Industrial Electric Mfg. (IEM)

IEM is the largest independent full-line manufacturer of electrical distribution equipment in North America

ISO 9001 Certified

IEM Consulting Engineer Support

Contact Me for:

- Layout Info.
- Tech. Questions
- IEEE Support
- Industry Info.
- Factory Tour
- Bud Lite

Medium Voltage Switchgear

Modified From Eaton Website

CAG Tab	Tab Title	Voltage Range	Switching Device	Drawout or Fixed	Front/Rear Accessible	Compartmentalized				Insulated Bus	ANSI Standards
						Breaker	Bus	Cable Area	VTs & CPTs		
5	Metal-Clad Switchgear— Medium Voltage Drawout Vacuum Breakers	4.76–38 kV	Vacuum breaker	Drawout	Front & rear required	■		■	■	■	C37.20.2
6	Metal-Enclosed Switchgear— Drawout Vacuum Breakers	4.76–15 kV			Front only AVAILABLE	■	Opt.	Opt.	■	■	C37.20.2 & C37.20.3
7.1	Metal-Enclosed Switchgear— Vacuum Breakers					Opt	Opt	Opt	Opt	②	C37.20.3
7.2	Metal-Enclosed Switchgear— MSB Medium Voltage Switch- and Fixed-Mounted Vacuum Breakers		Switch & vacuum breaker	Fixed			Opt.	Opt.	Opt.	②	
8	Metal-Enclosed Switchgear— MVS Medium Voltage Load Interrupter Fusible Switch	4.76–38 kV	Fusible switches							②	

Medium Voltage Switchgear

From Eaton Website

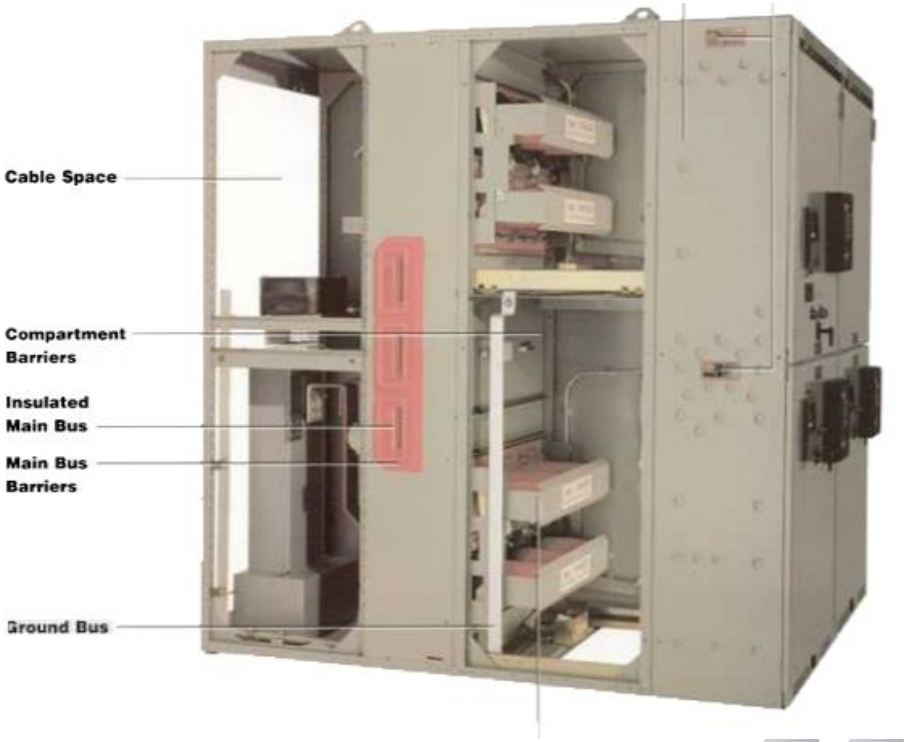
VacClad-W Metal-Clad Switchgear

MEB Metal-Enclosed Switchgear

MSB Metal-Enclosed Switchgear

Why Metal-Clad

- Defined by ANSI C37.20.2 includes: Removable (Drawout) Circuit Breakers Fully Compartmented Construction Grounded Metal Barriers Enclose all Live Parts .Automatic Shutters .Insulated Bus
- Long Equipment Mechanical &
- Electrical Life
- Reliable Relay Coordination



