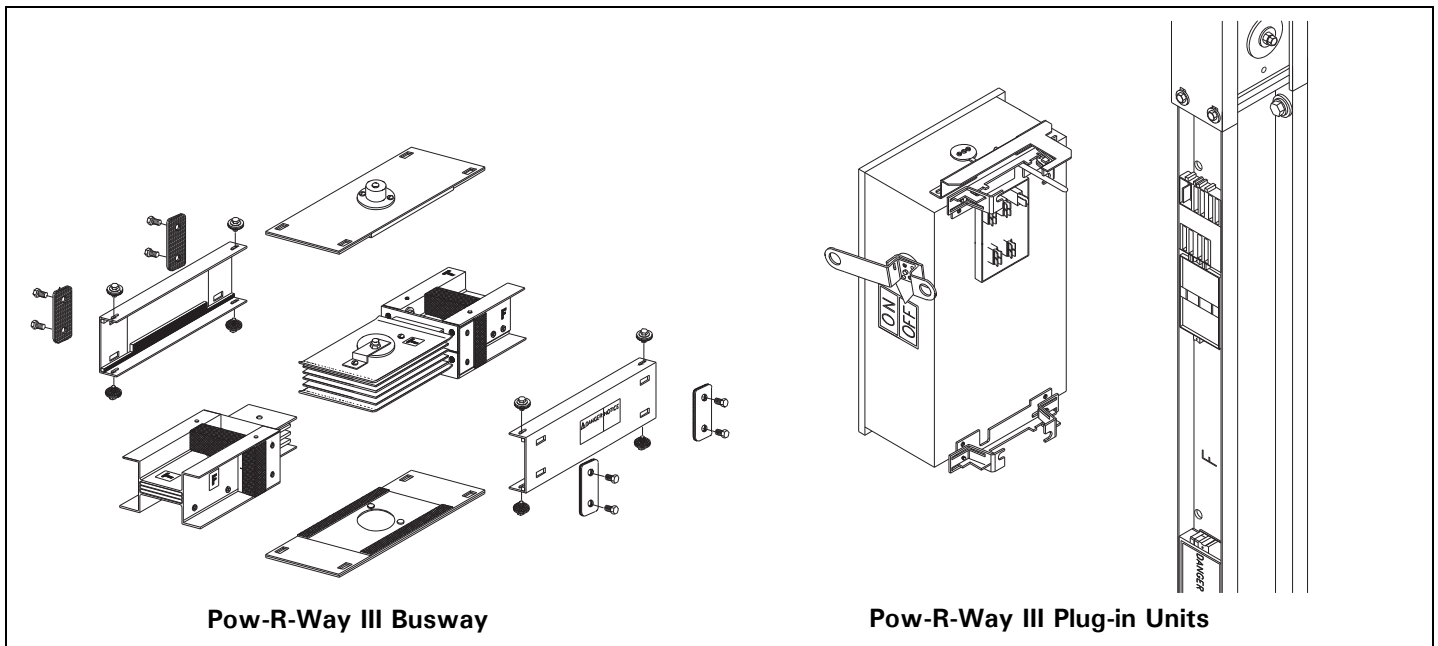


## Low Voltage Busway Pow-R-Way III

Storage, Installation, and Maintenance

### New Information

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## Introduction

This publication contains instructions for the storage, handling, installation, and maintenance of the Eaton Cutler-Hammer Pow-R-Way III busway. Only those qualified and trained in accordance with established safety procedures should handle, install, and maintain the Pow-R-Way III busway. Failure to follow danger/warning labels and established safety procedures will result in property damage, serious personal injury, or death.

### DANGER

**HAZARD OF ELECTRICAL SHOCK OR BURN. TURN THE POWER TO THE BUSWAY OFF BEFORE INSTALLING, REMOVING, OR WORKING ON THIS EQUIPMENT.**

This publication does not cover all the details or variation in equipment and hardware nor cover every possible contingency regarding storage, handling, installation, and maintenance for Pow-R-Way III busway systems. Eaton does not make representation or warranty, expressed or implied and does not assume responsibility for the accuracy or completeness of information contained herein.

## Receiving

Once the material is received, inspect each box/crate for damage. Also check for concealed damage. Should any damage be found, notify the carrier immediately and file any claims as required by the carrier. If no visible or concealed damage is found, the product is ready for storage or installation.

Do not remove the busway from the original shipping container until ready for installation. This will help prevent damage to the busway from occurring prior to installation.

## Storage

The Eaton Cutler-Hammer Pow-R-Way III busway should be stored in a covered, clean, dry space which is climate controlled to prevent condensation. Do not allow the busway to come in contact with corrosive fumes, liquids, salts, or forms of concrete.

Storing the busway outdoors should be avoided if at all possible. However, if it cannot be avoided, it must be stored off the ground and securely covered to provide protection from dirt and moisture. Temporary electrical heating must be provided and evenly distributed beneath the cover to prevent condensation. At least 3 watts per cubic foot is adequate for average environments.

Failure to properly store and protect the busway may cause damage and will void the warranty.

Outdoor-rated busways are not rated for outdoor applications until they are completely and properly installed. They should be treated as indoor busways prior to complete installation.

## Preparation and Inspection

Deliver all busway sections and components to the installation location prior to unpacking, if possible. This will help prevent damage. Each crate/box is clearly marked with its contents and quantities.

Unpack and inspect each piece for any signs of visible damage. Check the housing for dents or cracks caused by physical damage. Inspect the Pow-R-Bridge joints to ensure they are clean and that the insulators are not cracked or broken. Consult the factory regarding any physical damage.

Perform an insulation resistance test on each busway section by Megger testing at 1000 volts, phase-to-phase, phase-to-neutral, and phase-to-ground to ensure system integrity.

Readings will vary with humidity. If readings are less than 1 megohm per 100 ft (30.48 m) in length, do not use the busway section or apply voltage. Consult the factory.

$$\text{Megohms} = 100/\text{length of run in feet}$$

$$\text{Megohms} = 30.48/\text{length of run in meters}$$

Record the readings of each item and of each installed run. Provide these readings as part of the permanent maintenance records.

Once inspected and tested, each busway pieces is ready for installation.

## Handling

The Eaton Cutler-Hammer Pow-R-Way III busway is manufactured with two sets of lifting holes at the ends of each piece to help hoist and position the busway during installation. Refer to Figure 1 for the location of lifting holes for both vertical and horizontal installation.

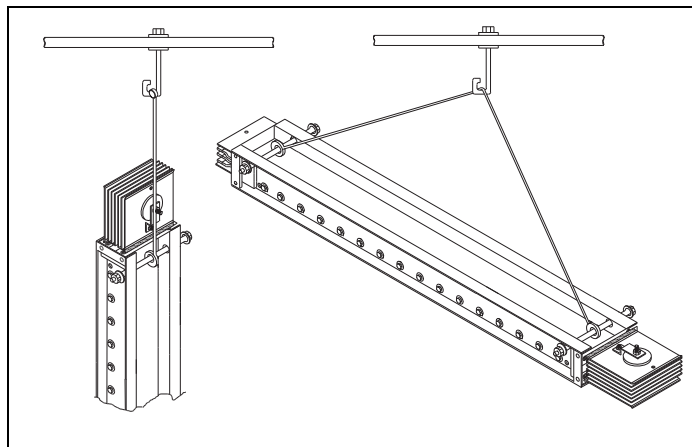


Figure 1. Busway Handling.

When lifting or hoisting the busway, make sure the weight of the busway is distributed and balanced. Use lifting devices that will not damage the busway.

**Installation**

One set of construction drawings is sent with the initial shipment of each busway order. The crate/box with the drawing package will be marked with red labels that read "Drawing Package Inside". This drawing package will contain the layout of each run, showing where each piece of the run is located, and other possible cut sheets and instructions. The installer should review these drawings prior to and during installation to ensure proper installation.

**Identification**

Each piece of the Eaton Cutler-Hammer Pow-R-Way III busway has a nameplate label as shown in Figure 2. This label identifies each piece and its ratings. At the end of the style number there is an alphanumeric number preceded by a dash (e.g. LBW01234 - A01). This is the item number of the piece, which corresponds to the item number on the construction layout drawings. It is recommended that each piece be installed sequentially, starting at the beginning point of the run. This would typically be the cable tap box, transformer, switchboard, or switchgear connection.

