DC BUS DUCT
DESCRIPTION AND INSTALLATION

CONTENTS PAGE

1. GENERAL

1.01 This section describes and provides typical installation procedures for dc bus (feeder) duct, manufactured by GTE Sylvania Zinsco Electrical Products Inc. or Continental Electric Equipment Company.

2. DESCRIPTION

2.01 The dc bus duct has been designed for 24-volt, 48-volt, or 130-volt electrical power distribution. It is used to transmit large ampacities from power boards to various equipment in multi-floor buildings.

Duct Sections

2.02 Duct sections include horizontal, vertical elbow, offset, conversion, and shock-expansion sections (Figures 1 through 7). These sections consist of a steel housing, bus bars, and component parts that meet Underwriter Laboratories (U L) standards.

2.03 Each section is marked with the manufacturer's name, section number, and maximum load amperage and voltage. The isolation assemblies are marked with 1/2-inch letters, "DO NOT OPERATE UNDER LOAD."

2.04 The duct housing is formed with phospfatized steel. A flat undercoat is applied to the coupling and housing, and all external surfaces are finished with a light gray enamel.

2.05 The maximum allowable load for each duct is determined by the number and size of the bus bars (battery and ground), the length of the duct run from the switchboard to the distribution bay and the permitted voltage drop. (Refer to Table 1 for load capacity information concerning aluminum bus bars and to Table 2 for load capacity information concerning copper bus bars.)

Bus Bars

2.06 Bus bars are available in aluminum or copper. The aluminum bars (Table 1) provide 56 percent conductivity, and the copper bars (Table 2) provide 98 percent conductivity. While the copper bars offer greater conductivity, the aluminum bars cut down approximately half of the weight per section for installations. This weight reduction helps solve the problem of horizontal bus duct supports and eliminates the need for a lifting device.

2.07 The bus bars are rectangular with fully rounded, l/4-inch edges. Copper bus bars are silver plated (at minimum) at all contact points. Aluminum bus bars are tin plated overall. All bus bars are encased with two layers of high-voltage insulating tape or rubber sleeves.

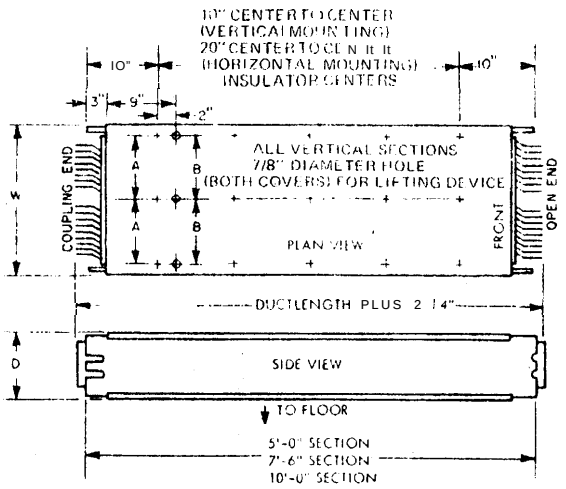
NOTE: All brazed joints at elbows, offsets, extended bars, etc, also have the insulating tape covering.

2.08 Bus bar connections are factory-prepared for compression. This compression is exerted from both directions toward the center of the duct. A minimum 1-1/2 ton pressure is exerted independently of the enclosure and applied by means of bolts that are externally accessible. This pressure is applied to each bus bar connection, regardless of the number of bars in the width of the duct. Torque (12 to 15 foot-pounds) may be applied to the joint compression bolts from both sides. Instruction labels are fixed to the duct sides.

2.09 Typically, the bus bars are assembled on 3/4-inch centers (Figure 8). Sometimes, depending on the supplier, a space of less than 3 inches between each group of bars is allowed. The flat sides of the bars are adjacent to each other, The bus bar assemblies are arranged for short-circuit stresses. The spacer element of the bus bar supports are polypropylene. The joint insulator assemblies (Figure 9) consist of molded material that is strapped to apply compression between insulated parts and the bars. Pressure is applied at all points of the joint insulator assemblies. Removable covers are provided for each section joint. This permits proper alignment of the bus bars and the insulated assembly.

Additional Sections, Assemblies and Supports

2.10 The joint pressure coupling assembly (Figure 10) may be extended beyond the joint during installation of two sections to facilitate easy lapping of the bus bars. It is

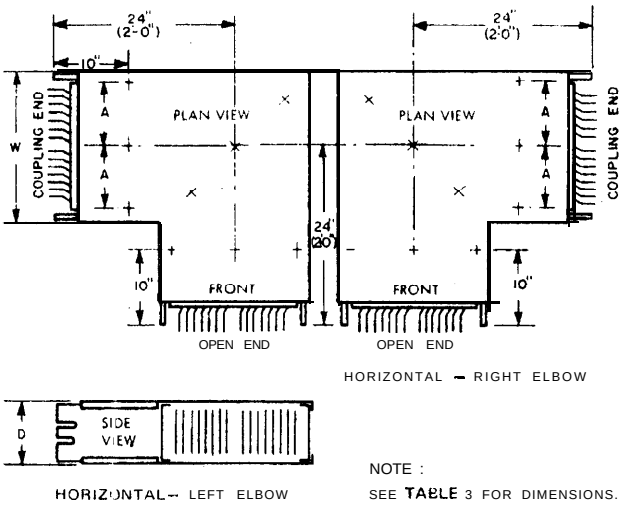


NOTES:

1 SEE TABLE 3F OH DIMENSIONS

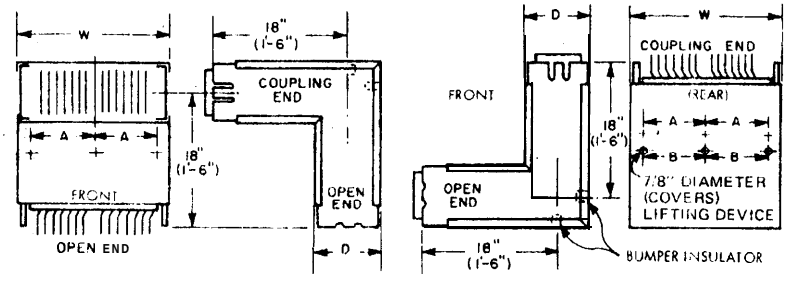
7 VERTICAL MOUNTING ONLY ONE PINNING ASSEMBLY (FIGURE 15) IS REQUIRED FOR EACH 1-FOOT TO 6-FOOT SECTION TWO PINNING ASSEMBLIES ARE REQUIRED FOR SECTIONS OVER 6 FEET

Figure 1. Horizontal and Vertical Duct Sections.



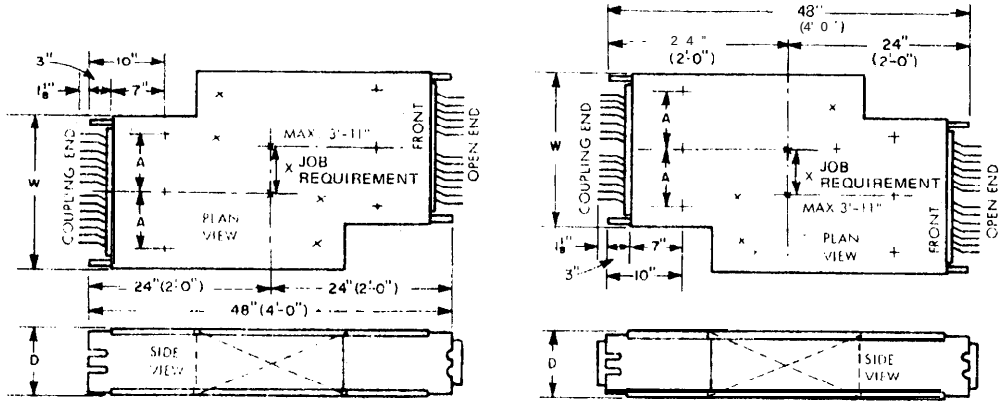
NOTE :
SEE TABLE 3 FOR DIMENSIONS.

Figure 2. Horizontal El bow Sections.



NOTE.
SEE TABLE 3 FOR DIMENSIONS.

