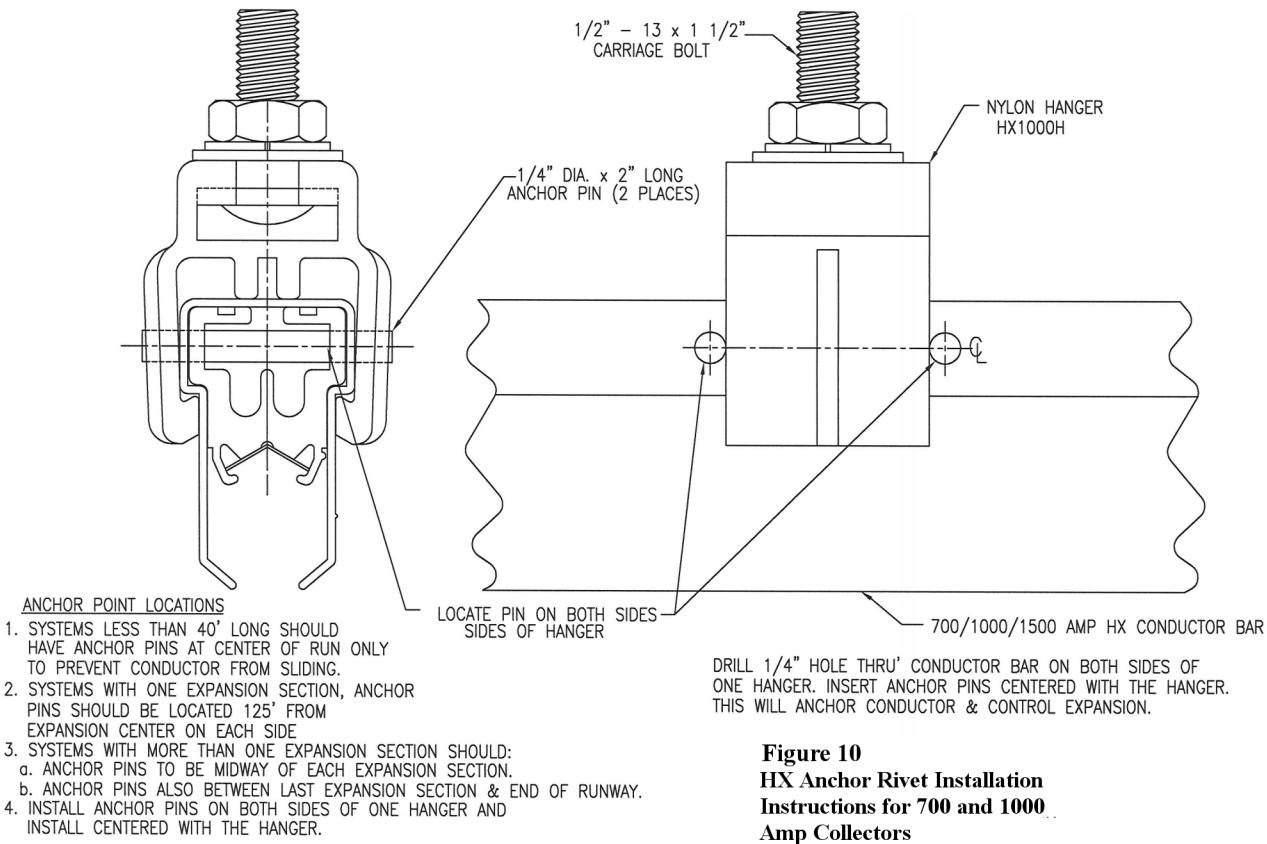


ANCHOR POINT LOCATIONS

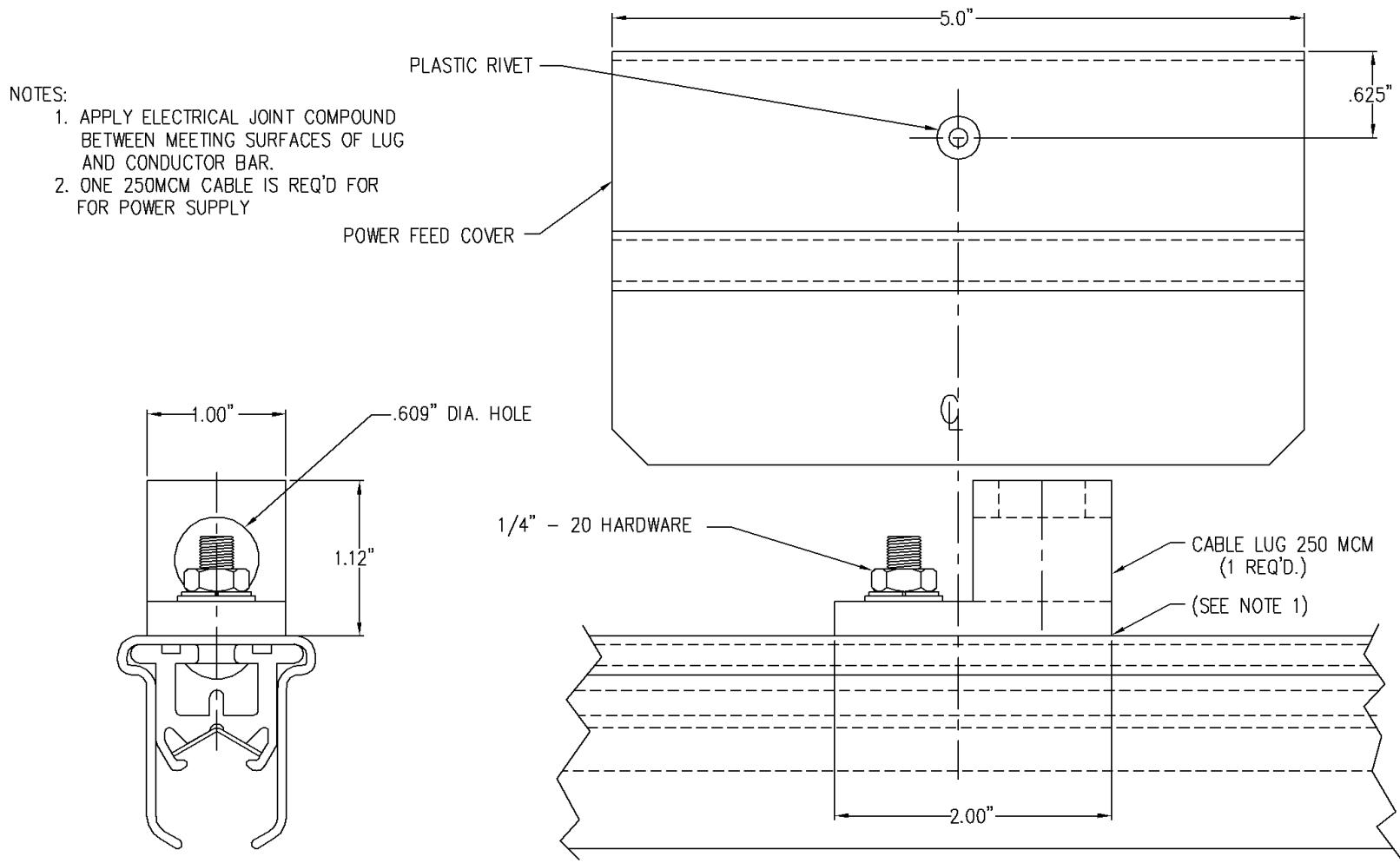
1. SYSTEMS LESS THAN 40' LONG SHOULD HAVE ANCHOR PINS AT CENTER OF RUN ONLY TO PREVENT CONDUCTOR FROM SLIDING.
2. SYSTEMS WITH ONE EXPANSION SECTION, ANCHOR PINS SHOULD BE LOCATED 125' FROM EXPANSION CENTER ON EACH SIDE
3. SYSTEMS WITH MORE THAN ONE EXPANSION SECTION SHOULD:
  - a. ANCHOR PINS TO BE MIDWAY OF EACH EXPANSION SECTION.
  - b. ANCHOR PINS ALSO BETWEEN LAST EXPANSION SECTION & END OF RUNWAY.
4. INSTALL ANCHOR PINS ON BOTH SIDES OF ONE HANGER AND INSTALL CENTERED WITH THE HANGER.

DRILL 1/4" HOLE THRU' CONDUCTOR BAR ON BOTH SIDES OF ONE HANGER. INSERT ANCHOR PINS CENTERED WITH THE HANGER. THIS WILL ANCHOR CONDUCTOR & CONTROL EXPANSION.

