

# IEEE/ANSI Standards and Switchgear For Surface Mining

Western Mining Electrical Association

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- PES – Power Engineering Society of IEEE
- Sponsor – Switchgear Committee
- Standards – Developed by Working groups
- Breakers
- Switches
- Fuses
- Switchgear Assemblies
- Metal-enclosed bus

# IEEE – Institute For Electrical And Electronics Engineers, Inc.

- IEEE was formed in 1963 with merger of
- AIEE – American Institute of Electrical Engineers and
- IRE – Institute of Radio Engineers

# IEEE has

- More than 365,000 Members in over 150 Countries
- More than 1,430 Student branches at Colleges and Universities in 80 Countries
- More than 300 Conferences Worldwide each year
- About 900 Active IEEE Standards and more than 400 in Development

# ANSI – American National Standards Institute

- ANSI Publications are available from the Sales Department, 11 W. 42<sup>nd</sup> Street, 13<sup>th</sup> floor, New York, NY10036
- IEEE develops its standards through a consensus development process, approved by the ANSI

- National Electrical Safety Code (NESC) is a registered trademark of IEEE
- National Electric Code (NEC) is a registered trademark of the National Fire Protection Association, Inc.

# Switchgear Assemblies

## Keywords & Definitions

- Switchgear assembly – An assembled Equipment including but not limited to one or more of switching, interrupting, control, instrumentation, metering, protective and regulating devices, together with their supporting structures, enclosures, conductors, electric interconnections, and accessories

# Switchgear Assemblies

## Keywords & Definitions

- Metal-Enclosed Interrupter Switchgear (MEI)
- a) Interrupter switches (Stationary mounted)
- b) Power fuses (Stationary mounted)
- c) Bare bus and connections (Bus Ins not reqd)
- d) Instrument transformers
- e) Control wiring and accessory devices

