

ELECTRIFICATION PRODUCTS

SafeGear® Motor Control Center

Arc-resistant metal-clad construction

Installation, operation and maintenance manual



**Medium voltage SafeGear®
Motor Control Center: controlling
energy for a safe world**

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General instructions

Read these instructions carefully before installation and use them as a guide during installation and initial operation.



File these instructions with other instruction books, drawings and descriptive data of the MCC. Keep this book available for the installation, operation, and maintenance of equipment. Using of these instructions will facilitate proper maintenance of the equipment and will prolongs its useful life.

Assembly manuals available for consultation about the equipment: Frame assembly manual, Main bus assembly manual and Wiring installation manual.

Scope of instructions

The instructions are general in nature. They cover requirements for installation, setup, checkout and maintenance as applied to ABB medium voltage Motor Control Centers (MCC). These instructions do not attempt to cover all variations and combinations of equipment and installations. Information on particular installations appears in the following:

- Bills of materials that list electrical devices and equipment
- Front view in the general arrangement
- Single line drawings showing power connections
- Floor plan, representing available space for power and control conduits
- Special construction details
- Elementary and schematic diagrams
- Connection diagrams

Safety notes and warnings

Equipment operation depends on proper handling, installation and maintenance. Neglecting fundamental requirements may lead to personal injury, failure of the equipment and property damage.

Safety as described in this instruction book involves two conditions:

- Personal injury
- Product or property damage

Note: See "Disclaimer of warranties and limitation of liability", in this document.

Safety notations

Safety notations alert personnel to possible death, injury or property damage situations. The safety notations appear before the step in which the condition applies. The four hazard levels are:



WARNING

Danger, indicates a hazardous situation which, if not avoided, will result in death or serious injury.

Prior to performing any work on this equipment, qualified personnel should verify that the equipment has been fully de-energized. You should assume that all equipment is energized until such time as you have verified that the electrical circuits are completely de-energized and electrically isolated so that there is no possibility that the equipment could become energized while work is being performed on, and in proximity to, the equipment.

 **WARNING**

WARNING, indicates a hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION**

CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE, is used to address practices not related to personal injury.

Personnel installing, operating or maintaining this equipment must be qualified on all applicable local, regional, industry, governmental and OSHA safety procedures, as well as commonly accepted safe working practices. Personnel working in or around this equipment must also exhibit common sense and good judgment regarding the potential hazards for themselves and other personnel in the area. These instructions are intended for use by fully qualified personnel and are not a substitute for adequate training, experience and supervision.



Should clarification or additional information be required, refer the matter to your ABB sales office. When communicating with ABB regarding the product covered by this Instruction book, always reference the ABB assigned Purchase Order (P.O.) number and/or equipment serial number.

Note: The Occupational Safety Hazards Administration, OSHA, is an organization of the government of U.S.A. dedicated to safety.

Receiving, handling and storage

Receiving

Before shipment, the equipment is inspected and marked with its number and position. The factory ships the contactors separately.

Upon receipt, examine the shipment for damage or loss. Check the contents against the packing list before discarding any packing material. Notify the carrier and ABB at once of any discrepancies.

If there is damage from improper handling, file a claim for damages at once with the carrier and notify ABB.

Note: ABB standard shipments are "FOB Factory." ABB is not responsible for damage after delivery of the equipment to the carrier unless otherwise specified on the PO

Handling

NOTICE

For structural integrity, all doors and panels must be in place and securely fastened before moving the equipment.

Do not move or transport the frames with contactors or other drawout equipment installed in the compartments.

Before energizing the space heaters, remove all the packing materials. Open the breaker or cutout device that controls the heaters when is using a separated power source.

Storage

Place the equipment on the shipping base. Store all equipment indoors in a well-ventilated area.

The storage building should have a well-drained paved floor. The temperature should be between 23°F (-5°C) and 104°F (40°C). The air should be dry (50% maximum humidity).

The sections ship wrapped in plastic for protection during shipment only. Remove the plastic wrap just before placing into storage. Cover with heavy wrapping paper or other moisture barrier. Use materials that will not trap moisture inside the unit. Do not cover louvered openings.

For long-term storage, or in high-humidity, use space heaters to keep the interior dry. Bring power for the space heaters to the load terminals of the device that controls the heater circuits.

Note: The heater can be energized with an external source of power.