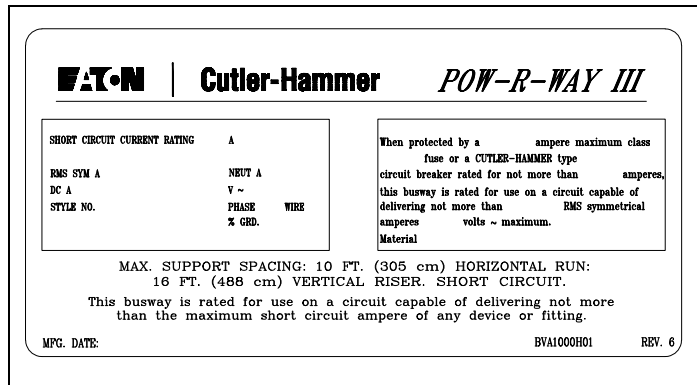


Figure 2. Busway Nameplate.

**Phasing and Orientation Labels**

Each piece of the Eaton Cutler-Hammer Pow-R-Way III busway has "T" and "F" labels as shown in Figure 3. The "T" label indicates phasing. From the "T" side of the busway, the standard phasing is G-A-B-C-N unless the layout drawings specify an alternate phasing. The "F" label is used for orientation.



Figure 3. Busway Labels.

The Pow-R-Way III busway construction is not symmetrical. It is imperative for all sections of the busway to be installed with all of the labels aligned and consistent throughout the run and per

Eaton-supplied construction drawings. Failure to do so may result in damage to the busway as well as property damage, physical harm or death.

**⚠ WARNING**

**FAILURE TO INSTALL THE BUSWAY CORRECTLY MAY RESULT IN DAMAGE TO THE BUSWAY AS WELL AS PROPERTY DAMAGE, PHYSICAL HARM, OR DEATH.**

When phase transposition sections are utilized, this phasing convention will change. The "T" and "F" labels will be rotated 90 or 180 degrees from one side of the piece to the other. Correct alignment will be shown on the construction drawings.

**Joint Installation**

When connecting pieces of the Eaton Cutler-Hammer Pow-R-Way III busway together, make certain that contact surfaces are clean and free from contaminants. Some section may have electrical lubricant on the contact surfaces, which was applied by the factory. This will aid in joint installation.

Align the left end of one section to the right end of the adjoining section with the "T" and "F" labels in alignment. One end will have a Pow-R-Bridge joint installed and the other end will be conductor end. Figure 4 illustrates correct joint installation.

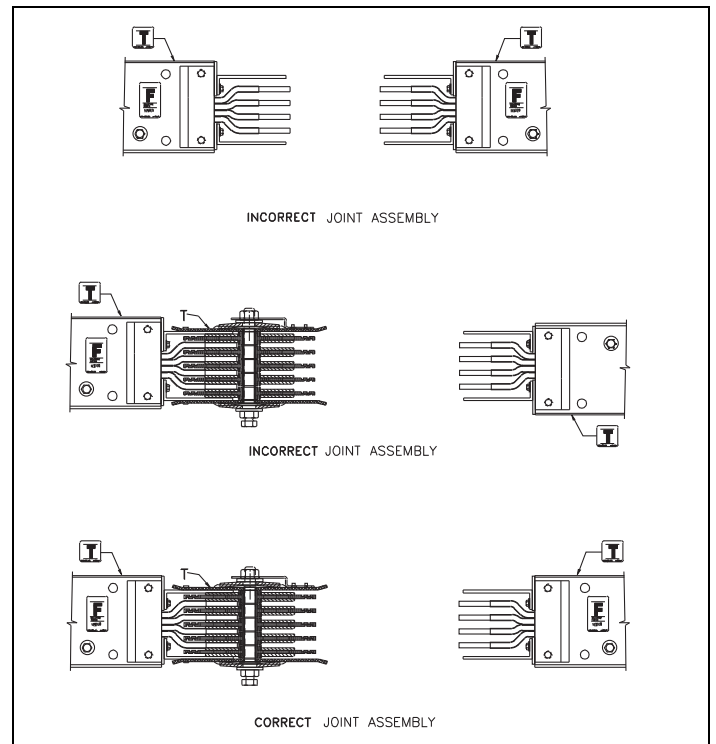


Figure 4. Joint Installation.

Slide the conductor end into the joint end. To avoid insulator damage, ensure that the phase conductors and top and bottom ground plates are properly seated within the Pow-R-Bridge joint before the two sections are fully drawn together. Each section should be 4.5 in. (114.3 mm) measured from the edge of the housing to the center-line of the joint bolt. Pow-R-Bridge joints are adjustable +/- 1 in. (25.4 mm). When adjustment is required,

remove the bridge joint retainer screw, loosen the joint cover bolts and then push the two sections together or pull apart as required. The joint covers are slotted to ensure proper clearance and contact surface area. Figure 5 illustrates joint installation using joint puller catalog number JP-1. See instruction drawing BVD1098.

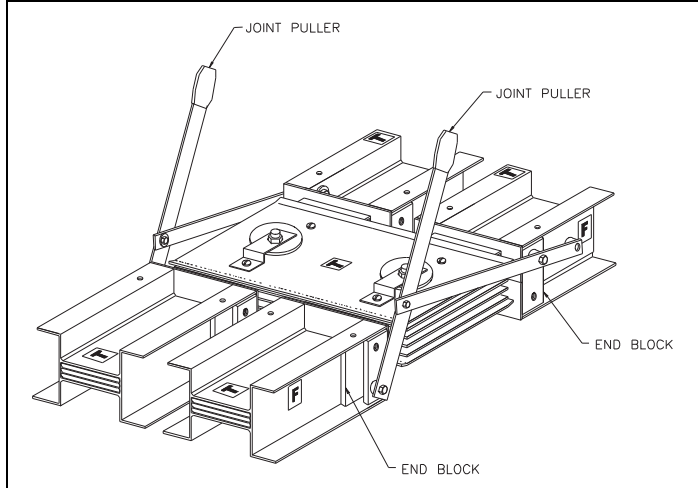


Figure 5. Joint Puller.

**Torque Indication Bolt**

When the two sections have been properly joined together, the joint bolt may be tightened. This joint bolt is a special torque-indicating bolt with two bolt heads to ensure that the proper installation torque is achieved. Fall away instruction tags are provided between the upper and lower bolt heads. A standard socket wrench with a minimum 14 in. (355.6 mm) handle should be used to tighten the joint bolt. Torque should only be applied to the upper bolt head. When the proper torque is achieved, this bolt head will shear off, allowing the tag to fall to the floor (see Figure 6).

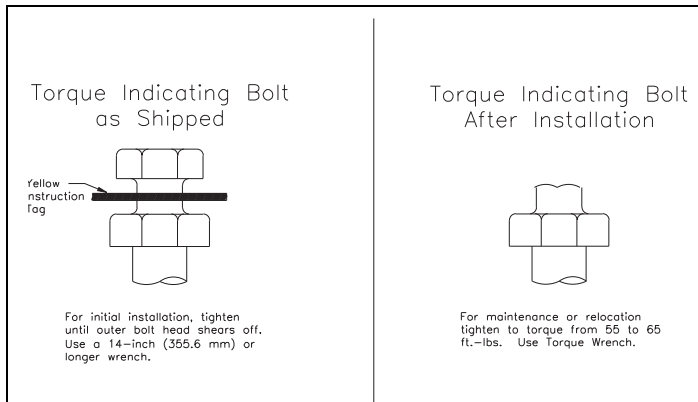


Figure 6. Joint Bolt Detail.

Any joint bolt that is improperly tightened will retain the highly visible tag and should be retightened. The lower bolt head remains intact for future maintenance. A label is provided on the Pow-R-Bridge joint with the proper torque requirements (see Figure 7).

