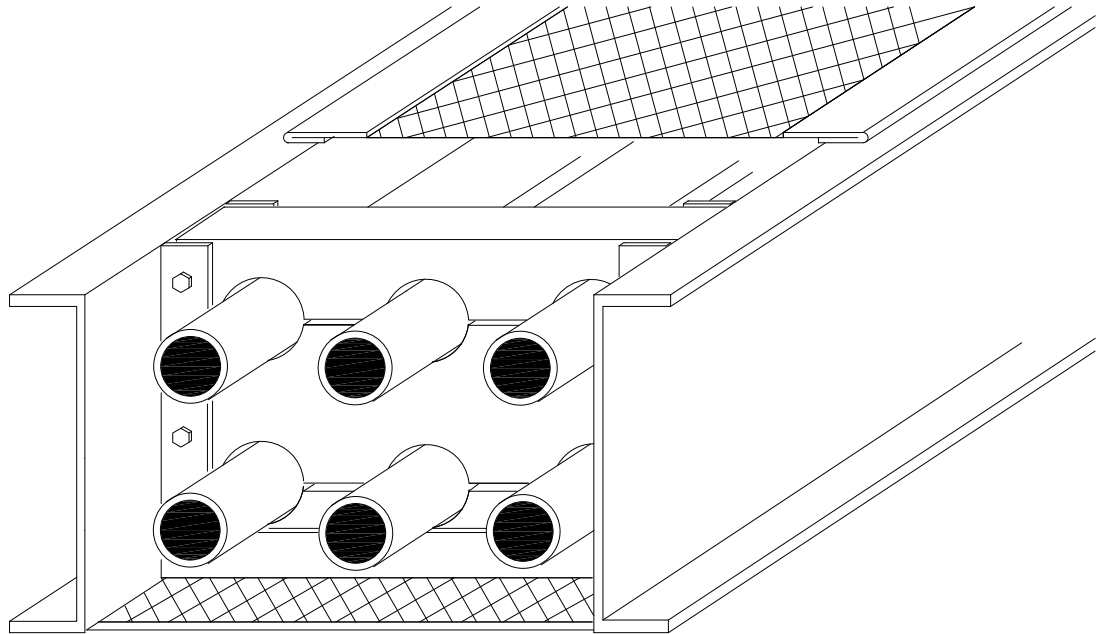


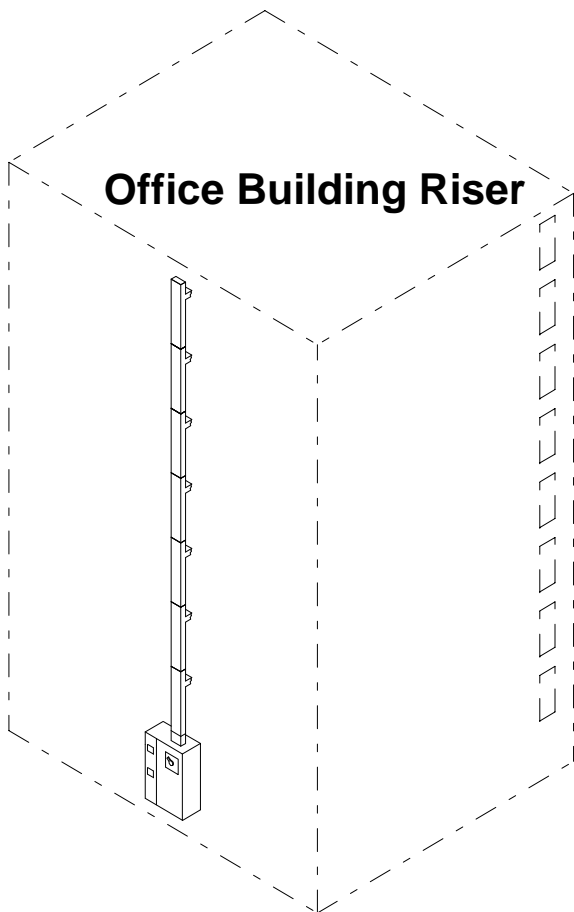
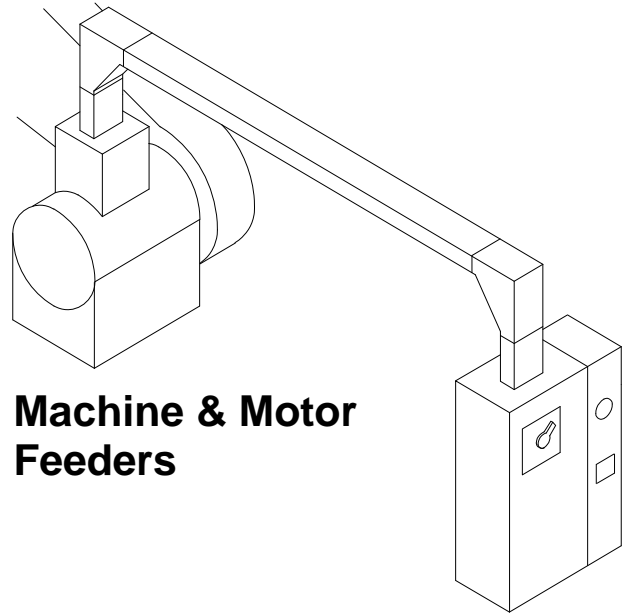
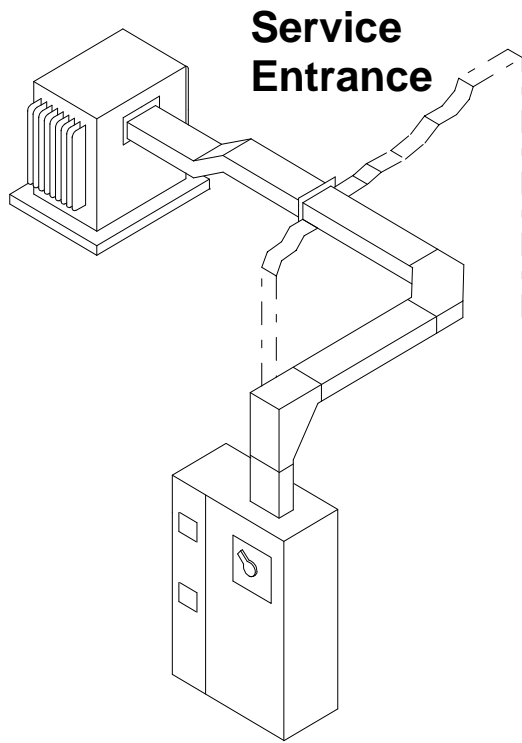
CABLE BUS