- Store contactors upright in their original shipping base
- Do not stack
- Do not store contactors in the compartments

Location site preparation

Overview

Before installing, consult all drawings supplied for the particular order. Drawings show top and front views of the lineup, primary and secondary connection diagrams and Bills of Materials. Study these drawings and the following recommendations before preparing the site plan drawings.

Location

Locate the lineup in accordance with local regulations. Clearances at the front should allow installation and removal of the draw-out equipment and lift devices. Allow enough clearance to service draw-out equipment in back to back installations (when it is applicable).

High recommended

Nominal current	Ft
25 kA	12
14	16
50 kA	

* Maintain approximately 4 feet or more clearance from the top of the equipment to any obstruction.

Foundation

The factory supplies floor plan drawings for each installation. The floor must be straight and level within 0.25 inches over the full length and depth of the lineup. The finished floor under and in front of the line-up should be smooth.

Install power and secondary (control) conduits before moving the unit to the site. Available space for the conduits appears on the floor plans supplied with the units. Conduits should not extend more than one inch above the station floor level. Cover the conduit openings in the floor.

Indoor Installation

General

WARNING

Drilling or punching of holes in the equipment in any way will affect the arc-resistant integrity of the MCC. Consult the factory engineer before proceeding.

In order to obtain an optimum installation sequence and ensure high quality standards, site installation of the MCC should only be carried out by specially trained and skilled personnel.

Metal-clad MCC ships are in sections. These sections group are on disposable steel shipping bases. Equipment is not to be permanently installed on the shipping bases.

Unload the units as close to the installation site as possible. Remove all drawout elements and secure all doors and panels. To move the shipping sections to their final position, one of four methods can be used.

Forklift – place forks through locations provided in the shipping bases (see Figures 01 and 02).

Lift the MCC frames slowly and tilt forks slightly rearward to balance. Move carefully into the final position taking into account the center of gravity (see Figure 04).

— 01 Forklift provisions in shipping channels.

— 02 Forklift forks penetrating shipping channels.

— 03 Complete fork penetration of all 3 shipping channels.

— 04 Lifting of switchgear frames with forklift.



— 01



— 02



— 03



— 04

Towing - use chains rated for safe handling of the shipping splits. Consult the chain manufacturer or local code requirements for proper safety factors. Attach the chains to the holes at each end of the shipping base. Secure chains to the towing equipment. Make sure that the floor height is consistent or provide heavy duty steel sheets to bridge any inconsistencies. Protect the lower edge of the switchgear from damage by the chains.

Crane - using a spreader bar and either chains or slings connected to the shipping channel extensions, part no. 921309T01 (provided upon request), lift carefully taking into account the center of gravity. Once located, final positioning can be done with a forklift. When using either chains or wire rope slings, place a wooden 4" x 4" block between the equipment and the sling to protect the equipment from damage.

Jacks and Rollers - raise the units with jacks located at the corners of the shipping bases and move on steel pipe rollers with the shipping bases attached.

CAUTION

Use of forklift trucks for jacking or placing the jacks other than as described may result in stress distortions and irreparable damage to the equipment.

Do not remove the shipping bases until the units are set in place. Moving the units without the shipping base will cause irreparable damage and a hazardous condition.

Removal of the Shipping Base

Once the units are in their final place, the shipping bases can be removed.

Open the equipment doors. Remove the bolts holding each of the three shipping bases to the equipment. If circuit breakers were installed for shipment, the lower position breakers will need to be removed prior to this step.

Close and secure all doors and panels. Raise the units to a height that allows removal of the base. Use four jacks located at each corner of the shipping split, just inside of the shipping bases for this operation. Keep the units uniformly level to prevent distortion.

Select four pieces of wood thick enough to permit removal of the jack after lowering. Place one under each corner. Slowly lower one side until it rests on the pieces of wood. Repeat this process on the other side.

Use a pry-bar to lift each corner enough to remove the four pieces of wood.

Attaching to the Floor

Following the removal of the shipping bases, the MCC units should be secured to the floor either by bolting per the guidelines outlined on the ABB factory drawings. Welding is not recommended and no guidelines exist for attachment using this method.

Connections

DANGER

Before making primary source connections, verify that the primary cables are de-energized and the equipment is properly grounded.

Bolt the separate units together. Reconnect the main bus and control wiring at the shipping splits. Follow the connection diagram when replacing secondary and control wiring.

Bolted connections should be torqued to required levels as outlined in Appendix C.