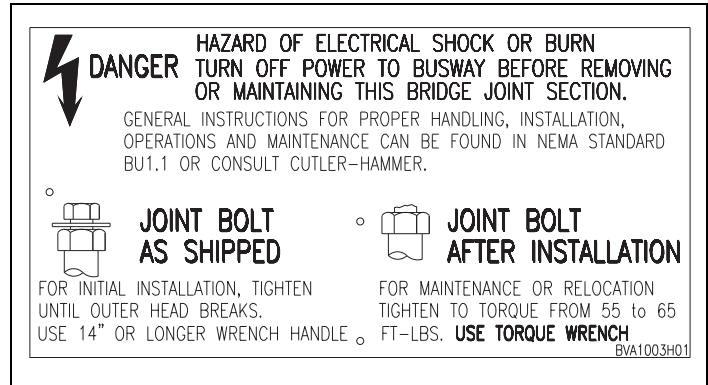


Figure 7. Joint Bolt Label.

**Note:** For maintenance or relocation, torque joint bolts from 55-65 ft. lbs. (74.57 - 88.13 N-m) using a torque wrench.

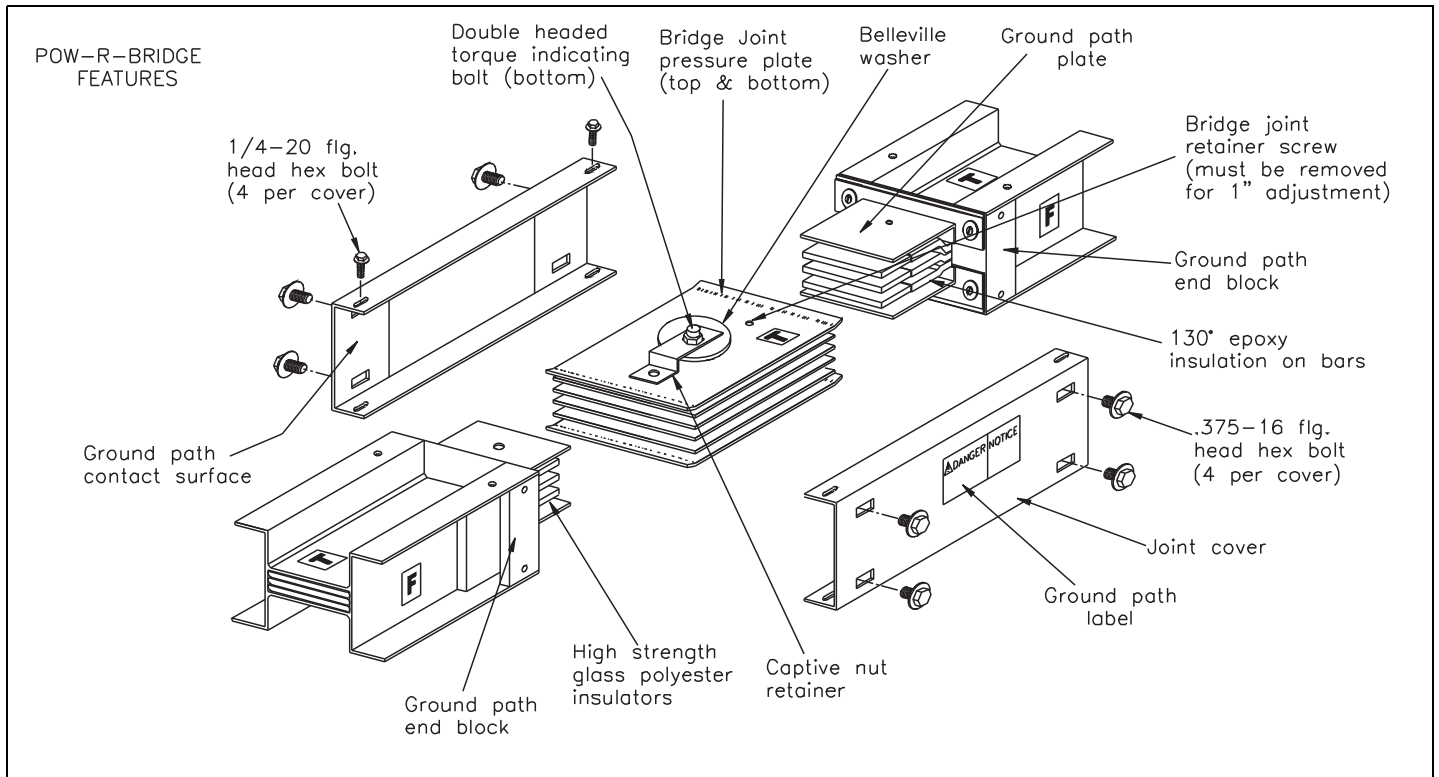
**Joint Cover Installation**

After each joint bolt has been tightened to the proper torque, the joint covers may be installed. For indoor joint cover installations, see joint assembly instructions BVD1050 and Figure 8. Joint covers prevent incidental contact with energized conductors and connect a portion of the housing ground path between two sections of busway.

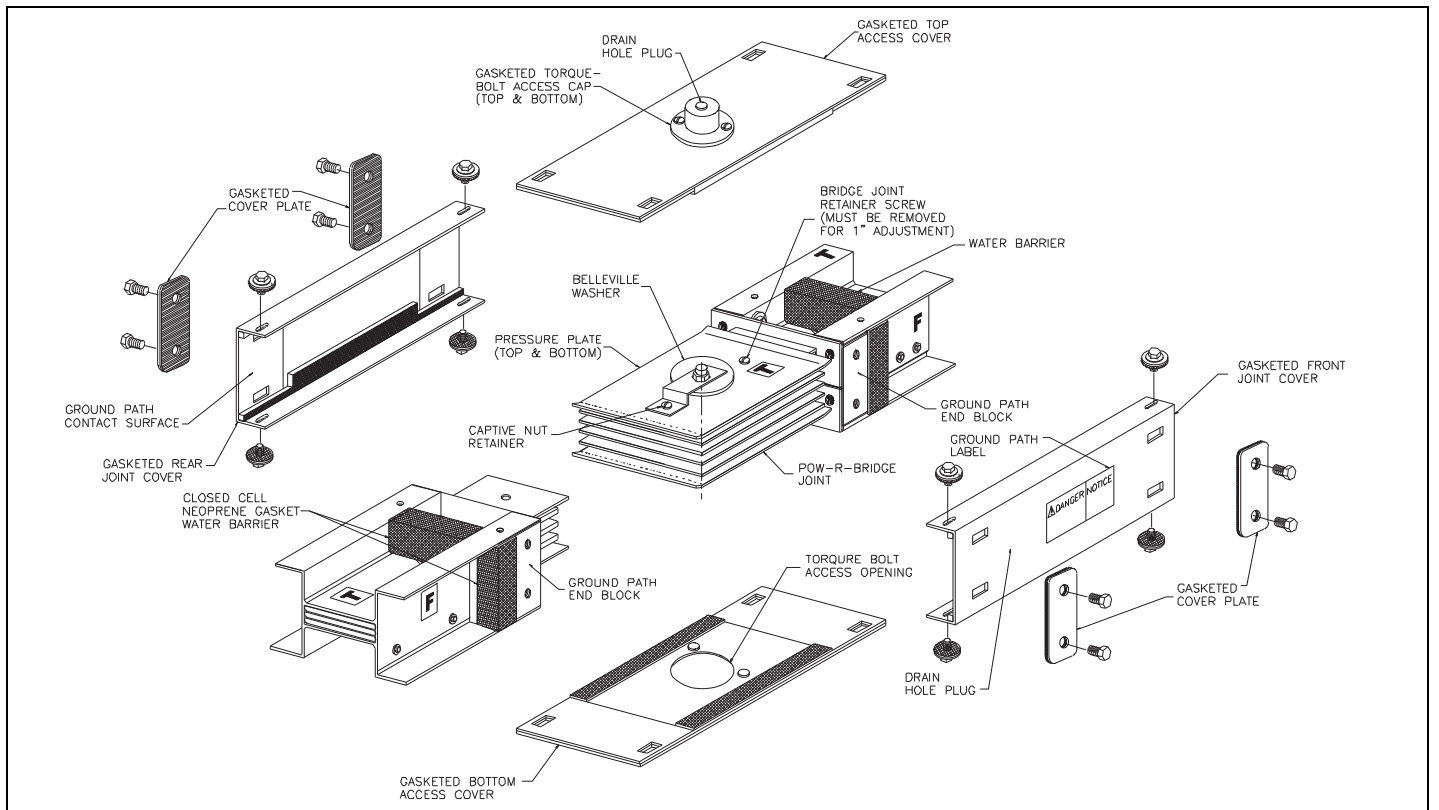
For outdoor joint cover installations, see joint assembly instructions BVD1082 and Figure 9. Aluminum water barriers are provided across the "T" and "T-opposite" sides of both joint ends of each section of outdoor rated busway. Ensure that the closed-cell neoprene gasket material is not damaged and is clean and free of debris and that the covers are not bent or damaged to ensure proper seal.