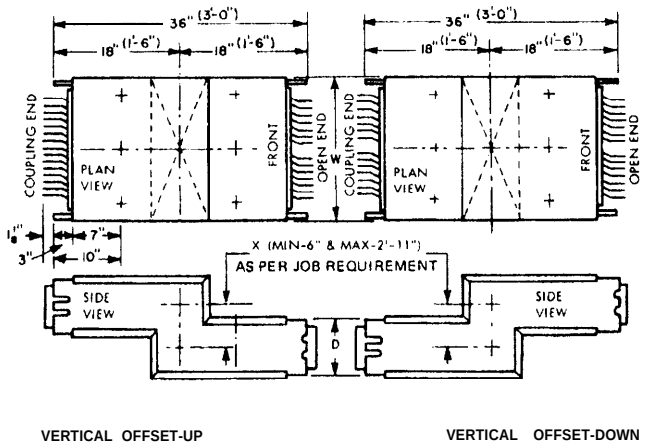
Figure 3. Vertical Elbow Sections.



NOTES:

1. SEE TABLE 3 FOR DIMENSIONS.
2. X DIMENSIONS ARE BY JOB REQUIREMENT.

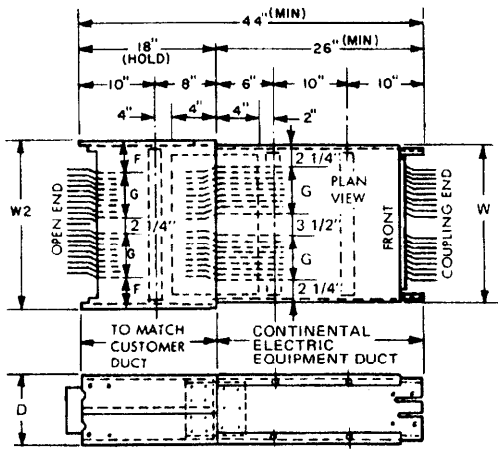
Figure 4. Horizontal Offset Sections.



VERTICAL OFFSET-UP VERTICAL OFFSET-DOWN

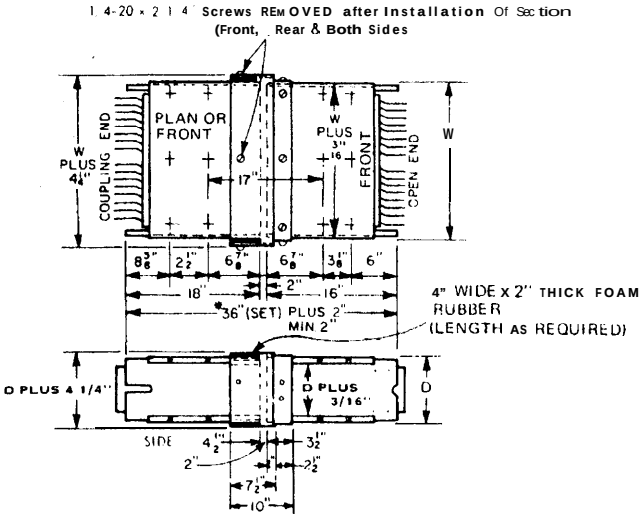
NOTE.
SEE TABLE 3 FOR DIMENSIONS

Figure 5. Vertical Offset Sections.



NOTE:
SEE TABLE 3 FOR Dimensions.

Figure 6. Conversion Section.



NOTES.
1 SEE TABLE 3 FOR DIMENSIONS
2 ' IF PINNING Assembly Required ADD 6 INCHES.

Figure 7. Shock-Expansion Section (Horizontal or Vertical).

then returned to its position at the joint to complete the pressure contact to the bus bars.

2.11 Fire barrier assemblies are furnished at each floor level and wall passage. The fire barriers are of I/2-inch-thick insulating material that allows the fire barriers to be properly secured into position.

2.12 Channel supports are supplied in lengths of 5 feet for horizontal runs, as required. Additional supports for risers are supplied on floors or intermediate levels as required.

2.13 Spring-loaded floor supports (Figure 11) are provided, if required. These supports are constructed of structural angle iron with the proper number and size of springs to support one floor load. Fixed floor supports are also available (Figure 12).

2.14 Tap-off sections (Figures 13 and 14) are provided as required for present or future horizontal extensions from the riser. If lugs at the tap-offs are required, they are provided and are accessible by removing a steel enclosure sleeve.

2.15 One pinning assembly (Figure 15) is provided for each 5 feet of riser duct inside the housing assembly.

2.16 Isolation assemblies (Figure 16) are provided at each stub, if required, where future extension of the duct system is anticipated. This safety device consists of contact blades included in a stub section. When the blades are in the open position, the extended run can be continued to a distribution frame. When the installation is completed, the blades are engaged and bolted securely.

3. PRELIMINARY INSTRUCTIONS

Engineering Applications

3.01 Bus duct systems should be located in areas of the building away from air conditioning ducts, water pipes, etc, if possible.

3.02 On new buildings, duct supports should be engineered into the building when it is being built, if possible.

3.03 Prior to installing duct systems, keep the area for the bus ducts clear of all obstacles.

3.04 Caution should be used when supplying supports hung from ceilings, especially if the ceiling is concrete.

Table 1. Aluminum Bus Duct (Unventilated).

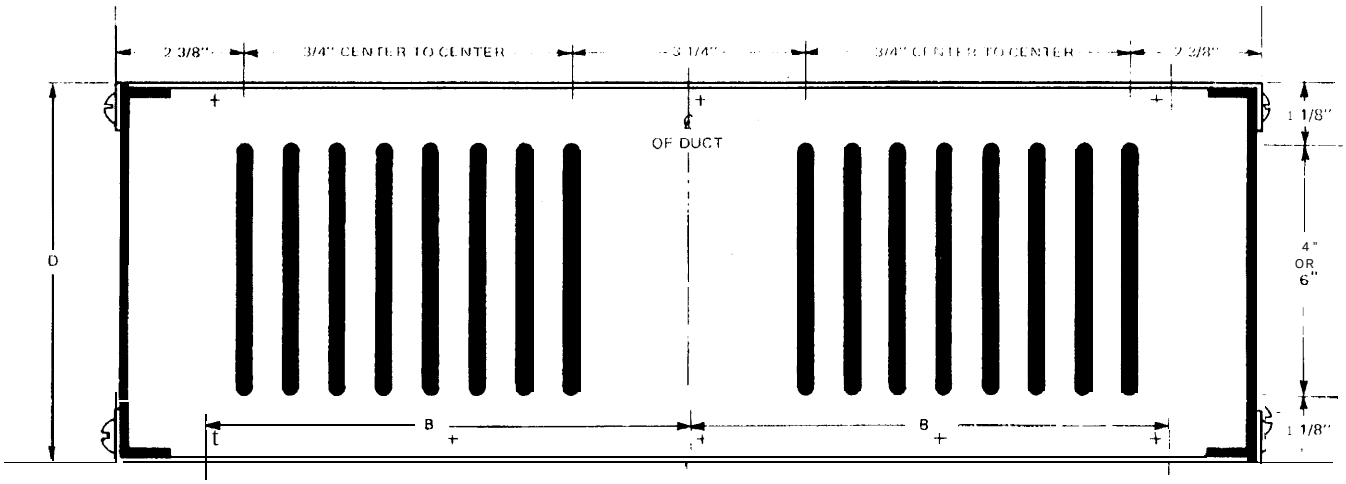
DUCT WIDTH" (INCHES)	DUCT HEIGHT* (INCHES)	MAXIMUM BHD (AMPERES)	ALUMINUM BAR SIZE (INCHES)	NO. OF BARS/ POLARITY	SQUARE INCHES PER POLARITY	MICROHMS PER FOOT	LOOP VOLTAGE DROP AT MAXIMUM BHD** (AMPERES)		WEIGHT (POUNDS PER FOOT)
							25-FOOT DUCT AND 50 LOOP FEET	100-FOOT DUCT AN0 200 LOOP FEET	
11	8-1/4	1,200	1/4x6	3	4.5	3.04	0.18	0.73	51
12-1/2	8-1/4	1,600	1/4x6	4	6.0	2.28	0.18	0.73	54
14	8-1/4	2,000	1/4x6	5	7.5	1.82	0.18	0.73	58
17	8-1/4	2,500	1/4x6	7	10.5	1.30	0.16	0.65	60
lb 1'2	8-1/4	3,000	1/4x6	8	12.0	1.14	0.17	0.68	63
21-1/2	8-1/4	4,000	1/4x6	10	15.0	0.91	0.18	0.73	77
21-1/2	10-1/4	4,000	1/4x8	10	20.0	0.68	0.14	0.54	87

*Approximate dimensions.
**Busy hour drain.

Table 2. Copper Bus Duct (Unventilated).