Industrial
Commercial
Utility

600Volt, 5KV, 15KV, & Up!

400 to 6000 Amps!



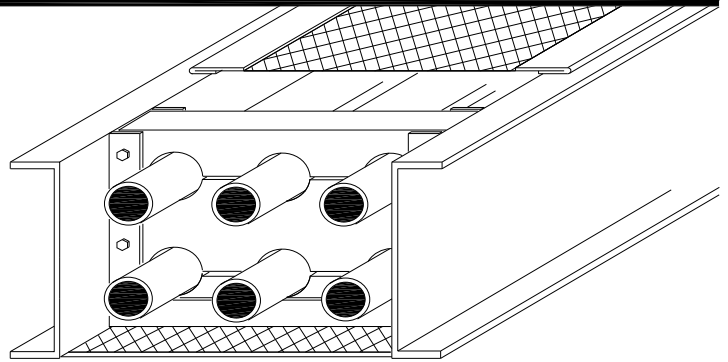
Plant Distribution
Primary & Secondary Feeders
Industrial Plants
Convention Centers
Hospitals
Airports
Shopping Malls
Sports Complexes

Indoors
Or
Outdoors

MDF

CABLE BUS SYSTEMS

- Safe
- Reliable
- Lowest Cost Systems \$\$\$



Industrial

Commercial

Utility

600Volt, 5KV, 15KV & Up to 69KV

400 to 6000 Amps

MDF CABLE BUS SYSTEMS

a division of

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Hebron, KY 41048

Phone: 888- 808 -1655

859- 586 - 6515

Fax: 859 - 586 - 6572

Email: Sales@mdfbus.com

Website: www.mdfbus.com

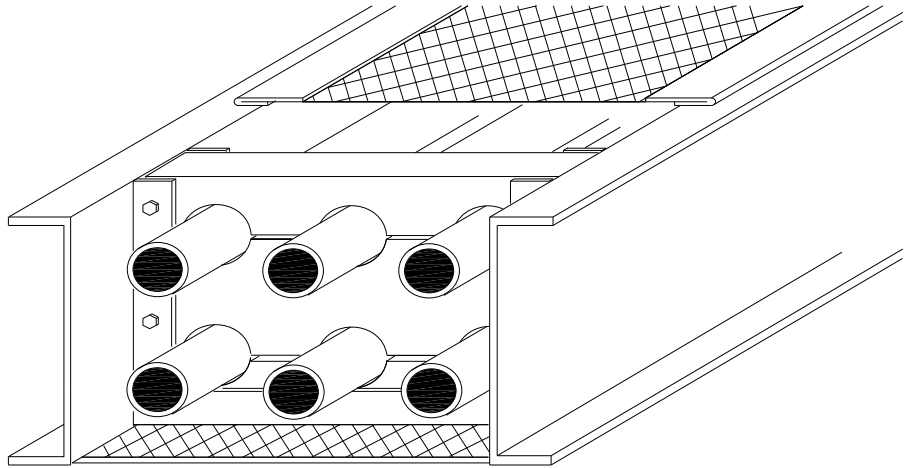
Contents:

