

# Power Plant Bus Bar Installation

Contents	Subject	Page
	<b>1. General</b> .....	<b>1</b>
	1.1 Purpose .....	1
	1.2 Filing Instructions .....	1
	1.3 Supersedures .....	1
	1.4 Copyright and Responsibility .....	2
	1.5 Disclaimer .....	2
	<b>2. Overview</b> .....	<b>3</b>
	2.1 Engineering Drawings .....	3
	2.2 Precautions .....	3
	2.3 Miscellaneous Materials .....	4
	<b>3. Preparing Bus Bars</b> .....	<b>4</b>
	3.1 Cutting .....	4
	3.2 Drilling .....	4
	3.3 Bending .....	4
	3.4 Preparing Joints .....	5
	<b>4. Erection and Supporting</b> .....	<b>7</b>
	4.1 Bolting .....	7
	4.2 Torque Requirements .....	8
	4.3 Clamping .....	8
	4.4 Supporting and Insulating .....	11

## 1. General

- 1.1 Purpose** This practice describes installation methods for power plant bus bars, including:
- Initial installations in a new office\_
  - Procedures used when expanding an existing office\_
- 1.2 Filing Instructions** This practice supersedes Issue 7, July 1989. Remove Issue 7 and replace with this Issue 8 in your practices set.
- 1.3 Supersedures** This practice supersedes all local addendums to GTE Practice 205-705-201, Issue 7, including but not limited to:
- 205-705-201 CA, Power Plant Busbar.
  - 205-705-201SW, Power Plant Bus Bar Installation.
  - 205-705-202CA, DC Bus Duct – Description and Installation.

# 1. General, continued

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## 1.4 Copyright and Responsibility

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## 1.5 Disclaimer

This practice has been prepared for GTE Telephone Operations employees, customers, and end users' employees who operate and maintain the equipment engineered and installed by GTE. The information in this practice is subject to change and may not be suitable in all situations. GTE Telephone Operations acknowledges that a customer's special requirements or practices may take precedence over those supplied in this practice if a conflict develops during installation or ongoing operation. GTE Telephone Operations hereby disclaims any responsibility or liability for any consequential or inconsequential damages that may result from the use of this practice.

## 2. Overview

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### 2.1 Engineering Drawings

Engineering drawings for the installation must specify:

- All materials and details to be used ( bus bar, clamps, fittings, insulators, supports, etc.).

AND

- The routing that the bus bar will follow.

Study these drawings carefully to determine the best possible sequence of assembly and erection to follow. Installing the terminating details first and working toward the clamping points is usually the sequence to follow. In this manner, variations can be absorbed in the assembly of the clamped points.

### 2.2 Precautions

In order to prevent personal injury, observe the following precautions when installing bus bars.

- Wear safety goggles when drilling or cutting the bus bar.
- Remove all burrs and sharp edges from the bus bar after cutting or drilling.
- Cover all tools used when working on live bus bars with approved insulating material.
- Ensure that proper supervision is provided when an installer performs any work on live bus bars or equipment. Refer to GTE Telephone Operations Practice 200-001-000.
- When working on live bus bars, use a battery-powered drill. If a battery-powered drill is not available, use a double-insulated drill or isolate the third-wire (ground) from the AC plug of a grounded drill. Before starting to drill, check the drill chuck with a volt-ohm meter while the drill is running to make sure there is no potential on it.

**WARNING: Remove the drill bit and chuck key before attempting this procedure. Be sure no loose clothing, cords, etc., become entangled in the rotating chuck.**

- When connecting a bus bar to any point which could possibly be live, use a volt-ohm meter to determine whether a voltage exists between the point and the bar to be connected. If voltage does exist, do **not** make a connection until it is determined that no personnel hazard or service hazard exists.
- When any work is being performed near or above live bus bars, cover the bus bars with a suitable insulating material (e.g., rubber blanket) to prevent shorting the live bus bars.

