TECHNICAL AND APPLICATION GUIDE

SafeGear® HD

5/15 kV, 63 kA arc-resistant high duty switchgear

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General overview

Introduction
SafeGear® HD is ABB's ANSI arc-resistant, metal-clad switchgear line for short circuit currents at 50 or 63 kA providing the proven safety of the SafeGear platform at higher short circuit current capacities.

Certifications
SafeGear HD is seismic certified to IBC region D with importance factor of 1.0. The manufacturing location for SafeGear HD is both ISO 9001 and 140001 certified. SafeGear HD switchgear is available with UL label or as a CSA certified lineup.

Applicable standards
SafeGear HD is built per IEEE C37.20.2 metal-clad switchgear construction standards and tested per IEEE C37.20.7 for arc-resistance with a 0.5 second arc-duration.

Arc-resistant accessibility types
Per NFPA 70E 2015 edition, Table 130.7(c)(15)(A)(a), arc-flash PPE is not required for arc-resistant switchgear tested in accordance with IEEE C37.20.7 for racking of circuit breakers, the ground and test device or the voltage transformers as long as the following is true: clearing times are less than the rated arc-duration with the prospective fault current not to exceed the arc-resistant rating of the equipment, the equipment is properly maintained and installed, all equipment doors are closed and secured, all covers are in place and secured, and there is no evidence of impending failure. Please see the NFPA 70E standard for more information including definitions for properly installed, properly maintained and evidence of impending failure. For 2B accessibility types, the instrument door is allowed to be open, but all other doors must be closed and secured and all other covers must be in place and secured. Definitions are per IEEE C37.20.7 test guide.

- Type 2: Front, sides and rear protection with all doors and panels closed and latched.
- Type 2B: Front, sides, rear and LV compartment. LV compartment door can be open. All other doors and panels must be closed and latched.

SafeGear HD is offered in accessibility types 2 and 2B.

Construction
SafeGear HD is manufactured of hem bent, 12-gauge galvanized steel for superior rust and scratch protection. All non-galvanized steel parts are treated and painted ANSI 61 gray.

SafeGear HD's modular design and bolted frame with 19, 38 or 57-inch compartments provides highly flexible design configurations, and makes field changes faster to prevent downtime.

Outdoor enclosures
SafeGear HD can be supplied in PDC (power distribution center) or sheltered aisle enclosures for outdoor use.

Breakers used in the SafeGear HD platform
The SafeGear HD platform uses AMVAC and ADVAC breakers. More details, including detailed ratings tables, timing tables and power requirements can be found in the AMVAC Breaker Technical Guide (1VAL050601-TG) and ADVAC Breaker Technical Guide (1VAL050501-TG). For 63 kA requirements, only ADVAC breakers can be used.

Instrument transformers
SafeGear HD switchgear is available using SAB-1, SAB-1D, SAB 2 and SAB-2D CTs. Up to four SAB-1 and SAB-2 CTs can be fitted per phase. Higher accuracy SAB-1D and SAB-2D CTs are limited to two CTs per phase. SafeGear HD is available with AWG #12 or AWG #10 wire for CT secondaries.

Leads from the CT secondaries to the relay are approximately 10 feet in length. For ground CT requirements, SafeGear HD is available utilizing BYZ-S, BYZ-O or BYZ-L ground CTs. The type of CT is chosen based on the necessary window size required for cables and cable bending. For 5 kV applications, SafeGear HD switchgear utilizes VIY-60 potential transformers.

For 15 kV applications, SafeGear HD uses ABB VIZ-11 and VIZ-75 PTs. All PTs are vailable in wye-wye, open delta, line to line and line to ground configurations.

Rating tables and additional details for all instrument transformers used in SwitchGear HD can be found in the Switchgear Components and Accessories Technical Guide (1VAL104601-TG).

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Table 1: SafeGear HD Overview

		Rated maximum voltage level		
Characteristic	**Unit**	**5 kV**	**8.25 kV**	**15 kV**
Rated Nominal Voltages	kV	2.4, 4.16, 4.8	4.8, 6.9, 7.2	6.9, 7.2, 8.4, 11, 12, 12.47, 13.2, 13.8, 14.4
Main Bus Continuous Current	A			1200, 2000, 3000, 4000**
Short Circuit Current (rms)	kA			50, 63
Rated Frequency	Hz			50, 60
Low Frequency Withstand (rms)	kV	19	36	36
Impulse Level (BIL, crest)	kV	60	95	95

* Ratings given are for service conditions within temperature and altitude limitations as defined by IEEE C37.20.2-1999 metal-clad standard.
** 4000A is forced-air cooled.

Available accessories

SafeGear HD switchgear is available with the following accessories:

- Breaker accessory kit including breaker, PT, CPT, racking handle, and lifting yoke
- Lift truck
- Test cabinet and test jumper
- SmartRack™ remote racking device
- Manually operated ground and test device

Testing

SafeGear HD is design tested per IEEE C37.20.2 and includes the following production tests:

- One second dielectric test of 1800 VAC for control circuits
- Control circuit verification
- Instruments energized via the low voltage winding of instrument transformers and operated through ratings ranges
- Mechanical check for breaker alignment and interlock verification
- Power frequency withstand test (HI-POT) phase to phase and phase to ground
- Static circuit check
- Relays checked for proper performance characteristics
- Ratio and interconnection check for potential transformers
- Polarity verification for current transformer

Factory witness testing is also available on request.

Options

- Installation, operation and maintenance manual by CD or printed
- Mechanical options
  - Tin plated bus
  - Mimic bus
  - Cable supports
  - Mechanical trip on breaker doors
  - IR windows (IRISS or Fluke)
  - Channel sills
- Electrical options
- Separate or common pull-out fuse block or molded case circuit breaker trip and close coil protection
- Maximum 20% spare terminal blocks per row
- Phase bus marking labels
- Instrument door ground strap
- 12 or 10 AWG CT wiring

Configuration software

Medium Voltage Pro (MVP) has been developed to be a switchgear design tool and helps design offices in creating a switchgear lineup including front elevations and floor plans. A version of this software is available for consultants and designers. Please contact your local ABB representative for more information.

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Table 2: Reference documents

Document	Document number
SafeGear HD Descriptive Bulletin	1VAL108002-DB
SafeGear HD Flyer	1VAL108003-FL
Installation, Operation and Maintenance Manual for SafeGear HD	1VAL108001-MB
ADVAC Breaker Technical Guide	1VAL050501-TG
AMVAC Breaker Technical Guide	1VAL050601-TG
Switchgear Components and Accessories Technical Guide	1VAL104601-TG
Plenum Application Guide	1VAL108001-AP
REF615 Feeder Protection Relay Product Guide	1MAC105361-PG
REF620 Feeder Protection Relay Product Guide	1MAC506635-PG
REM615 Motor Protection Relay Product Guide	1MAC251744-PG
REM620 Motor Protection Relay Product Guide	1MAC609372-PG
RET615 Transformer Protection Relay Product Guide	1MAC204375-PG
RET620 Transformer Protection Relay Product Guide	1MAC554110-PG
REA Arc Fault Protection System Product Guide	1MRS756449

Arrangement rules

- Every lineup must contain at least one (1) 57-inch instrument compartment for every seven (7) frames in order to provide a path to the plenum for arc ventilation.
- 2000 A lineups require at least one (1) 57-inch instrument compartment for every two (2) 2000 A breakers in order to provide a path to the plenum for heat ventilation
- CPTs greater than 15k VA single-phase require a draw-out fuse unit with stationary mounted CPT.
- 3000 A and 4000 A must be located in their own frame with a 57-inch instrument compartment located above the breaker.

Construction
Doors

SafeGear HD front doors consist of the breaker compartment, auxiliary unit compartments and LV compartments. These doors are provided with a single handle, multi-point latch as standard.

All doors are hinged on the left as standard (when facing the doors). Right-hand hinged doors are available as an option.

Rear doors on the SafeGear HD product are used to access the high voltage cable compartments. These doors are available as split doors (top compartment /bottom compartment) hinged and bolted. Hinged doors are provided with left-hand hinges (when facing the door). Right-hand hinged doors are optional.

All front and rear doors are constructed using 11-gauge painted steel.

Padlock provisions are available on all front and rear doors. These padlock provisions are used to lock the door closed to prevent access inside the compartment. On breaker compartment doors, padlock provisions are also supplied on the racking release lever, to prevent racking of the breaker.

Breaker and auxiliary unit doors include a viewing window used for observing the position and status of the components inside the compartment with the door closed. These doors can also be provided with the SmartRack mounting provisions for remote racking applications.

Due to the small footprint design, installation of protection and control devices on the breaker and auxiliary unit doors are not possible.

— 01 SafeGear HD front view

— 01

Compartment types

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02 Circuit breaker compartment with ADVAC breaker

Circuit breaker compartments
SafeGear HD circuit breaker compartments are designed for maximum operator safety by providing two viewing windows and automatic latching, three-position closed door racking. The circuit breakers have self-aligning, fully automatic primary and secondary contacts allowing operators to keep the door closed throughout the entire racking operation, which maintains the arc-resistant feature of the switchgear. These features make SafeGear HD easy to install, operate and maintain while making safety a priority.

Unique racking system and interlocks
The racking system is unique and features a three-position closed door system for all circuit breakers. The racking mechanism is integral to the circuit breaker, so moving parts can be inspected and maintained outside the circuit breaker compartment and away from energized primary parts. A solid stationary ground contact engages the grounding contact of the circuit breaker prior to the coupling of the primary or secondary contacts and is continuous during the racking operation.

The three racking positions are defined as follows:
- **Disconnected:** Primary and Secondary (control) contacts are disengaged.
- **Test:** Primary contacts are disengaged. Secondary (control) contacts are engaged for in-cell breaker testing.
- **Connected:** Primary and secondary (control) contacts are engaged.

The racking system includes all necessary interlocks in compliance with ANSI/IEEE standards to assure proper sequencing and safe operation. For improved safety, the interlocking system prohibits operation of the breaker while in an intermediate position and prohibits insertion of an improperly rated breaker.

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Secondary disconnect system
A dual (50-pin) self-aligning secondary disconnect for control circuitry is provided as a standard feature. The female portion resides in the circuit breaker module. The secondary contacts are recessed and are touch safe. No manual connection of the secondary contacts is required.

Primary shutters
Primary shutters automatically cover the primary contacts when the breaker is not in the connected position. The shutters may be grounded metal or optional Lexan material. Primary shutter opening and closing is forced by the circuit breaker movement, rather than relying on springs or gravity. An Integral interlock prevents opening of the shutter when the circuit breaker is removed, and can be padlocked for added security.