Complete all internal connections. Make the external connections to control power sources and circuits, to secondary and potential circuits, to feeders, power sources and to ground.

WARNING

Power cable penetrations, top entry or bottom entry, into the equipment should be secured in the provided gland plates with sealing glands/hubs. Failure to use sealing glands/hubs will affect the arc-resistant performance of the MCC.

Note: After completing all connections to secondary (control) circuits, follow these circuits and remove temporary connections from current transformer secondaries (see Figure 1).

Temporary jumpers protect against voltages that may occur if the current transformer primaries carry currents while the secondary circuits are still not complete. With the secondary circuits connected, remove the jumpers.

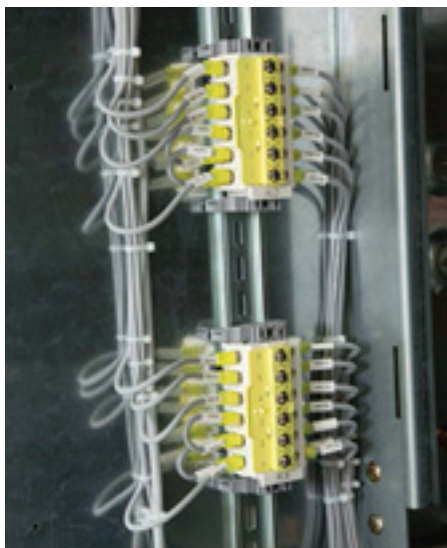


Fig. 1 CT Shorting Blocks

CAUTION

Ground bus connections should not penetrate any part of the MCC not intended for cable of bus entrance. Not following this practice will affect the arc-resistant performance of the MCC.

Note: Failure to remove the jumpers will interfere with meters, relays, or other devices in these circuits (see Figure 1).

If shorting terminal blocks are used, review the connection diagram that was shipped with the unit, for position of shorting screws. See step 10 of the control circuit checkout.
The wiring connections are explained in Appendix C

Connection to Ground Bus

The factory bolts the ground bus bars to each frame. Connect the ground bus bars between the shipping splits and to the station ground with a cable or bus of equal or larger gauge than the housing ground bus.

Do not run cable or bus in conduit. The cable or bus should take the most direct path to ground.

Installation of the Plenum

The MCC plenum is shipped separately in pre-assembled sections on pallets. Refer to the General Arrangement drawings for details on the layout of the plenum.

Remove all packing material and lift plenum sections to the top of the MCC by suitable lifting means. Each section is then bolted to the plenum base mounted on the MCC roof and also to the adjoining plenum section with provided hardware.

Once the roof-mounted plenums are in place install additional plenum sections, for venting outside the building, one at a time starting at the MCC boundary (see Fig. 2).

As each section is installed provide permanent support for each section, either from above or below, starting with the first plenum section. The support should be able to brace the weight of each in accordance with local building code requirements.

Follow the specific plenum routing shown on the General Arrangement drawings:

The exhaust vent section (see Fig. 3) should be installed in the building wall and connected to the last plenum section (see Fig. 2). Additional plenum information can be found in the Field Installation of Plenum Sections, 1YEPMSC2516E007.

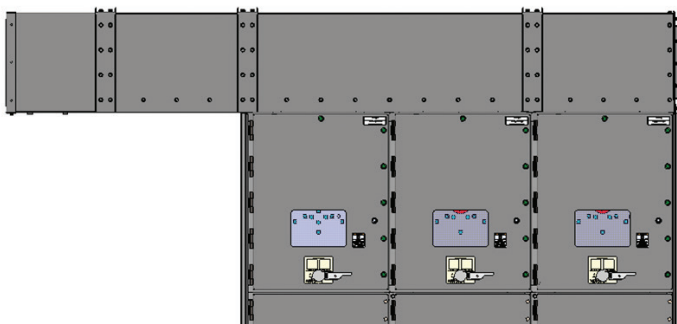


Fig. 2 Plenum Installation

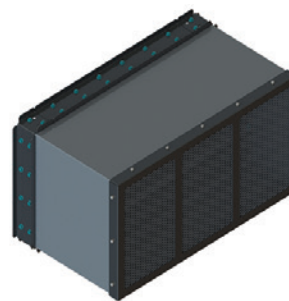


Fig. 3 Plenum Exhaust Vent

The area outside the plenum exhaust vent needs to be kept clear of personnel and equipment due to the potential for super-heated pressurized exhaust gasses being expelled in the area as a result of an arc fault in the MCC. Specifically, a horizontal cylindrical volume, with an 96 inches diameter, centered on the plenum exhaust vent and extending out 180 inches, needs to be clear at all times (see Fig. 4).