**Figure 9**  
**HX Anchor Rivet Installation**  
**Instructions for 400 Amp Conductor**



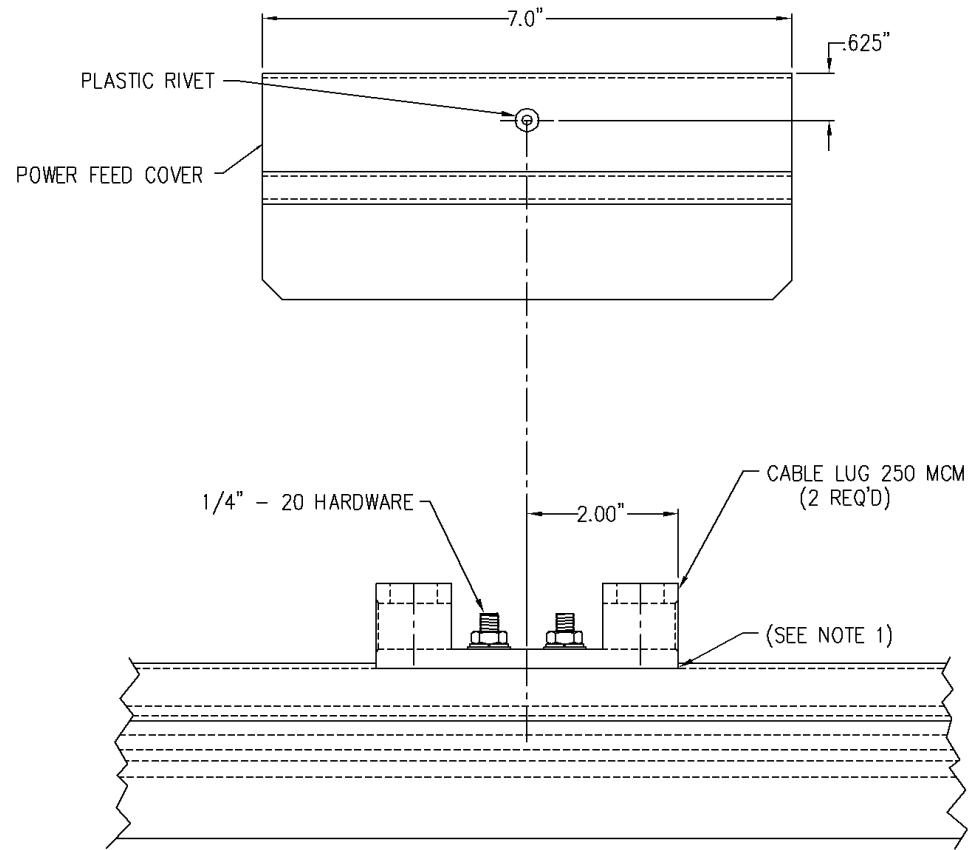
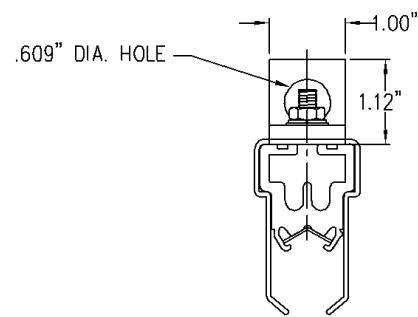
**Figure 10**  
**HX Anchor Rivet Installation**  
**Instructions for 700 and 1000**  
**Amp Collectors**



**Figure 11**  
**Power Feed Kit Assembly with cover for 400 HX Conductor**

NOTES:

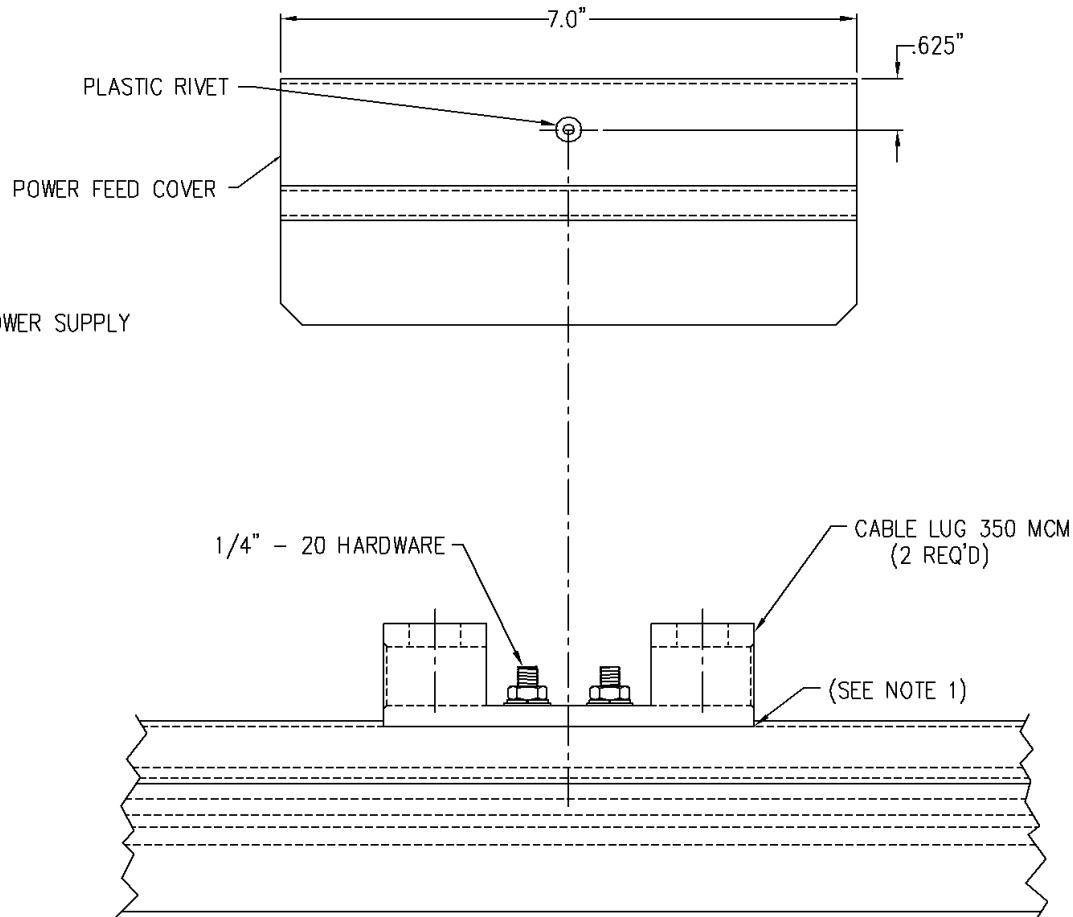
1. APPLY ELECTRICAL JOINT COMPOUND BETWEEN MEETING SURFACES OF LUG AND CONDUCTOR BAR.
2. TWO 250 MCM CABLES ARE REQ'D FOR POWER SUPPLY