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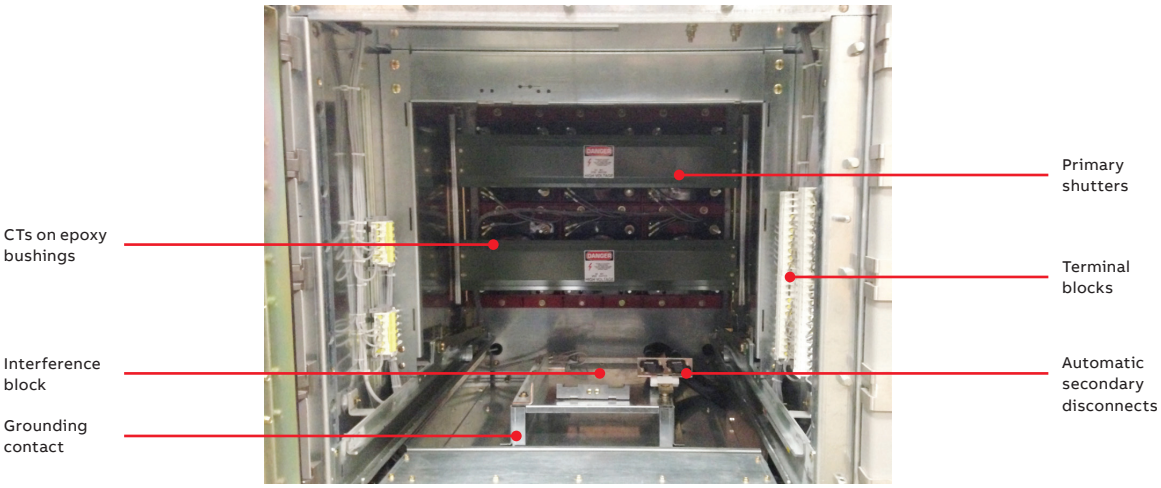
03 Circuit breaker compartment racking system



Note: Terminal blocks normally covered by grounded metal barrier have been removed in this photo

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03

Auxiliary modules

PT/CPT/Draw-out fuse compartments
Similar to breaker compartments, potential transformer, control power transformer and draw-out fuse compartments are inserted via an automatic latching racking mechanism which allows for closed door racking of auxiliary equipment. The cell interface uses the same components as the circuit breaker module and is compatible with ABB's remote racking device, the SmartRack. Secondary contacts engage/disengage automatically and interlocks ensure proper operation where applicable.

All primary auxiliary compartments, including potential transformers, control power transformers and draw-out fuse compartments, use arc-quenching Delrin® technology for primary contact assemblies (Delrin® is a registered trademark of DuPont). A Delrin® tipped conductor probe is inserted into a Delrin® receptacle with recessed contacts.

During load break, localized heating of the Delrin material due to arcing causes the material to release an inert gas which fills the small isolating gap to contain the arc and extinguish it safely.

The PT drawout units can be withdrawn beyond the front of the frame via rails, which allow easy access to the fuses for inspection or replacement.

Control Power Transformer (CPT) and Draw-out fuses
CPT modules provide convenient mounting and operation of single-phase control power transformers in ratings up to 15kVA, minimizing the possibility of inadvertent interruption of control power for AC operated switchgear.

—
04 Delrin primary probe and recessed contact assembly

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05 PT drawout assembly with three voltage transformers - the fuses can be removed without removing the PT truck from the rails

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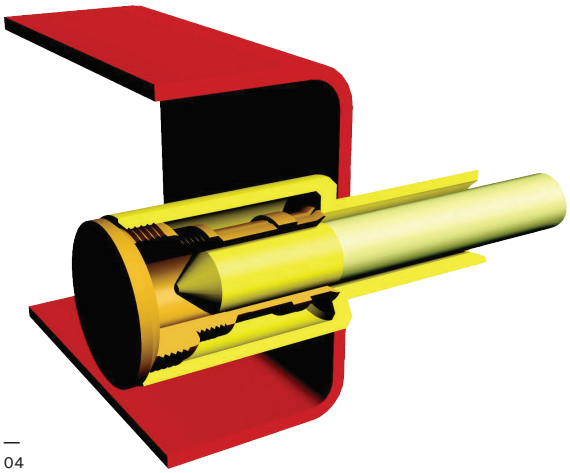
06 Low voltage instrument module isolated for maximum safety when working with low voltage circuits



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Fuse modules accommodate up to three primary fuses for use with fixed-mount control power transformers. Fuse modules are provided with stationary control power transformers in ratings up to 75 kVA three-phase or 50 kVA single phase. Fixed mounted CPTs can be mounted in the rear lower cable compartment or at a remote location.

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Instrument compartment
ABB mounts all protection and control devices in a dedicated low voltage module. Each low voltage instrument module is completely isolated and segregated from high-voltage components which ensures the safety of operations and maintenance personnel while they work on control and auxiliary circuits. The LV wiring pans are designed to be removeable and customizable.

Plastic enclosed wireways are used to provide protection for the wiring, as well as a neat and organized appearance. This allows for easy additions of wiring, should they be needed.

Devices and control switches are mounted on the door for easy readability and convenient access. Those devices that do not require immediate access are mounted inside the compartment.

Frame-to-frame interconnect wiring is achieved through accessholes located in the rear of the LV compartment. Each hole is 3“ x 4“ and provides with edge guard to ensure wires do not run over sharp edges.

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07 LVC door panel 19"

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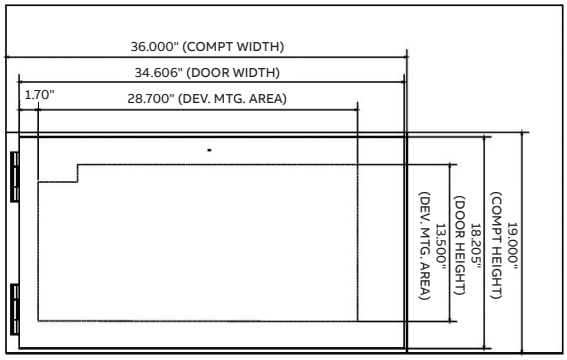
08 LVC door panel 57"



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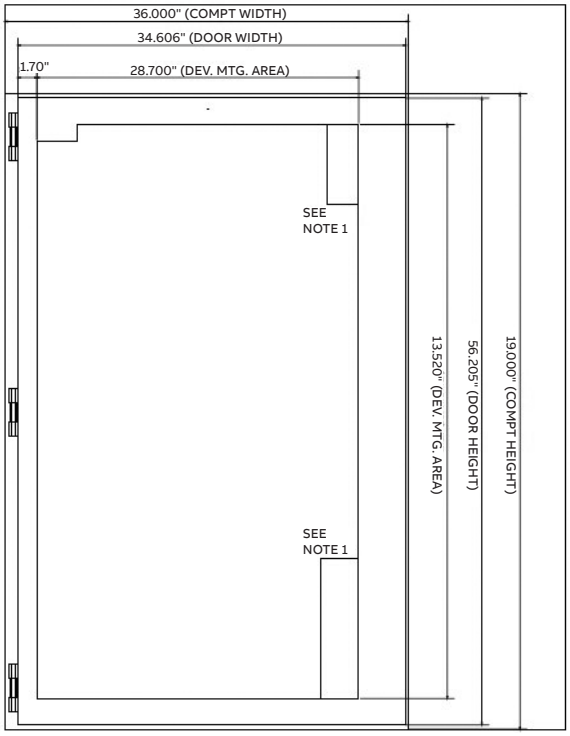

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Bus compartment

Main bus compartment
All primary buses are copper with a corona-free design, and are available in 1200, 2000, 3000 and 4000 A ratings (4000 A rating achieved by forced air cooling). The bus is silver-plated at joints and bolted together with a minimum two (2) half-inch SAE grade 5 bolts. Proper torque is verified by calibrated tools for both safety and optimum performance. The main bus is not tapered and is easily extended at both ends to facilitate future expansions.

The bus is epoxy insulated with an advance powder coat system that eliminates voids and other potential defects, resulting in maximum integrity of the insulation system. Removable, reusable boots are provided at each joint to simplify access and maintenance.

Insulating standoffs rigidly support the bus. This includes risers, the connections from stationary primary contacts to the main bus and runbacks the connections from the stationary primary contacts to line or bus terminations. Internal standoffs and interframe supports are epoxy for all ratings.

SafeGear HD arc-resistant metal-clad switchgear design certifications are based on epoxy primary bus supports. Epoxy is standard for standoff bus insulator supports, primary breaker bushings and interframe main bus supports. Separate drawings are available to indicate the position and dimensions of the epoxy compartment-mounted primary contact supports, epoxy inter-frame horizontal bus supports, and standoff insulators. If porcelain bus supports and insulators are needed, contact factory.

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09 Main bus compartment

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10 Cable compartment (main bus - cover installed)

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Table 3: Epoxy primary bus supports

Characteristics	Epoxy specification
Flexural Strength, MPA	120 - 150
Tensile Strength, MPA	70 - 90
Impact Strength, KJ/m²	10 - 15
Thermal Class	F
Dielectric Strength (Short Time), kV/mm	> 23

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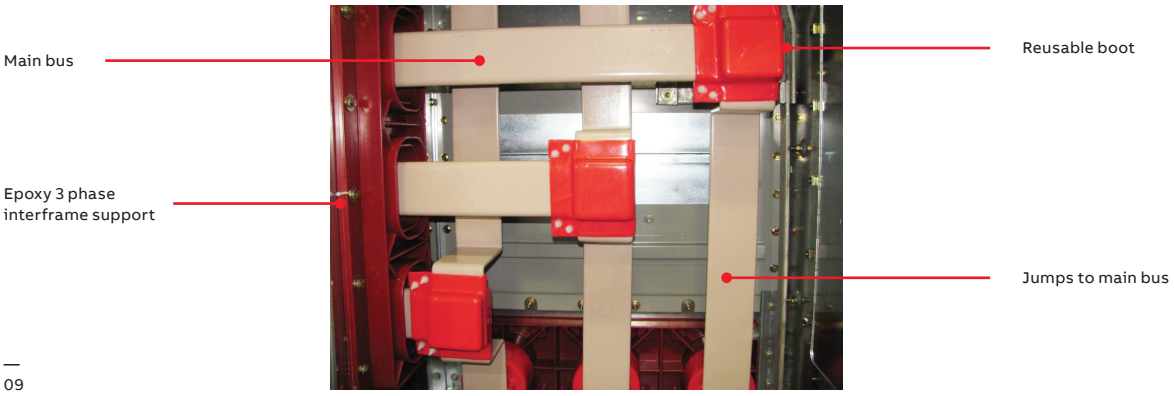
Table 4: Ratings

Continuous current	Rating	Quantity / phase	Size
1200 A	63 kA	1	.75" x 4"
2000 A	63 kA	1	.75" x 4"
3000 A	63 kA	2	.75" x 4"
4000 A	63 kA	2	.5" x 6"



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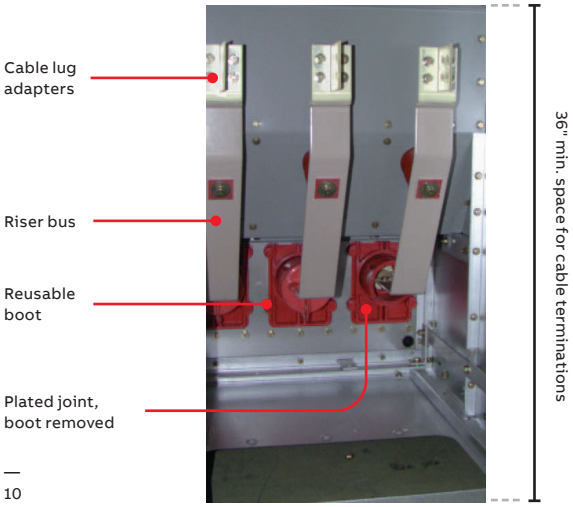
Cable compartment
The design of the cable compartments for SafeGear HD provides an efficient layout with ample room for stress cones and a choice of cable terminations and lug types. Customers also have the flexibility of top or bottom cable entry. Top and bottom connections can also be made to bus duct or roof bushings.