Metal- Clad / Metal Enclosed One-Line

From Eaton Website

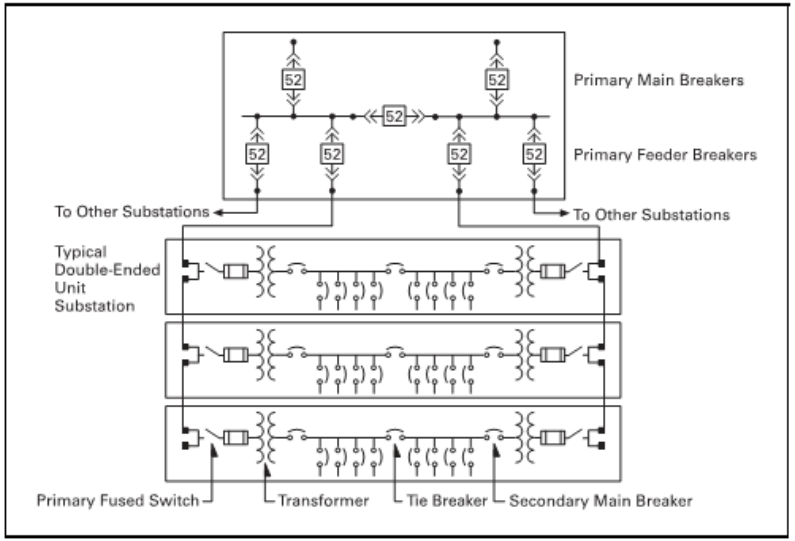
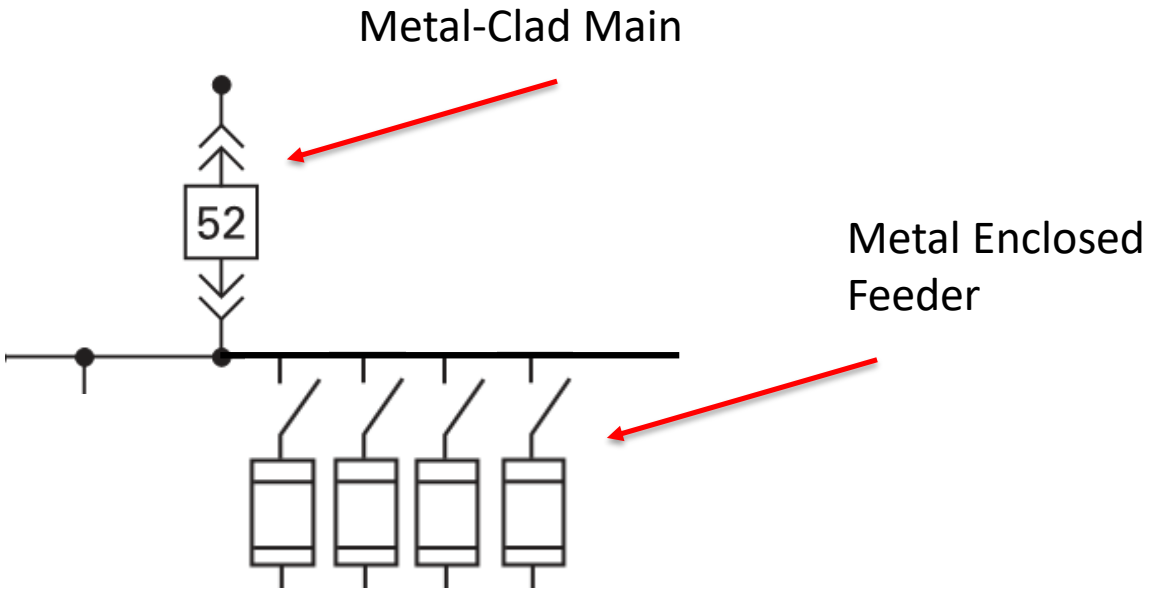