| | |
|-----------------------------------|--------------------|
| General Information | pages 2-3 |
| System Selector | pages 4-5 |
| Fittings & Accessories | pages 6-7 |
| Engineering Information | pages 8-10 |
| Cable Bus Specification | pages 11-12 |

Safe

Reliable

**Lowest
Installed
Cost \$\$\$**



Cable Bus has proven to be the safest, most reliable electrical power feeder system for over 50 years. Electric UTILITIES were the First to recognize the merits of Cable Bus Systems and now use this economical system extensively throughout electrical generating plants from station power switchgear ties to motor feeders and even for generator leads in some special applications.

In 1969 Cable Bus was introduced into the National Electric Code in article 365 (Current article 370). Since that time INDUSTRIAL plants have used Cable Bus from service entrance applications to feeders for large motors, machines, induction furnaces, and for primary and secondary feeders in plant electrical distribution.

COMMERCIAL applications for Cable Bus are also growing. Service entrances and power distribution feeders for large shopping malls, office buildings, sports complexes, convention centers, and hospitals are just some of the commercial applications for cable bus.

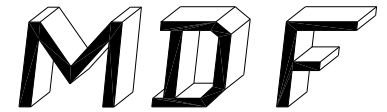
What is Cable Bus ?

Cable bus is an electrical power feeder System that employs fully insulated Electrical conductors to carry currents Between 400 to 6000 amps per phase, at voltage levels typically from 240 volts up to 35KV and higher.

The single conductor cables are protected, in a fully ventilated enclosure and supported with cable support blocks at regular intervals. The support blocks maintain the cables at a fixed spacing and phasing arrangement while also providing support needed to withstand the high fault currents of electrical power systems. After the enclosure has been completely field installed the cables are then pulled into place in contiguous lengths.

Cable Bus Systems are totally engineered and are provided with complete installation drawings and instructions.

ADVANTAGES OF MDF CABLE BUS



RELIABLE

- ❑ Fully insulated conductors offer high system reliability even in outdoor environments.
- ❑ Conductors are continuous from source to load, eliminating intermediate splices and potential trouble spots.
- ❑ Systems are carefully designed to safely handle rated voltages and currents within specified temperature rise limitations.
- ❑ Ventilated enclosure eliminates hot spots and allows excellent cooling of conductors.
- ❑ Conductors are isolated from all metal parts.

LOWEST COST \$\$

- ❑ Material and installation costs are low compared to other systems.
- ❑ Ventilating enclosures and maintained cable spacing permits optimum system designs and minimizes conductor material.
- ❑ Lightweight aluminum enclosure allows for ease of installation with no special lifting equipment.
- ❑ Continuous conductors eliminate the expensive labor involved in splice joints.
- ❑ No special installation tools are required.

SAFE

- ❑ Totally insulated conductors reduce shock hazard.
- ❑ Ventilated enclosure guards against entry of foreign objects and protects cables from physical damage.

- ❑ Designed to safely handle high short circuit currents.
- ❑ Aluminum enclosure and high pressure splice joints provide excellent ground continuity. No additional ground wire required for most systems.

LONG SPAN

- ❑ Cable Bus systems can be designed for up to 20 foot support spans thereby reducing support costs and installation labor.

ENCLOSURE

- ❑ Our standard enclosure is manufactured from a structural grade aluminum alloy which has excellent corrosion resistance and is far superior to painted steel products in industrial and outdoor environments.
- ❑ The aluminum enclosure also reduces electrical losses compared to steel enclosures.

FLEXIBILITY

- ❑ System is very adaptable in joining or connecting to other equipment or other systems.
- ❑ Bus can be easily routed around obstructions or equipment.
- ❑ High salvage value. System can be dismantled and reused or rerouted.