In two-high arrangements with stacked circuit breakers, steel barriers separate the compartments and isolate the primary circuits. All configurations come standard with lug boots and have the option for cable supports to make field connections more secure.

Cable compartments are available with optional readily accessible zero sequence current transformers, surge arrestors and capacitor and ground studs on the bus risers. When a draw-out fuse compartment is installed in the front of the switchgear, the rear cable compartment offers room for a large three-phase floor-mounted control power transformer up to 75 kVA.

The 112-inch depth of SafeGear HD provides ample space for various cable terminations and protection monitoring and control devices as needed.

Primary cable compartments are provided with removable, nonpainted stainless steel cover plates used to install conduit or cable sealing glands. 12-gauge type 304 stainless steel is used in Safegear HD for the cover plates. Cover plates are required for top and bottom of the cable compartment. All conduit/ cable entries must be sealed to prevent arc-faults from leaking through the installation at the cover plates. ABB recommends the use of sealing glands for all primary cables to ensure arcresistant design integrity is not compromised.



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11 Surge arrestors

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12 Connection of up to eight cables per phase (three cable lugs shown)

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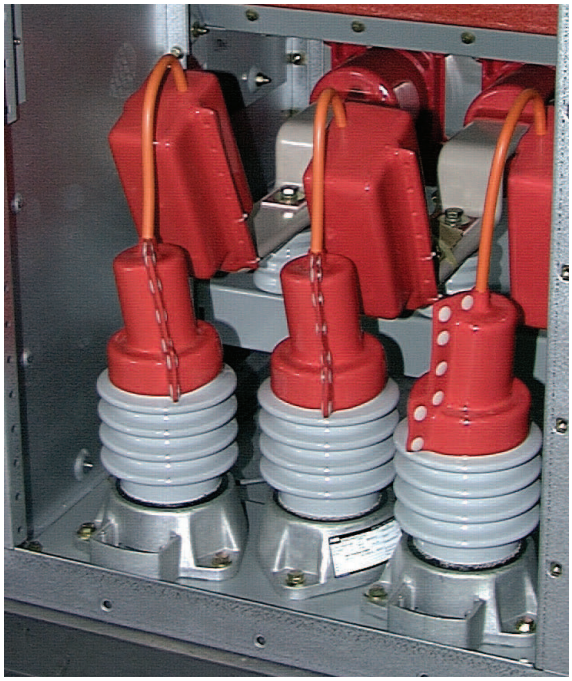
13 Large fixed-mount CPT up to 75 kVA 3-phase or 50 kVA single-phase



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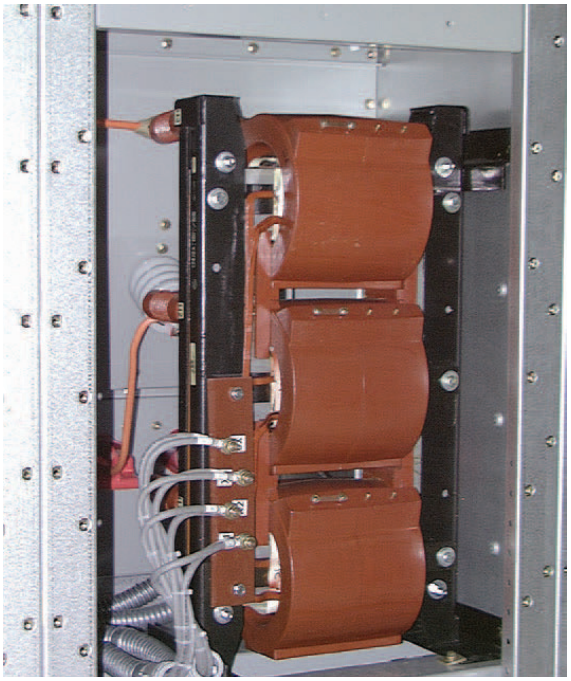

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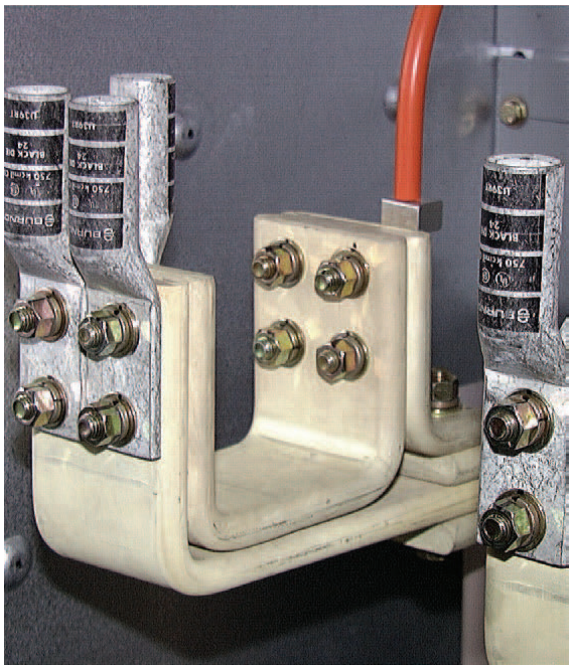

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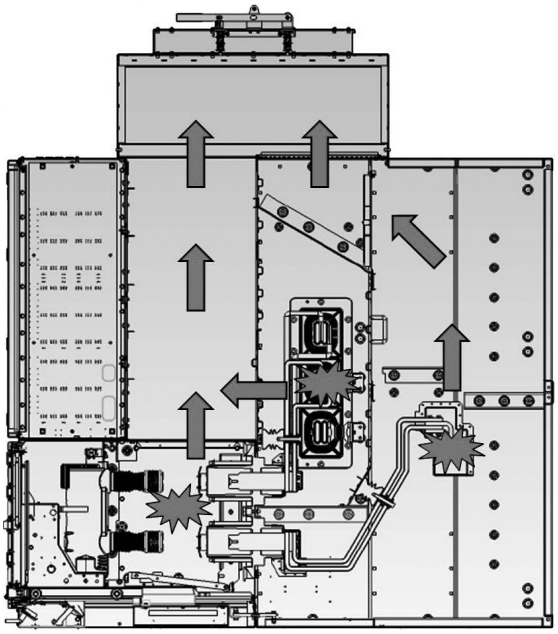
Arc chamber and plenum

A system of chambers inside the switchgear lineup serves as an exhaust system which vents gases away from personnel and the affected cubicle in the case of an arc fault. Vents and flaps are located inside the chamber system which leads to a top-mounted plenum on the enclosure. Once inside the top-mounted plenum, the gases and pressure are directed to an area outside the building and away from personnel. The plenum sections feature external flanges for ease of bolting sections together at assembly and installation. ABB developed this venting system which combines the internal chamber and plenum and holds patents on the construction details of this truly innovative design.

Plenum exhaust clearance requirements
For proper and safe arc fault by-product exhausting, it is recommended that an eight foot cylinder projecting out 15 feet be clear of all objects and personnel at the point where the plenum exits the building. Refer to the Plenum Application Guide, 1VAL108001-AP, for more details.

Installation expertise is required to properly install and commission arc-resistant metal-clad switchgear. Consult with the factory for assistance.

The vent chambers used for channeling arc faults are also used as ventilation ducts during normal operating conditions. Ventilation is necessary to ensure equipment will operate within the ANSI standard design temperature limits. These chambers should not be blocked, or otherwise modified to impede the normal flow of air.



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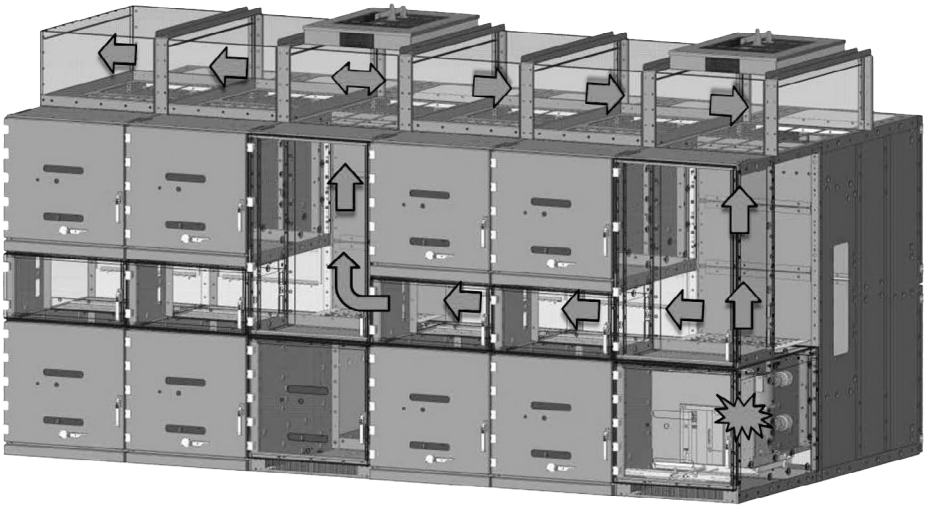
14 Side-view of switchgear lineup exhaust system and plenum



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15 Front-view of switchgear lineup exhaust system and plenum

Available frame types
One-high frames

Description
The one-high, bottom mounted device frame consists of a 57-inch instrument compartment stacked over a 38-inch breaker, PT, CPT or draw-out fuse compartment.

Table 5: Cable termination information

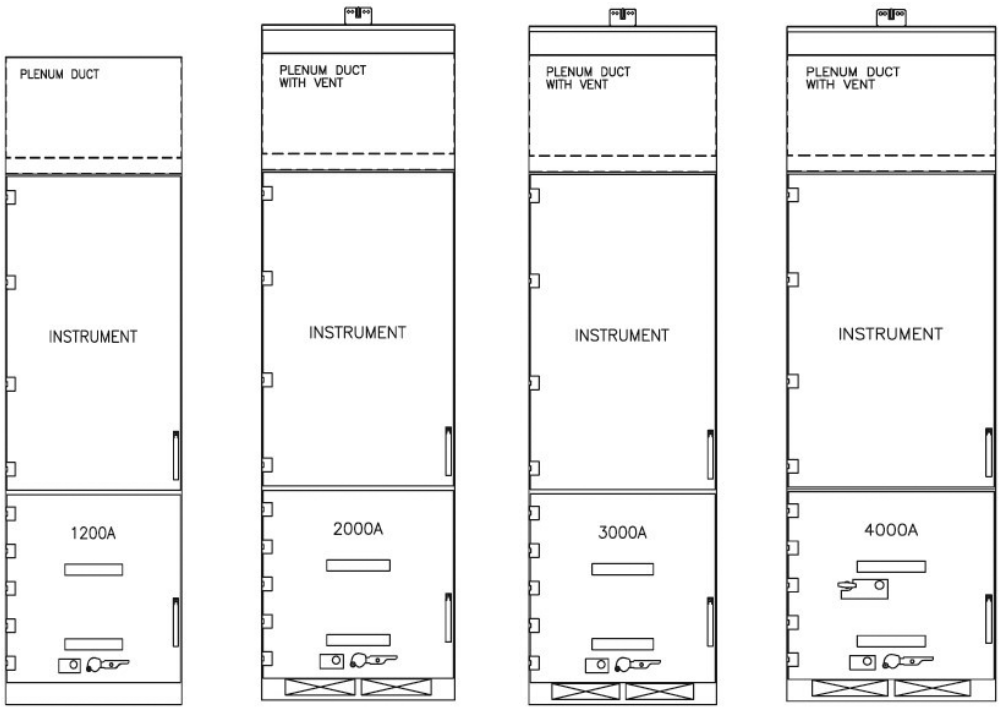
Cable size	# of Terms single pad per phase	# of Terms bifurcated pad per phase*	GCT option
#2 AWG	4	8	BYZ-S
#4 AWG	4	8	BYZ-S
500 MCM	4	8	BYZ-S
750 MCM	4	8	BYZ-L
1000 MCM (2-hole)	2	4	BYZ-S
1000 MCM (4-hole)	1	2	BYZ-S

* Bifurcated lug pad requires 92" depth.