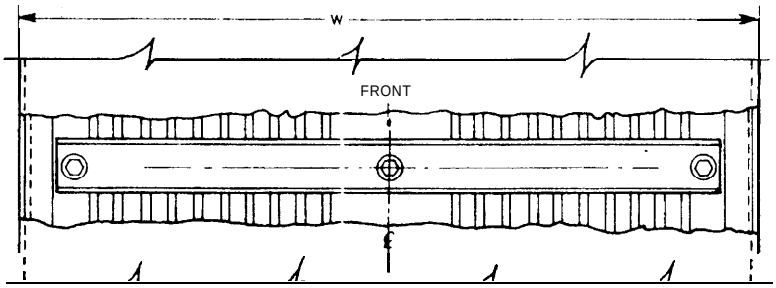
DUCT WI OTH* (INCHES)	DUCT HEIGHT* (INCHES)	MAXIMUM BHD (AMPERES)	COPPER BAR SIZE (INCHES)	NO. OF BARS/ POLARITY	SQUARE INCHES PER POLARITY	MICROHMS PER FOOT	LOOPVOLTAGE OROPAT MAXIMUM BHD (AMPERES)		WEIGHT (POUNDS PER FOOT)
							25-FOOT DUCT AND 50 LOOP FEET	100-FOOT DUCT AND200 LOOP FEET	
il	6-1/4	1,200	1/4x4	3	3	2.82	0.17	0.68	60
12 1/2	6-1/4	1,600	114x4	4	4	2.12	0.17	0.68	68
54	6-1/4	2,000	1/4x4	5	5	1.70	0.17	0.68	76
17	6-1/4	2,500	1/4x4	7	7	1.21	0.15	0.60	86
18-1/2	6-1/4	3,000	1/4x4	8	8	1.06	0.16	0.64	94
21-1/2	6-1/4	4,000	1/4x4	10	10	0.85	0.17	0.68	116
21 1/2	8-1/4	4,000	1/4x6	10	15	0.56	0.11	0.45	153

*Approximate dimensions.



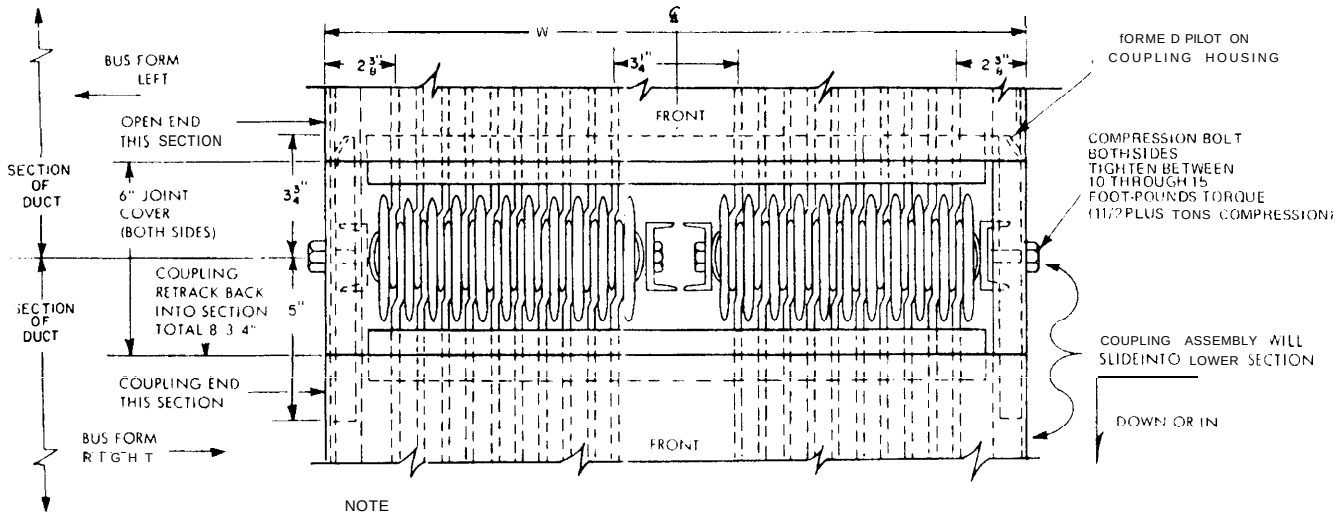
NOTES:
1. SEE TABLE 3 FOR DIMENSIONS
2 + INDICATES 7/8 INCH-DIAMETE ? HOLES LOCATED 17 INCHES FROM END OF GIVEN VERTICAL SECTION TO ACCEPT STUDS OF LIFTING DEVICE (FIGURE 271 THE HOLES ARE FILLED WITH STANDARD PLUGS AFTER DUCT INSTALLATION.

Figure 8. Front View of Duct Section Showing Bus Bars.



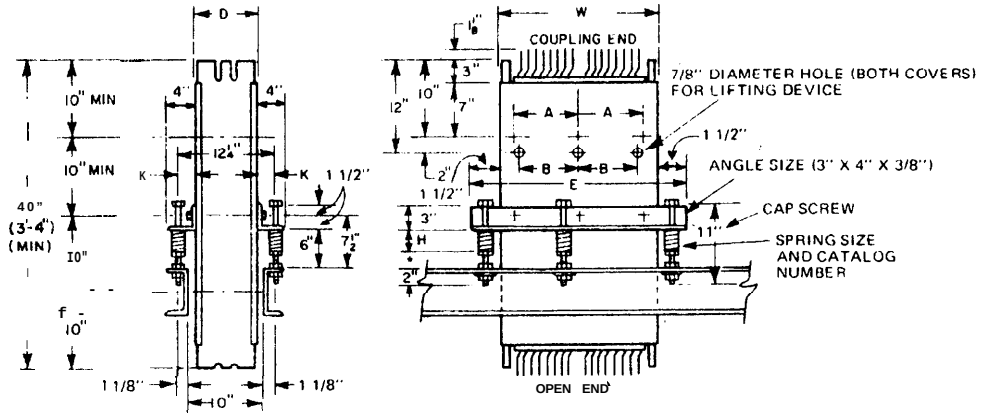
NOTES.
1. SEE TABLE 3 FOR DIMENSION?
2. LOCATIONS. VERTICAL MOUN 'ING10 INCHES FROM EACH END AND MAXIMUM 10 INCH CENTE RS. HORIZONTAL MOUNTING -- 10 INCHES FROM EACH END AND MAXIMUM 20 INCH CENTERS.

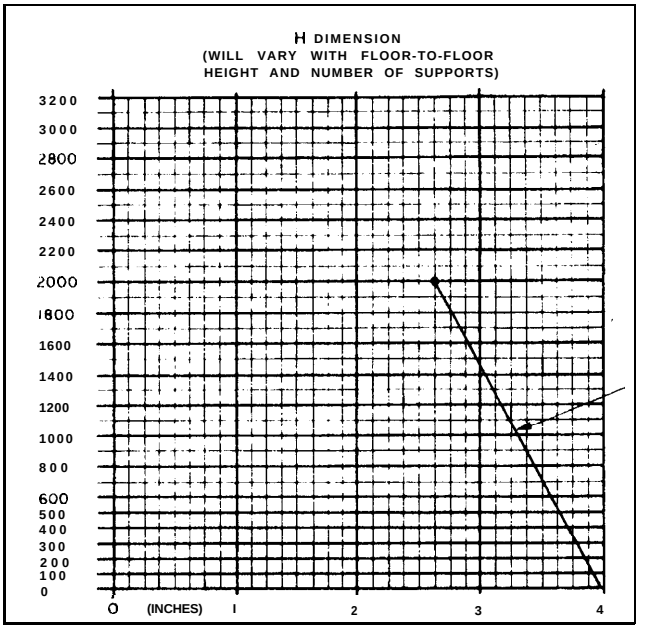
Figure 9. Front View of Insulator Assernbly.



NOTE
WHEN COUPLING IS PUSHED INTO SE' TIONS THE ADJOINING SECTION MAY BE ADDED OR TAKEN FROM RUN OF DUCT

Figure 10. Front View of Joint Coupling Assembly with Cross-Tie Yoke Removed.