DRAWINGS

- ❑ Complete set of installation drawings and instructions.
-

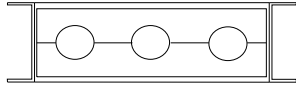


Figure "A"

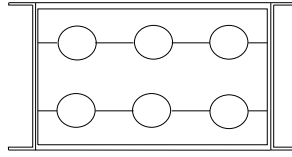


Figure "B"

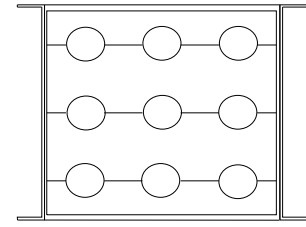


Figure "C"

COPPER Conductor System Configurations

| FIGURE | AMPACITY | CONDUCTOR SIZE (MCM) | NUMBER CABLES / PHASE | ENCLOSURE DIMENSIONS (NOMINAL) | WEIGHT Lbs/Ft (NOMINAL) |
|--------|----------|----------------------|-----------------------|--------------------------------|-------------------------|
| A | 600 | 500 | 1 | 6"H x 12"W | 11 |
| A | 800 | 750 | 1 | 6"H x 12"W | 14 |
| A | 1000 | 1000 | 1 | 6"H x 12"W | 16 |
| B | 1200 | 500 | 2 | 8"H x 12"W | 19 |
| B | 1600 | 750 | 2 | 8"H x 12"W | 25 |
| B | 1800 | 1000 | 2 | 8"H x 12"W | 31 |
| D | 2000 | 500 | 4 | 8"H x 24"W | 37 |
| D | 2500 | 500 | 4 | 8"H x 24"W | 37 |
| D | 3000 | 750 | 4 | 8"H x 24"W | 45 |
| D | 3500 | 1000 | 4 | 8"H x 24"W | 56 |
| E | 4000 | 750 | 6 | 12"H x 24"W | 67 |
| E | 5000 | 1000 | 6 | 12"H x 24"W | 82 |
| E | 6000 | 1250 | 6 | 12"H x 24"W | 101 |

1. System configurations are for 3 phase/ 3 wire systems. For 4 wire, single phase, or DC systems consult factory for configuration.
2. Nominal dimensions are given for enclosure size. For exact dimensions of a specific system design, contact factory.
3. Weights are given for 5KV systems.

ALUMINUM CONDUCTOR SYSTEMS

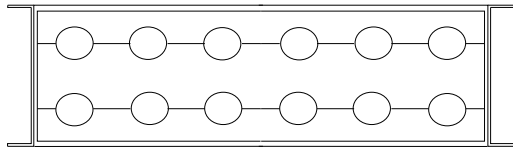
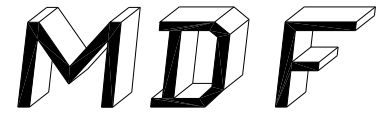


Figure "D"

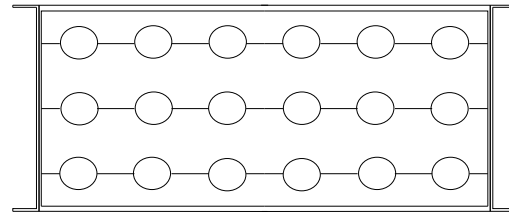


Figure "E"

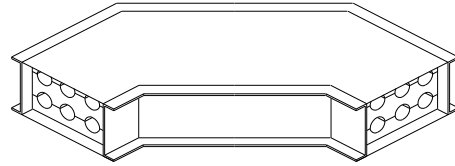
ALUMINUM Conductor System Configurations

| FIGURE | AMPACITY | CONDUCTOR SIZE (MCM) | NUMBER CABLES / PHASE | ENCLOSURE DIMENSIONS (NOMINAL) | WEIGHT Lbs/Ft (NOMINAL) |
|--------|----------|----------------------|-----------------------|--------------------------------|-------------------------|
| A | 400 | 500 | 1 | 6"H x 12"W | 8 |
| A | 600 | 750 | 1 | 6"H x 12"W | 9 |
| A | 800 | 1000 | 1 | 6"H x 12"W | 10 |
| B | 1000 | 500 | 2 | 8"H x 12"W | 13 |
| B | 1200 | 750 | 2 | 8"H x 12"W | 15 |
| B | 1600 | 1000 | 2 | 8"H x 12"W | 17 |
| C | 1800 | 750 | 3 | 12"H x 12"W | 22 |
| C | 2000 | 1000 | 3 | 12"H x 12"W | 25 |
| D | 2500 | 750 | 4 | 8"H x 24"W | 27 |
| D | 3000 | 1000 | 4 | 8"H x 24"W | 31 |
| E | 3500 | 750 | 6 | 12"H x 24"W | 38 |
| E | 4000 | 1000 | 6 | 12"H x 24"W | 45 |
| E | 5000 | 1250 | 6 | 14"H x 30"W | 54 |

1. System configurations are for 3 phase/ 3 wire systems. For 4 wire, single phase, or DC systems consult factory for configuration.
2. Nominal dimensions are given for enclosure size. For exact dimensions of a specific system design, contact factory.
3. Weights are given for 5KV systems.

