Non-Segregated 600V-15,000V • 1200V-4000V

POWER ZONE® Metal-Enclosed Bus

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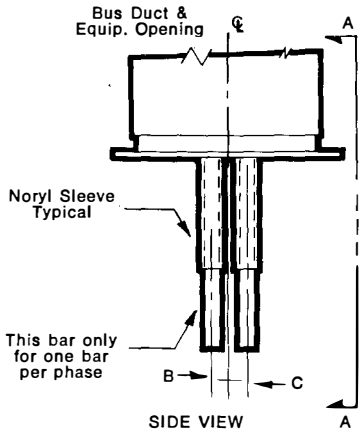
FILE: Distribution Products Catalog

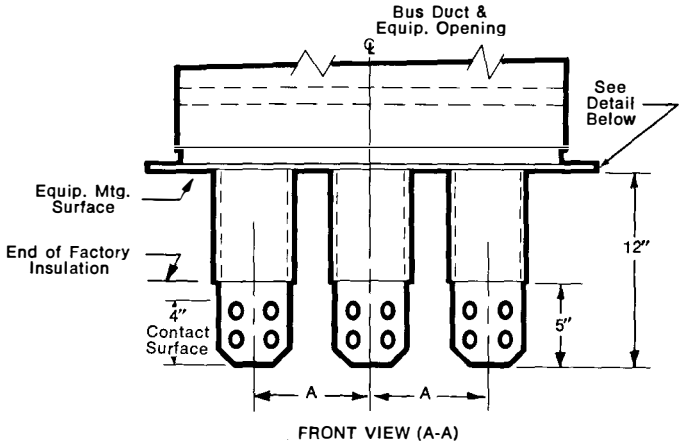
SQUARE D COMPANY

POWER ZONE METAL-ENCLOSED BUS

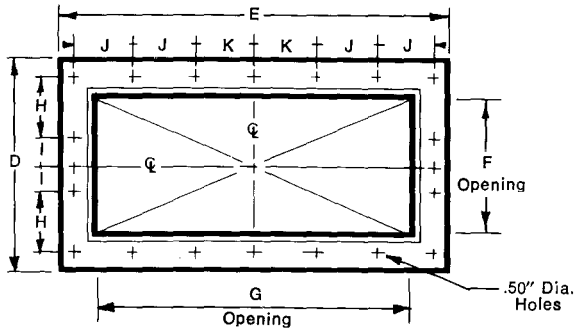
FLANGED END (SWITCHGEAR CONNECTION)



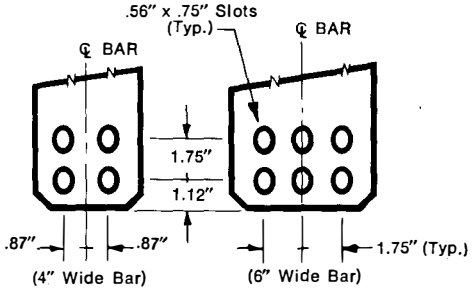
SIDE VIEW



FRONT VIEW (A-A)



FLANGE END DRILLING DETAIL



BUS BAR DRILLING DETAIL

Cont. Current Rating	Voltage: 15000 V Bus Bars Per Phase	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"
1200 A	(1) .37" x 4"	8.12"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
1600 A	(1) .62" x 4"	7.87"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
2000 A	(2) .50" x 4"	8.00"	0.75"	1.37"	16"	31"	12"	27"	4.75"	2.37"	5.81"	2.87"
2500 A	(2) .62" x 4"	7.87"	0.75"	1.37"	16"	31"	12"	27"	4.75"	2.37"	5.81"	2.87"
3000 A	(2) .62" x 6"	9.87"	0.75"	1.37"	16"	37"	12"	33"	4.75"	2.37"	5.87"	5.81"
4000 A	—	—	—	—	—	—	—	—	—	—	—	—

Cont. Current Rating	Voltage: 600 V/15000 V Bus Bars Per Phase	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"
1200 A	(1) .37" x 4"	7.12"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
1600 A	(1) .62" x 4"	6.87"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
2000 A	(2) .50" x 4"	7.00"	0.75"	1.37"	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
2500 A	(2) .62" x 4"	6.87"	0.75"	1.37"	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
3000 A	(2) .62" x 6"	8.87"	0.75"	1.37"	14"	33"	10"	29"	—	6.00"	5.18"	5.12"
4000 A	—	—	—	—	—	—	—	—	—	—	—	—

Cont. Current Rating	Voltage: 15000 V Bus Bars Per Phase	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"
1200 A	(1) .37" x 4"	8.12"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
1600 A	(1) .50" x 4"	8.00"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
2000 A	(2) .37" x 4"	8.12"	0.75"	1.37"	16"	31"	12"	27"	4.75"	2.37"	5.81"	2.87"
2500 A	(2) .50" x 4"	8.00"	0.75"	1.37"	16"	31"	12"	27"	4.75"	2.37"	5.81"	2.87"
3000 A	(2) .62" x 4"	7.87"	0.75"	1.37"	16"	31"	12"	27"	4.75"	2.37"	5.81"	2.87"
4000 A	(2) .62" x 6"	9.87"	0.75"	1.37"	16"	37"	12"	33"	4.75"	2.37"	5.87"	5.81"

Cont. Current Rating	Voltage: 600 V/15000 V Bus Bars Per Phase	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"
1200 A	(1) .37" x 4"	7.12"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
1600 A	(1) .50" x 4"	7.00"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
2000 A	(2) .37" x 4"	7.12"	0.75"	1.37"	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
2500 A	(2) .50" x 4"	7.00"	0.75"	1.37"	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
3000 A	(2) .62" x 4"	6.87"	0.75"	1.37"	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
4000 A	(2) .62" x 6"	8.87"	0.75"	1.37"	16"	33"	12"	29"	4.75"	2.37"	5.18"	5.12"

Cont. Current Rating	Voltage: 15000 V Bus Bars Per Phase	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"
1200 A	(1) .25" x 4"	8.25"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
1600 A	(1) .37" x 4"	8.12"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
2000 A	(1) .62" x 4"	7.87"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
2500 A	(2) .50" x 4"	8.00"	0.75"	1.37"	16"	31"	12"	27"	4.75"	2.37"	5.81"	2.97"
3000 A	(2) .62" x 4"	7.87"	0.75"	1.37"	16"	31"	12"	27"	4.75"	2.37"	5.81"	2.87"
4000 A	(2) .62" x 6"	9.87"	0.75"	1.37"	20"	37"	16"	33"	6.00"	3.00"	5.87"	5.81"

Cont. Current Rating	Voltage: 600 V/15000 V Bus Bars Per Phase	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"
1200 A	(1) .25" x 4"	7.25"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
1600 A	(1) .37" x 4"	7.12"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
2000 A	(1) .62" x 4"	6.87"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
2500 A	(2) .50" x 4"	7.00"	0.75"	1.37"	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
3000 A	(2) .62" x 4"	6.87"	0.75"	1.37"	16"	27"	12"	23"	4.75"	2.37"	5.00"	2.50"
4000 A	(2) .62" x 6"	8.87"	0.75"	1.37"	20"	33"	16"	29"	6.00"	3.00"	5.18"	5.12"