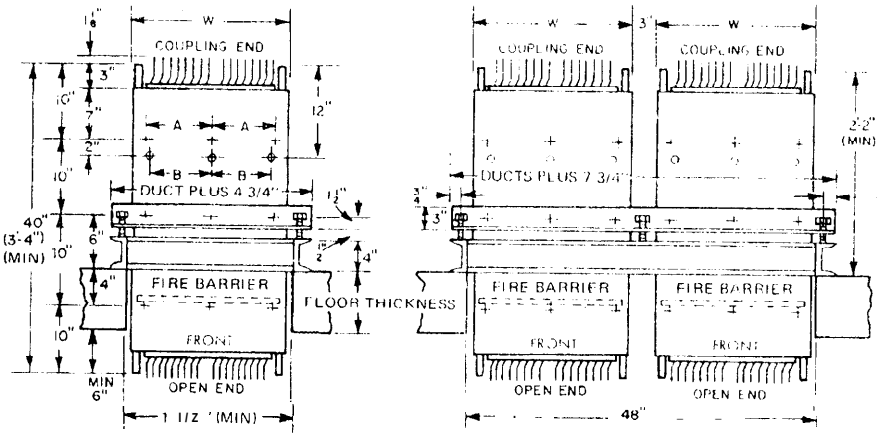
NOTES:

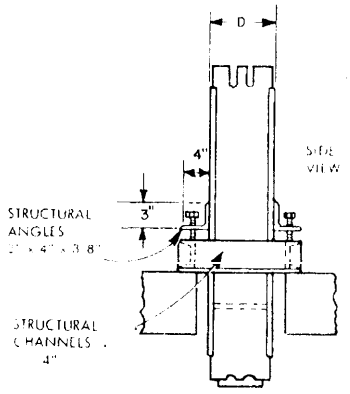
1 SEE TABLE 3 FOR DIMENSIONS

2 2" X 6" ROLLED CHANNEL.

3 • LOCATED BY ADJUSTMENT

Figure 11. Spring-Loaded Supports.





NOTE
SEE TABLE 3 FOR DIMENSIONS

Figure 12. Fixed Floor Supports.

Consideration should be given to fioor supports when there is a horizontal span in a duct.

Unpacking and Inspection

3.05 Manufacturer's (engineering) drawings should be forwarded to the site prior to the time the bus duct is delivered. When the equipment arrives, place equipment if the approximate installation location, referring to the engineering drawing, to avoid unnecessary moving of equipment later.

3.06 When unpacking bus duct, inspect sections received to ensure that there is no visual damage and compare these items with the packing list to ensure that the correct items have been received. Each section is individually packed, and each crate is marked with the section number. Also, ensure that the bus bar ends are clean and free of contaminants.

Reference Material

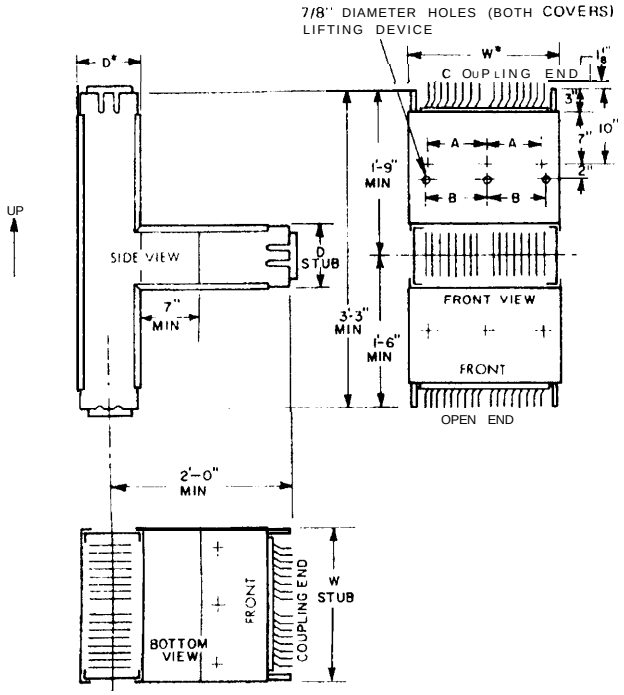
3.07 Individuals performing the installation should be familar with the following:

(a) Engineering floor plan drawing showing installation location of ducts.
(b) Figures 1 through 27. These figures show typical duct types and the method of duct installation.
(c) Tables 1 through 3. These tables provide duct (aluminum and copper) specifications and typical dimensions that are referenced in the figures.

4. INSTALLATION

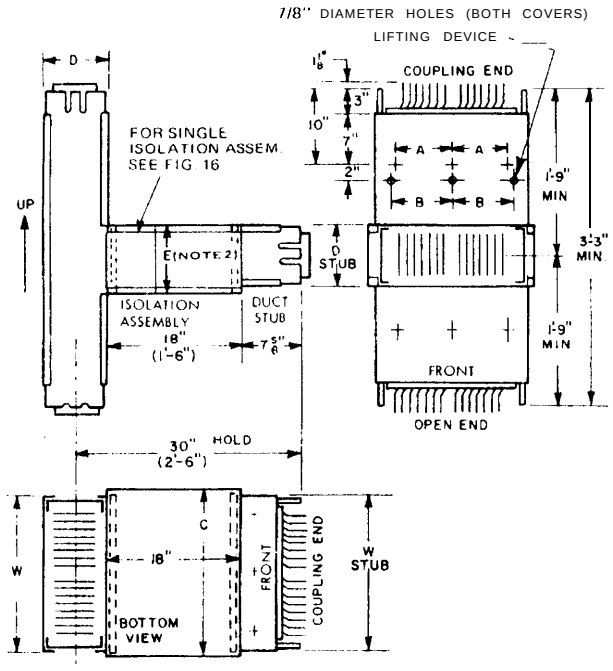
Prepar ing Joint Coupling

4.01 To prepare the joint coupling assembly (Figure 10) for installation, proceed as follows:



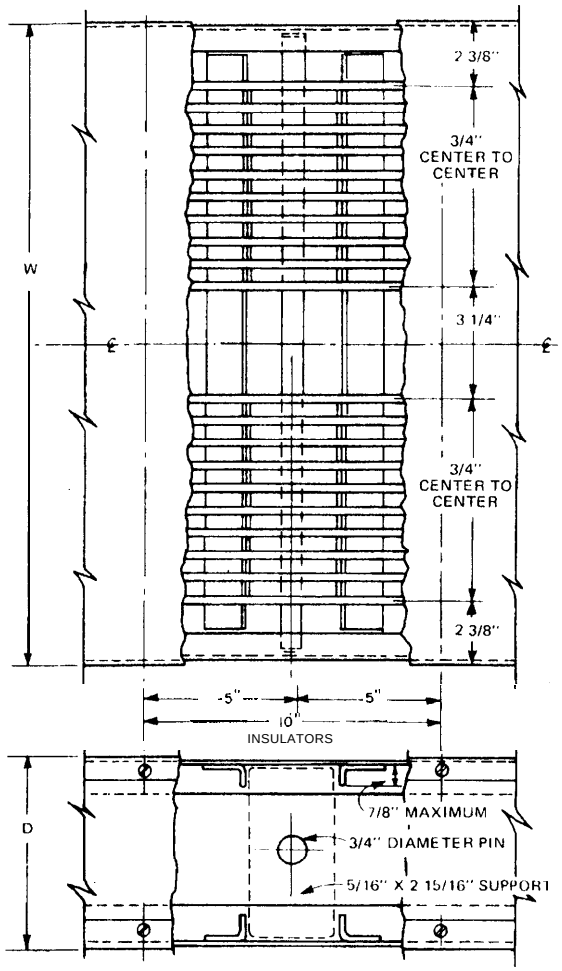
NOTES.
1 SEE TABLE 3 FOR DIMENSIONS.
2 * WIDTH & DEPTH OF LARGER SIZE DUCT OF RISER. EXTEND 8 INCHES IN STUB.

Figure 13. Vertical Tap-Off Section Without Isolation Assembly.



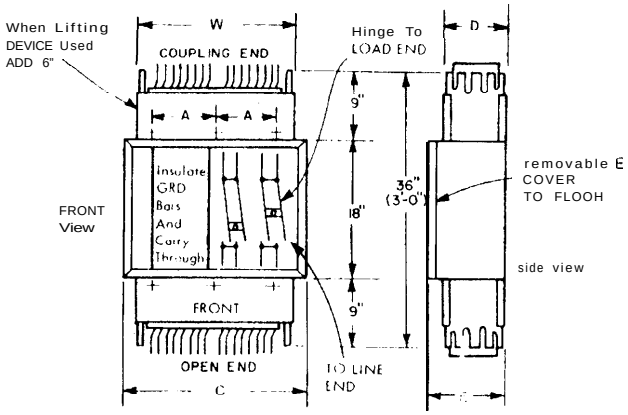
NOTES
1 SEE Table 3 FOR DIMENSIONS
2 ISOLATION ASSEMBLY MAY BE IN TOP OR BOTTOM VERTICAL LEG USING PROPER DUCT LENGTH

Figure 14. Vertical Tap-Off Section with Isolation Assembly.