## 2. Overview, continued

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### 2.3 Miscellaneous Materials

Miscellaneous materials referenced in this practice are listed in the following chart.

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Item	Material Code
Non-oxidizing compounds:	
No-Ox-ID Type A Grease	769213
Kopr-Shield	760293
Electrical Joint Compound (EJC)	766618
Rubber Blanket	571030

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## 3. Preparing Bus Bars

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### 3.1 Cutting

Cut copper or aluminum bus bars:

- With either a hand or power hacksaw.

**WARNING:** If a power hacksaw is used, perform the potential check as instructed in paragraph 2.2.

- At a speed slightly slower than when cutting mild steel.

**NOTE:** Use a wax-type cutting lubricant, since both materials tend to load up the saw teeth.

After the bus bar is cut:

- File the end smooth.
- Round or bevel the sharp edges.

### 3.2 Drilling

When drilling copper or aluminum bus bars for bolted joints, use a drill bit 1/32 of an inch larger than the bolt to provide ample clearance. After drilling the hole, countersink both sides of the bar slightly to remove burrs.

### 3.3 Bending

Use the bus bar manufacturer's recommended bender only. The bender must be capable of:

- Bending the bars with an inside radius equal to the thickness of the bars.
- Doing the job without marring or deforming the bar in any way.

### 3. Preparing BUS Bars, continued

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#### 3.4 Preparing Joints

Prepare bus joints as described in the following chart.

<b>If the Bus Joint is:</b>	<b>Then:</b>
Unplated Copper/Copper	<ol style="list-style-type: none"><li>1. Clean the mating surfaces with a Teflon pad or similar material. Do <b>not use</b> a metal pad, wire brush, or rotary tool.</li><li>2. Coat the mating surfaces with No-Ox-ID Type A Grease or Kopr-Shield.</li></ol> <p><b>NOTE: After the joint is made, bolted, or clamped, wipe away excess compound.</b></p>
Aluminum/Aluminum	<ol style="list-style-type: none"><li>1. Clean the mating surfaces with a Teflon pad or similar material.</li><li>2. Coat the mating surfaces with Alcoa #2 Electrical Joint Compound (WC).</li><li>3. Abrade the surfaces through the compound with a fine wire brush.</li><li>4. Using a paper towel or cloth, smooth out the grease to ensure complete coverage. (This is necessary because aluminum oxidizes within seconds after cleaning.)</li></ol> <p><b>NOTE: After the joint is made, bolted, or clamped, wipe away excess compound.</b></p>
Aluminum/Copper	<ol style="list-style-type: none"><li>1. Clean the mating surfaces with a Teflon pad or similar material.</li><li>2. Coat the mating surfaces with Alcoa #2 Electrical Joint Compound (WC).</li><li>3. Abrade the surfaces through the compound with a fine wire brush.</li><li>4. Using a paper towel or cloth, smooth out the grease to ensure complete coverage. (This is necessary because aluminum oxidizes within seconds after cleaning.)</li></ol> <p><b>NOTE: After the joint is made, bolted, or clamped, wipe away excess compound.</b></p>

(continued)

### 3. Preparing BUS Bars, continued

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#### 3.4 Preparing Joints, continued

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If the Bus Joint is:

Then:

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Silver/Silver

Does **not** require a joining compound. When joining duct sections containing ten or more bars, use unmedicated petroleum jelly as a lubricant to aid installation.

**NOTE: When mating any surface to a silver-plated surface, do not polish the silver-plated surface. Silver oxide is a very good conductor.**

**NOTE: After the joint is made, bolted, or clamped, wipe away excess petroleum jelly.**

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Tin/Tin

Does **not** require a joining compound. When joining duct sections containing ten or more bars, use unmedicated petroleum jelly as a lubricant to aid installation.