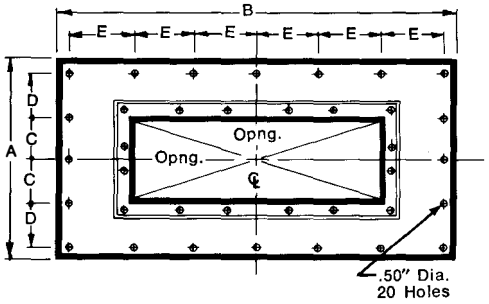
Cont. Current Rating	Voltage: 15000 V Bus Bars Per Phase	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"
1200 A	(1) .25" x 4"	8.25"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
1600 A	(1) .25" x 4"	8.25"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
2000 A	(1) .37" x 4"	8.12"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
2500 A	(1) .62" x 4"	7.87"	0.31"	—	14"	31"	10"	27"	—	6.00"	5.81"	2.87"
3000 A	(2) .37" x 4"	8.12"	0.75"	1.37"	16"	31"	12"	27"	4.75"	2.37"	5.81"	2.87"
4000 A	(2) .62" x 4"	7.87"	0.75"	1.37"	16"	31"	12"	27"	4.75"	2.37"	5.81"	2.87"

Cont. Current Rating	Voltage: 600 V/15000 V Bus Bars Per Phase	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"
1200 A	(1) .25" x 4"	7.25"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
1600 A	(1) .25" x 4"	7.25"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
2000 A	(1) .37" x 4"	7.12"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
2500 A	(1) .62" x 4"	6.87"	0.75"	—	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
3000 A	(2) .37" x 4"	7.12"	0.75"	1.37"	14"	27"	10"	23"	—	6.00"	5.00"	2.50"
4000 A	(2) .62" x 4"	6.87"	0.75"	1.37"	16"	27"	12"	23"	4.75"	2.37"	5.00"	2.50"

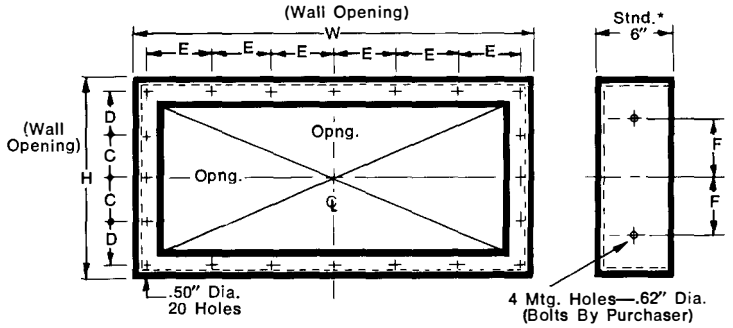
POWER ZONE METAL-ENCLOSED BUS

CLASS 6090

WALL ENTRANCE SEAL

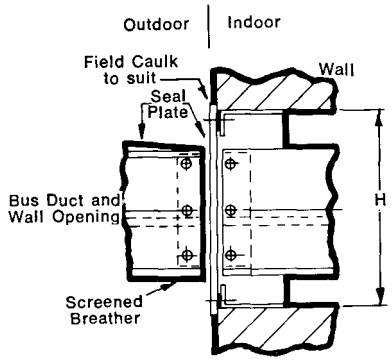


WALL FLANGE



WALL THROAT

*Variable to suit type of bldg. wall



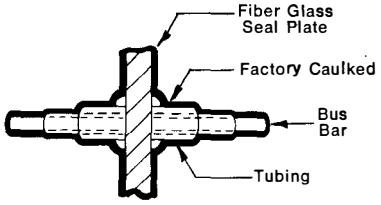
WALL THROAT & PLATE ASSEMBLY

VOLTAGE: 600V - 5kV

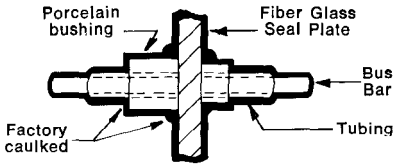
Current Rating		H	W	A	B	C	D	E	F
Alum.	Copper								
1200-2500	1200-2500	18	36	17.37	35.37	2.66	5.33	5.66	5
3000	—	18	42	17.37	41.37	2.66	5.33	6.66	5
—	3000	18	36	17.37	35.37	2.66	5.33	5.66	5
—	4000	22	42	21.37	41.37	5	5	6.66	6

VOLTAGE: 15kV

Current Rating		H	W	A	B	C	D	E	F
Alum.	Copper								
1200-2500	1200-2500	18	36	17.37	35.37	2.66	5.33	5.66	5
3000	—	18	42	17.37	41.37	2.66	5.33	6.66	5
—	3000	18	36	17.37	35.37	2.66	5.33	5.66	5
—	4000	22	42	21.37	41.37	5	5	6.66	6



600V, 5kV SEAL ASSEMBLY DETAIL



15kV SEAL ASSEMBLY DETAIL

A wall entrance seal is used to prevent smoke, vapor, air and gases from passing from one room to another or from outdoor to indoor. It consists of a wall throat which is bolted to the wall and one wall flange which is an integral part of the bus and is bolted to the wall throat. This throat/flange combination supports the bus at the wall penetration. The internal seal has a ½ hour fire rating. Higher ratings are available — consult factory.

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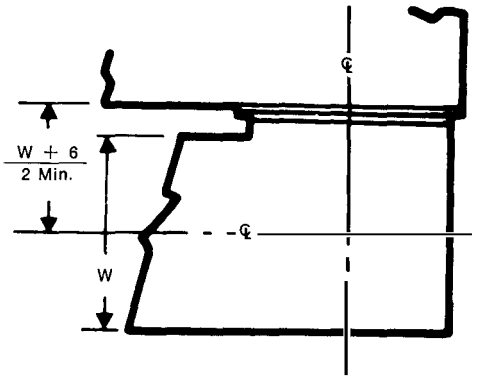
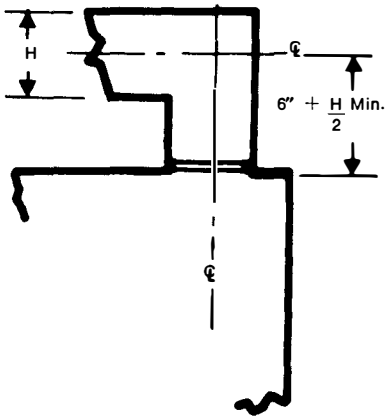
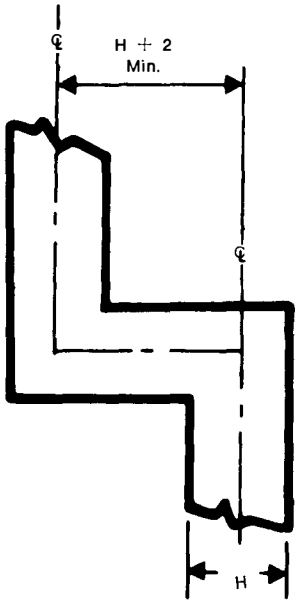
POWER ZONE METAL-ENCLOSED BUS