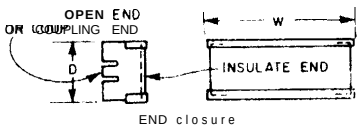
NOTE:
SEE TABLE 3 FOR DIMENSIONS

Figure 15. Pinning Assembly.



NOTES:
1. SEE TABLE 3 FOR DIMENSIONS.
2. COUPLING OR OPEN END MATCHES GI E AE FURNISHED EQUIPMENT OR DC DUCT

Figure 16. Single Isolation Assembly.



NOTE
SEE TABLE 3 FOR DIMENSIONS

Figure 17. End Closure Section.

(a) Remove the four machine screws on each side of the assembly.

NOTE: There is a total of eight screws.

(b) Hand loosen the large hex-head torque compression bolts on both sides of the assembly. Do not loosen beyond the maximum open position.

(c) leave the coupling in the retracted position.

Installing Vertical or Horizontal Duct Sections

4.02 To install duct sections, proceed as follows:

(a) Before lifting a section into position, determine the weight of each duct piece. This gives the installation team some idea of the type of lifting device that is required to install the duct piece. (Refer to Table 1 (aluminum) or Table 2 (copper) for bar-weight information.) Examples are as follows:

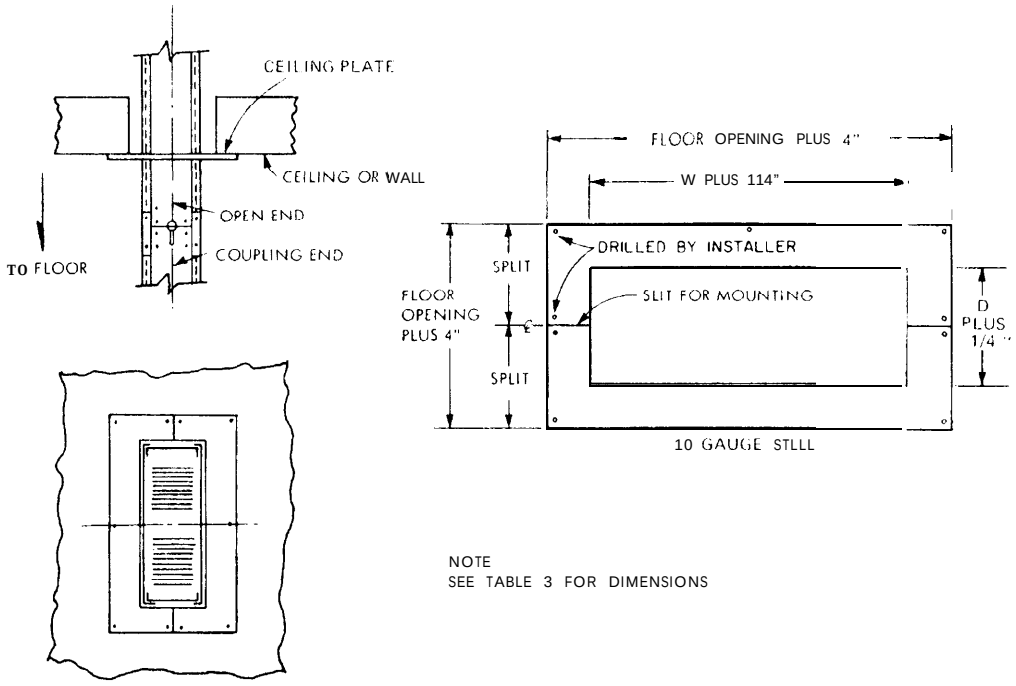
(1) A 'I-foot section with 20 copper bars (1/4-inch by 6-inch weighs approximately 1,071 pounds.

(2) A 5-foot section with 10 aluminum bars (1/4-inch by 6-inch) weighs appr oxirnately 150 pounds.

WARNING: Because of the weight of some sections, extreme care should be exercised against personal injury, damage to equipment, and service interruptions in all phases of handling. Installers should keep their fingers away from the bus bar when splicing two sections. A wood dowel ot similar device should be used to guide the bus bars in place when necessary. Do not stand directly beneath a bus duct section when lifting it into place. Avoid damage to bus bar ends protruding from the opposite end of the section, If sections are more than 10 bus bars wide, apply pure petrolatum or a recognized electrical joint compound sparingly on the bar ends only.

(b) Lift the section into position. If a forklift is not available, use a hoisting method. Figure 26 shows the lifting of a duct section off the shipping skid using two chain hoists and two nylon slings.

(c) When sliding a section toward an installed section, allow each bus bar to saddle the companion bar of the adjoining section.



NOTE
SEE TABLE 3 FOR DIMENSIONS

Figure 18. Ceiling or Wall Plate Installation.

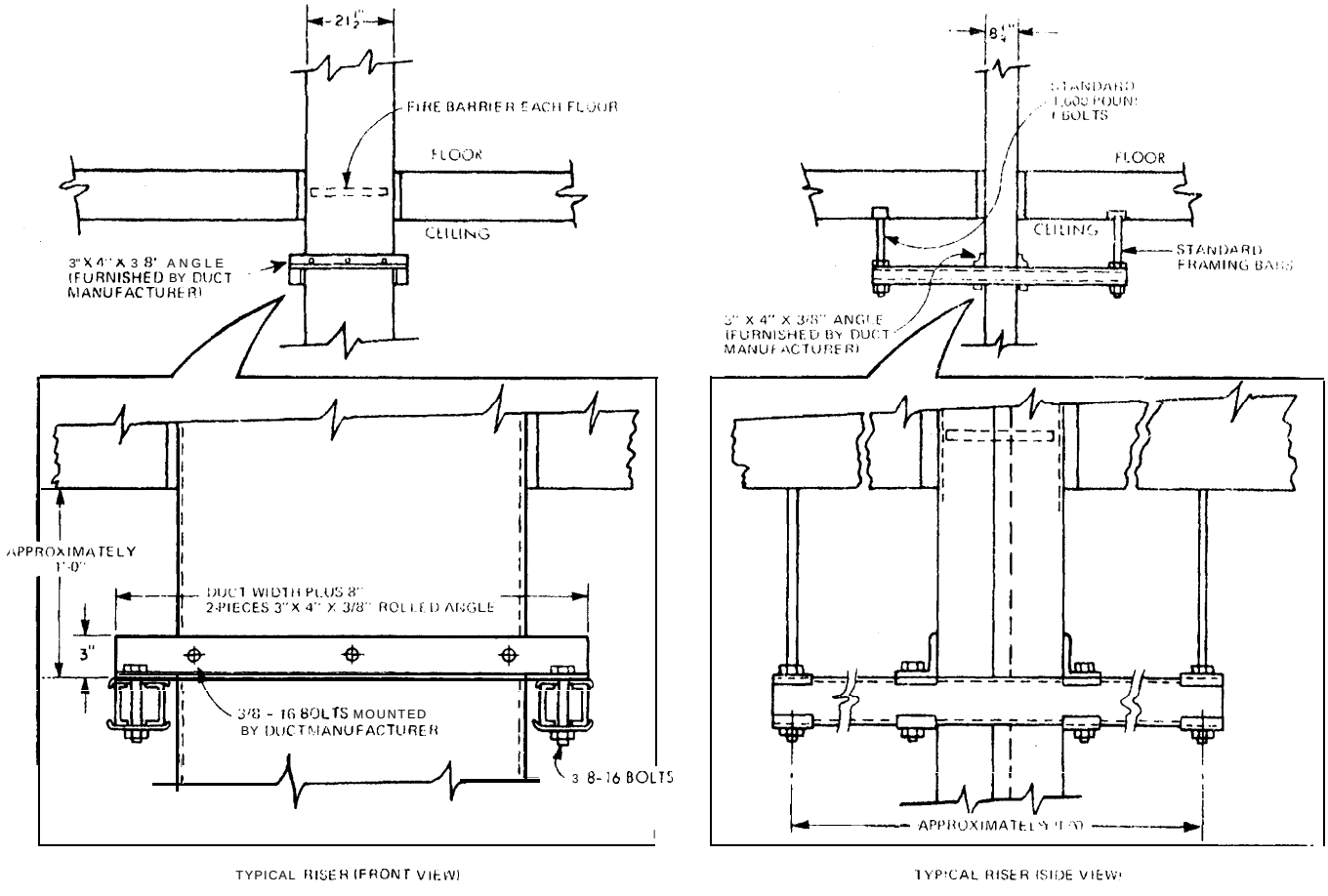


Figure 19. Typical Mounting of Riser Ducts.