Figure 1.3-14. Two-Source Primary—Secondary Selective System

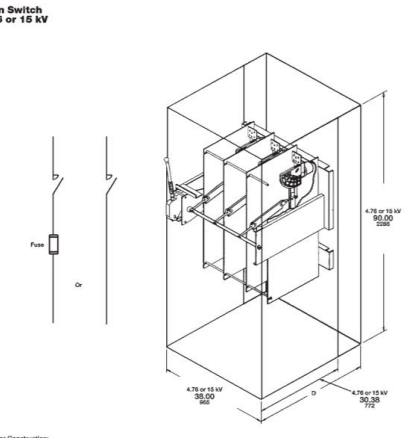
Metal-Clad primary switchgear offers excellent coordination, and the ability to switch loads on/off….
Metal Enclosed switches provide substation protection and isolation.

Metal- Clad / Metal Enclosed One-Line

Metal Enclosed feeders provide a value engineered option when frequent switching of the feeders is not necessary, and when fuses provide adequate protection. If the customer needs to switch loads often, like at a data center, or industrial facility, then consider Metal-Clad feeder breakers.



Fusible Load Interrupter Metal-Enclosed Switchgear

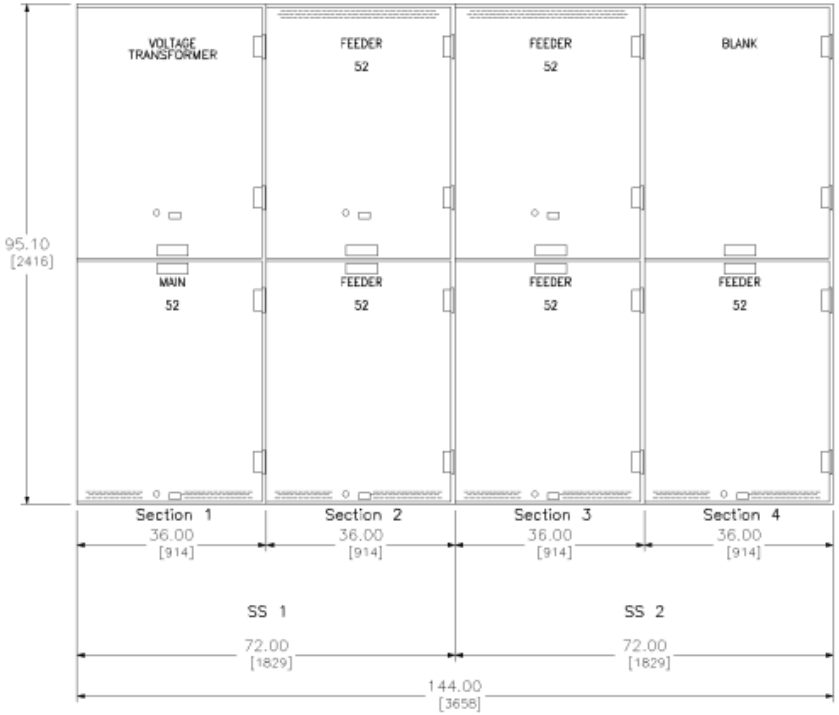


- Why Metal-Enclosed Switchgear?
  - Current rating from 600-1200A continuous
  - Short time ratings from 25 -50kA without fuses (See mfgr. Specs.)
  - Limited Switching (150-1000 mech. Operations typical)
  - Fused protection TYPICALLY
  - Reduced system expense
    - $25K -$30K/ Switch NEMA1
  - Ease of Maintenance
  - Fast Shipment (Some Units in Stock – contact supplier)
  - Typically use interrupter switches for load switching, and fuses for fault protection.