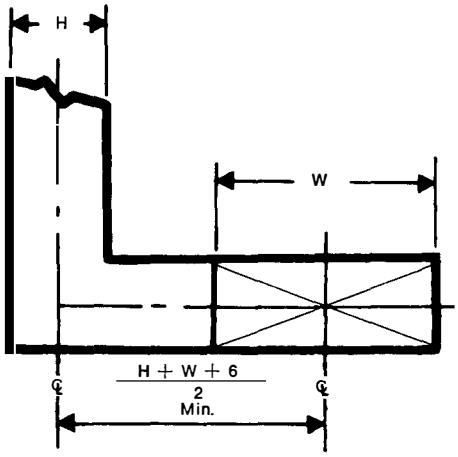
MINIMUM CONSTRUCTION DIMENSIONS

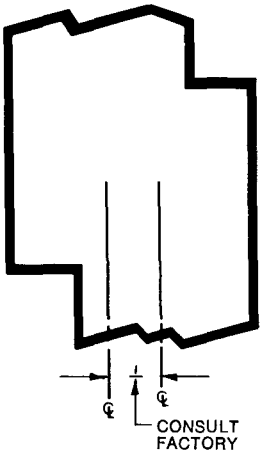
	Cont. Cur. Rating	600V/5000V				15000V			
		Totally Enclosed		Ventilated		Totally Enclosed		Ventilated	
		H	W	H	W	H	W	H	W
Aluminum	1200 A	25.50"	10.00"	25.50"	10.00"	29.50"	10.00"	29.50"	10.00"
	1600 A	25.50"	10.00"	25.50"	10.00"	29.50"	10.00"	29.50"	10.00"
	2000 A	25.50"	10.00"	25.50"	10.00"	29.50"	12.00"	29.50"	12.00"
	2500 A	25.50"	10.00"	25.50"	10.00"	29.50"	12.00"	29.50"	12.00"
	3000 A	31.50"	10.00"	25.50"	10.00"	35.50"	12.00"	29.50"	12.00"
	4000 A	—	—	31.50"	12.00"	—	—	35.50"	12.00"
Copper	1200 A	25.50"	10.00"	25.50"	10.00"	29.50"	10.00"	29.50"	10.00"
	1600 A	25.50"	10.00"	25.50"	10.00"	29.50"	10.00"	29.50"	10.00"
	2000 A	25.50"	10.00"	25.50"	10.00"	29.50"	10.00"	29.50"	10.00"
	2500 A	25.50"	10.00"	25.50"	10.00"	29.50"	12.00"	29.50"	10.00"
	3000 A	25.50"	12.00"	25.50"	10.00"	29.50"	12.00"	29.50"	12.00"
	4000 A	31.50"	16.00"	25.50"	12.00"	35.50"	16.00"	29.50"	12.00"

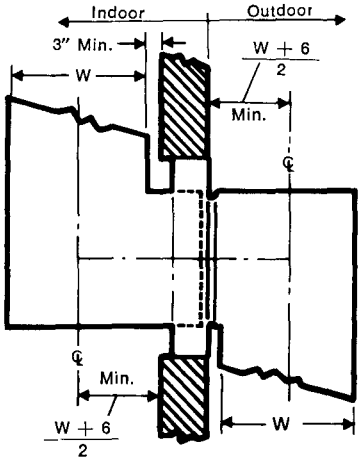


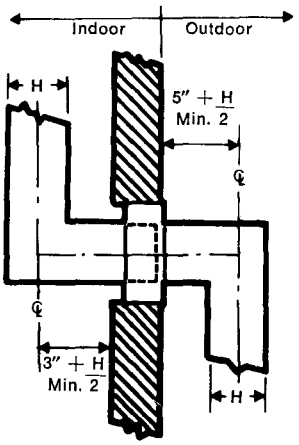












POWER ZONE METAL-ENCLOSED BUS

NONSEGREGATED PHASE BUS SPECIFICATIONS

1.0 General:

1.1 This specification describes the electrical and mechanical requirements for metal-enclosed, 600V through 15kV class, 60 Hz. feeder bus. The specification can be readily adapted to 25.8kV and 38kV applications. The bus system described is to be suitable for indoor and outdoor installations, with nominal current ratings maintained in ambient temperatures to 40°C.

1.2 This specification covers only the general requirements of the bus duct assemblies. The specific requirements of each assembly (plan, arrangement, components, etc.) will be shown on drawings provided by the Purchaser. These drawings will form the basis for manufacturing and installation drawings developed by the Vendor.

2.0 Standards and Codes:

2.1 The assemblies shall be constructed, wired and tested in accordance with all applicable sections of the latest listed standards and codes.

2.1.1 National Electrical Manufacturer Association (NEMA)

2.1.2 American National Standards Institute (ANSI - C37.20d, 1978)

2.1.3 National Electric Code (NEC) (NFPA No. 70)

2.2 It shall be the manufacturer's responsibility to be, or to become, knowledgeable of the requirements of these Standards and Codes. Any changes or alterations to the equipment to make it meet Standards and Codes requirements shall be at the expense of the Manufacturer.

3.0 Basic Construction:

3.1 Housing

3.1.1 The bus duct shall be nonlouvered outdoors, and shall be (louvered) (nonlouvered) indoors. Housing and accessory flanges, terminal enclosures, etc., shall be primed and painted (steel) (corrosion resistant aluminum) construction. All outdoor hardware shall be 316 stainless steel.

Indoor hardware (unless in corrosive environment) shall be manufacturer's standard.

3.1.2 Steel housings shall have 14 gauge sides and covers, and 11 gauge end flanges. Aluminum housings shall be nominal ⅛" thickness material minimum throughout.

3.1.3 Totally enclosed, nonlouvered housings shall be fitted with screened breathers and space heaters in sufficient quantity and rating to minimize condensation. Space heaters shall be completely factory wired with no exposed wiring inside the bus housing. Heaters shall be (thermostatically controlled) (manually controlled). Heater wiring shall be (terminated in an octagonal box at designated end of bus housing) (provided with 3'-0" coiled extension for connection into Purchaser's switchgear power source). Heaters shall be rated at 240 Volts and operated at 120 Volts (½ voltage) to maintain low heater surface temperature, and shall be designed for easy removal without requiring opening of the bus housing.

3.1.4 All housing and flange gasketing shall be closed-cell neoprene rubber, or other noncorrosive material, and shall be completely concealed for protection against deterioration.

3.1.5 The temperature rise at any point on the housing shall not exceed 30°C above an ambient temperature of 40°C.

3.1.6 A fire resistant divider or barrier shall be provided at all points where the bus duct extends through building walls.

3.2 Phase Bus Bars

3.2.1 Phase bus bars shall be of the nonsegrated phase type, completely metal-enclosed.

3.2.2 Bus bars shall be full round edge rectangular (98% IACS copper) (57% IACS aluminum) of sufficient cross-section to assure full current rating without exceeding a hot spot temperature rise of 65°C in an ambient air temperature of 40°C. Joints between bus bar sections and at terminal connections shall be designed for a maximum rise of 65°C in a 40°C ambient.

3.2.3 Phase bus bars shall be mounted and secured against movement during short-circuit in tracking-resistant, molded, glass-reinforced polyester blocks, spaced along the bus run as required to meet the short-circuit current rating. The support blocks shall be ribbed to provide long creepage paths and fitted with corona suppressors, consisting of silicone rubber inserts between the insulated bus bars and support blocks.

3.2.4 Phase bus bars, at 5kV class and above, shall be insulated with extruded Noryl® tubing, rated for continuous operation at 130°C.

3.2.5 Contact surfaces of copper bus bars shall be silver plated electrically by tank or brush method. Contact surfaces of aluminum bus bars shall be electro-tinned over bronze strike by the ALSTAN 80-A process. All bus bar connections shall be bolted. Bolts shall pass through the bus bar conductors,

and shall be capable of being properly torqued and locked in place, to provide and maintain full and uniform pressure under all operating conditions. (Torque requirements in ft.-lbs. shall be furnished by Manufacturer.) Temperature rise of bus bar joint shall not exceed bus bar rise by more than 5°C and in no case shall such bus bar joint temperature rise exceed 65°C.

A ground bus (shall) (shall not) be furnished which will electrically connect together all equipment connected to the bus duct. If the bus duct enclosure is so constructed and connected that it provides a continuous path for ground current, it may serve as the ground bus. If the enclosure is used as the ground bus, a tooth type lock washer shall be furnished under each bolt head and each nut at connections between sections of bus duct. If the enclosure is not so constructed, the bus duct shall be furnished with a (aluminum) (copper) ground bar (inside) (outside) the housing. The ground bus shall have suitable terminating pads for Purchaser's connections to station ground system.

3.2.6 Flexible connections shall be provided for connecting bus to porcelain apparatus bushings. All necessary adapter bars and spacers, bolting hardware and insulating materials, for connection to transformer or switchgear terminals, shall be provided and the proper coordination of connections between bus and terminal equipment shall be the responsibility of the bus Manufacturer.