Table 6: Dimensions

Frame	Width (in)	Height with plenum (in)	Depth (in)
2000/3000/ 4000 A frames	36	129.5	112
All other frames	36	116	112

Options
- Ground CTs
- Surge arrestors
  - Distribution
  - Intermediate
  - Station
- Surge capacitor
- Ground studs
- Space heaters
- Cable supports



16 One-high frames

* Refer to page 23 for floorplan

Available frame types
Two-high frames

Description
The two-high breaker frame consists of two 38-inch breaker compartments with a 19-inch instrument compartment in between for two breakers in a single frame.

Table 7: Cable termination information

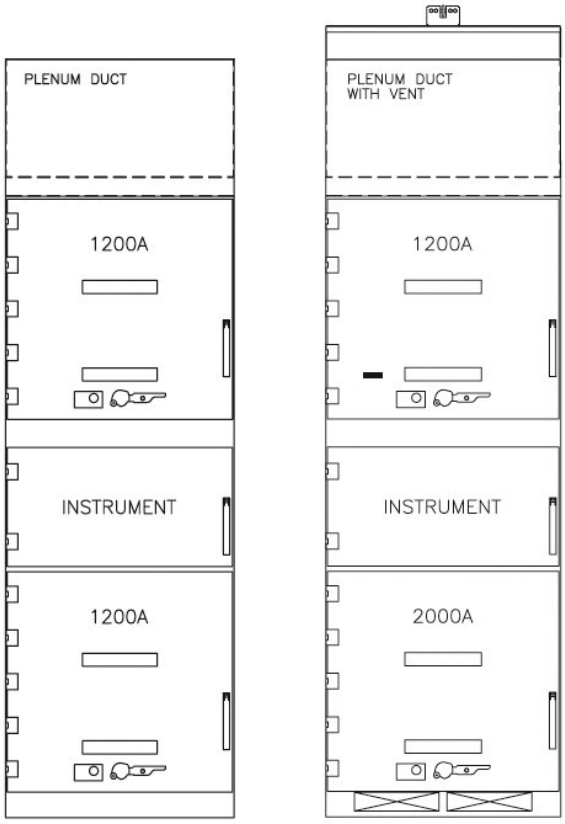
Cable size	# of Terms single pad per phase	GCT option
#2 AWG	4	BYZ-S
#4 AWG	4	BYZ-S
500 MCM	4	BYZ-S
750 MCM	4	BYZ-L
1000 MCM (2-hole)	2	BYZ-S
1000 MCM (4-hole)	1	BYZ-S

Table 8: Dimensions

Frame	Width (in)	Height with plenum (in)	Depth (in)
2000 A frames	36	129.5	112
All other frames	36	116	112

Options
- Ground CTs
- Surge arrestors
  - Distribution
  - Intermediate
- Surge capacitor (or arrestors, one or the other)
- Ground studs
- Space heaters
- Cable supports

17 Two-high frames



* Refer to page 22 for floorplan

Available frame types
Breaker and auxiliary frames

Description
The two-high breaker and auxiliary frame consists of two 38-inch compartments with a 19-inch instrument compartment in between for one breaker and an auxiliary device in a single frame.

Table 9: Cable termination information

Cable size	# of Terms single pad per phase	# of Terms bifurcated pad per phase*	GCT option
#2 AWG	4	8	BYZ-S
#4 AWG	4	8	BYZ-S
500 MCM	4	8	BYZ-S
750 MCM	4	8	BYZ-L
1000 MCM (2-hole)	2	4	BYZ-S
1000 MCM (4-hole)	1	2	BYZ-S

* Bifurcated lug pad requires 92" depth.

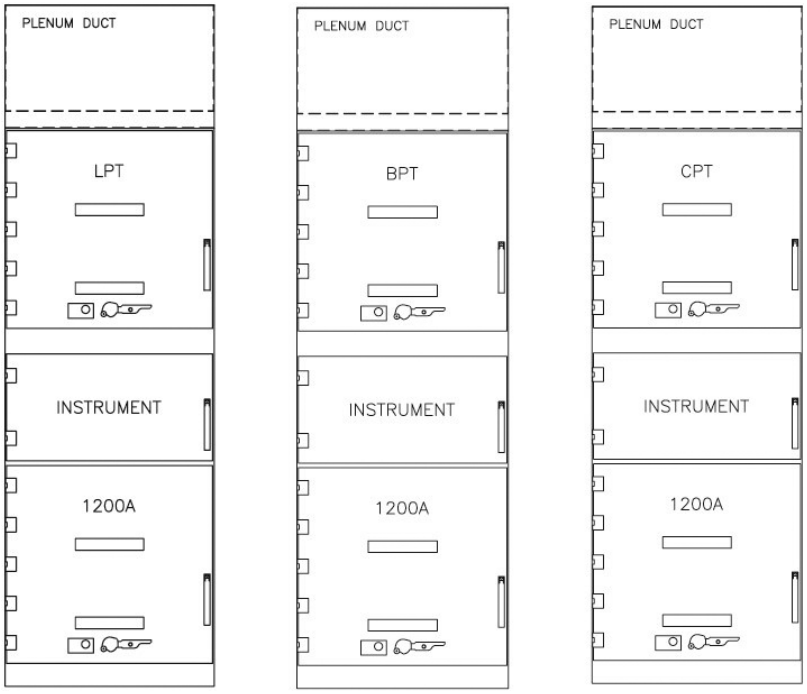
Table 10: Dimensions

Frame	Width (in)	Height with plenum (in)	Depth (in)
2000 A frames	36	129.5	112
All other frames	36	116	112

Options
- Ground CTs
- Surge arrestors
  - Distribution
  - Intermediate
  - Station
- Surge capacitor
- Ground studs
- Space heaters
- Cable supports

Notes:
1. See page 25 for floorplan
2. CPT=control power transformer
3. LVC=low voltage compartment/instrument compartment
4. PT=potential transformer
5. DOF=drawout fuse

18 Breaker below



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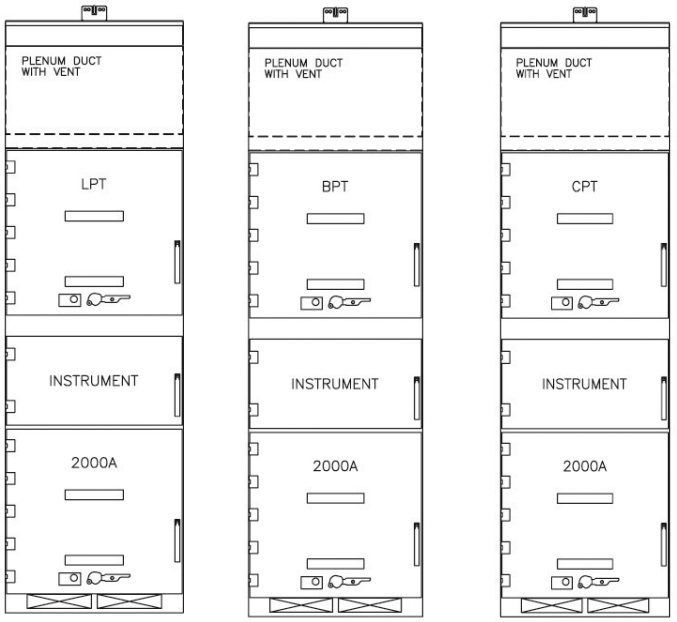
19 Breaker below

—
20 Breaker above



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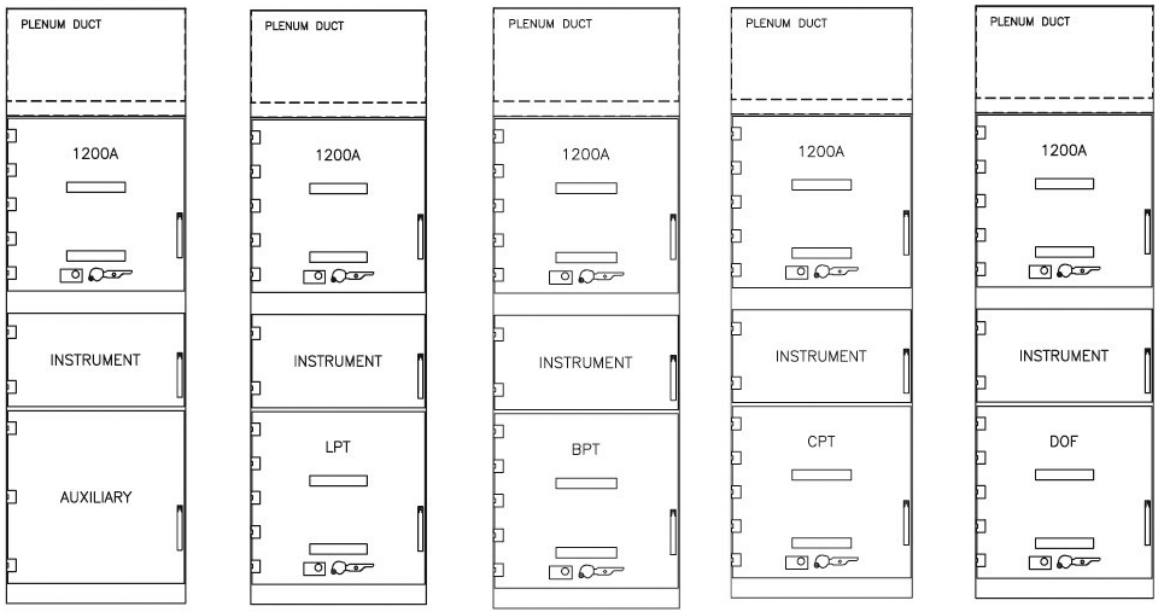

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Available frame types
Auxiliary frames