**NOTE: After the joint is made, bolted, or clamped, wipe away excess petroleum jelly.**

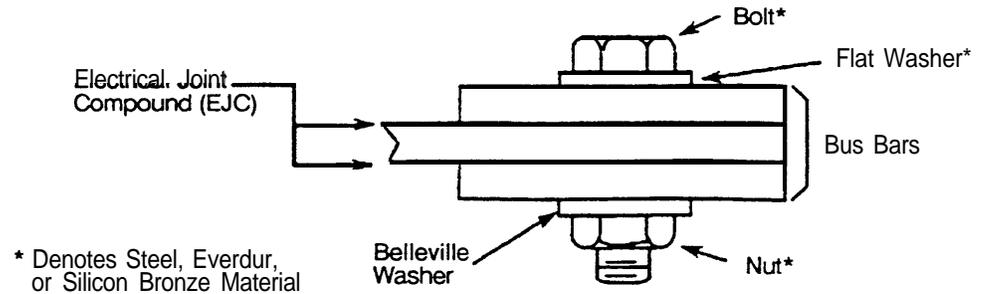
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# 4. Erection and Supporting

## 4.1 Bolting

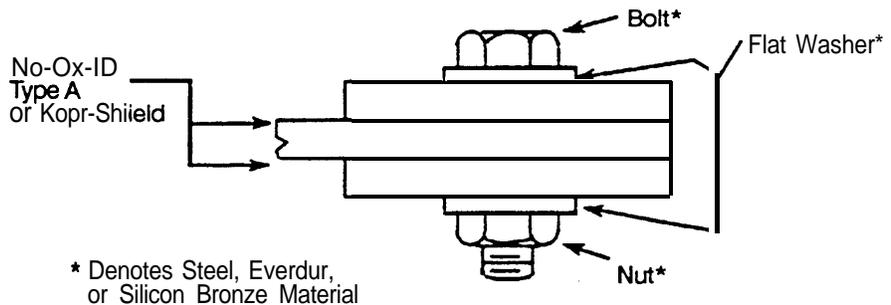
Assemble the various bus bar materials as instructed in the following chart.

When Bolting:	Use:
Aluminum-to-aluminum joint	Steel, Everdur, or Silicon Bronze hardware, and a Belleville washer.
OR	
Copper-to-aluminum joint,	



**NOTE:** When tightening a Belleville washer, tighten the nut until the washer is flattened, then release slightly, not more than one-fourth turn.

Copper-to-copper joint	Steel, Everdur, or Silicon Bronze hardware. Do <b>not</b> use Belleville washers to bolt copper-to-copper bus bar.
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**NOTE:** Do not use split lockwashers on bus bar joints.

## 4. Erection and Supporting, continued

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### 4.2 Torque Requirements

Table 1 lists the tightening torque for bolts used in the joint assembly, except when a Belleville spring washer is correctly used. The spring washer is used to compensate for differences in expansion of bolting various bus bar materials. After the bolt is torqued, as instructed in paragraph 4.02, line mark (torque mark) the nut and bolt with a dark felt-tip pen.

**TABLE 1. Torque Values for Aluminum, Cadmium Steel, Everdur, or Silicon Bronze Bolts**

SIZE	INCH LB	FOOT LB
8	18	1.5
10	24	2
1/4	72	6
5/16	132	11
3/8	228	19
7/16	360	30
1/2	480	20
9/16 – 5/8	660	55
3/4 OR LARGER	900	75

**CAUTION:** The torque values given are to be used on clean, dry (not greased or lubricated) screws, nuts, and bolts. Lubricated or greased threads may cause as much as a tripling of the intended torque value as measured by a torque wrench. Before torquing, use a dry cloth to remove any accidental application of lubricant or grease.

Torque all bolts again after a week to allow compound to settle. When bolting bus bar using a Belleville washer, the torque requirements do **not** apply.

The final installation quality audit consists of checking the torque of:

- Three bus bar clamps (twelve bolts).