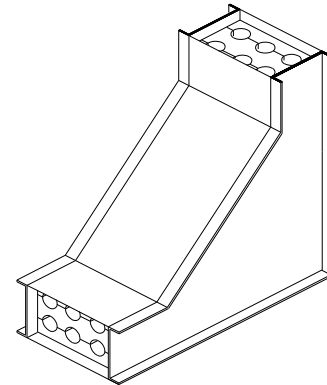
HORIZONTAL ELBOW

Horizontal elbows are used to make changes in direction as required from 15 to 90 degrees. For dimensional information consult factory.



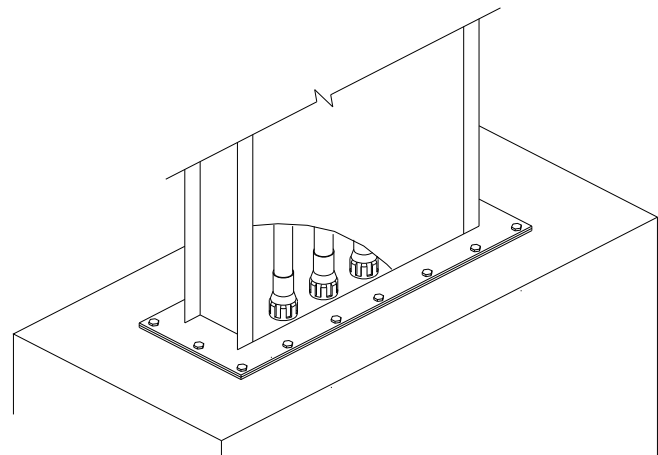
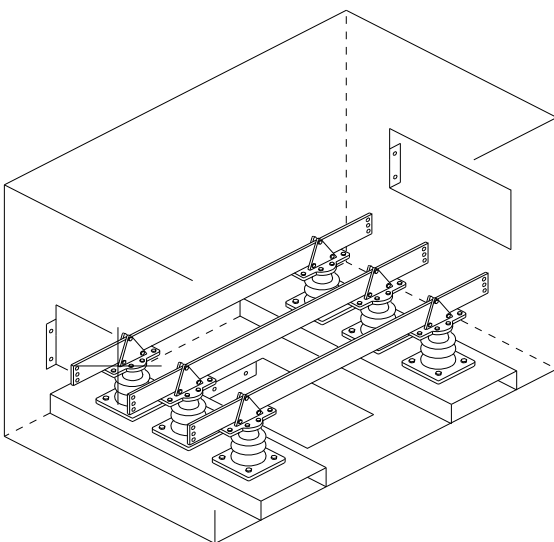
VERTICAL ELBOW

Vertical elbows are used to make changes in the vertical direction as required from 15 to 90 degrees. For dimensional information consult factory.

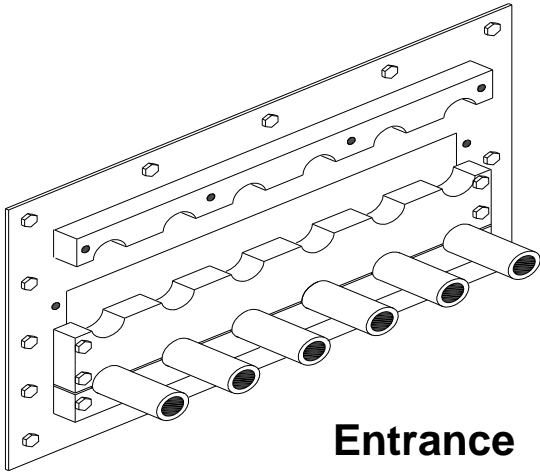


TAP BOX

Tap boxes are supplied to make taps from main bus runs to intermediate loads or bus ties. These aluminum boxes can be supplied for indoor or outdoor use.