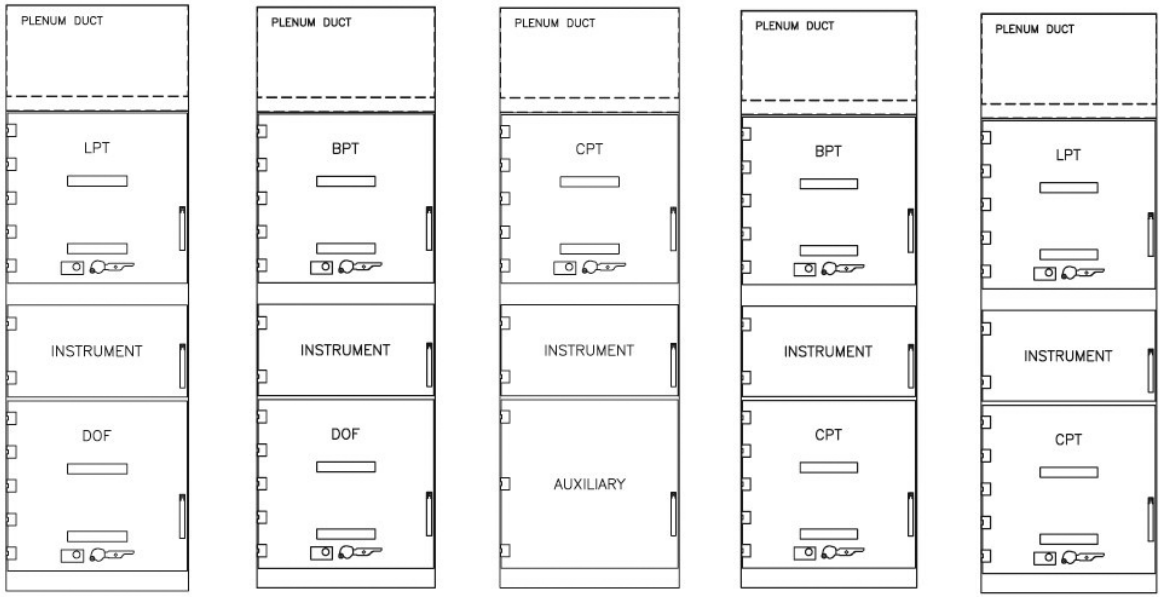
21A Auxiliary frames

Description
The two-high auxiliary frame consists of one or two 38-inch compartments with a 19-inch or 57-inch instrument compartment for one or two auxiliary devices in a single frame.

Options
- Space heaters

Table 11: Dimensions

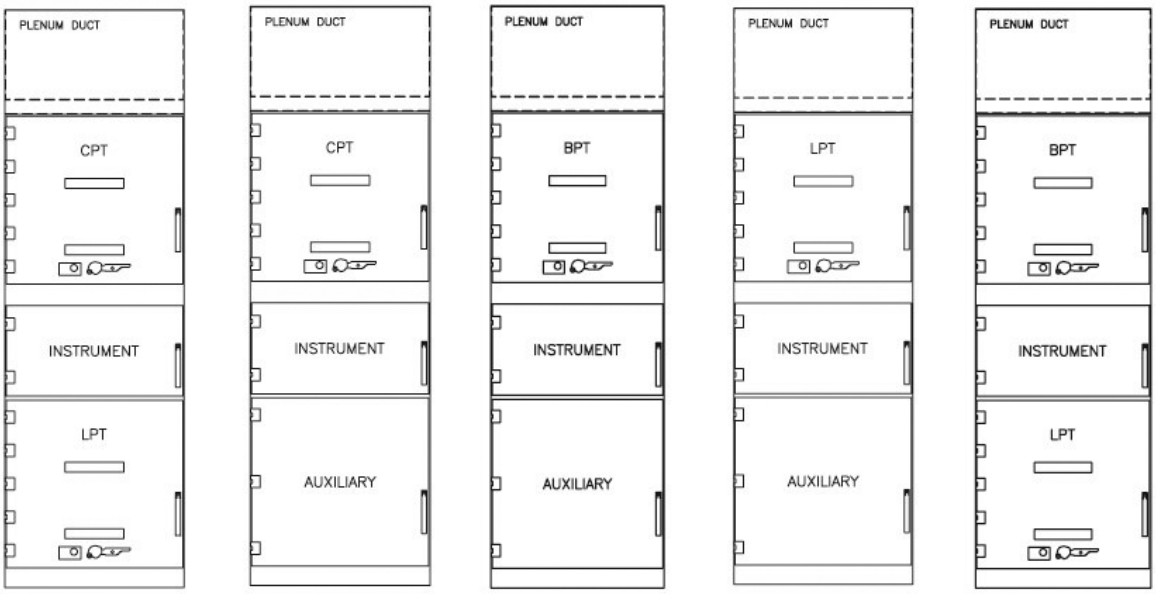
Frame	Width (in)	Height with plenum (in)	Depth (in)
All frames	36	116	112



21A

—
21B Auxiliary frames

—
21C Auxiliary frames



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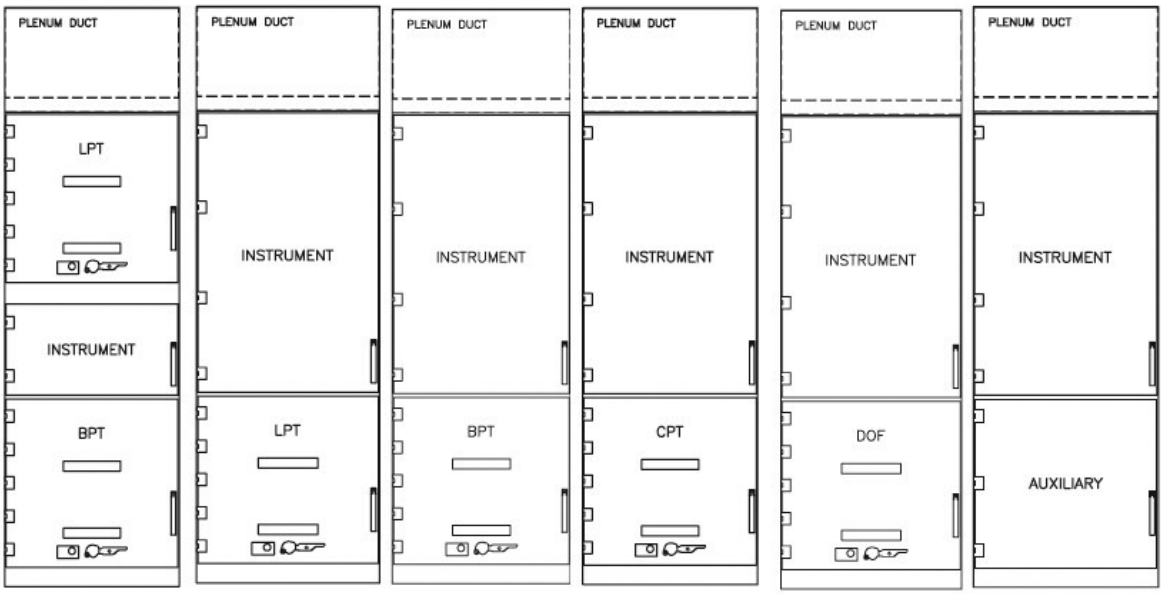
21B



—
21C

Typical arrangements

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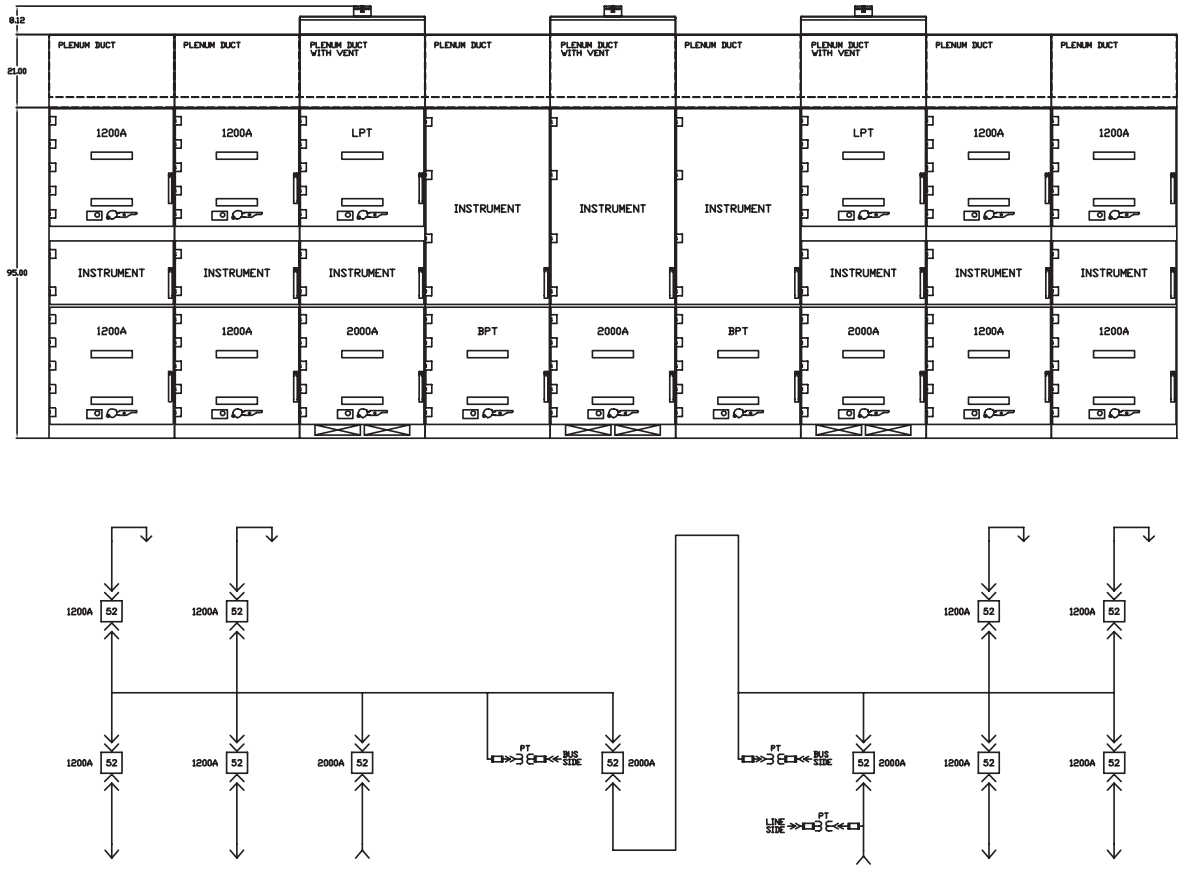
22 Main-Tie-Main - 2000 A/1200 A

Main-Tie-Main - 2000 A/1200 A
Arrangements are the same for for 5 kV, 8.25 kV and 15 kV.