**Note:** Outdoor joints require caulk to be applied by the installer before the joint is considered fully outdoor rated. Dow Corning 795 silicone caulking compound or Dap Inc. Dynaflex 230 latex sealant is recommended.

**Note:** Drain plugs positioned on the under side of the horizontally mounted Pow-R-Way III busway must be removed to allow drainage of moisture or condensation. For the vertically positioned Pow-R-Way III busway, the lower drain plugs on the side covers must be removed.



**Figure 8. Indoor Joint Assembly.**



**Figure 9. Outdoor Joint Assembly.**

### Horizontal Mounting

For over-head mounting of the Eaton Cutler-Hammer Pow-R-Way III busway, 0.5 in. (12.7 mm) all-thread drop rods must be used for standard hangers and 0.75 in. (19.1 mm) all-thread drop rods for seismic rated applications. All-thread drop rods must be provided by the installer and should not be spaced more than 10 ft (3 m) apart.

Two types of hanger support may be provided: hook hangers requiring a single drop rod or angle hangers requiring two drop rods (see Figure 10).

Hook hangers are supplied as standard with angle hangers provided for busways with 2 conductors per phase or if requested. All seismic rated applications must use angle hangers. See horizontal hanger data BVC1037.

Care should be given when locating drop rods in order to avoid placing hangers at joint and plug-in unit locations. Adequate ceiling clearance must be allowed for plug-in units.

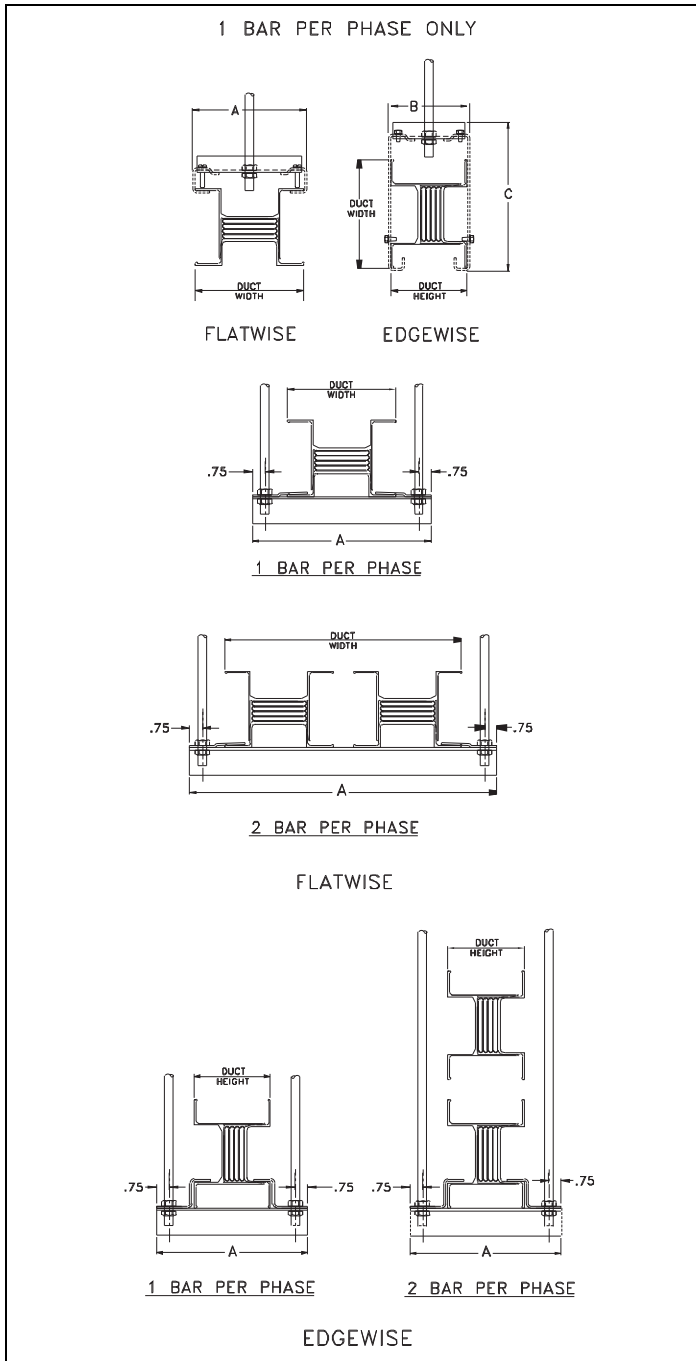
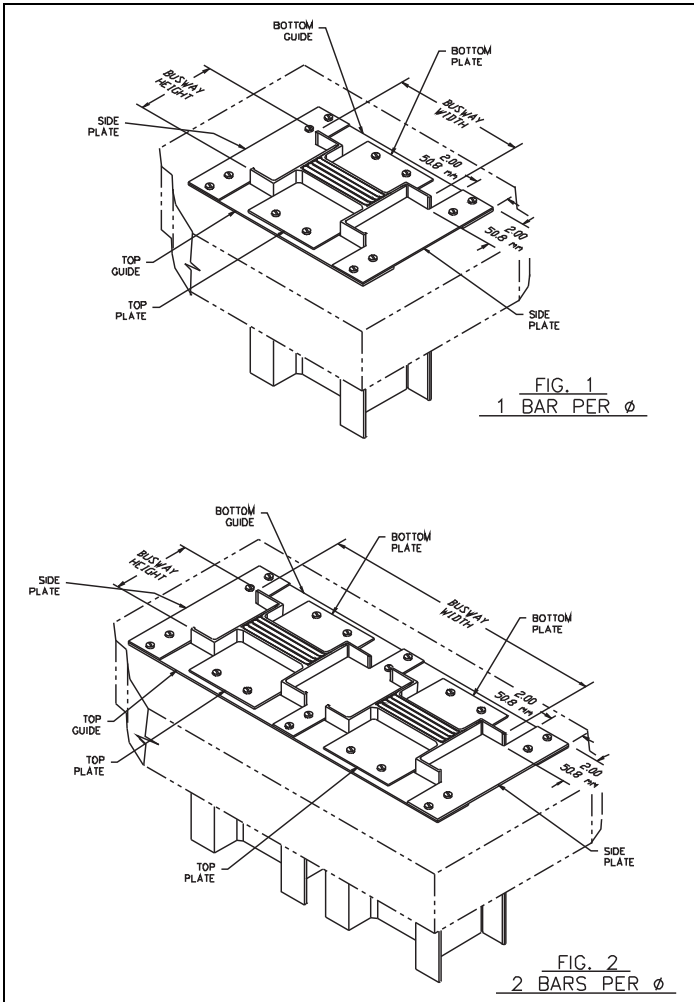


Figure 10. Hook and Angle Hangers.

**Vertical Mounting**

For mounting the busway vertically, vertical spring hangers must be used. A vertical hanger must be used on every floor or a maximum of every 16 ft (4.9 m). Intermediate hangers are required for floor heights exceeding 16 feet (4.9m).