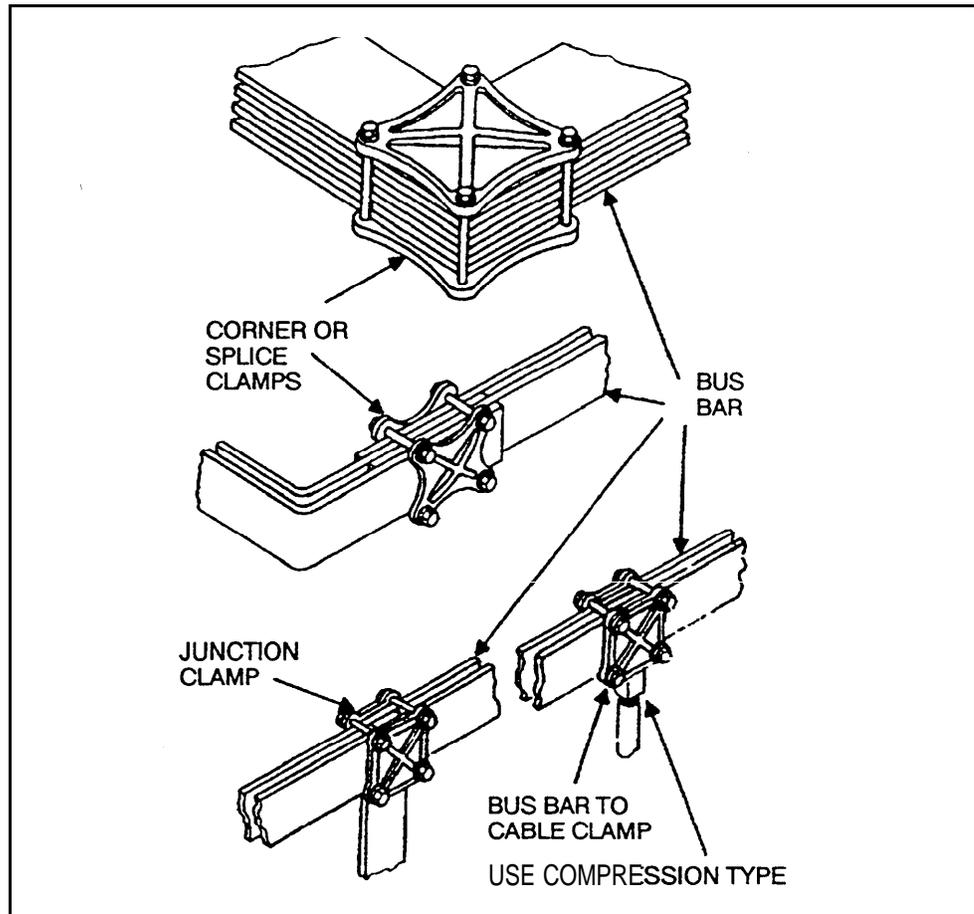
AND

- Three bolted copper-to-copper bus bar connections.

## 4. Erection and Supporting, continued

### 4.3 Clamping

When joining multiple bus bars, use only four-bolt bus bar clamps. These clamps are available in a wide range of sizes and material, depending upon the bus bar to be used. The following illustration shows some typical examples of clamps and arrangements (washers are not required).



## 4. Erection and Supporting, continued

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### 4.3 Clamping, continued

Table 2 lists the tightening torques for bolts used with the clamps.