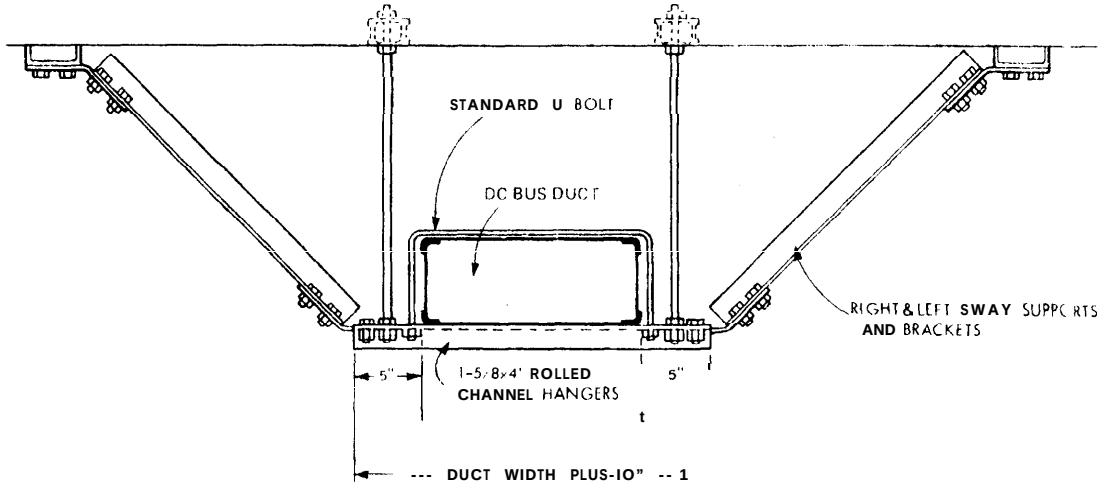
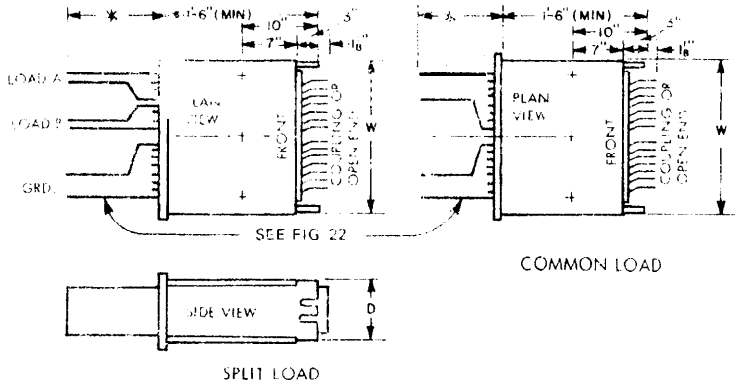


Figure 20. Method of Supporting and Earthquake Bracing of Horizontal Bus Duct Runs.

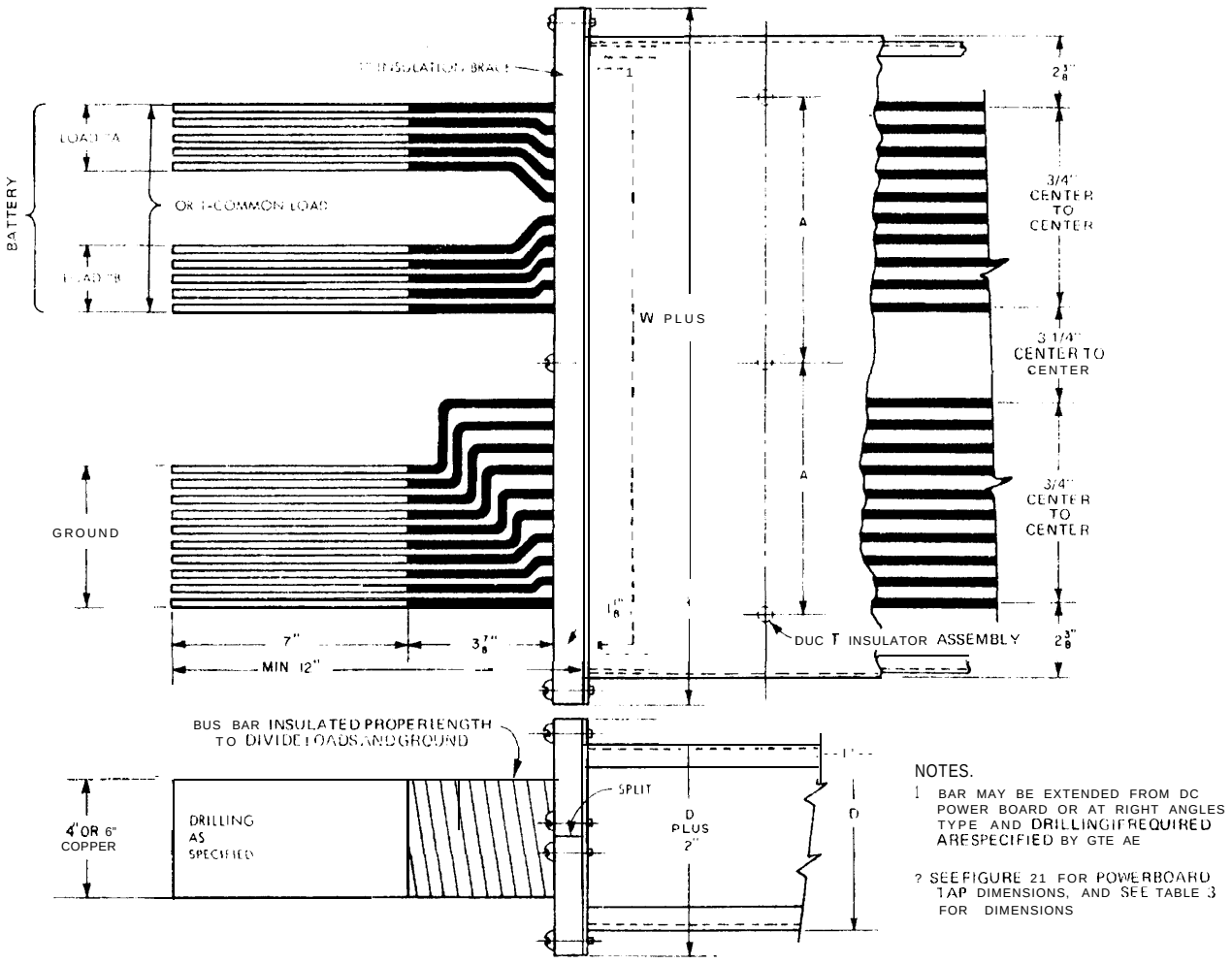


NOTES

1 SEE TABLE 3 FOR DIMENSIONS

2. * FANNING AND DRILLING DIMENSION BY EQUIPMENT ENGINEER

Figure 21. Power Board Tap Dimensions.



NOTES.

1 BAR MAY BE EXTENDED FROM DC POWER BOARD OR AT RIGHT ANGLES TYPE AND DRILLING IF REQUIRED ARE SPECIFIED BY GTE AE

2 SEE FIGURE 21 FOR POWER BOARD TAP DIMENSIONS, AND SEE TABLE 3 FOR DIMENSIONS

Figure 22. Power Tap.