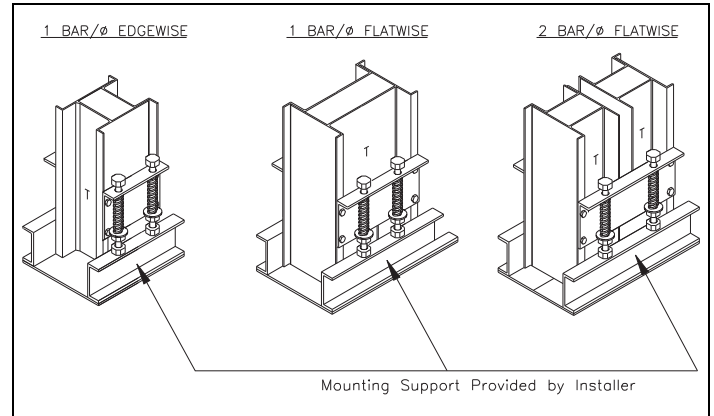
The hole in each floor through which the busway penetrates should not be more than 1 in. (25.4 mm) wider than each side of the busway. After the busway is placed through the floor, the floor flange must first be installed before installing the vertical spring hanger. See Figure 11 and floor flange installation instructions BVC1084.



**Figure 11. Floor Flange Details.**

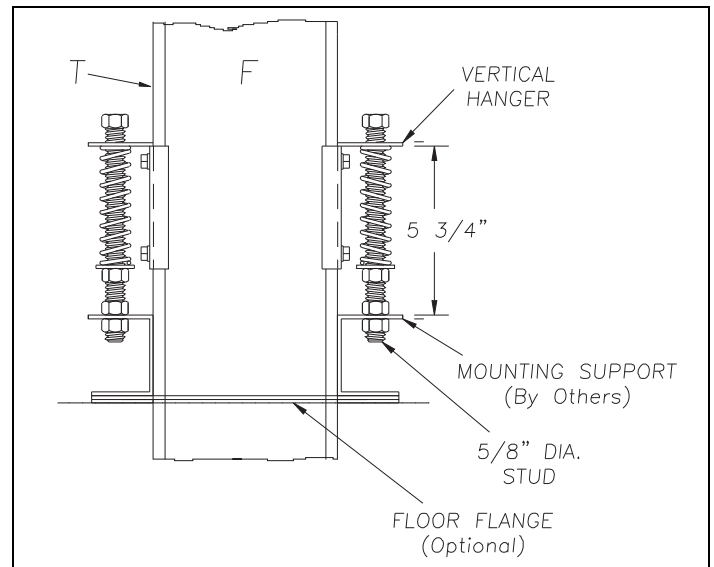
Before the vertical spring hanger is installed, ensure that the joint above the floor is minimum 16 in. (406.4 mm) above the floor or curb, or according to the dimensions shown on the construction layout drawings. This will prevent interference with the joint covers.

After the floor flange is installed, the vertical spring hanger may be installed. This must be done in conjunction with a mounting support or channel and must be provided by the installer (see Figure 12).



**Figure 12. Vertical Spring Hanger Mounting Support.**

The vertical hanger should be mounted 5.75 in. (146.1 mm) above the mounting support (see Figure 13). Install per vertical hanger instructions BVC1033. Determine the location where the spring bolts come in contact with the mounting support. Drill 0.625 in. (15.9 mm) holes into the mounting supports and install the spring bolts.



**Figure 13. Vertical Spring Hanger Details.**

Once the vertical spring hanger is installed, tighten the nut below the spring per instructions BVC1033 (see Figure 14). This is adjusted according to weight.

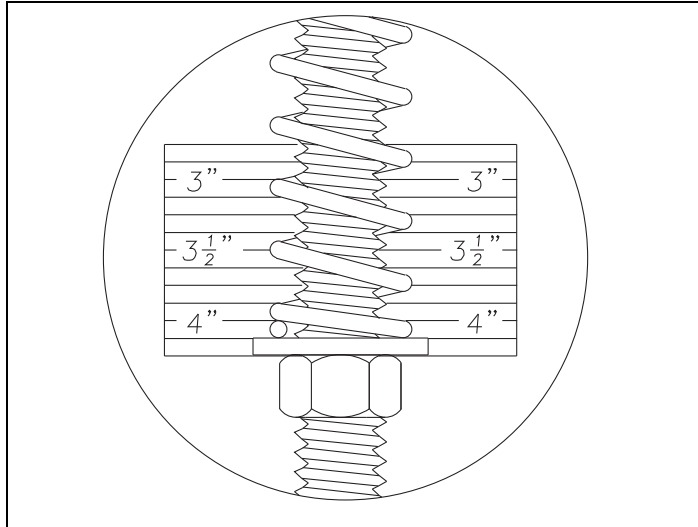


Figure 14. Vertical Spring Hanger Adjustment.

### Wall Penetrations

When an Eaton Cutler-Hammer Pow-R-Way III busway passes through a wall or vertical barrier, the opening should be at least 1 in. (25.4 mm) larger than the outside dimensions of the busway (see Figure 15). Install a wall flange on each side of the wall per wall flange instructions BVC1084.

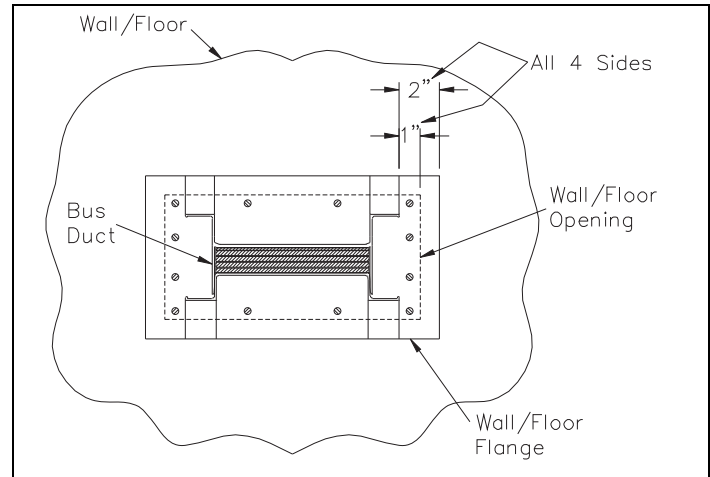
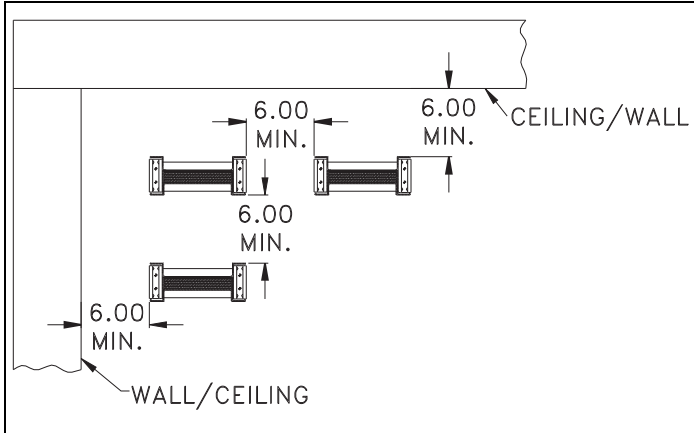


Figure 15. Wall Flange Details.



**Busway Installation Clearances**

For individual and multiple runs of Eaton Cutler-Hammer Pow-R-Way III busways, thought must be given to horizontal and vertical clearances between runs, walls, and ceilings. Clearances shown in Figure 16 must be maintained for assembly purposes.

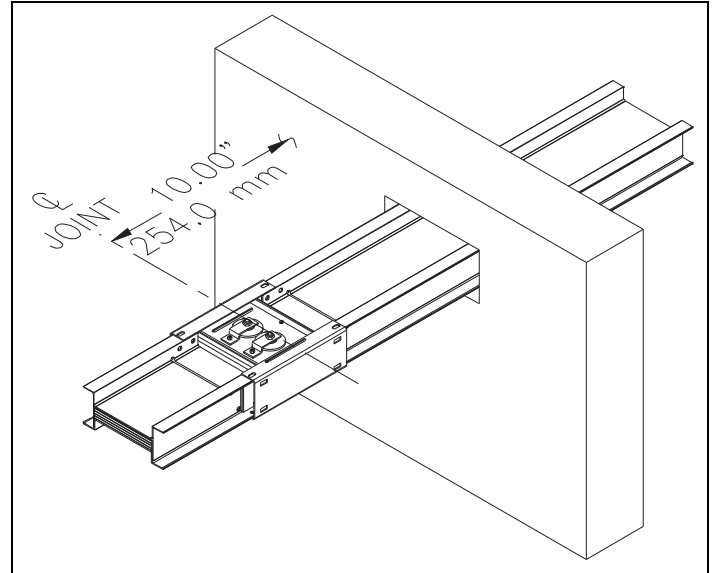


**Figure 16. Minimum Busway, Wall, and Ceiling Clearances.**

**Note:** The joint bolt-head is on the T-opposite side of the busway. The installer should ensure that there is adequate room for installation and maintenance.