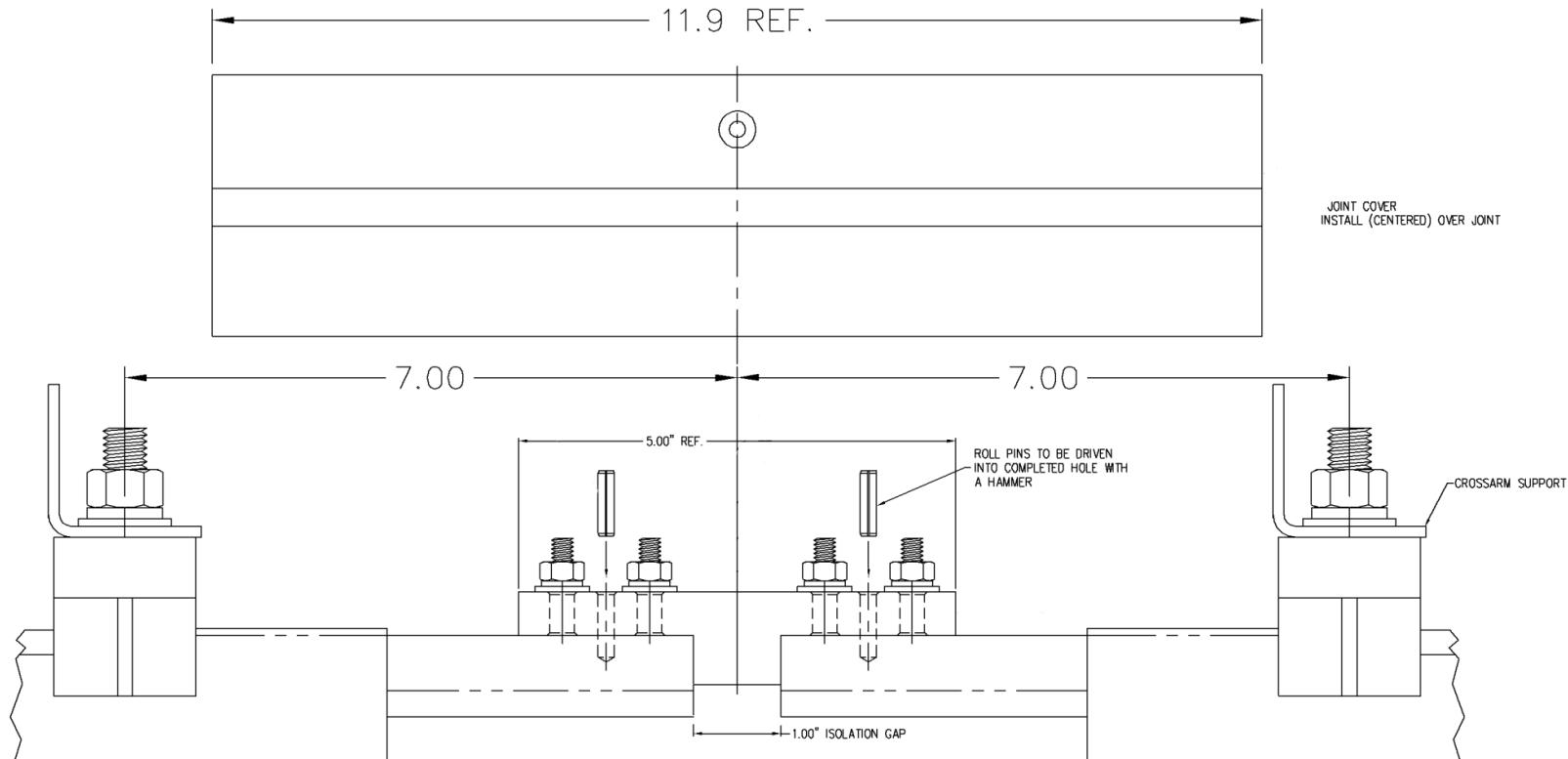
**Figure 12**  
**Power Feed Kit Assembly with cover for 700 Amp Conductor**

NOTES:

1. APPLY ELECTRICAL JOINT COMPOUND BETWEEN MEETING SURFACES OF LUG AND CONDUCTOR BAR.
2. TWO 350 MCM CABLES ARE REQ'D FOE POWER SUPPLY