3.2.7 Purchaser will provide Manufacturer with applicable switchgear and transformer drawings for matching and coordination requirements.

3.3 Ratings:

3.3.1 The maximum hot-spot temperature rise at any point in the bus duct, at continuous rated load, shall not exceed 65°C above an ambient temperature of 40°C.

3.3.2 The ratings of the bus duct shall be:

Voltage Class
_____ Volts

Nominal Voltage Rating
_____ Volts

Continuous Current Rating
_____ Amperes

Short Circuit Rating:

Momentary Current Amps
_____ rms asym.

Short Time Current Amps
_____ rms sym. (Not less than short time ratings of protective devices.)

Basic Insulation Level (BIL)
_____ kV

3.4 Supports:

Bus duct supports shall be (indoor trapeze type) (outdoor column type with base plates for attaching to Purchaser's foundations) (knee-brace type for wall mounting).

POWER ZONE METAL-ENCLOSED BUS

STANDARDS AND CODES

NEC
ARTICLE 364 — BUSWAYS

A. General Requirements

364-1. Scope. This article covers service-entrance, feeder, and branch-circuit busways and associated fittings.

364-2. Definition. For the purpose of this article a busway is considered to be a grounded metal enclosure containing factory mounted, bare or insulated conductors which are usually copper or aluminum bars, rods, or tubes.

(FPN): For cablebus, refer to Article 365.

364-3. Other Articles. Installations of busways shall comply with the applicable provisions of Article 300. (Wiring Methods.)

364.4 Use.

(a) Use Permitted. Busways shall be installed only where located in the open and are visible.

Exception: Busways shall be permitted to be installed behind panels if means of access are provided and if all the following conditions are met.

a. No overcurrent devices are installed on the busway other than for an individual fixture.

b. The space behind the access panels is not used for air-handling purposes.

c. The busway is totally enclosed, nonventilating type.

d. Busway is so installed that the joints between sections and fittings are accessible for maintenance purposes.

(b) Use Prohibited. Busways shall not be installed: (1) where subject to severe physical damage or corrosive vapors; (2) in hoistways; (3) in any hazardous (classified) location, unless specifically approved for such use [see Section 501-4(b)] (Class I, Division 2); nor (4) outdoors or in wet or damp locations unless identified for such use.

364-5. Support. Busways shall be securely supported at intervals not exceeding 5 feet (1.52 m) unless otherwise designed and marked.

364-6. Through Walls and Floors. It shall be permissible to extend unbroken lengths of busway through dry walls. It shall be permissible to extend busways vertically through dry floors if totally enclosed (unventilated) where passing through and for a minimum distance of 6 feet (1.83 m) above the floor to provide adequate protection from physical damage.

364-7. Dead Ends. A dead end of a busway shall be closed.

364-9. Overcurrent Protection. Overcurrent protection shall be provided in accordance with Sections 364-10 through 364-14.

364-10. Rating of Overcurrent Protection — *Feeders and Subfeeders. Where the allowable current rating of the busway does not correspond to a standard rating of the overcurrent device, the next higher rating shall be permitted.

364-15. Marking. Busways shall be marked with the voltage and current rating for which they are designed, and with the manufacturer's name or trademark in such manner as to be visible after installation.

B. Requirements for Over 600 Volts, Nominal

364-21. Identification. Each bus run shall be provided with a permanent nameplate on which the following information shall be provided; (1) rated voltage; (2) rated continuous current; if bus is forced-cooled, both the normal forced-cooled rating and the self-cooled (not forced-cooled) rating for the same temperature rise shall be given; (3) rated frequency; (4) rated impulse withstand voltage; (5) rated 60-Hz withstand voltage (dry); (6) rated momentary current; and (7) manufacturer's name or trademark.

Metal-enclosed buses shall be constructed and tested in accordance with ANSI C37.20-1974, Switchgear Assemblies (including metal fan).

364-22. Grounding. Metal-enclosed bus shall be grounded in accordance with Article 250.

364-23. Adjacent and Supporting Structures. Metal-enclosed busways shall be installed so that temperature rise from induced circulating currents in any adjacent metallic parts will not be hazardous to personnel or constitute a fire hazard.

364-24. Neutral. Neutral bus, where required, shall be sized to carry all neutral load current, including harmonic currents, and shall have adequate momentary and short-circuit rating consistent with system requirements.

364-25. Barriers and Seals. Bus runs having sections located both inside and outside of buildings shall have a vapor seal at the building wall to prevent interchange of air between indoor and outdoor sections.

Exception: Vapor seals not required in forced-cooled bus. Fire garriers shall be provided where fire walls, floors, or ceilings are penetrated.

364-26. Drain Facilities. Drain plugs, filter drains, or similar methods shall be provided to remove condensed moisture from low points in bus run.

364-27. Ventilated Bus Enclosures. Ventilated bus enclosures shall be installed in accordance with Article 710, Part D, unless designed so that foreign objects inserted through any opening will be deflected from energized parts.

364-28. Terminations and Connections. Where bus enclosures terminate at machines cooled by flammable gas, seal-off bushings, baffles, or other means shall be provided to prevent accumulation of flammable gas in the bus enclosures.

Flexible or expansion connections shall be provided in long, straight runs of bus to allow for temperature expansion or contraction, or where the bus run crosses building vibration insulation joints.

All conductor termination and connection hardware shall be accessible for installation, connection, and maintenance.

364-29. Switches. Switching devices or disconnecting links provided in the bus run shall have the same momentary rating as the bus. Disconnecting links shall be plainly marked to be removable only when bus is de-energized. Switching devices which are not load break shall be interlocked to prevent operation under load, and disconnecting link enclosures shall be interlocked to prevent access to energized parts.

364-30. Low-Voltage Wiring. Secondary control devices and wiring which are provided as part of the metal-enclosed bus run shall be insulated by fire-retardant barriers from all primary circuit elements with the exception of short lengths of wire, such as at instrument transformer terminals.

ANSI C37.20
Metal-Enclosed Bus — Voltage and Insulation Levels

Voltage (kV rms)		Insulation Level (kV) Power Frequency Withstand (rms)	
(Nominal)	(Rated Maximum)	(Dry 1 Minute)	Impulse Withstanding
0.6	0.635	2.2	—
4.16	4.76	19.0	60
13.8	15.00	36.0	95
14.4	15.50	50.0	110
34.5	38.00	80.0	150

NOTES:

1. Values tabulated below are for factory test. When field tests are performed these values should be reduced by 25%.

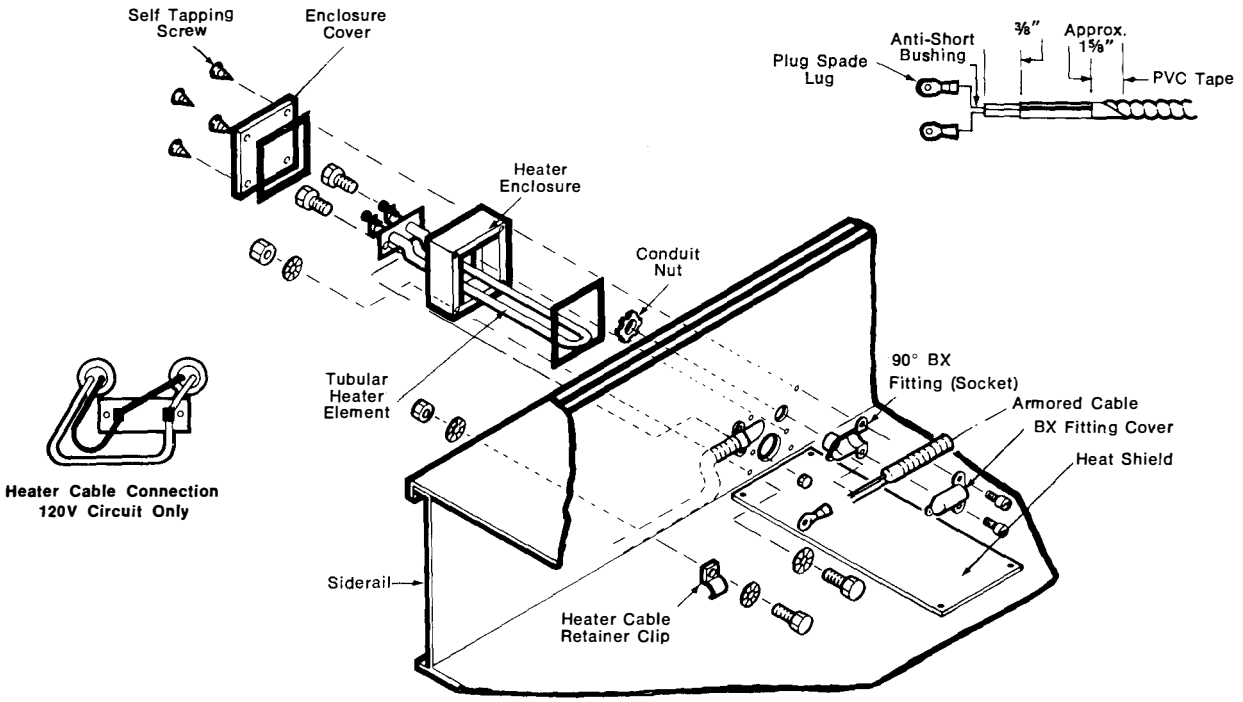
Limitations of Hottest Spot Temperature Rise Over Ambient Temperature 40°C

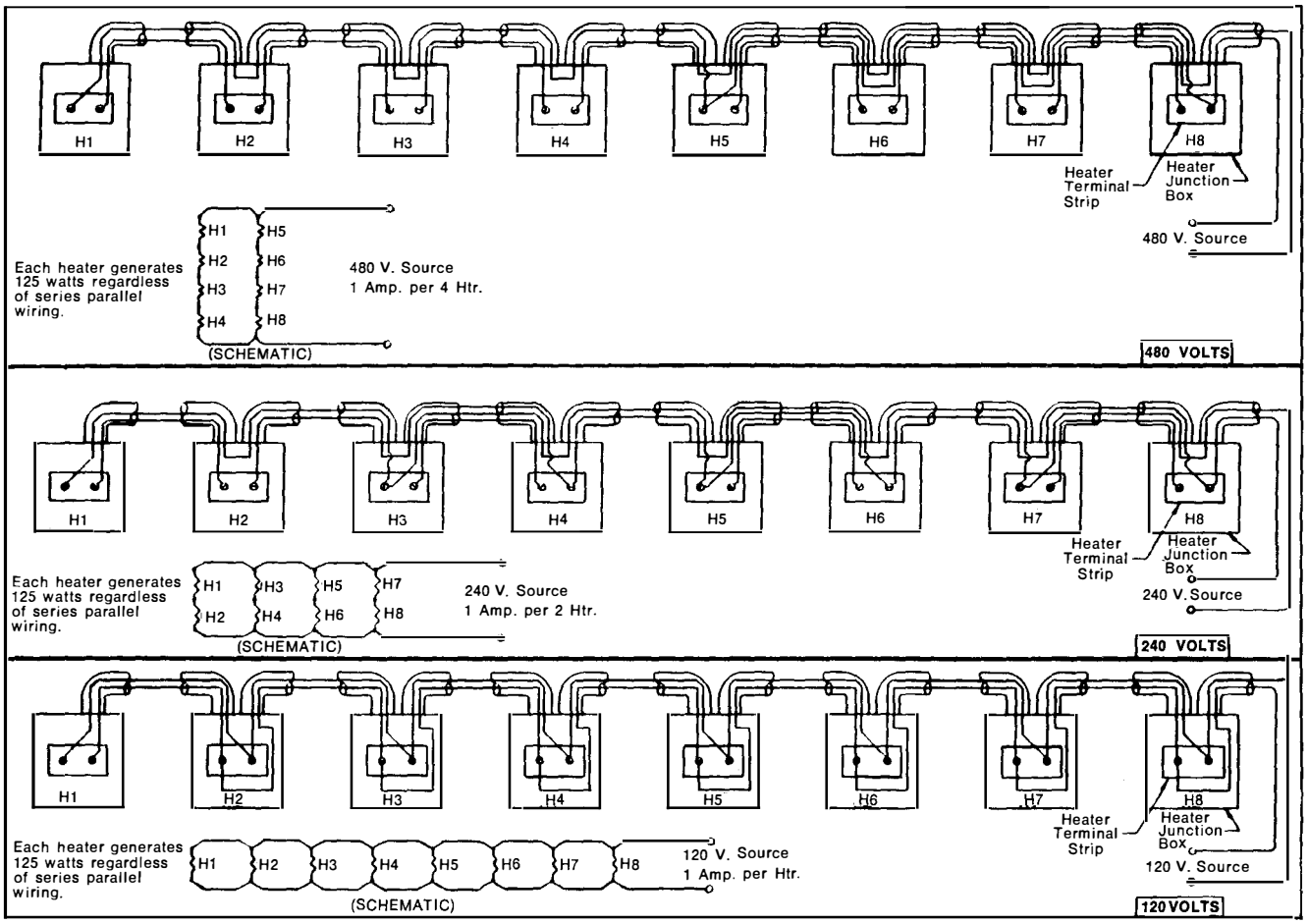
Part of Metal-Enclosed Bus, or Application	Limit of Hottest Spot Temperature Rise	Limit of Hottest Spot Total Temperature
Bus conductor silver plated (or tin plated) bus joint.	65°C	105°C
Enclosure and support structure, accessible to personnel.	30°C	70°C
Enclosure and support structure, inaccessible to personnel.	70°C	110°C
*Emergency overload.	90°C	130°C
Short circuit, short time heating (3 seconds and below).	N/A	250°C

*Emergency overload operations not to exceed 100 hours in twelve consecutive months or 500 hours in the lifetime of the bus duct system.