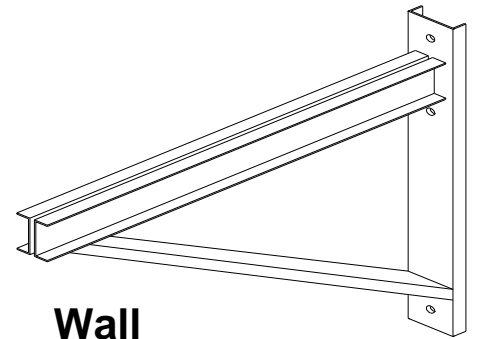
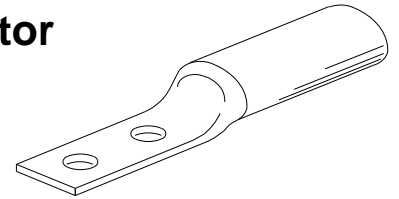


**Outdoor Vertical
Bus Seal**

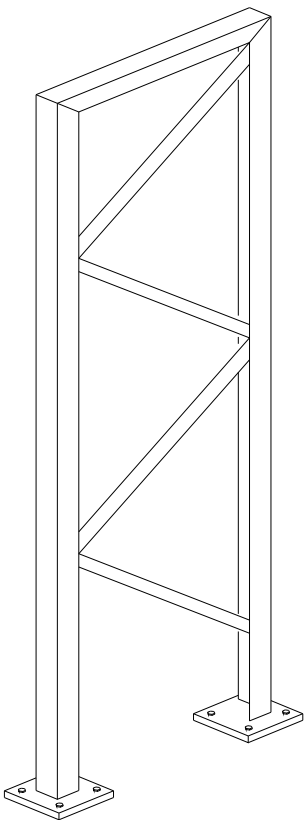


Entrance Fitting

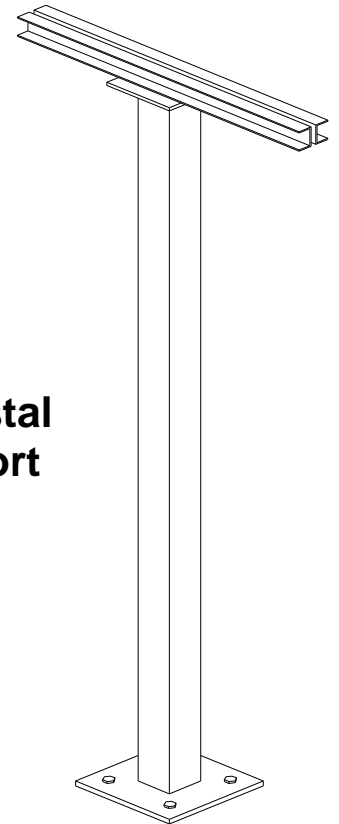
Compression Connector



Wall Bracket



Frame Support



Pedestal Support

Cables

General:

The main consideration in any cable bus system is the proper selection of power conductors. MDF uses only the highest quality cables, pre-tested and designed for use in cable bus systems for indoor or outdoor environments.

Conductors may be copper or aluminum and are typically supplied with an insulation temperature rating of 90° C or 105° C for 5 & 15KV cables.

Insulation:

Cross-linked Polyethylene - XLP. This is the most economical type of insulation. XLP has excellent resistance to most chemicals, and is very resistant to physical damage.

Ethylene-Propylene Rubber – EPR. EPR is recommended for all systems rated above 2000 volts. This insulation is superior to XLP in most all categories and results in a more reliable system, particularly in outdoor and wet environments.

Shielding:

Shielding is recommended on all systems over 2400 volts. A grounded shield does several things for the power cable:

1. Confines the dielectric field within the cable.
2. Provides a uniform stress distribution within the dielectric.
3. Protects the cable from induced potentials.
4. Limits radio interference.
5. Reduces shock hazard.
6. Provides a ground path for leakage and fault currents.

VOLTAGE DROP & POWER LOSS

MDF Cable Bus Systems have low impedance characteristics, which reduce power consumption and also minimize the system voltage drop. The actual voltage drop and power loss will of course depend on the specific Cable Bus system.

The typical system will have a 2 to 3 volt (line to line) voltage drop per 100 foot, at rated current. Computer analysis and printouts are supplied with each project detailing this information. If you have specific questions regarding voltage drop or power loss, please consult the factory.

PARALLEL CONDUCTORS & SYSTEM BALANCE

Cable Bus systems take advantage of the efficiency of using two or more conductors per phase in larger rated systems. As cable sizes increase the ampacity per circular mil decreases. This is due primarily to the “skin” effect or current distribution within the cable and the decrease in the heat radiating ability per cross section area as the cable size increases.

The current density is highest at the outer surface of the cable. Two smaller cables will have more surface area than one large cable of equal total conductor material and will, therefore, most often be more efficient.