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22

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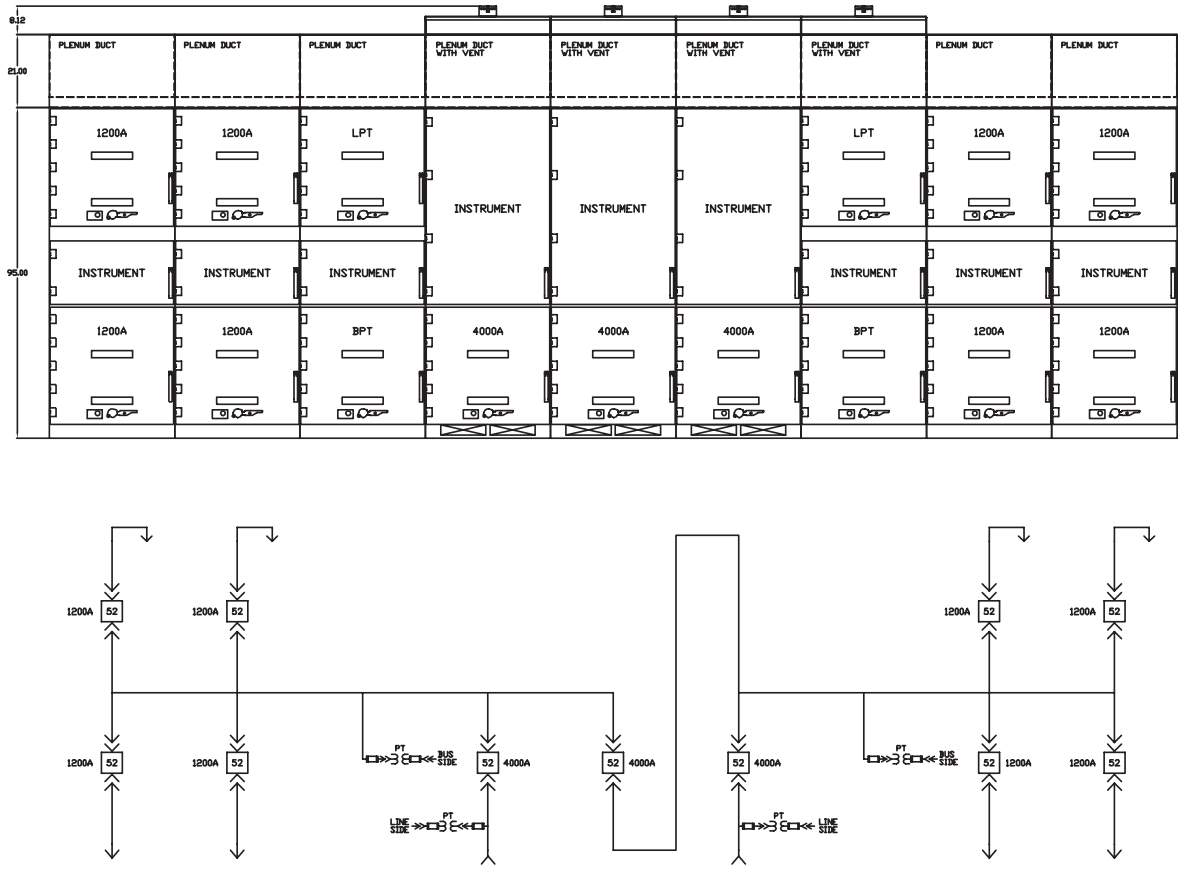
23 Main-Tie-Main - 3000A / 4000 A

Main-Tie-Main - 3000 A/4000 A

Arrangements are the same for for 5 kV, 8.25 kV and 15 kV.



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23

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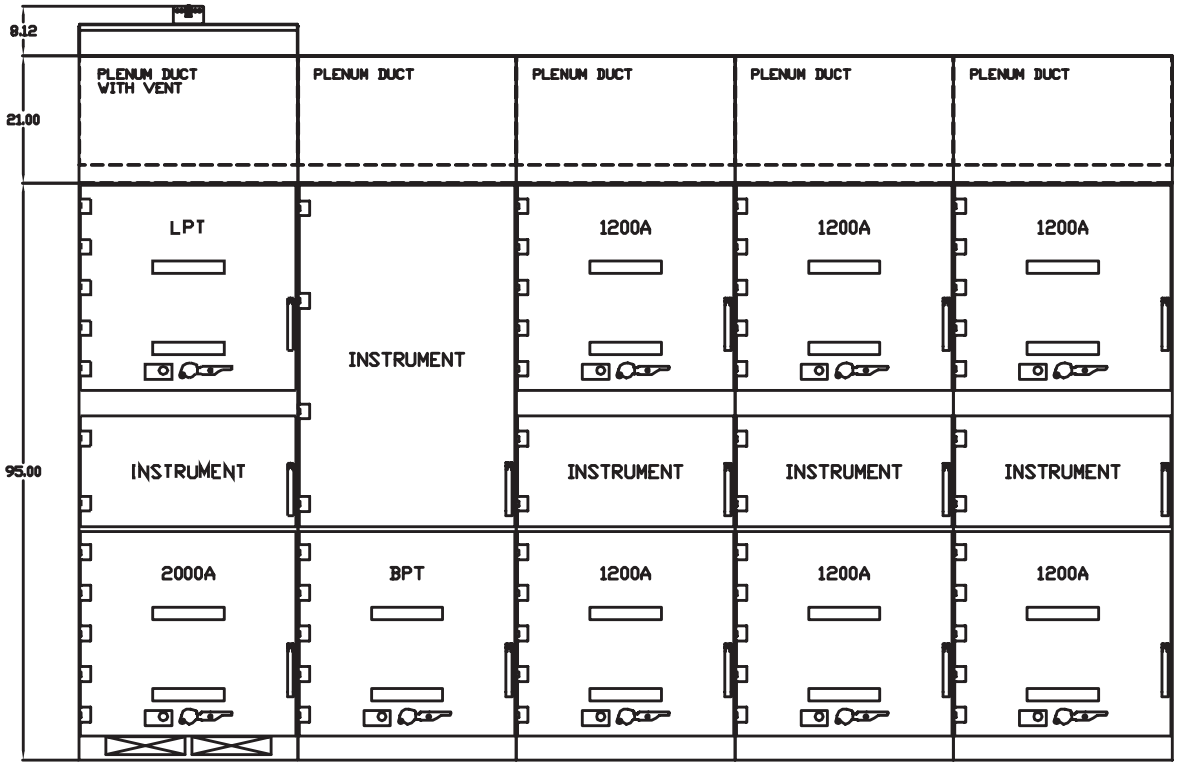
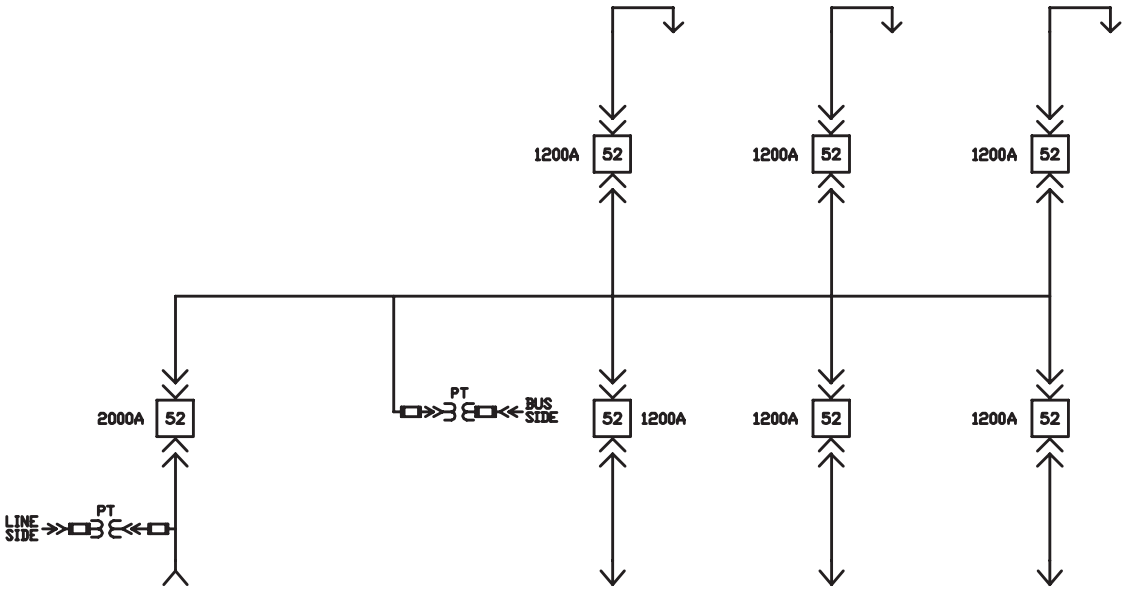
24 Main with feeders - 2000 A / 1200 A

Main with feeders - 2000 A/1200 A

Arrangements are the same for for 5 kV, 8.25 kV and 15 kV.





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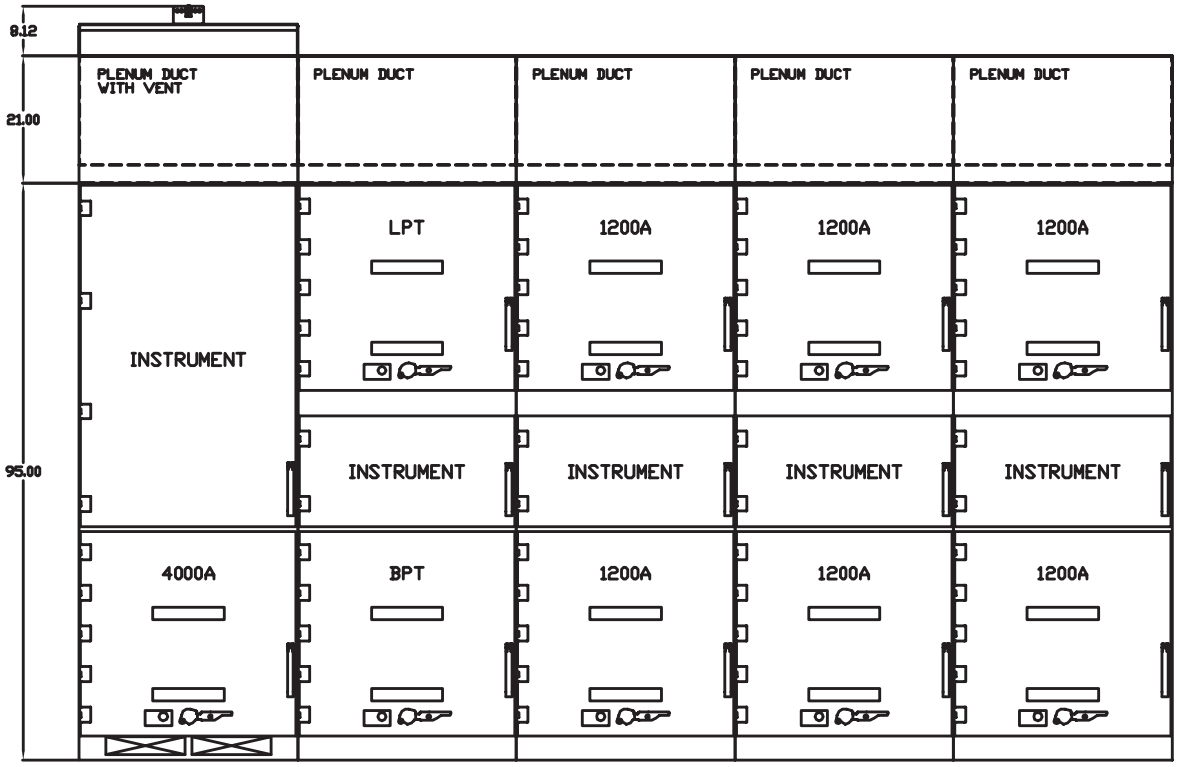
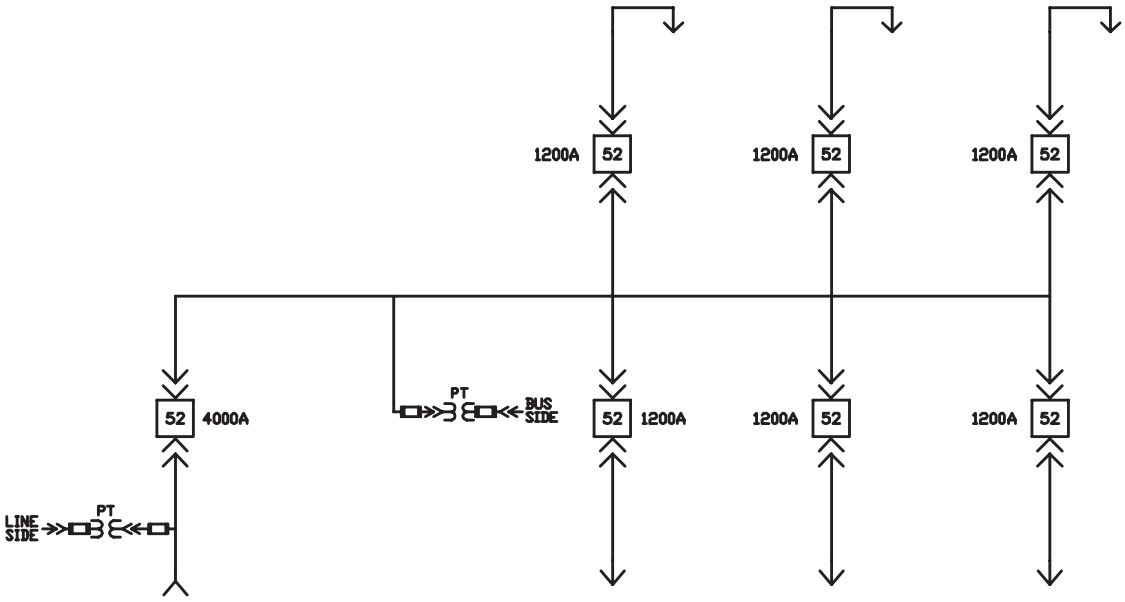
24