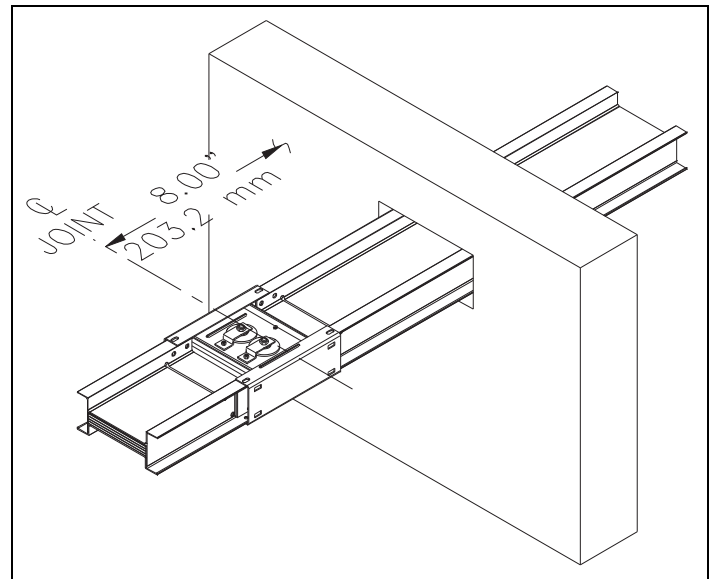
**Busway Joint Clearances**

Busway joint sections may not fall within walls or floors. Figures 17 through 19 illustrate the minimum clearances required as measured from the center-line of the joint to the wall, floor and ceiling.



**Figure 17. Minimum Outdoor Joint Clearances.**

**Note:** Busway joints on outdoor rated busway should have a minimum of 10 in. (254 mm) clearance on either side of walls.



**Figure 18. Minimum Indoor Joint Clearances.**

**Note:** Busway joints on Indoor rated busways should have a minimum of 8 in. (203.2 mm) clearance on either side of walls.

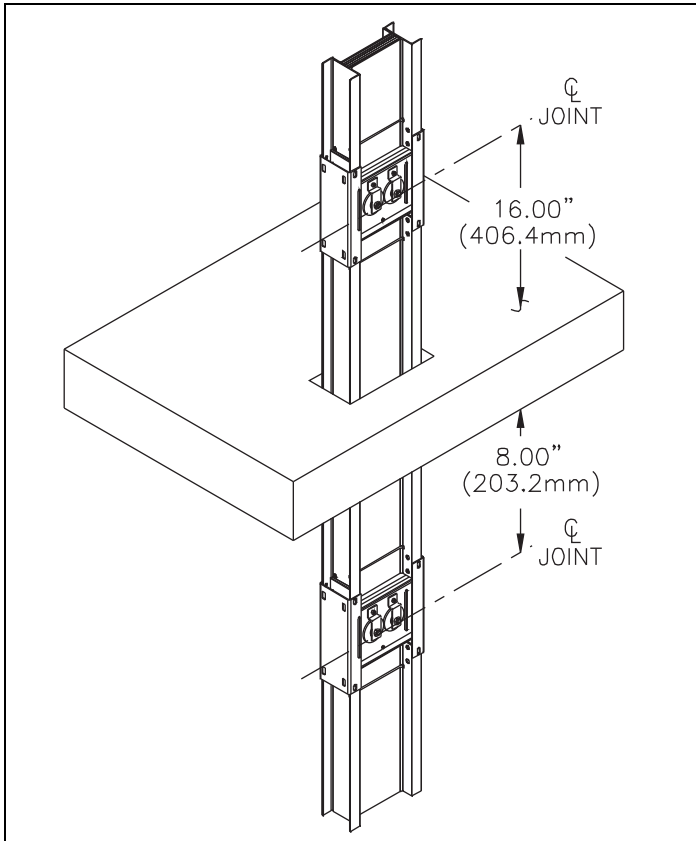


Figure 19. Minimum Floor/Ceiling Joint Clearances.

**Note:** Busway joints on vertically mounted busway should have a minimum of 8 in. (203.2 mm) clearance before ceilings and a minimum of 16 in. (406.4 mm) clearance above floors or curbs if used.

### Plug-In Unit Installation

Each Eaton Cutler-Hammer Pow-R-Way III plug-in unit is shipped with installation instructions located inside the enclosure (see publication IM017010003E).

#### **⚠ DANGER**

**HAZARD VOLTAGE AND EXPOSED ELECTRICAL CONDUCTORS ARE PRESENT THAT WILL RESULT IN ELECTRICAL SHOCK, BURN, OR EXPLOSION.**

**TURN OFF THE DISCONNECT BEFORE PLUGGING IN OR REMOVING THE BUS PLUG. DO NOT OPERATE THE SWITCH WITH THE COVER OPEN. TURN OFF THE DISCONNECT BEFORE OPENING THE COVER AND BEFORE TESTING, REMOVING, OR INSTALLING FUSES. SEE THE INSTRUCTIONS ON THE INSIDE OF THE COVER.**

**FAILURE TO DO SO WILL RESULT IN ELECTRICAL SHOCK, SEVERE PERSONAL INJURY, OR DEATH.**

The power to the busway/bus duct should be turned off to ensure that the installation of the plug-in unit if performed in the safest manner possible.

1. Prior to installing the plug-in unit, inspect it for damage.
2. Make sure there are no missing parts.
3. The operating handle must be in the off position before mounting the plug-in unit onto the busway.
4. Using established safety procedures while working on this equipment must be exercised.

### Operating Handle

The operating handle may be received in a shipping position. Ensure that the operating handle is adjusted by removing the center screw. Place the handle in the off position and re-tighten the center screw. The handle should be mounted on the end of the enclosure for horizontal mounting positions and mounted on the side for vertical mounting positions.

### Busway Joint Covers

If installing a plug-in unit over a joint cover and/or the busway is equipped with a 200% neutral, see Figure 20 and instructions IM017010003E.

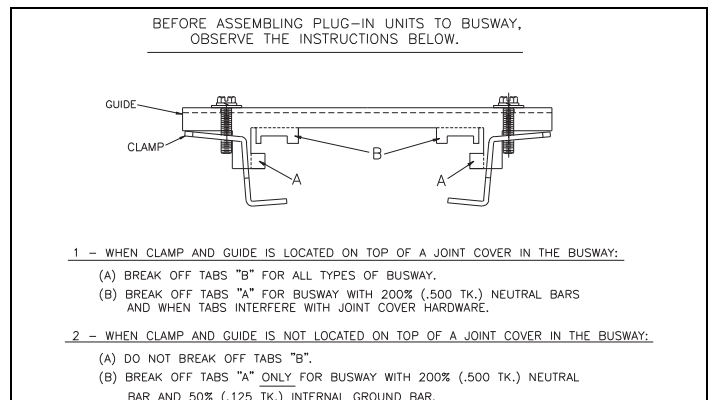
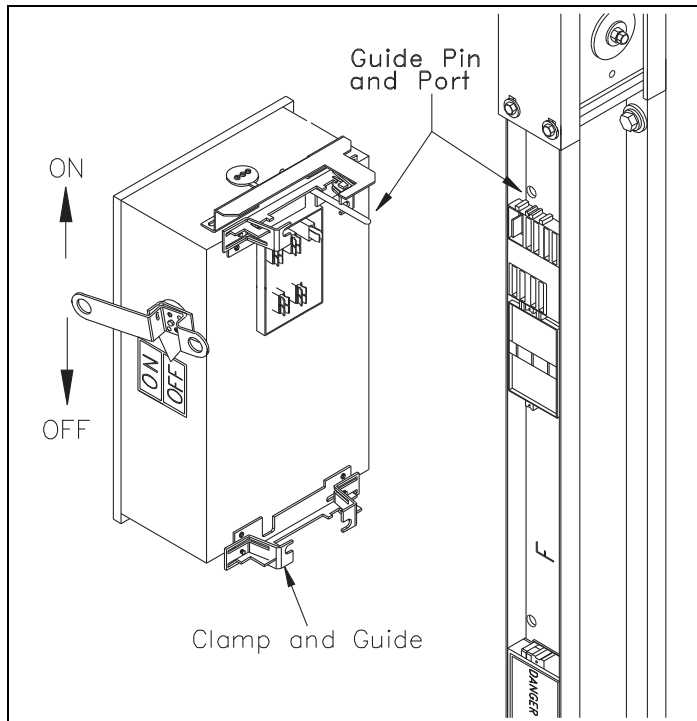


Figure 20. Plug-in Unit Guide Modifications.