Comparing Metal-Clad & Metal Enclosed Swgr.

- Metal-clad rated for 10,000 operations, metal-enclosed typically rated for under 1000 (exceptions Exist)
- Metal enclosed product is not always load break rated.
- Metal-clad uses protective relays, metal-enclosed fusible gear uses fuses for protection.
- Metal-clad uses drawout circuit breakers, metal-enclosed typically uses a fixed switch, circuit interrupter, or fixed mounted Vac. CB. Draw out CB's are available – contact your favorite vendor.
- Metal-clad is compartmentalized, metal-enclosed is a switch, or breaker , in a box, typically without isolated cable/ bus/ breaker compartments.
- Metal-clad has insulated bus, metal-enclosed std. design is typically un-insulated bus (See upcoming slide)
- Metal-clad is always electrically operated, metal-enclosed std is manually operated
- Metal-clad is a high speed switching device- 3cycles, metal-enclosed fuses are from 10 msec to 600sec, (ref MVL

Traditional Metal-Clad – This Stuff is Big!

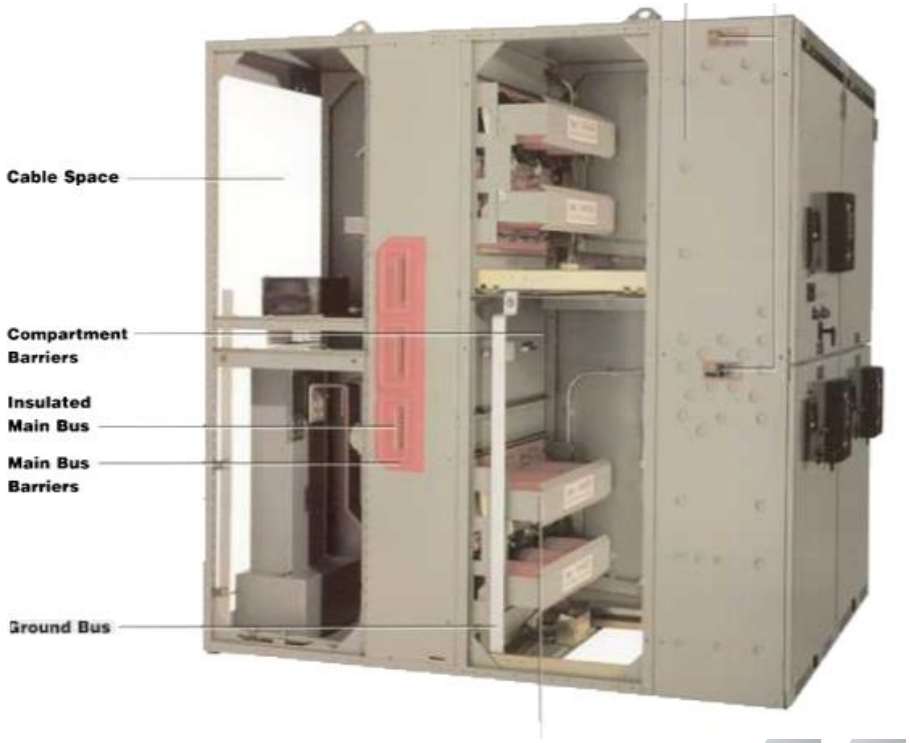


Each Section:36” W X 88” Deep. NEMA1

Yep – Another Look Metal-Clad

Compartmented Construction

- Defined by ANSI C37.20.2 includes: .Removable (Drawout) Circuit Breakers. Fully Compartmented Construction. Grounded Metal Barriers Enclose all Live Parts .Automatic Shutters .Insulated Bus .
- Long Equipment Mechanical &
- Electrical Life
- Reliable Relay Coordination