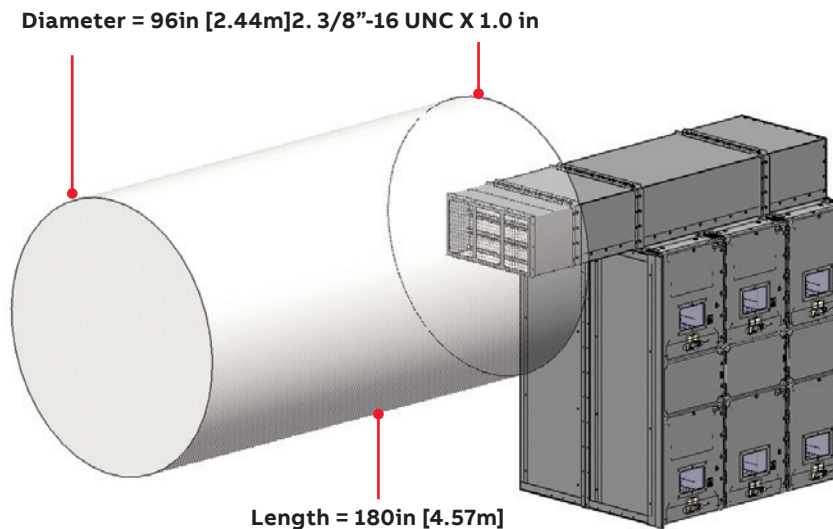


Fig. 4 Plenum exhaust area

Installation of bus bar connections between shipping splits

The factory assembles the main bus bar in each section. The splices at the shipping splits are unbolted for shipment. Refer to the General Arrangement Drawings.

The contact surfaces of the bus at bolted joints are plated. Clean contact surfaces with a clean cloth and an OSHA approved solvent.

CAUTION

Do not use alcohol or freon. Limit the use of solvents to removing grease and contamination from primary conductors, insulation and unpainted metallic surfaces. Use an OSHA approved, non-flammable solvent with a threshold limit of 300 PPM or higher in accordance with local regulations. Use solvents in well-ventilated areas.

Note: Take care not to remove or tarnish plating.

Remove barriers to access the main bus compartment. Bolt the main bus together using supplied hardware. Conductivity of a bolted joint depends on the pressure or torque applied.

Note: All bolted joints must be torqued per ABB specifications – see Appendix B.

Secondary and control connections

The MCC was wired in the factory in accordance with the Project specific Connection Diagrams. Refer to project specific drawings for locations of the incoming and outgoing wiring terminal blocks.

Openings in the side of the MCC in the Low Voltage/Instrument compartment area allow control connections between sections. When shipped in groups of several units each, the factory installs interconnection wiring between groups. The factory then disconnects and tags one end of each of the connections, then pulls the wire bundle back across the split within the adjacent frame. Reconnect these interconnections according to the project specific connection diagrams after the equipment shipping sections are installed in place. See Appendix C.



WARNING

All secondary power and control wiring should be routed through the provided locations and utilize the rubber grommets cut with the appropriate size center hole to accommodate the wiring bundle. Failure to do so will affect the arc-resistant integrity of the MCC.

Primary cable connections

Area for connection of primary cables is provided in the cable compartment either through the roof or floor as indicated in the General Arrangement drawings. The gland plates are made of .074" stainless steel - these plates must be utilized in the final assembly. Holes for entrance of power cables or conduits must be cut in the gland plate(s) and a sealing type bushing used.



WARNING

Use of sealing bushings for all power cable entries is required. Failure to do so will affect the arc-resistant integrity of the MCC.

Connection to control source

The control source wiring should be properly sized to support the requirements of the control circuit. Connect the control source leads to the terminal blocks as indicated on the project Connection Diagrams.

Note: Check the electrical phasing before connecting.

Testing and final inspection

Testing

DANGER

Disconnect the primary power source during testing. Do not exceed the listed voltage class of the equipment during testing. Disconnect shunt connected coils such as potential transformer. Do not test sensors in solid state and relay with high voltage. Disconnect them before applying voltage.