—
25 Main with feeders - 3000 A / 4000 A

Main with feeders - 3000 A/4000 A

Arrangements are the same for for 5 kV, 8.25 kV and 15 kV.





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25

Civil engineering details

Typical side views, floor plans and clearances

SafeGear HD switchgear two-high frames

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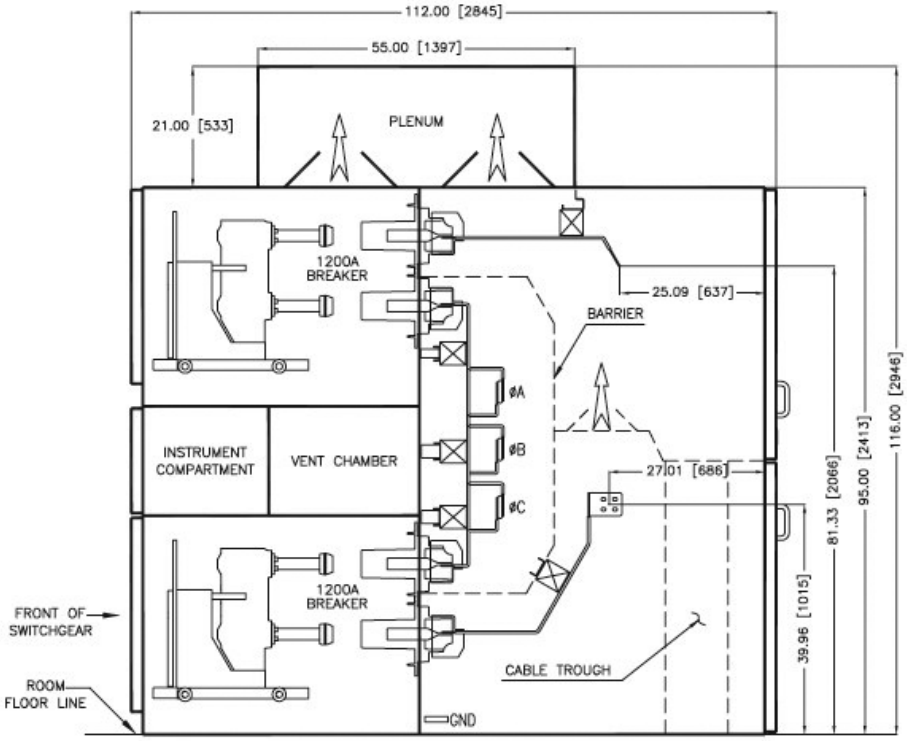
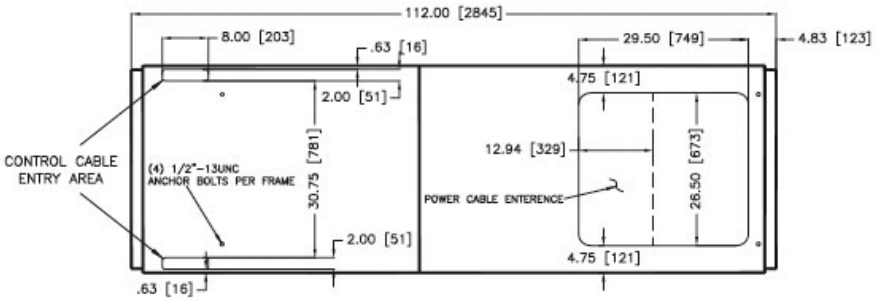
26 Circuit breaker:
1200 A/1200 A



SIDE SECTION



FLOOR PLAN

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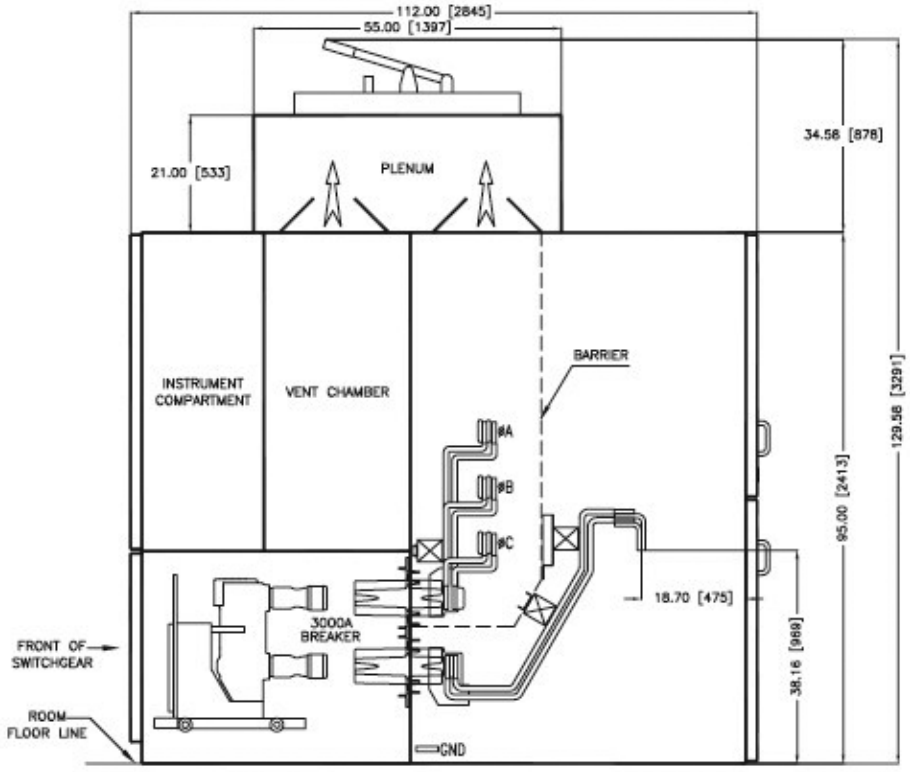
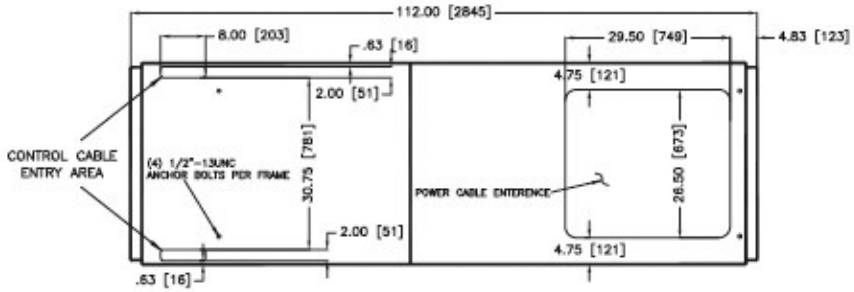
26

—
27 Circuit breaker: 3000 A

SafeGear HD switchgear one-high frames



SIDE SECTION



FLOOR PLAN

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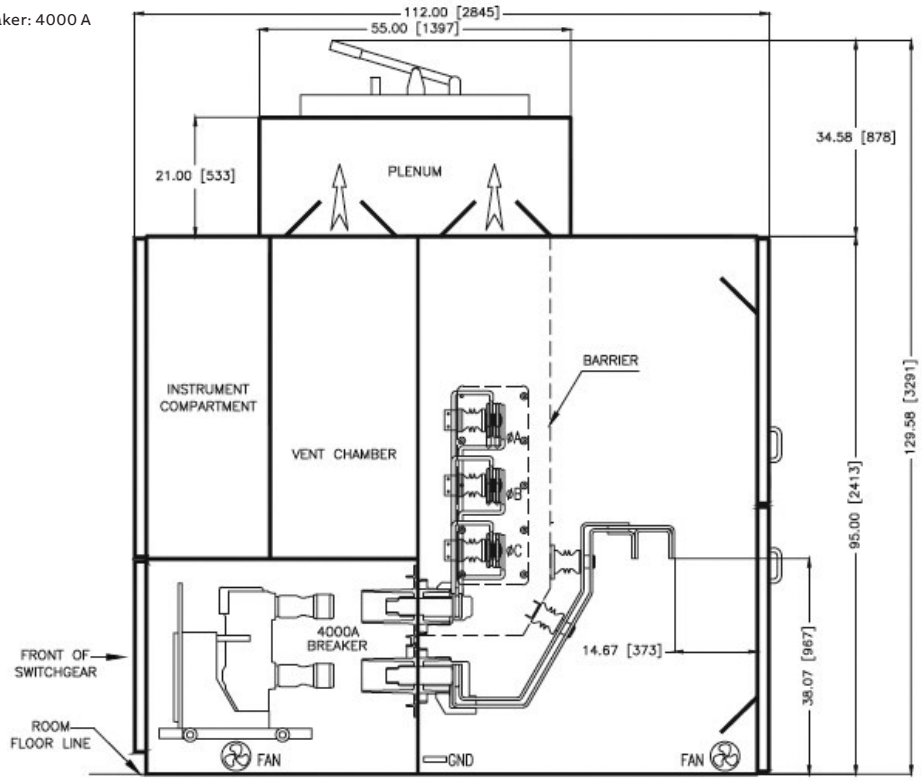
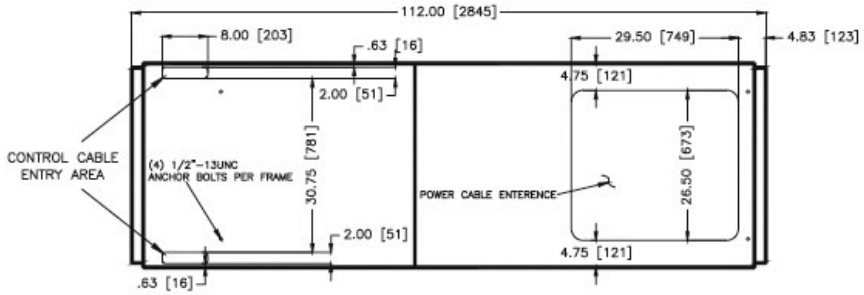
27