**Mounting**

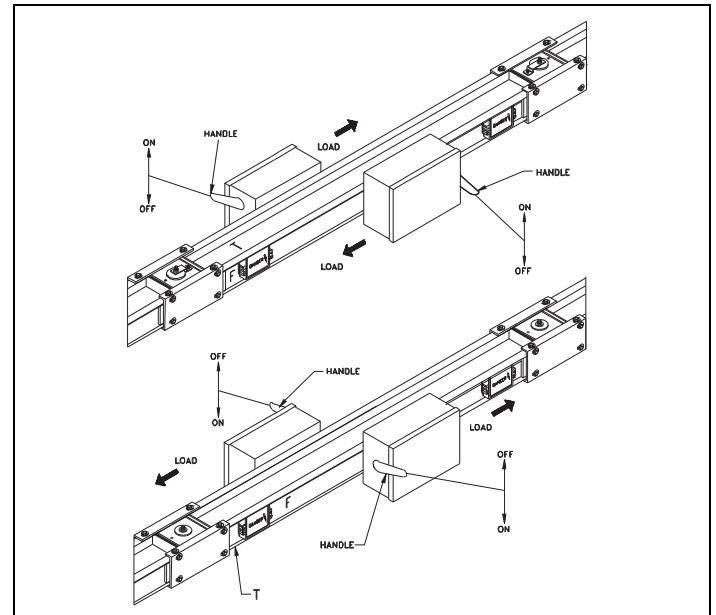
When mounting the plug-in unit to the busway, ensure that the clamps are loosened and spread apart and that the operating handle is in the off position. Insert the guide pin into the guide hole (see Figure 21). The guide pin ensures that the plug-in unit is installed with the proper phase sequence. Align the stabs, pressing them onto the busway and tighten down the clamps closest to the guide pin. Push on the bottom portion of the plug-in unit and then tighten down the remaining clamps.



**Figure 21. Plug-In Unit Mounting.**

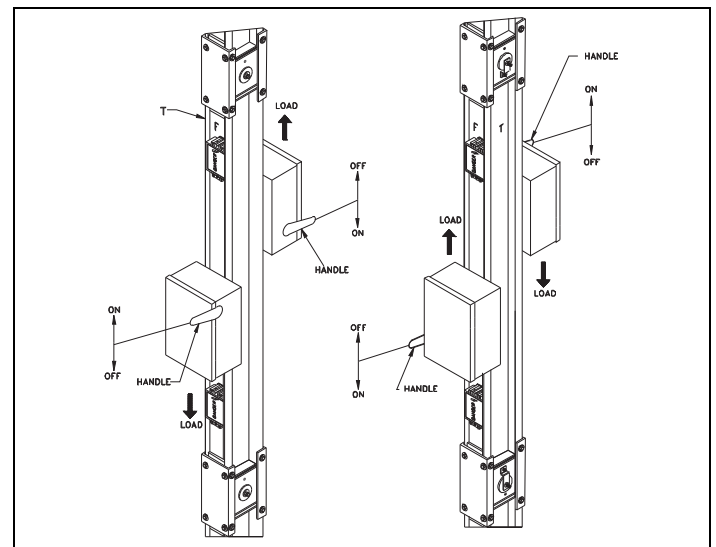
**Plug-in Unit Orientation**

The load end of the plug-in unit varies with the orientation of the busway, as determined by the "T" and "F" labels on the busway. Refer back to page 2 for information on phasing and orientation labels. Figures 22 and 23 illustrate the "On-Off" positions on the plug-in unit based upon the busway orientation.



**Figure 22. Horizontal Orientation.**

**Note:** For horizontal mounting positions, the plug-in unit operating handle will operate with "On" in the upward position and "Off" in the downward position if the "T" label is facing upward.



**Figure 23. Vertical Orientation.**

**Note:** For vertical mounting positions, the plug-in unit operating handle will operate with "On" in the upward position and "Off" in the downward position if the "T" label is facing to the left when looking straight at the busway.

### Plug-in Unit Installation Clearances

Clearances around plug-in units must be maintained to allow room for proper plug operation and access. Figures 24 through 26 illustrate clearance constraints. See TD01701001E (page 47) for dimension values.

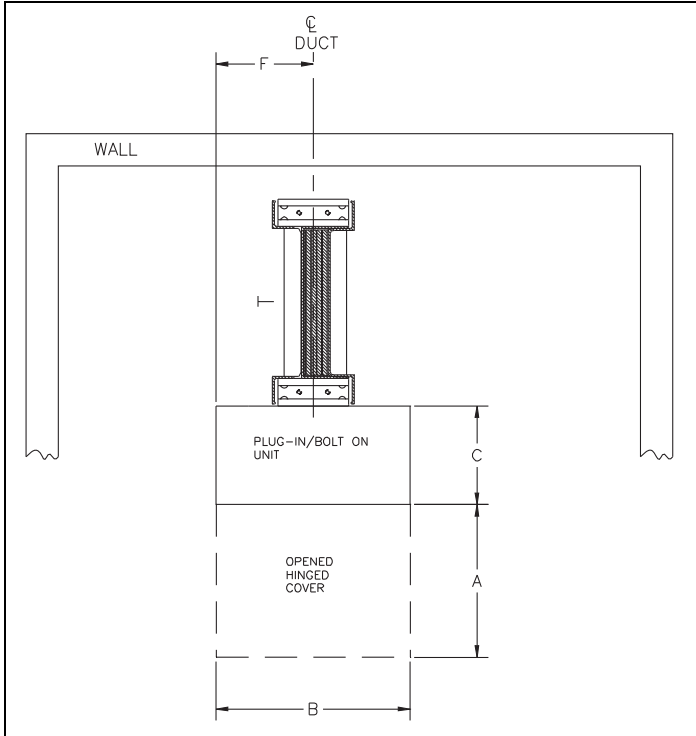


Figure 24. Plug-in Unit Door Clearance.

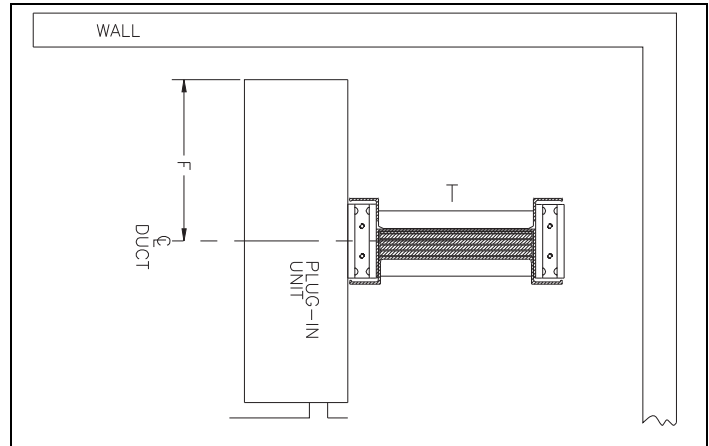


Figure 26. Plug-in Unit Wall Clearance.