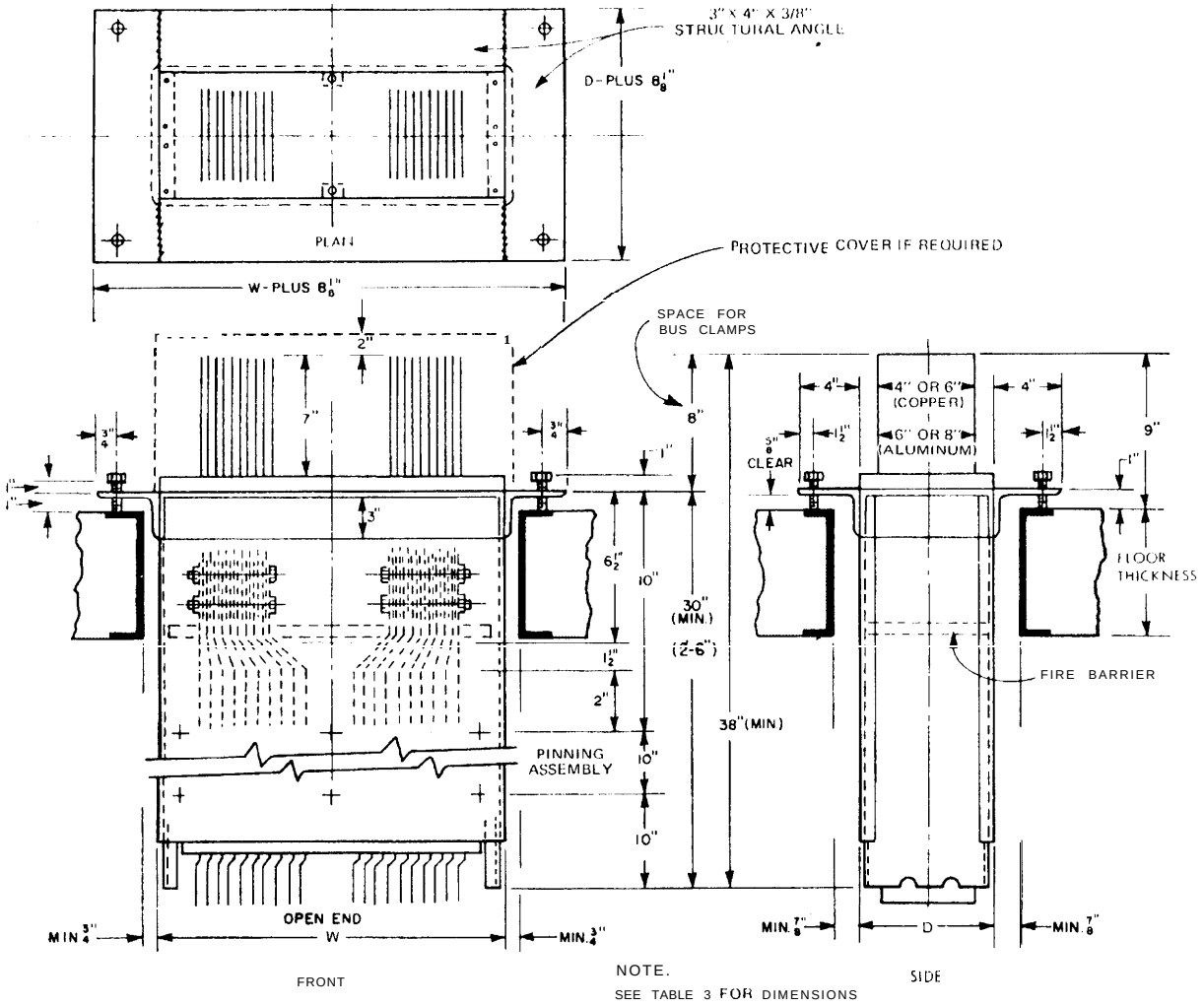


Figure 23. Power Board Floor Entrance — Rigid (In Floor).

NOTE : With sections containing more than 16 bus bars, a pair of joint jack sets is furnished to assist the joining operation. Remove the large hole plugs at the corners of the enclosures near both ends to be joined. Hook jacks into the holes. If both wide sides of the duct are accessible, use one jack set on each side, adjacent to the opposite narrow sides. Pull the sections together with ratchet wrenches. Carefully maintain alignment of the sections during jacking. Restore the hole plugs when joined.

(d) **Butt the steel side channels of both sections together.**

(e) **Slide the coupling assembly toward and into the newly installed section.**

NOTE: A coupling separator must separate the bar from the pressure plate on the two extreme outside bars and two center bars. A separator is also used to separate each pair of adjoining bars.

(f) **Insert machine screws, eight on the present section and eight on the newly installed section,**

NOTE There is a total of 16 screws.

(g) **Tighten the torque bolt to between 10 and 15 foot-pounds.**

(h) **Slide the joint inspection covers to the closed position.**

(i) **For vertical ducting, use the lifting device (Figure 27) when furnished. This device is used for lifting bus ducting between floors.**

NOTE: The lifting device is normally furnished only with copper bars or large multifloor installations.

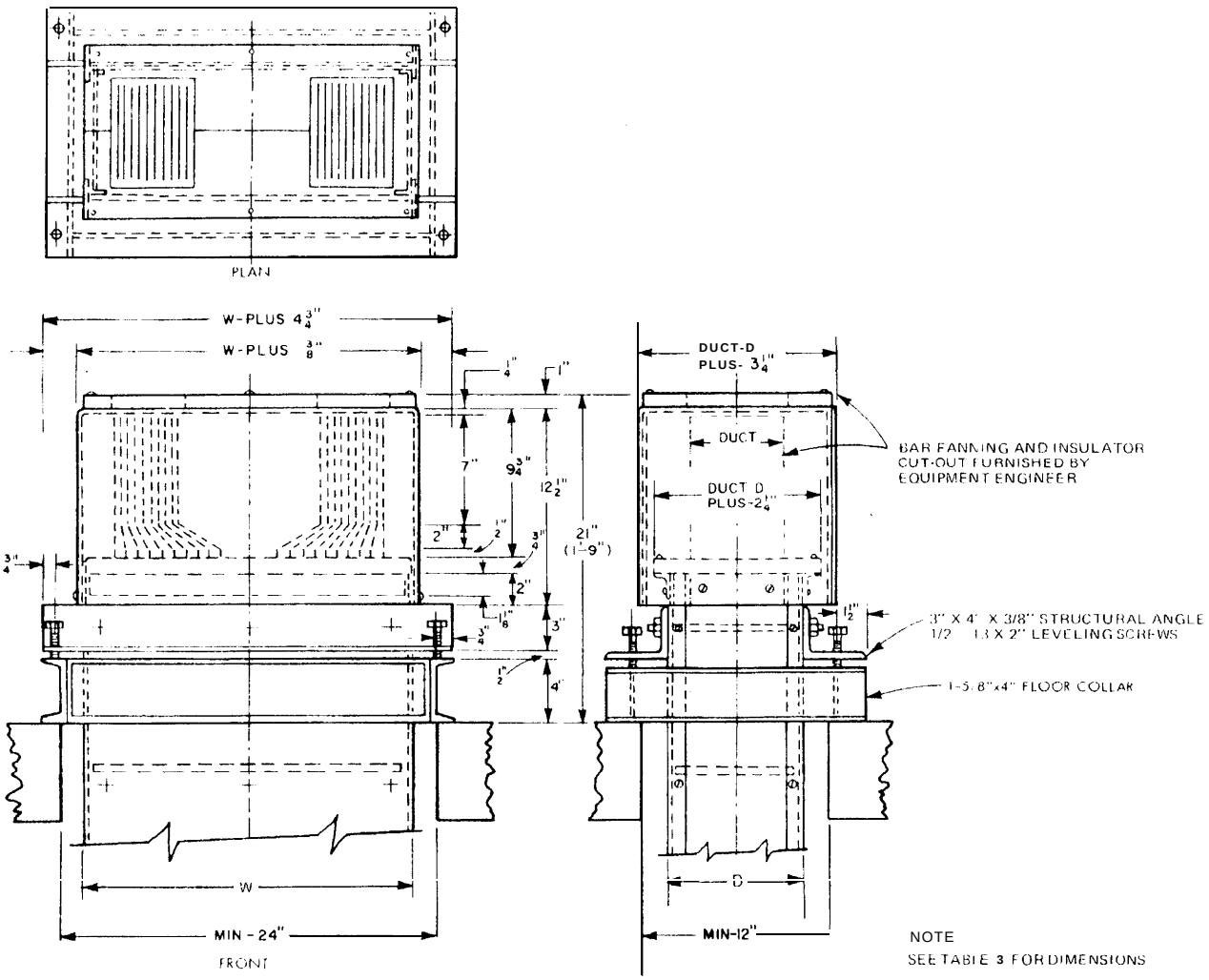


Figure 24. Power Board Floor Entrance — Rigid (Above Floor).

Installing Spring-Loaded Supports

4.03 To install spring-loaded supports, proceed as follows:

(a) Determine the footage between the spring-load supports (Figure 11).

(b) Multiply the number of feet by pounds per foot. (Refer to paragraph 4.02(a)).

(c) Divide the total weight of the section by 6 to determine the weight per spring.

EXAMPLE: 1,071 pounds (section) divided by 6 (springs) equals 178.5 pounds per spring.

(d) Refer to the graph in Figure 11 for deflection.

Installing Shock-Expansion Section (Vertical ot Horizontal)

4.04 This section (Figure 7) is shipped with six 1/4-inch by 20-inch screws, located in the upper sleeve. These screws keep the section in a fixed position duringshipment. Do not remove these screws until the section is completely installed.