The efficiency of paralleling conductors is not without certain potential problems. When two or more cables are paralleled per phase one might assume that the total current would automatically divide equally between these paralleled conductors. This is definitely not automatic.

Due to inductive coupling between conductors, the total impedance of each conductor also depends on the physical geometry of the system. The mutual coupling between conductors is dependent on the spacing between conductors and the relationship of the phasing of each conductor in the system. Current division between improperly balanced systems can be as high as a 30 to 70 percent split (in a two conductor system)!

One poor solution commonly offered to this problem is to transpose the cables within the cable bus system. Proper transposition techniques, however, would require five transpositions alone on a 2 cable per phase system.

The proper solution to this problem is to engineer each system to produce balanced conductor impedances through careful phasing and spacing arrangements of each conductor. Balance currents can be obtained for most systems through symmetrical cable arrangements.

MDF will provide a complete analysis of each system proposed indicating conductor currents for each cable in the system. If you desire additional information in this area, please contact the factory.

SHORT CIRCUIT CAPACITY

Cable Bus Systems must withstand the forces created by potential fault currents of power distribution systems. Forces are created as unusually large currents are passed through the system during a fault condition. The forces are a function of the current magnitude of each conductor as well as the distance or spacing between conductors. Cables of opposite phases will be repelled while cables of like phases will be attracted. A simplified formula for forces between conductors is given below.

$$\text{Force} = \frac{K (C1 \times C2)}{D}$$

K = constant

C1 = Current cable 1

C2 = Current cable 2

D = distance between conductors

MDF Cable Bus systems have been designed to withstand these forces. Conductor support blocks firmly hold cables in place within the cable bus enclosure. Blocks are spaced between 12 and 36 inches on centers depending on the required short circuit rating of the system (All vertical cable bus risers have support blocks spaced no greater than 18 inches on centers). The cable support blocks are completely framed and solidly secured to the enclosure to maximize the strength and capabilities of the system to withstand these forces.

CABLE SUPPORT BLOCKS

Cable support blocks can be supplied in either our standard High Density Polyethylene (HDPE-UV) material or an optional fiberglass or also an optional hard maple wood block.

Our fiberglass blocks are manufactured from NEMA GPO-3 grade material which is flame resistant as well as arc and track resistant.

GROUNDING

As in any electrical system, it is important that Cable Bus Systems be properly grounded per article 250 of the National Electric Code. MDF Cable Bus Systems have high pressure splice joints between bus sections. These joints eliminate the need for bonding jumpers across bus sections.

FIELD TESTING

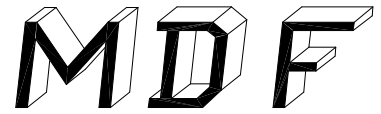
It is mandatory to conduct insulation testing for every Cable Bus System prior to energizing. The cables should be completely installed, secured and terminated (but not yet connected to other equipment). The bus covers should also be in place.

600 Volt systems can be meggered to proof test the insulation. Higher voltage systems must be tested using DC high potential testing per IEEE 400, or other suitable standard.

CONNECTORS & TERMINATIONS

Compression type cable connectors are supplied as standard. Termination kits are supplied for 5KV and 15KV systems. Either Heat shrink or Cold shrink kits are available.

CABLE BUS SPECIFICATION



GENERAL

This specification describes the electrical and mechanical requirements for metal enclosed Cable Bus Systems.

The system shall comply with Article 370 of the National Electric Code, and shall be suitable for indoor or outdoor use.

The Cable Bus System shall be manufactured by: **MDF Cable Bus Systems**

The Cable Bus System shall include all necessary straight sections, fittings, tap boxes, entrance fittings, conductors, cable connectors, cable terminations, and other accessories required to form a complete system.

A complete set of drawings shall be supplied for each system to facilitate system design and installation.

ELECTRICAL REQUIREMENTS

System Ratings:

System voltage _____ (line to line)

Continuous current rating _____ .

Frequency _____ .

Short Circuit Rating _____ .

All current carrying conductors shall be fully insulated and rated for the specified voltage. Cable insulation shall be rated for 90°C operating temperature for the ampacity and voltage specified. Cable shall be suitable for indoor or outdoor use.

System voltage drop shall not exceed _____% line to line.

Conductor material shall be (copper) (aluminum). Conductors shall be continuous, running the full length of the system. Conductors shall be installed in the cable bus enclosure after the enclosure has been completely installed in the field.

System ampacity shall be designed based on heat rise testing. Conductor temperature rise shall be limited to 50°C over a 40°C ambient temperature.