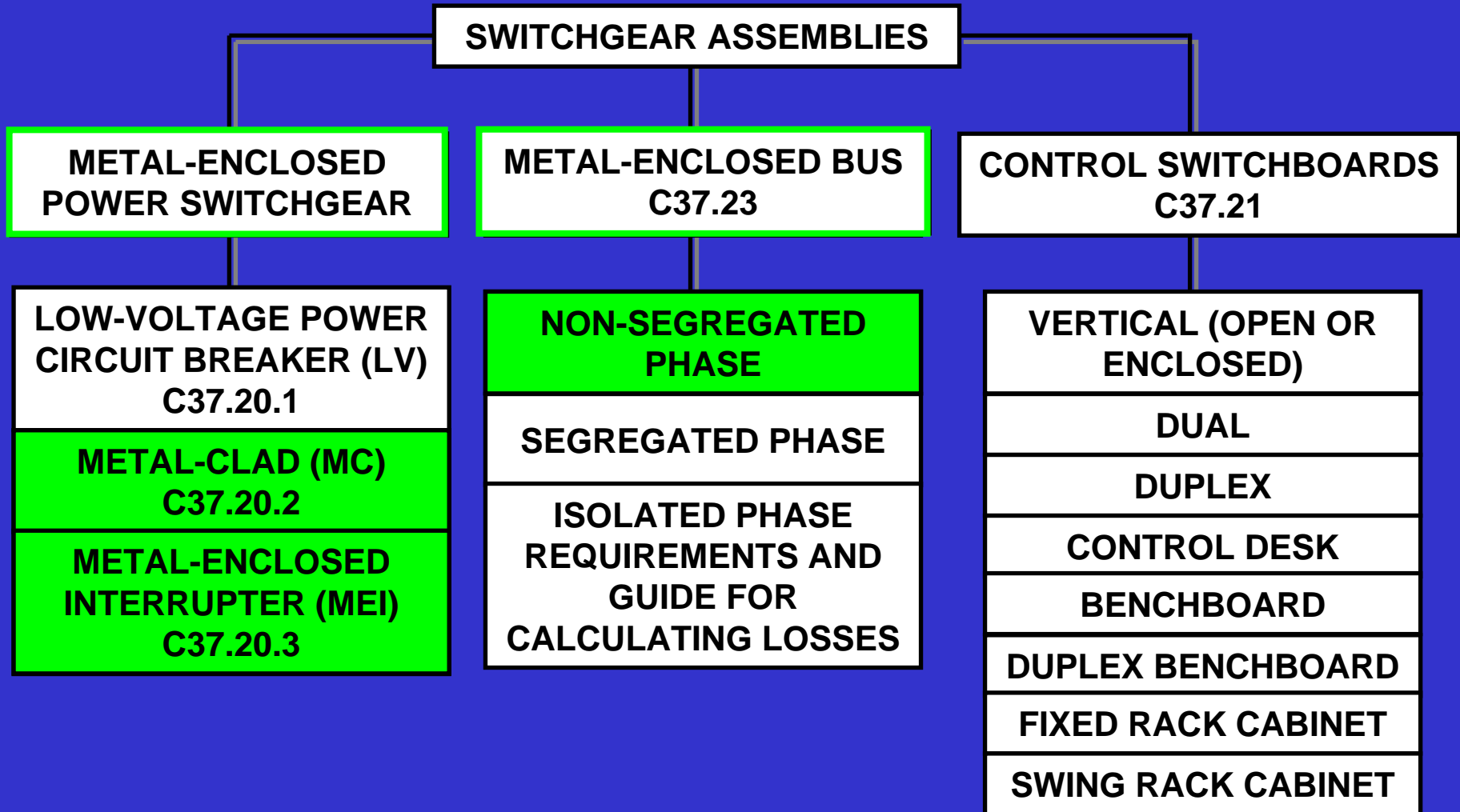


# Switchgear Assemblies

## Keywords & Definitions

- Metal-Clad Switchgear Assembly
- a) Interrupter device (Drawout, shutters, interlk)
- b) PT & CPT fuses (Drawout)
- c) Primary compts completely enclosed
- d) Insulated bus
- e) Control wiring and accessory devices

# Types of Switchgear Assemblies Defined by IEEE Standards



Let us Look at couple of  
illustrations

Is it Metal-clad switchgear or  
Metal-enclosed Interrupter  
switchgear (MEI)? or

Is it a Mining switchgear? Or  
Is Mining switchgear a MEI?