POWER ZONE METAL-ENCLOSED BUS

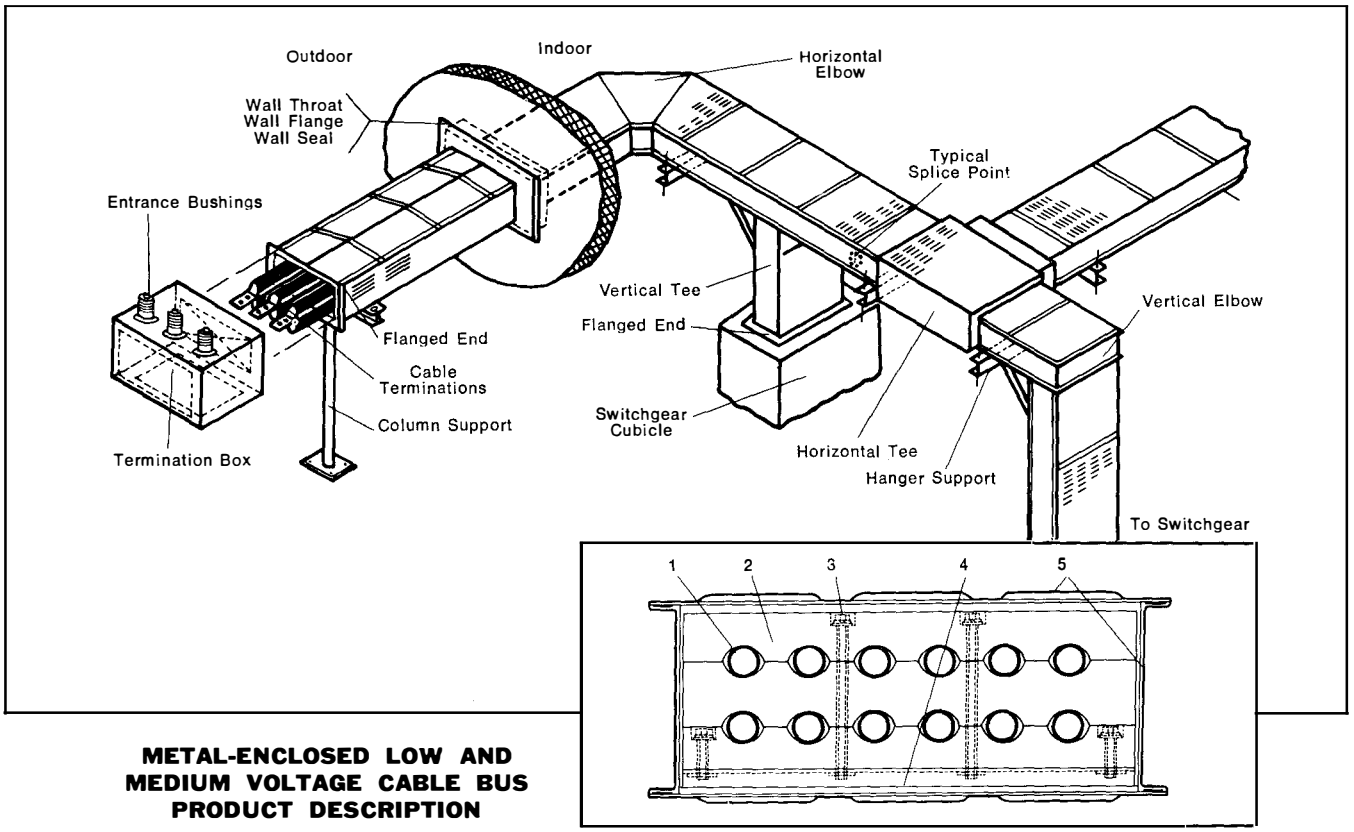
HEATER DETAIL AND WIRING DIAGRAM





POWER ZONE METAL-ENCLOSED BUS

CABLE BUS



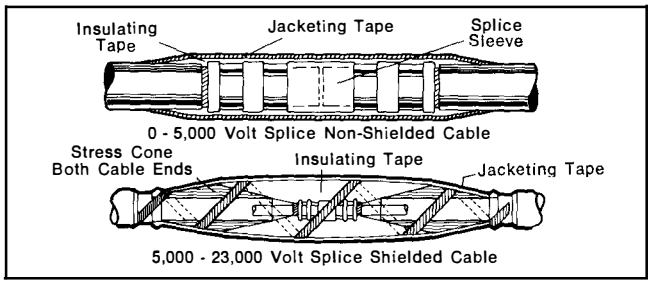
METAL-ENCLOSED LOW AND MEDIUM VOLTAGE CABLE BUS PRODUCT DESCRIPTION

1. Supplied with insulated copper or aluminum cable conductors as required, with or without neutral and with insulation and jacketing material per purchaser's requirements. Buses with 2 or more cables per phase are interleaved for best current balance and lowest impedance. See below for splicing and terminating details.
2. Cable support blocks are clear, hard maple, treated and painted with a non-toxic preservative.
3. Block sections are bolted together with non-magnetic through bolts to provide short-circuit strength.
4. Cable blocks and support brackets are located every 24" to 36" along the bus to provide the required short circuit strength.
5. Bus housing is fabricated of extruded aluminum side members (corrosion resistant alloy 6063-T6) with formed sheet aluminum covers. Outdoor bus has louvered side members and bottom covers with solid top covers. Indoor bus has louvered top and bottom covers. Non-ventilated bus designs can be supplied if required: current capacity is approximately 60% of the capacity of the same cables in standard ventilated housing. Primed and painted sheet steel housings available thru 2500A.

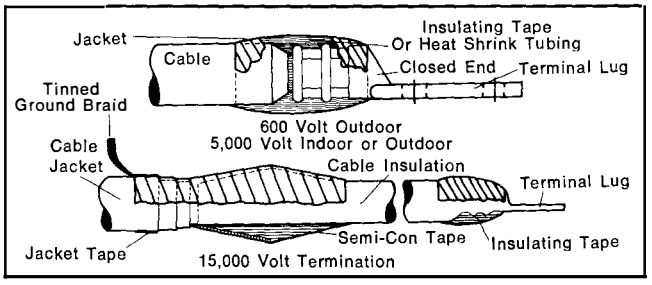
POWERZONE cable bus systems are available in three forms:

a. Factory assembled and conductored bus sections with factory made terminations and partially made splices.
b. Factory assembled and conductored bus sections with all splicing and terminating work done by purchaser.
c. Factory fabricated bus housing sections arranged for field installation and terminating of the cables.

TYPICAL CABLE SPLICING DETAILS



TYPICAL CABLE TERMINATION DETAILS



CABLE BUS SPECIFICATIONS

1.0 General:

1.1 This specification describes the electrical and mechanical requirements for metal-enclosed, low and medium voltage (thru 69kV) feeder bus. The bus system described is to be suitable for indoor or outdoor applications with nominal current ratings maintained in ambient temperatures to 40°C.

1.2 The bus shall be for indoor or outdoor application as designated in the Purchaser's specifications and shall include all necessary equipment connection flanges, wall entrance seals, transformer or equipment taps, elbows, offsets, cable splicing and terminating materials, terminal connectors, bushing stud connectors, and other miscellaneous parts required to make a complete coordinated bus installation. Drawings shall be supplied with each run of bus and each bus section identified on the installation drawings. Complete bills of material are supplied, keyed to the installation drawings, covering all materials supplied.

The bus will be supplied in lengths up to 30 feet (longer for special applications) with each piece sized to fit the installation conditions. Wherever practical, elbows, offsets and bends will be factory assembled into a bus section to reduce the number of sections shipped to a minimum.

2.0 Standards and Codes:

2.1 The assemblies shall be constructed, wired and tested in accordance with all applicable sections of the latest listed standards and codes.

2.1.1 National Electrical Manufacturers Association (NEMA)

2.1.2 American National Standards Institute (ANSI - C37.20a)

2.1.3 National Electric Code (NEC) (NFPA No. 70)

3.0 Basic Construction:

3.1 Housing

3.1.1 The bus duct shall be (louvered) (non-louvered) outdoors, and shall be (louvered) (non-louvered) indoors. Housing and accessory flanges, terminal enclosures, etc. shall be of primed and painted (steel) (corrosion resistant aluminum) construction. All outdoor hardware shall be stainless steel.

Indoor hardware (unless in corrosive environment) shall be manufacturer's standard.

3.1.2 Steel housings shall have 14 gauge sides and covers, and 11 gauge end flanges. Aluminum bus housings shall be of nominal ⅛" thickness material minimum throughout.

3.1.3 All housing and flange gasketing shall be of closed-cell neoprene rubber of other non-corrosive material and shall be completely concealed for protection against deterioration.

3.1.4 The temperature rise at any point on the housing shall not exceed 40°C above an ambient temperature of 40°C.

3.1.5 A fire and weather resistant divider or barrier shall be provided at all points where the bus duct extends through building walls.

3.2 Phase Conductors

3.2.1 Phase conductors shall be of non-segregated phase type, completely metal-enclosed in (ventilated) (non-ventilated) enclosure.