—
28 Circuit breaker: 4000 A



SIDE SECTION



FLOOR PLAN

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28

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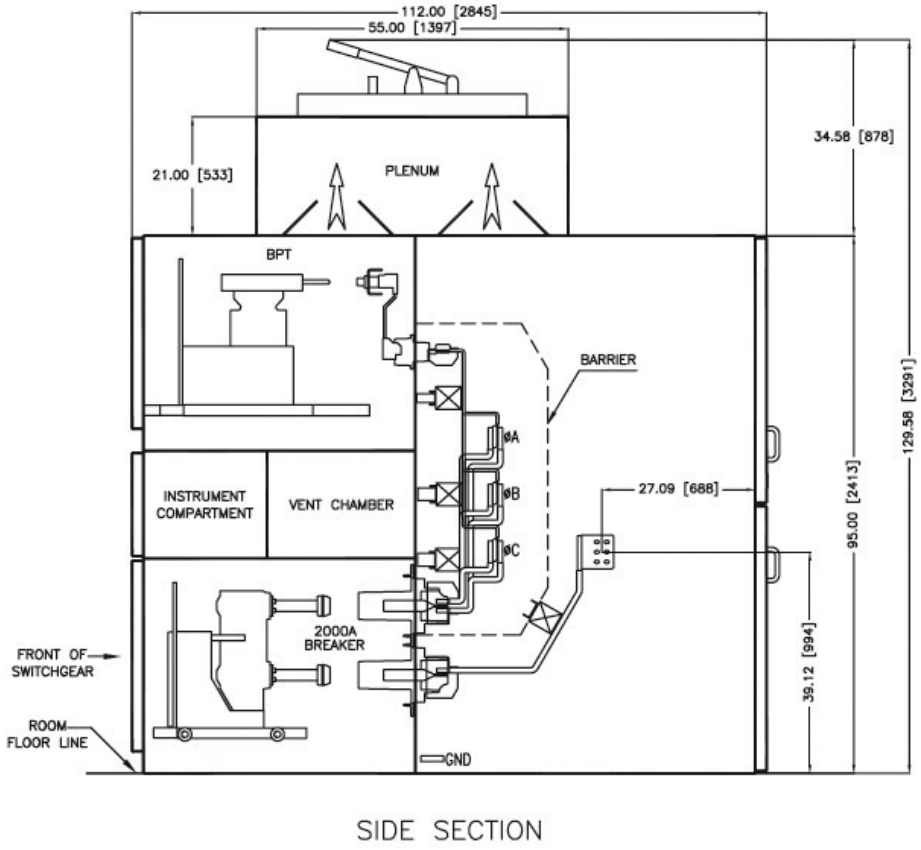
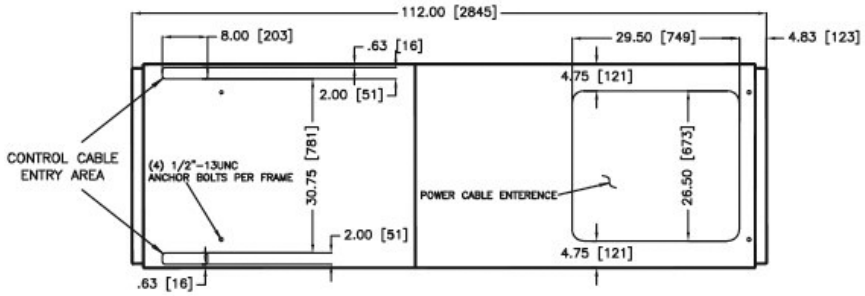
29 Circuit breaker: 2000 A

SafeGear HD switchgear breaker and auxiliary frames



SIDE SECTION



FLOOR PLAN

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29

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30 Typical civil engineering dimensions

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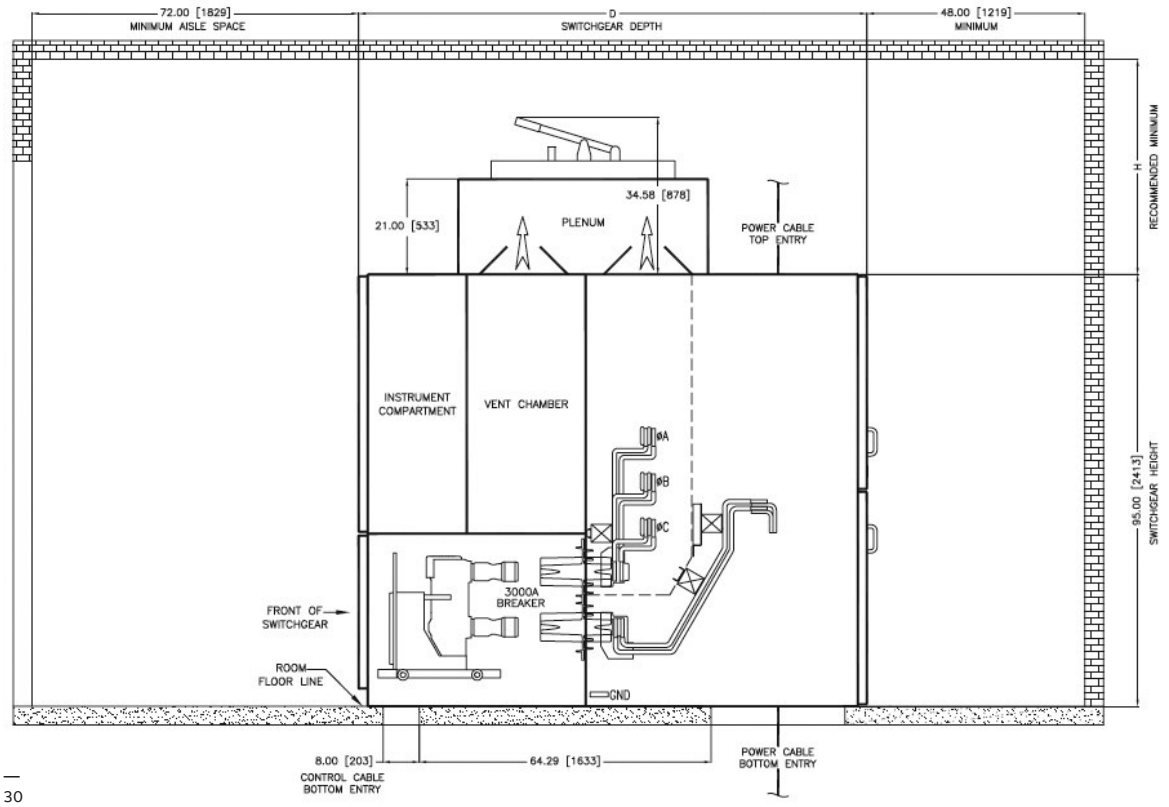
31 Arc-flash venting space requirement diagram



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30

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Table 12: Typical civil engineering dimensions - inches (mm)

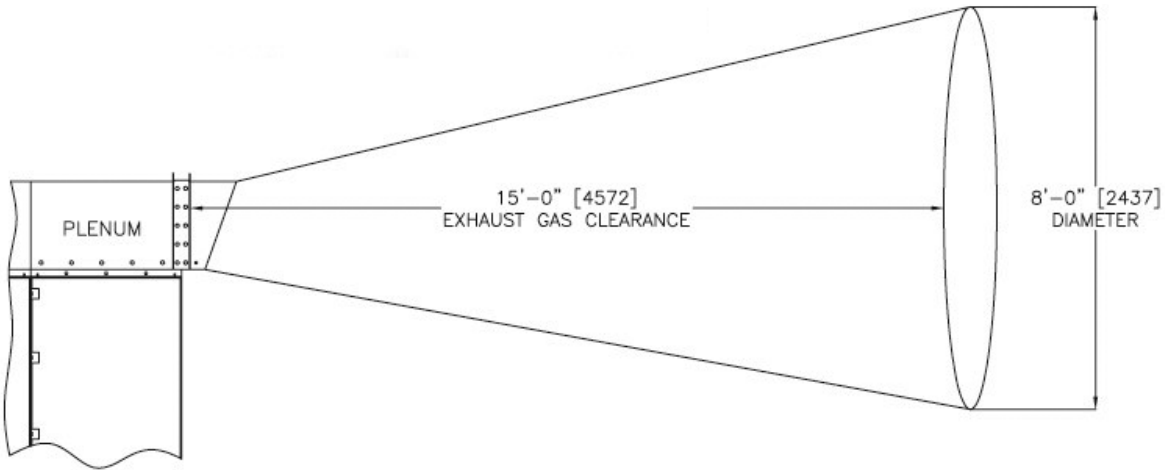
	Depth (D)
SafeGear HD	112 (2845)

Dimension H:
- 24 inches for 1200 A lineups
- 40 inches for 2000 A/3000 A lineups

Additional clearance may be needed during assembly of the plenum.

Indoor and outdoor applications
SafeGear HD is available in indoor construction. For outdoor applications, SafeGear HD is installed in a PDC building or outdoor sheltered aisle. Both applications offer the flexibility of one-high or two-high construction.

Standard indoor construction meets the requirements of ANSI and IEEE standards.



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31

Frame weights calculation
All frame styles

To calculate the weight of a frame, identify the current rating for each module. Select the weights from the appropriate column in the adjoining table for SafeGear HD components.

A frame consists of one bus and cable module and the approriate circuit breaker and auxiliary modules. The weight of the circuit breaker is given separately and must be added.

Low voltage modules may contain significant amount of secondary equipment and wiring. Depending on the extent of secondary protection and control equipment, ABB recommends adding 20% to 50% of the empty weight of the module.

The weight of the end panels has to be considered per lineup of switchgear. Weights given are for two end panels, one on each end of the switchgear lineup.

Typical frame weights are shown in Table 13. Detailed drawings for the arrangements are located in previous sections of this document. Weights include all modules and components as listed above.

Table 13: Frame weights

Basic frame configuration	Circuit breaker (rating)	Weight lbs	Weight kg
One circuit breaker	1200	4550	2068
	2000	4915	2234
	3000	5550	2523
Two circuit breakers	1200/1200	6380	2900
	1200	5350	2411
One circuit breaker, one VT	2000	5675	2580
One circuit breaker, one CPT	1200	5675	2423
	2000	5700	2591

Note: These weights do not include the circuit breakers. Please reference the AMVAC or ADVAC breaker technical guides for more information

ABB Inc.
305 Gregson Drive
Cary, NC 27511 USA
abb.com/contacts

abb.com/mediumvoltage

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