With the equipment raised, assembled and connected, perform the following process:

1. Remove packing and shipping materials.
2. Make sure that all internal parts are clean and dry. If moisture is present, blow dry with warm air.
3. Remove any shipping blocks from relays.
4. Check for damaged insulation by applying potential tests to the primary bus. Apply potential tests phase-to-phase and phase to ground in accordance with “Field Test” values.
5. When the main circuit is de-energized and grounded, check the continuity of all circuits after installing the contactors. After this, energize the control source and operate the equipment. The indicating instruments verify the continuity of current transformer circuits and the energizing of the main circuit.

Test voltages for dielectric voltage-withstand test

Rated control voltages	Factory test
0 V to 600 V	2 x nominal voltage +1000 V plus
601 V to 7200 V	2.25 x nominal voltage +2000 V plus

Control circuit checkout

DANGER

The contactor or cutout device of the local control power circuit must be opened when is used a separated control power source.

The preferred method to check the control circuit is to furnish a separate temporary control power source of the required control voltage rating. The temporary source must have a properly coordinated backup protective device in the circuit. Set the device to clear any faults that might occur. Initially all contactors should be racked out (“DISCONN.” position) and the main circuit deenergized and grounded. When AC control power is from control power transformers in the MCC, remove all fuses in the transformer circuits.

1. Make sure all contactor assemblies are open (OPEN).
2. Rack the contactors out to the disconnected position.
3. Open all control power source contacts, if supplied.
4. Check each control switch or push-button. Make sure that they are open position (OPEN).
5. Connect a temporary control power source to the circuit load terminals in the MCC. Energize the control circuit from the temporary control power source.
6. Rack the contactor to the connected position (CONN.). Open and close the contactor to verify the correct connection in the secondary plug. Repeat the same operation for every contactor assembly, one at a time.
7. Test the contactors for closing and tripping, operated on manual and electrically through the control circuit, while they are in the "DISCONN." position.
8. De-energize the control circuit. If AC control power is from transformers in the MCC, remove the separated temporary control power source. Reinstall all fuses in the transformer circuit.
9. Set all relays, regulators and other devices for proper operation of loads. The factory does not set the relays.
10. Remove shorting screws from the terminal blocks in the current transformers circuits. Store screw in the tapped holes in the corners of the blocks (see Figure 5).

NOTE: Verify the proper phasing of all main circuits according to diagram of control.

To open the short circuit device:

1. Make sure that the transformers circuits are completed. Do not put one of energized switch in a secondary open circuit.
2. To open the short circuit device:
 - 2.1) Single Ratio – Remove and store the shorting screw "a". Do not remove the ground screw "b".
 - 2.2) Multi Ratio – Remove the shorting screw "a" and insert it according to the connection diagram below.

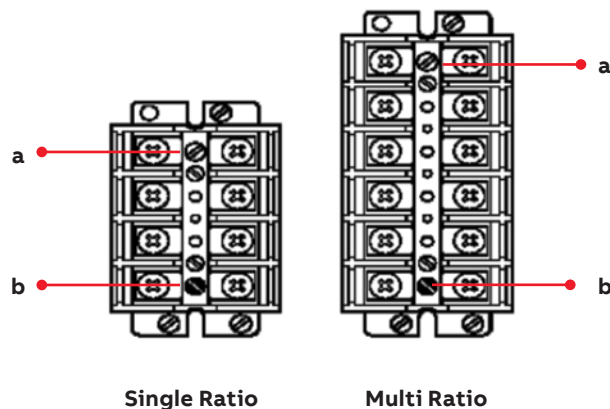


Fig. 5 Short circuit device

Final inspection

DANGER

The contactor or cutout device of the local control power circuit must be opened when is used a separated control power source.

Once installed and all connections made, perform a final check and test on the equipment and its controls. Check for correct equipment installation and that all connections are complete. Take extreme care to prevent the controlled equipment (load) from being connected to the system while performing preliminary tests.

Disconnect the line wirings if the line contactors are not in the system according to the connection diagram supplied with the equipment.