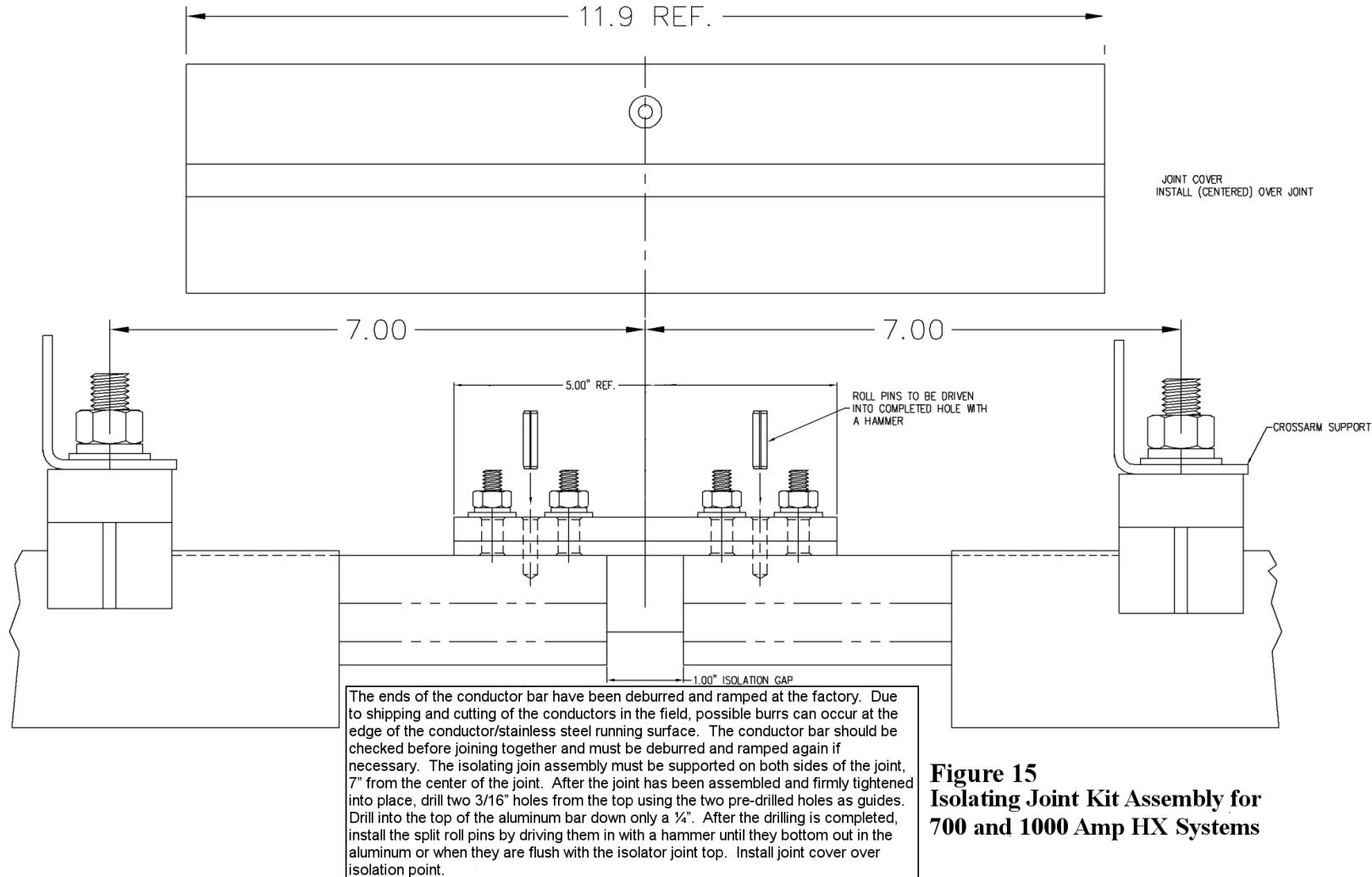


**Figure 13**  
**Power Feed Kit Assembly with cover for 1000 Amp HX Conductor**



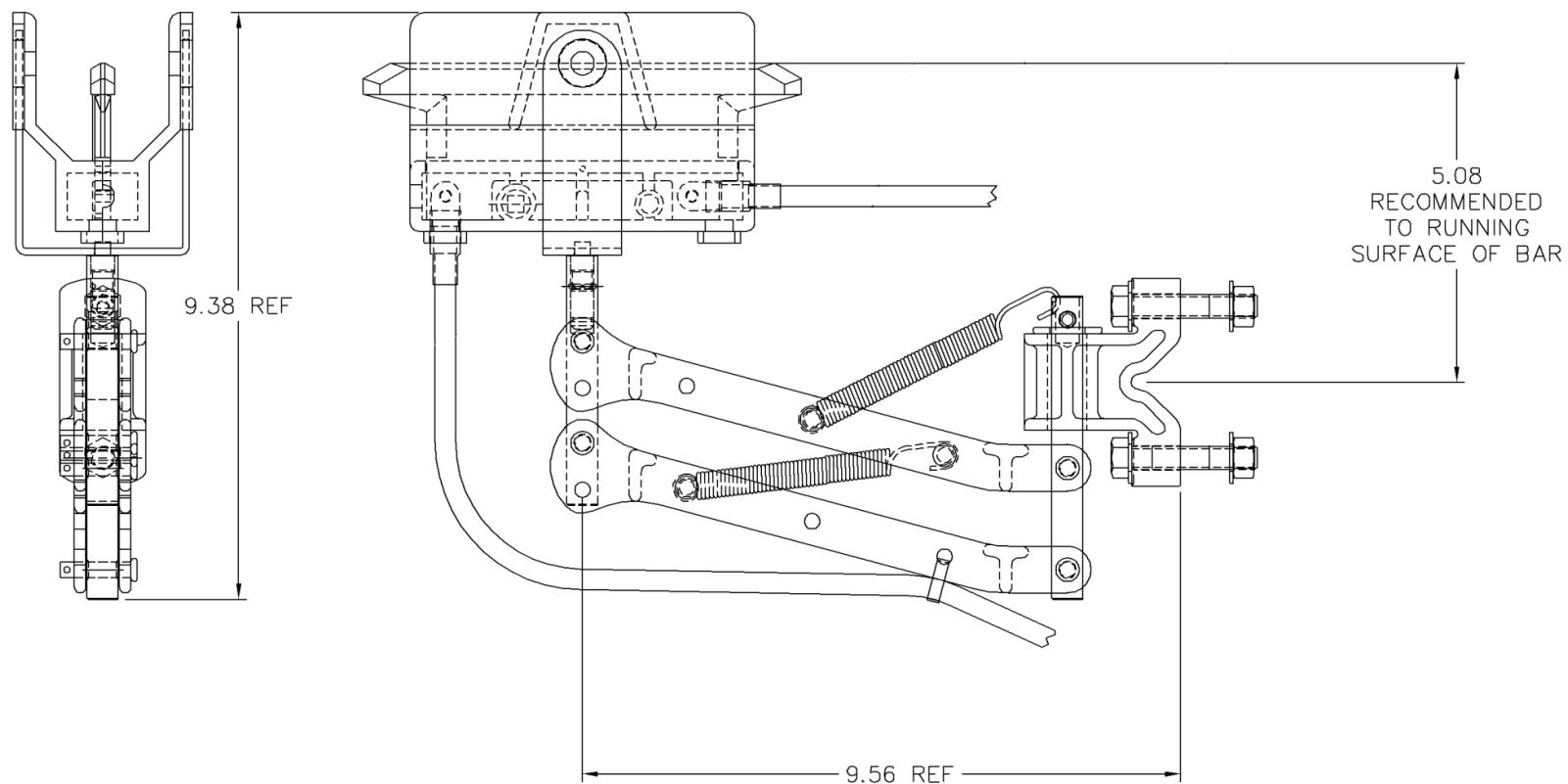
The ends of the conductor bar have been deburred and ramped at the factory. Due to shipping and cutting of the conductors in the field, possible burrs can occur at the edge of the conductor/stainless steel running surface. The conductor bar should be checked before joining together and must be deburred and ramped again if necessary. The isolating joint assembly must be supported on both sides of the joint, 7" from the center of the joint. After the joint has been assembled and firmly tightened into place, drill two 3/16" holes from the top using the two pre-drilled holes as guides. Drill into the top of the aluminum bar down only a  $\frac{1}{4}$ ". After the drilling is completed, install the split roll pins by driving them in with a hammer until they bottom out in the aluminum or when they are flush with the isolator joint top. Install joint cover over isolation point.