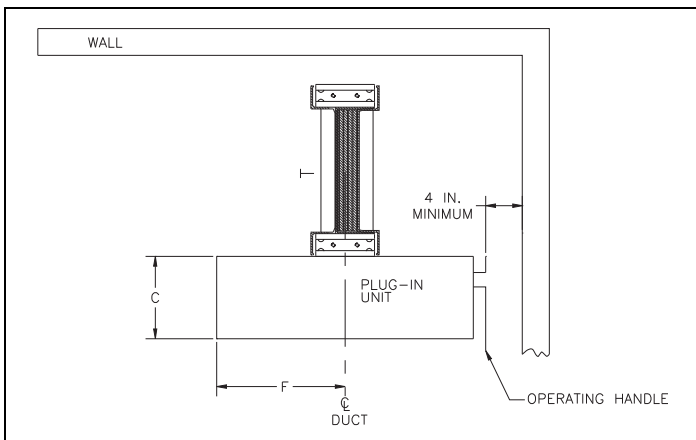


Figure 25. Plug-in Units Operating Handle Clearance.

## Care and Maintenance Procedures

A preventative maintenance schedule should be established in order to achieve the best possible service from your Eaton Cutler-Hammer Pow-R-Way III busway. It is recommended that an annual maintenance check and necessary procedures be conducted at a minimum. Busways subjected to severe operating conditions may require more frequent maintenance. For general instructions regarding handling, installation, operation, and maintenance of busway rated 600 volts or less, see NEMA Standards Publication BU 1.

It is recommended that a permanent maintenance record be kept recording the dates of service, work performed and any measured data.

### DANGER

**HAZARD OF ELECTRICAL SHOCK OR BURN. TURN THE POWER TO THE BUSWAY OFF BEFORE INSTALLING, REMOVING, OR WORKING ON THIS EQUIPMENT.**

### WARNING

**ONLY THOSE TRAINED AND QUALIFIED IN RECOGNIZED SAFETY PRACTICES SHOULD PERFORM MAINTENANCE ON THE BUSWAY.**

## Preventative Measures

Care should be taken to protect the busway from contaminants. For in-door applications, inspect the busway routing area looking for possible moisture points from roof leaks, pipe leaks, dripping condensation from pipes and HVAC equipment, and exhaust fans blowing dust and debris onto the busway. The busways should be protected from these hazards. All damaged equipment should be replaced. All equipment subject to moisture intrusion should be replaced.

## Busway Inspection

1. Clean the busway removing accumulated dust, dirt, and other debris. Do not use water, liquid cleaning solutions, or chemicals to clean the busway.
2. Perform a visual inspection on the busway looking for stress or damage and moisture intrusion.
3. Inspect the joint cover bolts for tightness.
4. Visually inspect the Belleville washers at each joint to ensure they are compressed. Compressed washers indicate proper torque.
5. Should additional torque be required, use a torque wrench and torque 55-66 ft lbs (74.57 - 88.13 N-m) as labeled at each joint.
6. Perform an infra-red thermal scan on all electrical connections, joint connections, and busway enclosures while the busway is fully energized and operating under full load conditions. Should readings change with time, further inspection and corrections may be required.

If damaged and/or over heating has been found, it is recommended the following procedures be performed.

### WARNING

**FOR THE FOLLOWING PROCEDURES, THE BUSWAY MUST BE SHUT OFF AND DE-ENERGIZED.**

### WARNING

**FAILURE TO FOLLOW SAFETY PROCEDURES MAY CAUSE PROPERTY DAMAGE, SERIOUS PERSONAL INJURY AND DEATH.**

1. After the busway has been de-energized, remove the joint covers and visually inspect the joints looking for gaps in the contact surface areas, cracks in the insulators, and contaminants or corrosion.
2. Clean, replace damaged parts, and re-torque as required.
3. Perform an insulation resistance test prior to re-energizing.
4. Should moisture intrusion be found, remove and replace all affected pieces.

Insulation resistance test should be done at 1000 volts and readings should be at least one megohm per 100 ft (30.48 m) of busway. The system and/or pieces should be checked phase-to-ground, phase-to-phase, and phase-to-neutral. The following formulas may be used for busway runs that are shorter or longer than 100 ft (30.48 m).

$$\text{Megohms} = 100/\text{length of busway in feet}$$

$$\text{Megohms} = 30.48/\text{length of busway in meters}$$

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## Plug-In Unit Inspection

When inspecting and performing maintenance on plug-in units, ensure the plug operating handle is in the "Off" position and that the power to the busway is turned off.

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### DANGER

**HAZARD OF ELECTRICAL SHOCK OR BURN. TURN THE POWER TO THE BUSWAY OFF BEFORE INSTALLING, REMOVING, OR WORKING ON THIS EQUIPMENT.**

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### WARNING

**RECOGNIZED SAFETY PROCEDURES MUST BE FOLLOWED PRIOR TO ANY WORK OR MAINTENANCE BEING PERFORMED.**

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## Note

These maintenance instructions and procedures do not represent an exhaustive list of maintenance steps required to maintain safe operation of the busway and plug-in units under all applications. Specific applications may require additional steps and procedures. For additional information or assistance with issues not covered sufficiently in this publication, contact the local Eaton sales office or call 1-800-498-2678 for renewal parts and factory assistance.

1. Move the operating handle of the plug-in unit to the "Off" position
2. Turn off power to the busway.
3. Using a multi-meter, open the plug-in unit door and check to ensure there is no voltage present on the line side of the unit.
4. For fusible units, check the fuse clip contact pressure and contact means. If there are any sign of over-heating, replace fuse clips.
5. Look for any signs of deterioration of insulating materials and protective barriers.
6. Check the operation of all mechanical components.
7. Check the mechanisms of all electrical and mechanical interlocks and padlocking means.
8. Check for missing or broken parts, rusting, corrosion, dirt, and excessive wear.
9. Check the line and load connections to ensure proper torque.
10. Clean off any arc spatter or soot deposits.
11. Replace any damaged parts.
12. Operate each switch or circuit breaker several times to ensure proper working order.

**Insulation Resistance Readings - Prior To Energizing**

<b>Date:</b>	
<b>Run:</b>	
<b>Phase</b>	<b>(M - Ohm)</b>
A - G	
B - G	
C - G	
N - G	
A - B	
A - C	
B - C	
A - N	
B - N	
C - N	

<b>Date:</b>	
<b>Run:</b>	
<b>Phase</b>	<b>(M - Ohm)</b>
A - G	
B - G	
C - G	
N - G	
A - B	
A - C	
B - C	
A - N	
B - N	
C - N	

<b>Date:</b>	
<b>Run:</b>	
<b>Phase</b>	<b>(M - Ohm)</b>
A - G	
B - G	
C - G	
N - G	
A - B	
A - C	
B - C	
A - N	
B - N	
C - N	

<b>Date:</b>	
<b>Run:</b>	
<b>Phase</b>	<b>(M - Ohm)</b>
A - G	
B - G	
C - G	
N - G	
A - B	
A - C	
B - C	
A - N	
B - N	
C - N	

<b>Date:</b>	
<b>Run:</b>	
<b>Phase</b>	<b>(M - Ohm)</b>
A - G	
B - G	
C - G	
N - G	
A - B	
A - C	
B - C	
A - N	
B - N	
C - N	

<b>Date:</b>	
<b>Run:</b>	
<b>Phase</b>	<b>(M - Ohm)</b>
A - G	
B - G	
C - G	
N - G	
A - B	
A - C	
B - C	
A - N	
B - N	
C - N	

<b>Date:</b>	
<b>Run:</b>	
<b>Phase</b>	<b>(M - Ohm)</b>
A - G	
B - G	
C - G	
N - G	
A - B	
A - C	
B - C	
A - N	
B - N	
C - N	

<b>Date:</b>	
<b>Run:</b>	
<b>Phase</b>	<b>(M - Ohm)</b>
A - G	
B - G	
C - G	
N - G	
A - B	
A - C	
B - C	
A - N	
B - N	
C - N	

<b>Notes:</b>

<b>Notes:</b>

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