4.05 To install the section, proceed as follows:

(a) Lift the section into position. Use a lifting dev ce on the upper section and a sling on the lower sec-tion to prevent shearing of the screws.

(b) After the section is in position and secured with spring-loaded supports (paragraph 4.03), remove the six screws.

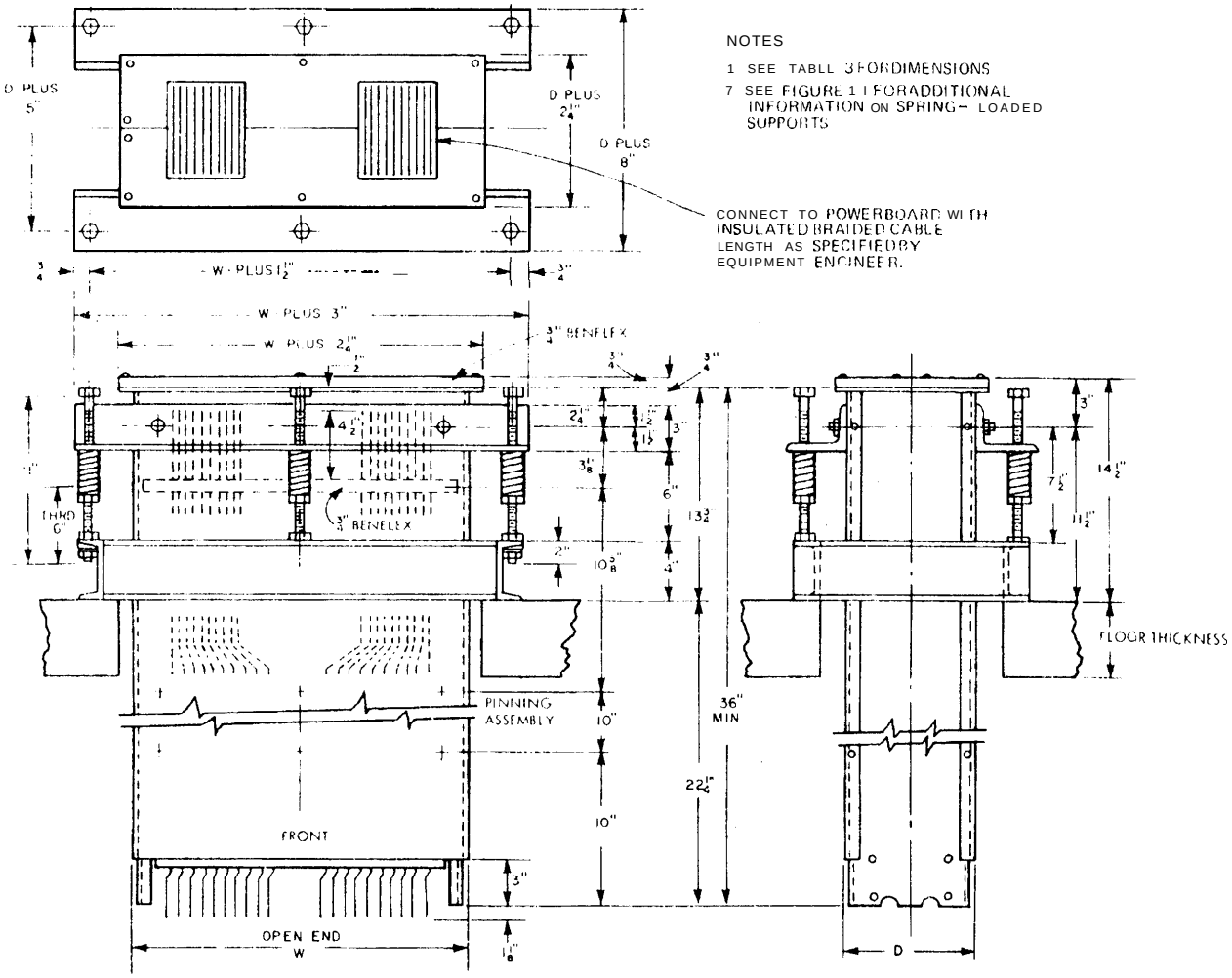
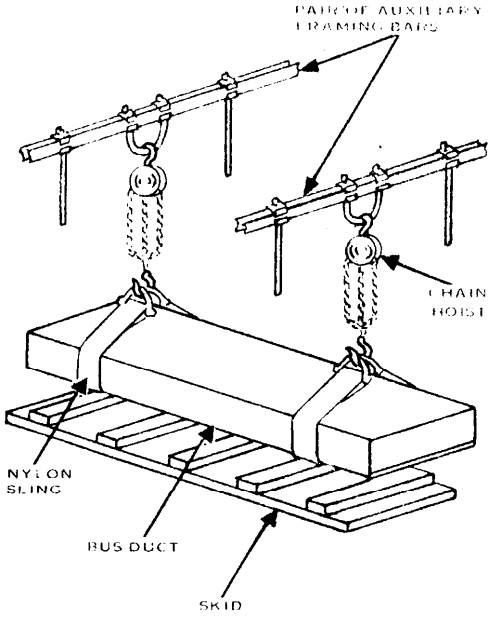


Figure 25. Power Board Floor Entrance — Spring Loaded.



NOTE

PLUMB end SO THAT MINIMUM ALIGNMENT
IS REQUIRED WHEN DUCT IS LIFTED

Figure 26. Typical Hoisting Method for Lifting Duct Off Shipping Skid.

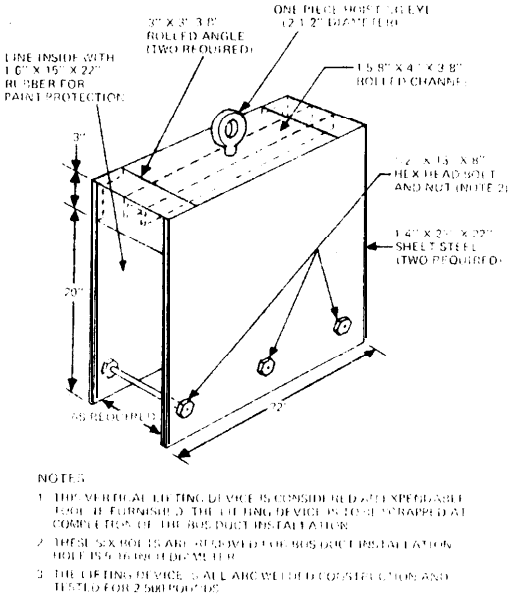


Figure 27. TYpical Lifting Device for Vertical Runs.

Table 3. Dimensions.

MAXIMUM LOAD (AMPERES)	TOTAL BUS BARS	DIMENSIONS (INCHES)														
		D		W	W2	A	B	C (SEE NOTE)	E		F	G	H	I	K	CAP SCREW SIZE	SPRING MAKE AND CATALOG NUMBER
		ALUMINUM	COPPER						ALUMINUM	COPPER							
1,200	6	8-1/4	6-1/4	11	10-3/8	3-3/4	4	11	10-1/4	8-1/4	2-7/16	1 1/2	See Chart in Figure 11	14	3	1/2-13	"A" MHC-41
1,600	8	8-1/4	6- 4	12- 2	13-3/8	4-1/2	4-3/4	12-1/2	10-1/4	8-1/4	2-3/16	2-1 4		15-1/2	3	1/2-13	"A" MHC-41
2,000	10	8-1/4	6-1/4	14	13-3/8	5-1/4	5-1/2	14	10-1/4	8-1/4	2-7/16	3		17	3	1/2-13	"A" MHC-41
2,500	14	8-1/4	6-1/4	17	16-3/8	6-3/4	7	17	10-1/4	8-1/4	2-7/16	4-1/2		20	3	1/2-13	"A" MHC-41
3,000	16	8-1/4	6-1 4	18-1/2	19-3/8	7-1/2	7-3/4	18-1/2	10-1/4	8-1/4	3-3/16	5-1/4		21-1/2	3	1/2-13	"A" MHC-41
4,000	20	8-1/4	6-1 4	21-1/2	22 3/8	9	9-9/16	21-1/2	10-1/4	8-1/4	3-3/16	6-3/4		24-1/2	3	5/8-11	"B" MHC-41
5,000	20	10-1/4	8-1/4	21-1/2	22-3/8	9	9-9/16	21-1/2	12-1/4	10-1/4	3-3/16	6-3/4		24-1/2	2	5/8-11	"B" MHC-41

NOTE:

When C dimension is less than W dimension of vertical riser, use W dimension of vertical riser.