Current balance between paralleled conductors shall be insured by proper phasing and spacing arrangements between conductors. Transposition of conductors to balance conductor currents is undesirable.

The cable Bus Enclosure shall be grounded in accordance with NEC section 250.

(continued)

MECHANICAL REQUIREMENTS

Enclosure:

The cable bus enclosure shall be manufactured from mill finished aluminum and suitable for indoor or outdoor use. Side rails, rungs, and splice plates shall be manufactured from 6063-T6 or 6061-T6 aluminum alloy and shall be 1/8 inch in thickness for maximum strength and maximum equipment ground conductor ratings.

The enclosure shall have ventilated top and bottom covers with a minimum of 50% open area for the passage of air to provide maximum cable cooling.

Cover ventilation openings shall be designed to prevent entry of foreign objects and rodents. Ventilation openings shall not permit entry of round rod measuring 5/16" in diameter. Top covers shall be removable.

Enclosure splice joints shall utilize high pressure splined bolts to maximize strength and electrical continuity for grounding purposes.

All Cable Bus hardware including splice plate, cable support block, and cover hardware shall be non-magnetic, stainless steel for maximum corrosion resistance and to minimize electrical losses.

CABLE SUPPORT BLOCKS

Cable support blocks shall have a chamfered cable bore to eliminate any undue stress or damage to the cable insulation. The Cable Support block shall be manufactured from either:

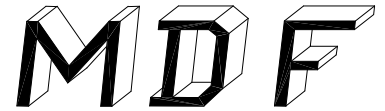
1. High Density Polyethylene (HDPE) UV resistant material suitable for indoor and outdoor use.

or

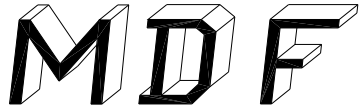
2. Fiberglass laminate manufactured in accordance with NEMA grade GPO-3.

Support blocks shall be spaced to withstand the forces due to the specified fault currents but in no case spaced greater than 36 inches for horizontal bus runs and 18 inches on vertical risers.

QUOTATION FILL-IN FORM



| | |
|---|---|
| <p>Requestors Name: _____</p> <p>Requestors Company: _____</p> <p>Address: _____</p> <p>Phone: _____ Fax: _____</p> <p>Email: _____</p> | <p>Project Name: _____</p> <p>Location: _____</p> <p>Owner: _____</p> <p>Engineer: _____</p> <p>Bid Date: _____ Ship Date: _____</p> |
| <p>Voltage: _____</p> <p>Current Rating: _____</p> <p>System Configuration:</p> <p>_____ 3 Phase / 3 Wire</p> <p>_____ 3 Phase / 4 Wire Full Neutral</p> <p>_____ 3 Phase / 4 Wire Half Neutral</p> <p>_____ 3 Phase / 4 Wire ____% Neutral</p> <p>_____ Single Phase AC</p> <p>_____ Two Pole DC</p> <p>_____ Other</p> <p>Ambient Temperature Other than (40° C) _____</p> <p>Cable Operating Temperature Other than (90° C) _____</p> <p>Conductor Material:</p> <p>_____ Copper</p> <p>_____ Aluminum</p> <p>600 Volt Cable Insulation:</p> <p>_____ XLP (XHHW-2)</p> <p>_____ Other</p> <p>Enclosure Ground: _____ External Ground: _____</p> <p>5kV & 15kV Cable Insulation:</p> <p>_____ EPR</p> <p>_____ Other</p> <p>5kV & 15kV Cable Jacket Material:</p> <p>_____ PVC</p> <p>_____ Other</p> | <p>Total Overall Cable Bus Footage:</p> <p>_____ Horizontal</p> <p>_____ Vertical</p> <p>_____ Total</p> <p>_____ Number of Bus Runs</p> <p>Quantities:</p> <p>_____ Horizontal 90 Deg Elbow</p> <p>_____ Horizontal 45 Deg Elbow</p> <p>_____ Vertical 90 Deg Elbow</p> <p>_____ Vertical 45 Deg Elbow</p> <p>_____ Wall Seal (Environmental Seal)</p> <p>_____ Fire Rated Wall Seal</p> <p>_____ Tap Box (with Bus Bars & Insulators)</p> <p>_____ Transition Box (Top Hat/Pull Box)</p> <p>_____ Splice Box</p> <p>_____ Indoor Equipment Seal Plate</p> <p>_____ Horizontal Outdoor Equipment Seal Plate</p> <p>_____ Vertical Outdoor Equipment Seal Plate (Water tight)</p> <p>List Other Special Requirements: _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> |



CABLE BUS SYSTEMS

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