# Metal-clad or Metal-enclosed ?

## Safety First



# Metal-clad or Metal-enclosed ?

## Safety First



# 8KV Skid Mounted Breaker House

## Safety First



# 8KV Skid Mounted Breaker House

## Safety First



# 8KV Skid Mounted Breaker House

## Safety First





# 25KV Skid Mounted Junction Box

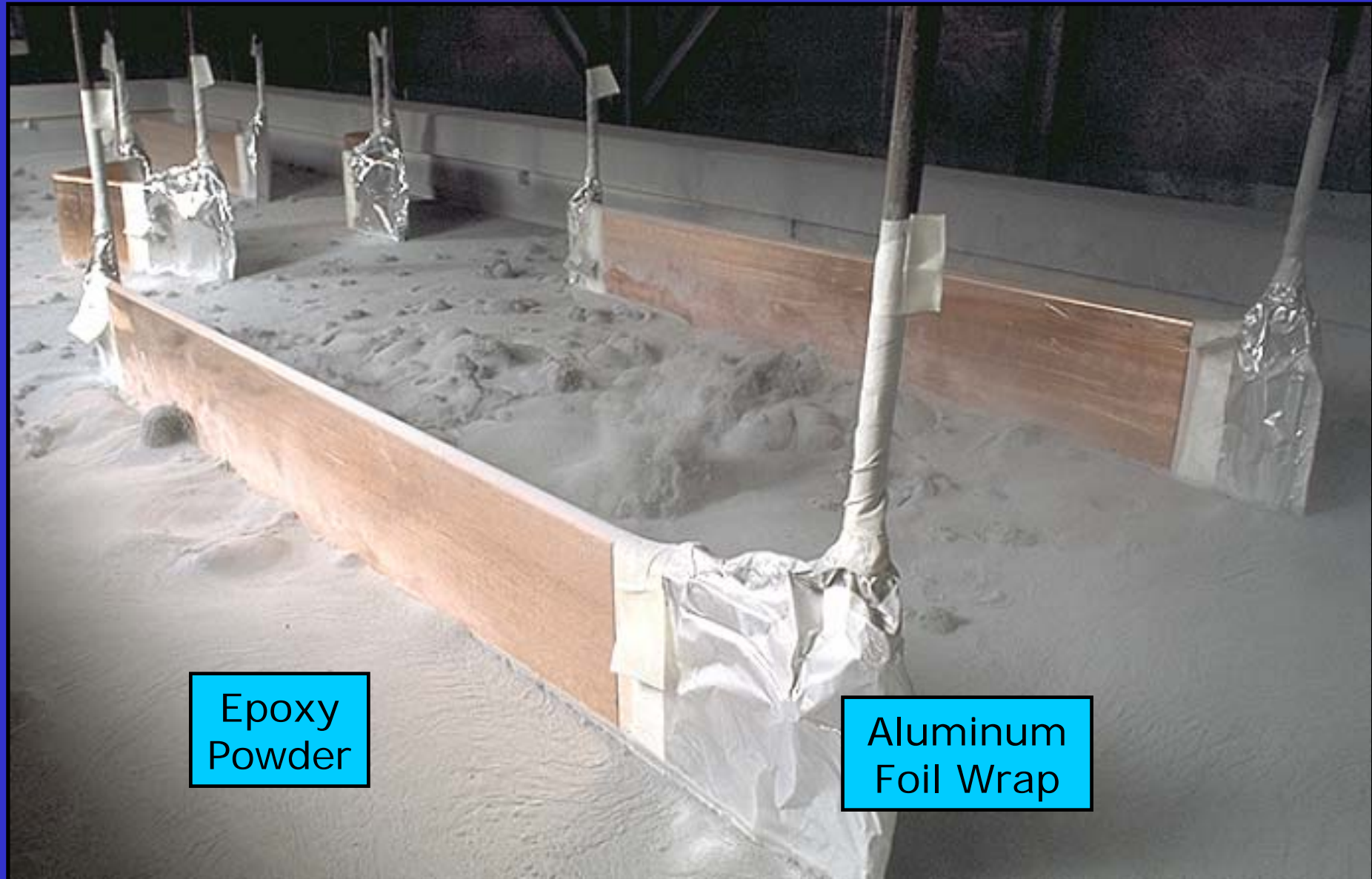
## Safety First



# 25KV Skid Mounted Breaker House W/NGR - Safety First

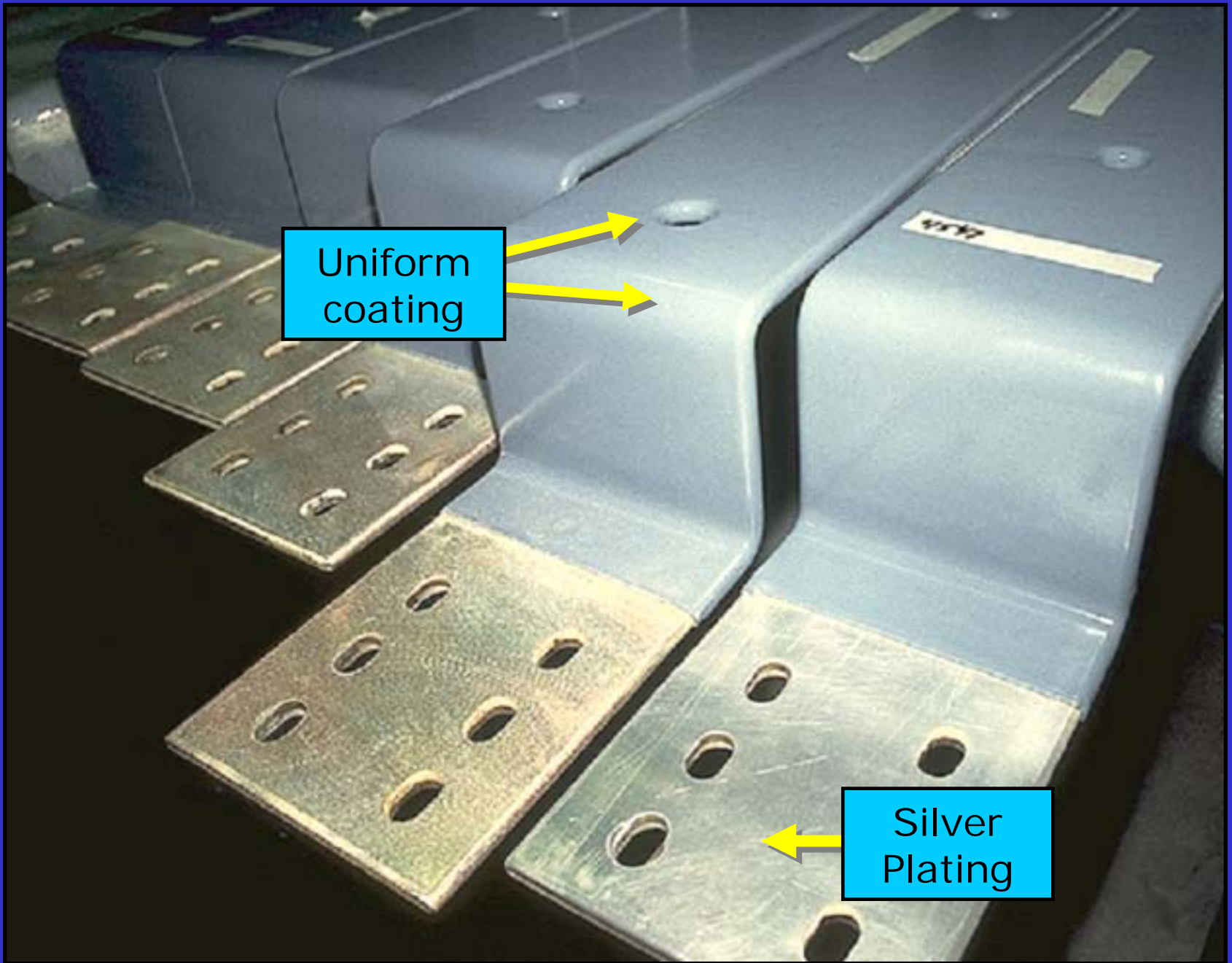


# *Fluidized Epoxy Bed*



Epoxy  
Powder

Aluminum  
Foil Wrap



Uniform  
coating

Silver  
Plating

# 25KV Skid Mounted Breaker House W/NGR - Safety First





**3750KVA Portable Substation**

# 5MVA Portable Skid Mounted Substation









**Skid Mounted Substation**

A large trailer-mounted substation is shown outdoors under a blue sky with scattered white clouds. The substation is mounted on a white multi-axle trailer. It features several large, grey, rectangular transformer units with vertical cooling fins. To the left, there are orange metal cabinets or enclosures. The entire assembly is enclosed within a silver metal frame and a chain-link fence. High-voltage electrical equipment, including insulators and busbars, is visible on top of the structure. The trailer is parked on a dirt or gravel surface.

Transformers  
up to 20 MVA

Primary Voltages  
up to 161kV

**Trailer Mounted Substation**





**38kV MetalClad Switchgear For Windfarm**

# Voltage and Insulation levels

Rated Max Voltage (kV)	60 Hz Withstand (kV)	Impulse Withstand (Peak kV)	Ref DC Withstand (kV)	Min Elect Air Clearance (Inches)
4.76	19	60	27	3.5
8.25	36	95	50	4.5
15.0	36	95	50	6
27.0	60	125	84	7.5
38.0	80	150	112	10.5

Questions?

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**Thank you!**