Typical circuit diagram HCV-5HA

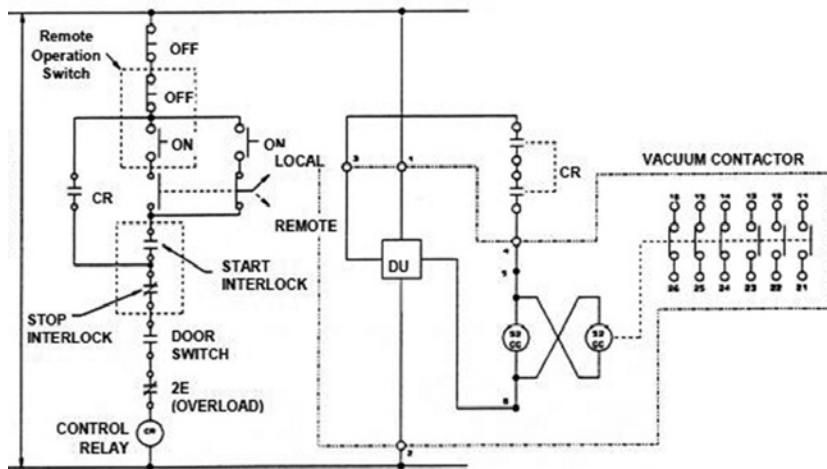


Fig. 6 Standard operation circuit diagram of normally energized type

Putting into service

Safety precautions

DANGER

There are hazards of electrical shocks and/or burns whenever working in or around electrical equipment. Turn off power of the MCC before performing any inspection or maintenance operations. Check incoming line terminals to verify that the equipment is de-energized and grounded. Check outgoing terminals to ensure that no back feed condition exists.

All contactors must be in “DISCONN.” position, when service or maintenance personnel are working on the MCC, unplug the main bus feed and ground the whole system.

Before energizing the MCC, do a complete review of the mechanical operation of all devices. Remove clips of the relays, contactors, meters, etc.

Manually operate all contactors and relays. Moving parts should not bend. Verify that there are no foreign objects in the equipment.

Use compressed, clean, dry air to clean all inside and outside surfaces.

Note: Current transformers secondary circuits should be short circuited.

Clean contact surfaces with a clean cloth and an OSHA approved solvent. Bolt the bus together. Conductivity of a bolted joint depends with the proper torquing of the bolts.

All contact surfaces of the bus will be bolted and plated.

Clean all surfaces with a clean cloth and use only OSHA approved solvent. Join bus bars with the correct screws a good conductivity depends of the appropriate torque applied.

Energizing main bus

After completing the control circuit checkout, energize the main bus as follows:

1. Verify that all doors and panels are in place and secured. All contactors must be racked out (“DISCONN.”).
2. Energize the incoming bus to the equipment’s main circuit breakers or any other device located in the incoming of the lineup.
3. Verify if operation of instruments and relays are correct.
4. Activate the independent control power source.
5. Energize the main bus closing the main circuit breaker; verify that the relays and other instruments are functioning correctly.
6. Place the contactors from the out position (“DISCONN.”) to the inserted position (“CONN.”).
7. Close the desired contactors.

Standard construction

Contactors compartment

The principle of manufacturing is modular, for 400 and 720 A contactors the compartment dimensions are 30” wide, 33.625” deep and 38” high. For control low voltage (LV) compartment the dimensions are 30” wide, 15.12” deep, and 19” or 57” high. For main bus and cable compartment rated at 1200, 2000 and 3000 A the dimensions are 30” wide, 31.38” deep and 95” high. The general dimensions of the SafeGear™ MCC are 30” wide, 68” deep and 95” high without plenum (21 in extra).

The compartments are manufactured of galvanized steel material. The main parts of each compartment are designed with a double-bend in the end sides in order to get higher mechanical strength. The contactor truck has a galvanized steel base with wheels, in which are set the contactor and the fuses box. Three phases are connected by finger contacts.

The new design of the contactor truck allows manual insertion only when the contactor compartment door is closed, using a tool (racking lever). The secondary automatic system is auto adjustable so it does not require manual connection.

The standard paint color is Grey ANSI 61. This powder paint has an electrostatic finish applied in a ferrous phosphate covering. This process reaches uniform and soft texture. Pieces that are not painted are fabricated with C.R.S. (Cold Rolled Steel) galvanized.

Painted pieces are of black sheet C.R.S. or could have another finish to meet the IEEE C37.20.2.