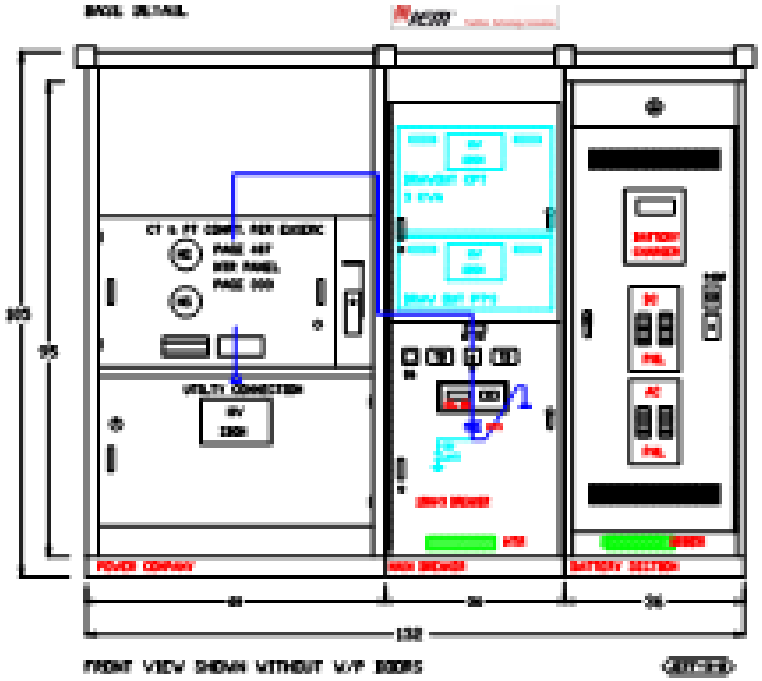


NEWER METAL ENCLOSED OPTIONS INCLUDE METAL-CLAD FEATURES

=S= PREMSET

- Newer Metal Enclosed options include Vac switches, SF6 switches & bolted or D/O Vac Breakers.
- Lots of insulated bus options
- Long Life cycle designs
- ALSO, Many GIS options from Siemens ABB & Schneider Electric
- SEE VENDOR WEBSITES

Metal-Clad Application Utility Metering EUSERC



98” Deep
NEMA3R

The Utility will typically consider a MV service when the customer’s load exceeds 500kVA

Compact Arc Resistant Metal-Clad

- Metal-Clad 2.0
  - Smaller
  - Stronger
  - More capable
- Voltage: 5-15kv, 95kV BIL
- Continuous Current: 600A-2000A, 31.5kA
- Dimensions: 24”W x 60”D x 96”H
- Magnetically actuated vacuum draw-out circuit breaker; PT, CT and CPT’s
- 100,000 operations w/o maintenance
- Front accessible CTs and front connected cables
- IR viewing ports and viewing windows
- Epoxy Insulated Bus
- Arc resistant, Type 2A or 2B
- Safe enough for PPE 0 clothing
- UL and cUL listed per ANSI / IEEE standards

Breakthrough. Breakout. Breakers.

VESTA-AR MV switchgear features magnetically actuated breakers that operate up to 100,000 times without maintenance. These revolutionary breakers feature far fewer parts and much simpler construction than molded case LV breakers and are among the most reliable in the industry.

VM1 Magnetically Actuated Vacuum Circuit Breaker

5kV - 15kV

MVA Rating	Rated Continous Current	Volatge		Dialelectric Ratings		Short-circuit Current					Mechanical Endurance; No. of Operations
		Max Rated Voltage	Nominal Rated Voltage	Power Frequency	Impulse Withstand Voltage	Withstand Current Rating	Making Capacity	Short Time Current Rating	Short Time Current Duration	Total Interrupting Time	
	A RMS	kV RMS	kV RMS	kV RMS	kV Peak	kV RMS	kV Peak	kV RMS	s	ms	
818	1200	17.5	15	36	95	31.5	80	31.5	2	45-60	100,000

Design. Simulate. Test.

- **Plenum directs arc flash to safe area**
- **Reinforced enclosure contains & directs the blast.**
- **Goal is to increase safety while offering a smaller footprint and higher reliability.**

KEMA Power Test Completed

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