3.2.2 Phase conductors shall be flexible (copper) (aluminum) cables, insulated, shielded and jacketed in accordance with Purchaser's requirements, of sufficient cross-section to assure full current rating without exceeding a hot-spot temperature rise of 50°C in an ambient air temperature of 40°C. Insulated cables are to be correctly interleaved to assure balanced current divisions between phase cables and to give minimum cable temperature rise.

3.2.3 Phase conductors (and neutral conductors if an ungrounded neutral is required) shall be mounted and secured against short circuit forces in clear hard maple support blocks, treated and painted with a non-toxic wood preservative.

3.2.4 Contact surfaces of cable terminals shall be tin plated electrically by the ALSTAN 80-A process. Any bus bar connections required shall be bolted, accomplished by bolts passing through the bus bar conductors, capable of being properly torqued and locked in place to provide and maintain full and uniform pressure under all operating conditions. (Torque requirements in ft.-lbs. shall be furnished by Manufacturer.) Temperature rise of bus bar joint shall not exceed cable temperature and in no case shall such bus bar joint temperature rise exceed 50°C.

3.2.5 All transition parts for connection to transformer or switchgear terminals shall be provided and the proper coordination of connections between bus and terminal equipment shall be the responsibility of the bus Manufacturer.

3.2.6 Purchaser will provide Manufacturer with applicable switchgear and transformer drawings for matching and coordination requirements.

CABLE BUS SPECIFICATIONS (Con'd.)

3.3 Ratings

3.3.1 The maximum hot-spot temperature rise at any point in the bus duct, at continuous rated load shall not exceed 50°C above an ambient temperature of 40°C.

3.3.2 The ratings of the bus shall be:

Voltage Class _____ Volts

Nominal Voltage Rating _____ Volts

Continuous Current Rating _____ Amperes

Frequency _____ Hertz

Short Circuit Rating

Momentary Current Amps
_____ rms assym.

Short Time Current Amps
_____ rms symm.

Basic Impulse Insulation Level (BIL) _____.

3.4 Supports

Bus duct supports shall be (indoor trapeze type) (outdoor column type with base plates for attaching to Purchaser's foundations) (knee-brace type for wall mounting).

POWER ZONE METAL-ENCLOSED BUS

CABLE BUS TECHNICAL INFORMATION

COPPER 600 VOLTS

Nominal Amp. Rating (a)	Conductors: No. Per Phase	Conductors: kcmil	Ampacity at 40° C Ambient	Three Phase-3W: Overall Dimensions H" x W" (b)	Wt./ Ft.
400	1	350	490	6½" x 12½"	11
600	1	500	620	6½" x 12½"	13
800	1	750	820	6½" x 14½"	16
1000	1	1000	1040	6½" x 14½"	19
1200	2	500	1250	8½" x 12½"	19
1600	2	750	1620	8½" x 14½"	25
1800	2	1000	1870	8½" x 14½"	30
2000	3	750	2370	8½" x 23½"	37
2500	3	1000	2740	8½" x 23½"	43
3000	4	750	3060	8½" x 23½"	45
3500	4	1000	3640	8½" x 23½"	55
4000	6	750	4300	12½" x 23½"	64
5000	6	1000	5160	12½" x 23½"	80
6000	6	1250	6200	14½" x 25½"	101

ALUMINUM 600 VOLTS

Nominal Amp. Rating (a)	Conductors: No. Per Phase	Conductors: kcmil	Ampacity at 40° C Ambient	Three Phase-3W: Overall Dimensions H" x W" (b)	Wt./ Ft.
400	1	500	480	6½" x 12½"	9
600	1	750	625	6½" x 14½"	10
800	1	1000	825	6½" x 14½"	11
1000	2	500	1025	8½" x 12½"	11
1200	2	750	1270	8½" x 14½"	14
1600	2	1000	1615	8½" x 14½"	16
1800	3	750	1870	8½" x 23½"	21
2000	3	1000	2200	8½" x 23½"	24
2500	4	750	2530	8½" x 23½"	24
3000	4	1000	3020	8½" x 23½"	28
3500	6	750	3610	12½" x 23½"	33
4000	6	1000	4350	12½" x 23½"	39
5000	6	1250	5100	14½" x 25½"	49
6000	6	2000	6340	16½" x 29½"	69

5,000 VOLTS ALUMINUM

Nominal Amp. Rating (a)	Conductors: No. Per Phase	Conductors: kcmil	Ampacity at 40° C Ambient	Three Phase-3W: Overall Dimensions H" x W" (b)	Wt./ Ft.
400	1	500	475	6½" x 14½"	11
600	1	750	630	6½" x 16½"	14
800	1	1000	815	6½" x 18½"	16
1000	2	500	1015	8½" x 14½"	15
1200	2	750	1230	8½" x 16½"	20
1600	2	1250	1700	10½" x 18½"	26
1800	3	750	1845	8½" x 25½"	28
2000	3	1000	2140	10½" x 28½"	34
2500	4	750	2510	8½" x 25½"	33
3000	4	1000	3020	10½" x 29½"	41
3500	6	750	3560	14½" x 25½"	48
4000	6	1000	4275	16½" x 29½"	58
5000	6	1250	5200	16½" x 30½"	65
6000	6	2000	6200	18½" x 34½"	90

5,000 VOLTS COPPER

Nominal Amp. Rating (a)	Conductors: No. Per Phase	Conductors: kcmil	Ampacity at 40° C Ambient	Three Phase-3W: Overall Dimensions H" x W" (b)	Wt./ Ft.
400	1	350	485	6½" x 14½"	13
600	1	500	615	6½" x 14½"	15
800	1	750	815	6½" x 16½"	19
1000	1	1000	1050	6½" x 18½"	22
1200	2	500	1235	8½" x 14½"	23
1600	2	750	1630	8½" x 16½"	30
1800	2	1000	1850	10½" x 18½"	38
2000	3	750	2240	8½" x 25½"	43
2500	3	1000	2700	10½" x 28½"	55
3000	4	750	3050	8½" x 25½"	53
3500	4	1000	3685	10½" x 29½"	68
4000	6	750	4250	14½" x 25½"	78
5000	6	1000	5120	16½" x 29½"	99
6000	6	1250	6150	16½" x 30½"	116

15,000 VOLTS ALUMINUM

Nominal Amp. Rating (a)	Conductors: No. Per Phase	Conductors: kcmil	Ampacity at 40° C Ambient	Three Phase-3W: Overall Dimensions H" x W" (b)	Wt./ Ft.
400	1	500	460	6½" x 15½"	13
600	1	750	618	6½" x 16½"	14
800	1	1000	800	6½" x 18½"	16
1000	2	500	1000	8½" x 15½"	18
1200	2	750	1210	8½" x 16½"	20
1600	2	1250	1670	10½" x 19½"	29
1800	3	750	1813	8½" x 26½"	29
2000	3	1000	2100	10½" x 29½"	37
2500	4	1000	2805	10½" x 30½"	44
3000	4	1250	3200	10½" x 32½"	51
3500	6	750	3500	14½" x 26½"	50
4000	6	1000	4200	16½" x 30½"	63
5000	6	1500	5090	16½" x 33½"	77
6000	6	2000	6100	18½" x 35½"	92

15,000 VOLTS COPPER

Nominal Amp. Rating (a)	Conductors: No. Per Phase	Conductors: kcmil	Ampacity at 40° C Ambient	Three Phase-3W: Overall Dimensions H" x W" (b)	Wt./ Ft.
400	1	350	480	6½" x 14½"	14
600	1	500	610	6½" x 15½"	16
800	1	750	800	6½" x 16½"	21
1000	1	1000	1010	6½" x 17½"	23
1200	2	500	1220	8½" x 15½"	24
1600	2	750	1600	8½" x 16½"	31
1800	2	1000	1820	10½" x 18½"	39
2000	3	750	2200	8½" x 26½"	46
2500	3	1000	2650	10½" x 29½"	57
3000	4	750	3000	8½" x 27½"	57
3500	4	1000	3620	10½" x 30½"	71
4000	6	750	4170	14½" x 26½"	83
5000	6	1000	5020	16½" x 30½"	104
6000	6	1250	6020	16½" x 32½"	123

(a) Ampere ratings are based on 3 phase temperature rise tests made to establish conductor arrangement for minimum temperature rise. The ratings meet the maximum allowable conductor temperature per IPCEA std., with housing rise limited to 30°C per USAS—C37.20-1974. Buses with lower conductor housing temperature rises can be provided.