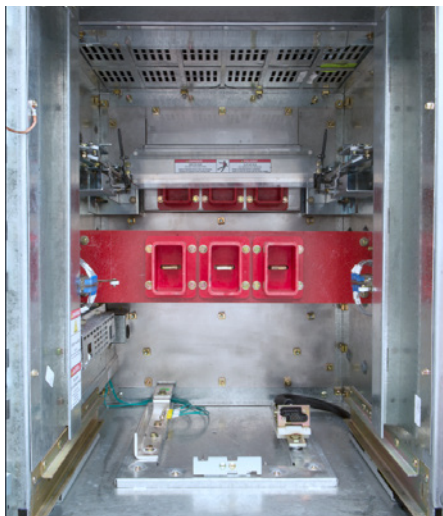


Fig. 6 Contactor compartment



Fig. 7 Power cables compartment

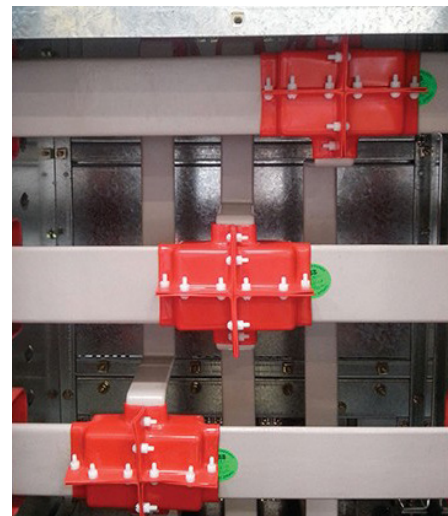


Fig. 8 Bus supports and bus bars

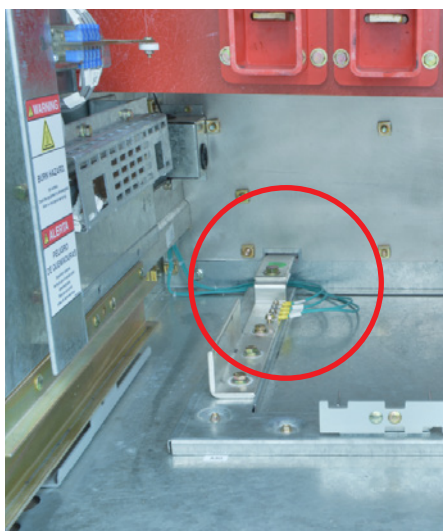


Fig. 9 Controller ground contact



Fig. 10 Automatic secondary



Fig. 11 Finger contacts

Power cables compartment

The power cables compartment has provisions for several devices, for instance: current transformers (up to 3 per phase), surge arresters and ground sensor.

The power cables compartment has enough space to lodge up to 2 power cables per phase of 350 MCM (133% insulation level) with a stress cone each.

Bus bars and supports

Bus bars are electrolytic copper sheathed in heat epoxy hysol (coating shrinkable tubing as an option). They run horizontally and vertically along the bus and cable compartments. The cross section allows meeting the current specified by the design. The bus supports are polyester GPO-3, this design supports the electrodynamic forces caused by short circuit effects.

Secondary connection

Each contactor compartment includes an automatic device that connects the contactor low voltage control circuit, as well as to connect the circuit of opening and closing of the contactor.

Contactor ground contact

The ground contact is located at the front of the contactor compartment. The contactor is grounded in each position.

Primary connection

Consists of a set of three copper contact fingers compressed by springs, these can be inspected by removing the contactor from the compartment. Line side finger contacts apply the correct pressure over the terminals, achieving self-alignment of the devices. All copper parts are silverplated (tin plated are an option) for better conduction.

Contactor Assembly Ratings

Contactor model	HCV-5HA	HCV-5HAL (Latched Type)	HCV-6KAU	HCV-6KALU* (Latched Type)
Rated voltage	2400/4200/6900 V (7.2 kV Max)		2400V/4200/6900 V (7.2 kV Max)	
Rated current	400 A		720 A	
Interrupting capacity	7000A RMS Symmetrical @5000V Max.		7200 A	
	4500A RMS Symmetrical @7200V Max.			
Peak withstand current	15.8 kA		20 kA	
Impulse withstand	60 kV			
Permissible switching	1200/Hour	300/Hour	600/Hour	300/Hour
Mechanical life operations	2,500,000	250,000	1,000,000	200,000
Electrical life operations	250,000	250,000	200,000	
Closing time	50-110 ms		80-120 ms	
Standard opening time	10-60 ms		35-85 ms	
Arcing time	10 ms or less			
Rated control voltage AC	115/120 or 230/240 V 50/60 Hz		100-240V AC	
Rated control voltage DC	120/125 or 240/250 V		100-240V DC	
Trip voltage	-	24, 32, 48 ,125, 250 VDC	-	24, 32, 48 ,125, 250 VDC
Control circuit burden (closing)	5.4 A peak @ 120 VAC, 670 VA (AC), 700 W (DC)		6 to 7.0 A @ 120 VAC, 840 VA (AC), 875 W (DC)	
Control circuit burden (holding)	0.12 A Avg. @ 120 VAC,85 VA (AC), 85 W (DC)		0.8 to 1 A @ 120 VAC 48 VA	
Auxiliary contact arrange	3 N.O. - 3 N.C.	2 N.O.-2 N.C.	3 N.O.-3 N.C.	2 N.O.-2 N.C.
Auxiliary contact rating	10 A, 600 V (NEMA Class A600)			