**Figure 14**  
**Isolating Joint Kit Assembly**  
**for 400 Amp HX Systems**

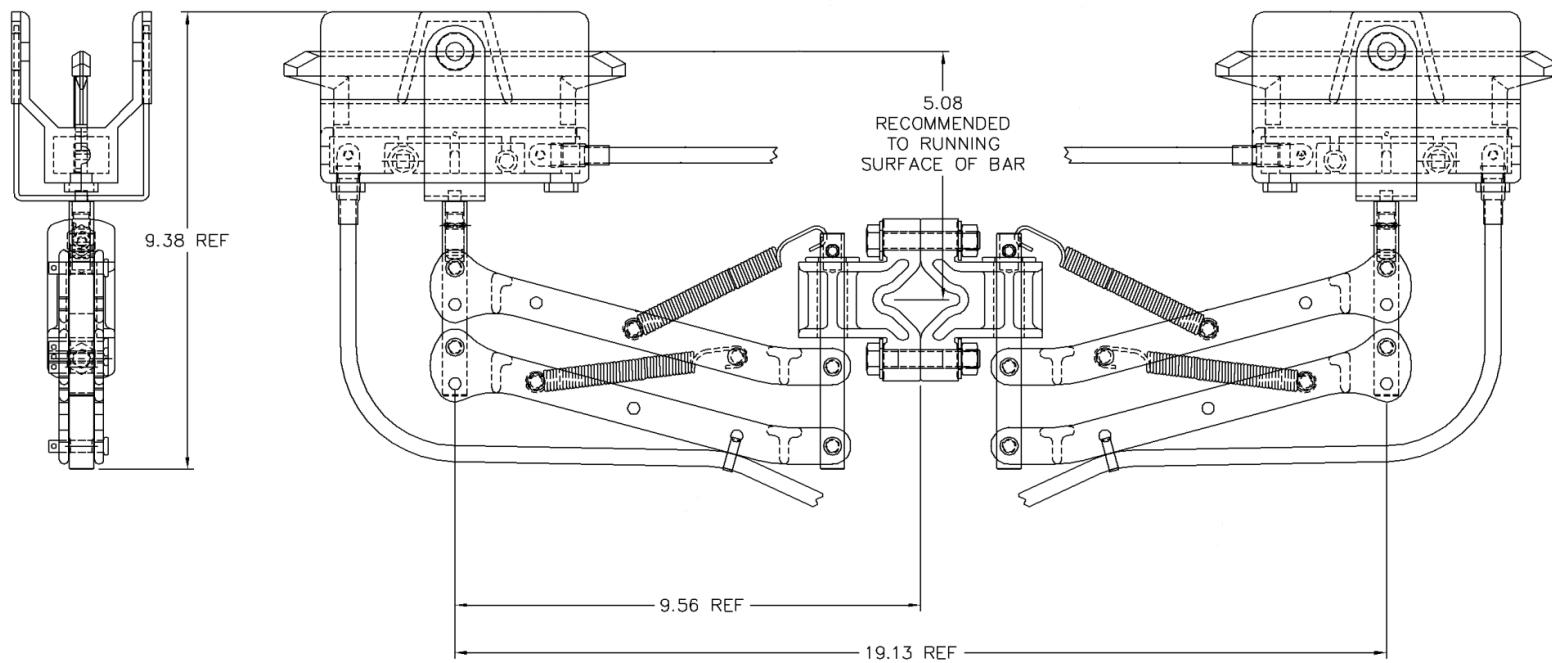


**Figure 15**  
**Isolating Joint Kit Assembly for**  
**700 and 1000 Amp HX Systems**

**Figure 16**  
**200 Amp Pantograph Collector - Single Shoe**

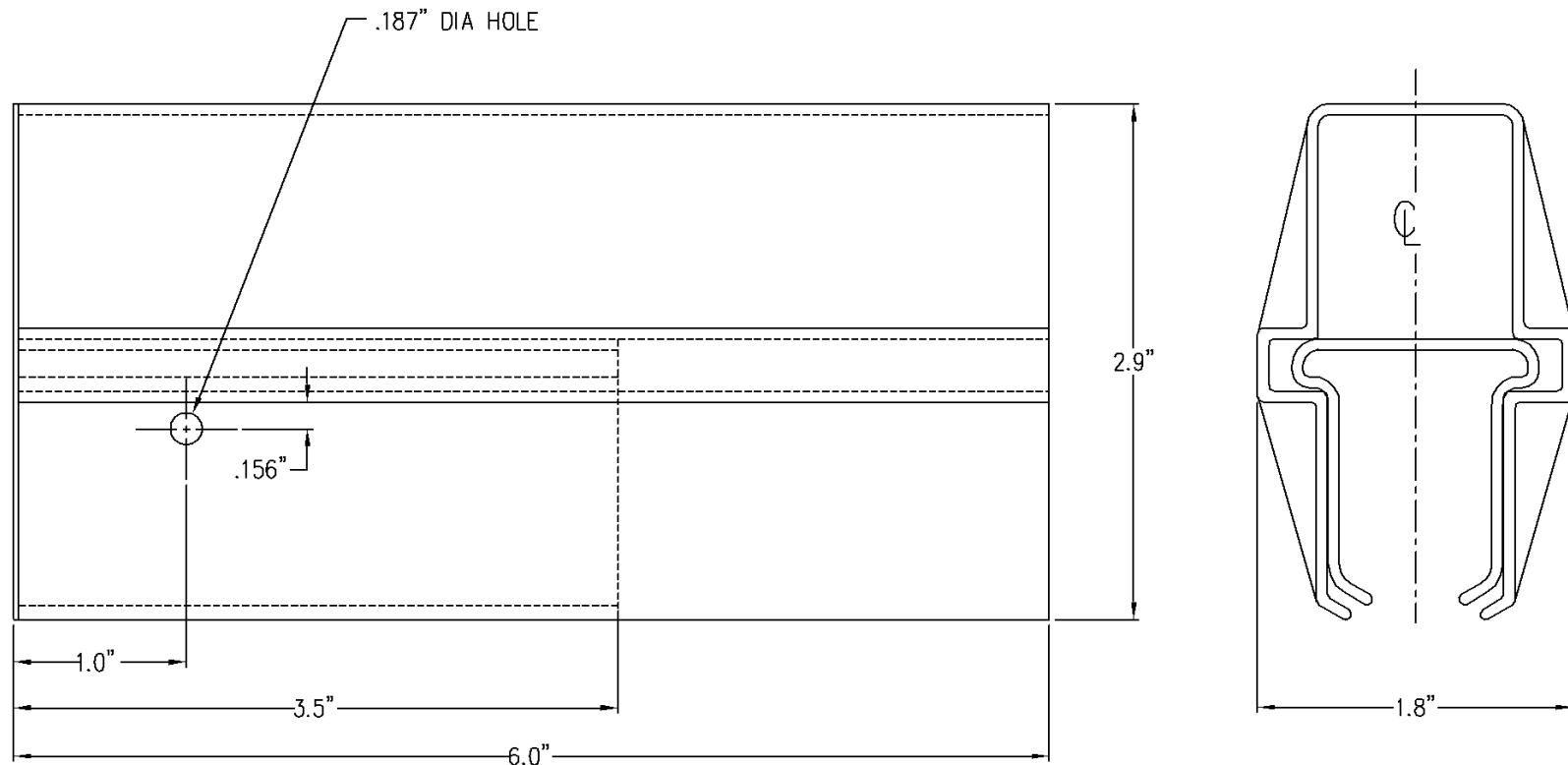


**Figure 17**  
**400 Amp Pantograph Collector Double Shoe**



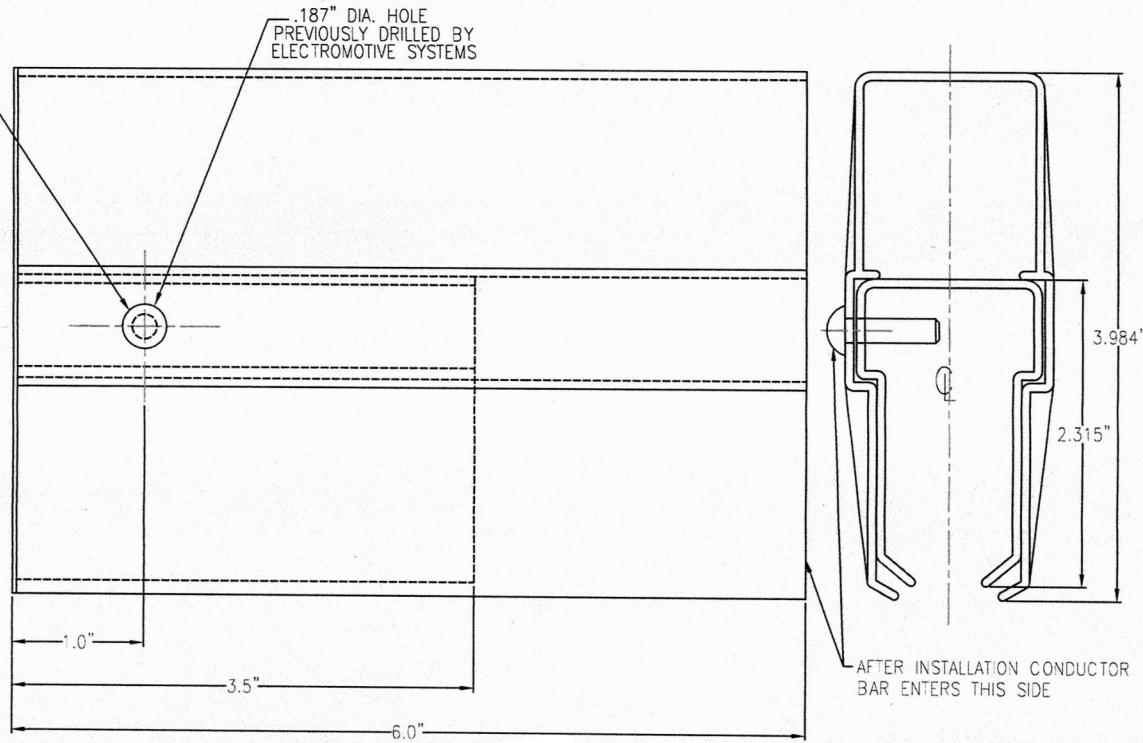
NOTE:

1. ENTIRE ASSEMBLY IS GLUED TOGETHER
2. END COVER INCLUDES RIVET 3/16" O.D. x 7/8" LG. TO BE INSTALLED IN THE FIELD BY END USER



**Figure 18**  
**End Cover Installation for 400 Amp HX Conductor**

USING HOLE DRILLED PREVIOUSLY AS A GUIDE, DRILL A 3/16" DIA. HOLE THROUGH ONE SIDE OF THE ALUMINUM CONDUCTOR. INSERT RIVET AND DRIVE PIN TO HOLD END IN PLACE.



**Figure 19**  
End Cover Installation for 700 and 1000 Amp HX Conductor