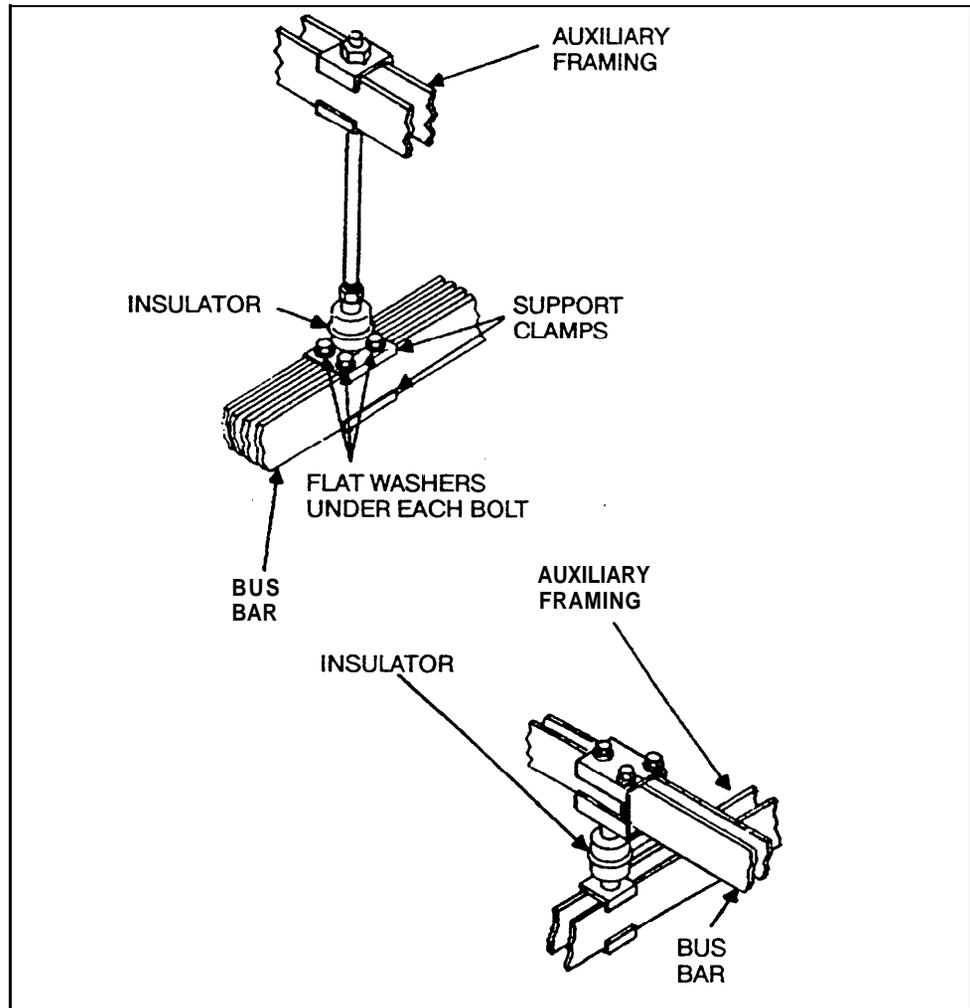
Table 2. Bolt Tightening Torque for Cadmium Steel, Everdur, or Silicon Bronze

BUS BAR CLAMP	BOLT SIZE	TORQUE	
		INCH- POUND	FOOT- POUND
D-69120-A	3/8	228	19
D-69120-B	3/8	228	19
D-69120-C	3/8	228	19
D-69120-D	3/8	228	19
D-69120-E	3/8	228	19
D-69120-F	3/8	228	19
D-691 20-G	1/2	480	40
D-691 20-H	1/2	480	40
D-691 20-I	1/2	480	40
D-69120-J	1/2	480	40
D-691 20-K	1/2	480	40
D-691 20-L	1/2	480	40
D-69120-M	5/8	660	55
D-69120-N	5/8	660	55
D-69120-P	5/8	660	55
HDF-80-4	3/4	900	75

## 4. Erection and Supporting, continued

### 4.4 Supporting and Insulating

The floor support method is standard for supporting and insulating bus bars; however, various other methods are available. The following illustration shows typical supporting methods.



Refer to AG Communication Systems Corporation (AGCS) drawing H-888000 for various methods of supporting and insulating bus bar installations. The floor support method uses columns, top angles, and auxiliary framing bars. The size of support material depends on the size and number of bus bars to be supported. Ceiling inserts or UNISTRUT® material are used only when requested by the customer.

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