(b) Minimum cable spacing is one cable diameter.

POWER ZONE METAL-ENCLOSED BUS

CLASS 6090

PROJECT CHECK LIST

Project Name: _____

Location: _____

Quotation Number: _____

Required Performance Dates:

Approval Drawings: _____

Record Drawings: _____

Shipment: _____

(A) Voltage Class:

(1) _____ 600V
(2) _____ 5kV
(3) _____ 15kV
(4) _____

(B) Insulation:

(1) _____ Bare (600V)
(2) _____ Insulated

(C) Current Rating:

(1) _____ 1200A
(2) _____ 1600A
(3) _____ 2000A
(4) _____ 2500A
(5) _____ 3000A
(6) _____ 4000A
(7) _____

(D) Bus Conductor:

(1) _____ Aluminum
(2) _____ Copper

(E) Bus Conductor Support:

(1) _____ Fiberglass
(2) _____ Porcelain
(3) _____ Hard Maple (Cable Bus)

(F) Housing Type:

(1) _____ Indoor Vent.
(2) _____ Outdoor TENV
(3) _____ Indoor TENV

(G) Housing Material:

(1) _____ Aluminum
(2) _____ Steel
(3) _____

(H) Housing Finish:

(1) _____ ANSI-61
(2) _____ ANSI-24
(3) _____ ANSI-70
(4) _____ ANSI-49
(5) _____

(I) Phases:

(1) _____ Single
(2) _____ Three
(3) _____ 50% Neutral
(4) _____ 100% Neutral
(5) _____

(J) Frequency:

(1) _____ 60HZ
(2) _____ 50HZ
(3) _____

(K) Ground Bus:

(1) _____ Housing
(2) _____ Internal
(3) _____ External
(4) _____ Copper
(5) _____ Aluminum
(6) _____ Not Required

(L) Momentary Bracing (Short Circuit): Asym. Current

(1) _____ 60kA
(2) _____ 75kA
(3) _____ 80kA
(4) _____ 100kA
(5) _____

(M) Service Conditions:

As Described by ANSI C37.20

(1) _____ Usual
(2) _____ Unusual
(3) _____ Seismic Zone
(4) _____ Explosive
(5) _____

(N) Basic Insulation Level:

(1) _____ 25kV
(2) _____ 60kV
(3) _____ 95kV
(4) _____ 110kV
(5) _____

Enter Quantity Required:

(A) Bus Duct Footage:

_____ Indoor
_____ Outdoor
_____ Total

(B) _____ Vertical Elbows
(C) _____ Horizontal Elbows
(D) _____ Wall/Floor Ent. Seal
(E) _____ Tee
(F) _____ Expansion Joint
(G) _____ Phase Transposition
(H) _____ Bus Termination Seal
(I) _____ Switchgear Term.
(J) _____ Transformer Term.
(K) _____ Flex. Housing Collar
(L) _____ PVC Splice Boots
(M) _____ PVC Term. Boots
(N) _____ Bushing Box Term.
(O) _____ Cable Tap Box
(P) _____ Trapeze Hanger
(Q) _____ Knee Brace Support
(R) _____ Column Support
_____ Height
(S) _____ Heaters
_____ Outdoor
_____ Indoor (Spl)
(T) _____ Thermostat

Special Parts/Requirements

_____

_____

_____

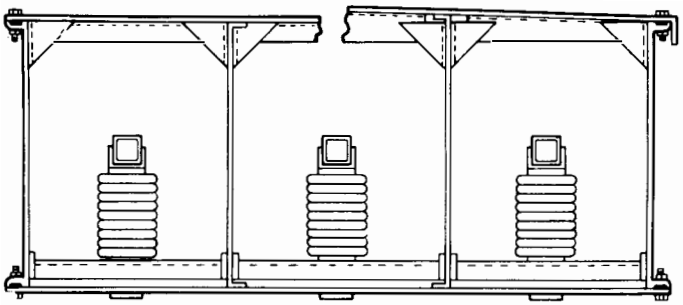
_____

PRINTED IN U.S.A.

POWER ZONE METAL-ENCLOSED BUS

ADDITIONAL PRODUCTS

SEGREGATED PHASE BUS



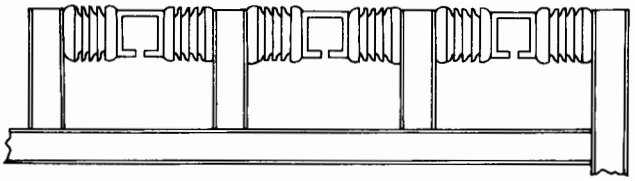
Description: All phase conductors are in a common enclosure, but are segregated by metal barriers between phases.

Application: Used as generator leads in power plants, switchgear tie-in for metal-enclosed substations, and in factories.

Conductors: Copper or aluminum.

Supports: Fiberglass or porcelain.

OPEN SUBSTATION BUS



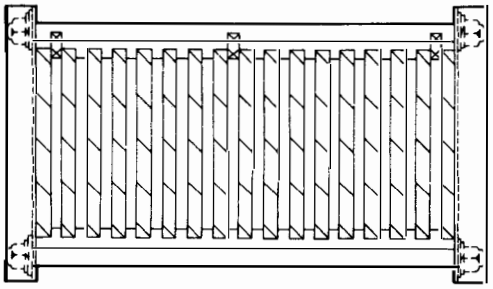
Description: Bare metal conductors mounted on porcelain insulators, with switches, instrument transformers, etc., assembled on structural steel supports to form AC or DC substation systems.

Applications: Outdoor substations for utility and industrial applications.

Conductors: Copper or aluminum.

Supports: Porcelain.

HIGH AMPACITY INDUSTRIAL BUS



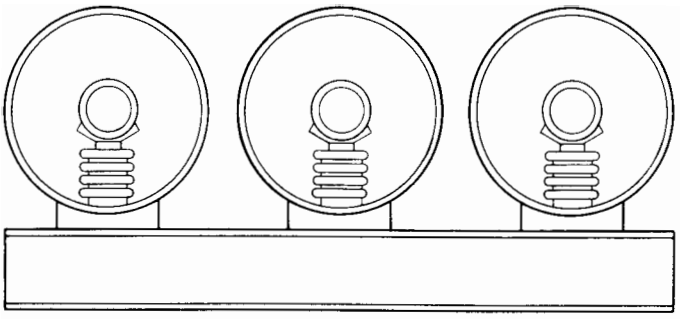
Description: Large bus bar assemblies with fiberglass or transite insulation, high pressure clamps, high current switches for A-C or D-C industrial service.

Application: Low voltage high current A-C and D-C buses for electric furnaces, electrochemical and electroplating systems, magnet leads and high energy battery systems.

Conductors: Copper or aluminum.

Supports: Fiberglass or transite.

ISOLATED PHASE BUS



Description: Each phase conductor is enclosed in an individual metal housing, separated from adjacent conductor housings by an air space.

Application: Used primarily as the main generator leads in power plants.

Conductors: Copper or aluminum.

Supports: Fiberglass or porcelain.