Fuse replacement

Please, refer to the Installation and operation manual for the controller for fuse replacement procedure.

The fuses replacement and installation are carried out with the contactor. Fuses are fixed by hexagonal screws. The fuses can be one barrel or double barrel; both have the same setup to fix, so additional attachment is not required.



Fig. 12 Contactor

Hardware	Qty. per fuse
Hexagonal 3/8"–16 X 1" UNC head screw Grade 5	4
Spring washer	4
Flat washer	4

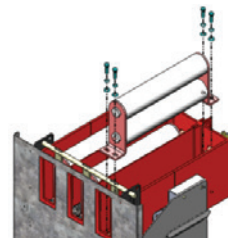


Fig. 13 Fuse replacement

Contactor compartment operation

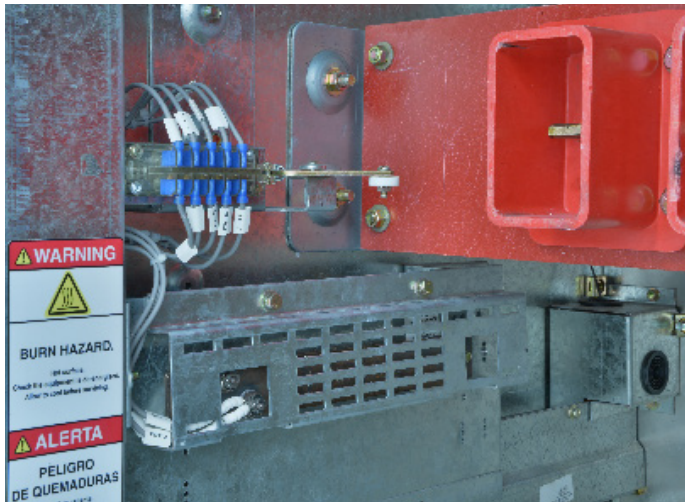


Fig. 14 TOC



Fig. 15 Line side shutter

Truck operated contact

The TOC interacts with the position of the contactor, either “CONN.,” “DISCONN.” or intermediate positions.
Note: TOC are factory calibrated, no further adjustment is necessary.

Line side shutter

The contactor compartment features a mechanical shutter lock to prevent access to the line side bus when the contactor is not in the compartment.

DANGER

Do not attempt to deactivate the shutter system. It only operates when the contactor is in the compartment. Hazardous voltage can cause electrical shock and burns. Disconnect power, then earth and short-circuit before accessing for any components in this area.

Additional features include provision for padlock, when maintenance is required.

Contactor mounting in compartment

The contactor is located outside the compartment ready to be inserted.

NOTICE

Before putting the contactor into the contactor compartment, place the automatic secondary at its initial position (at the front of the compartment).

1. Use a Lift Truck to move the contactor to the height of the compartment.
2. Insert the tray guides of the Lift Truck in position in the compartment slots.
3. Release the contactor of the tray with the front hand grips and slide them firmly to the compartment until reach the slots located on the rails of the compartment.
4. Release Lift Truck.

At this point the Contactor is not connected to the load side bus. The position indicator is “DISCONN.” (extracted) and the status indicator is “OPEN”.

The automatic secondary pins are connected to the contactor control board, which can close the contactor for testing in the status “CLOSED”.



Fig. 16 “DISCONN” position



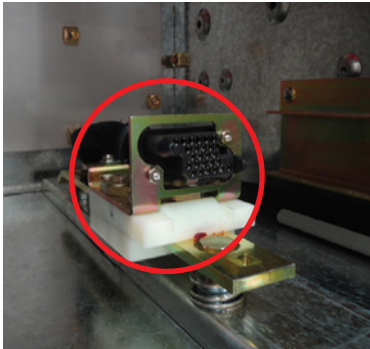
Fig. 17 Insertion of the contactor

Secondary connections mechanism alignment

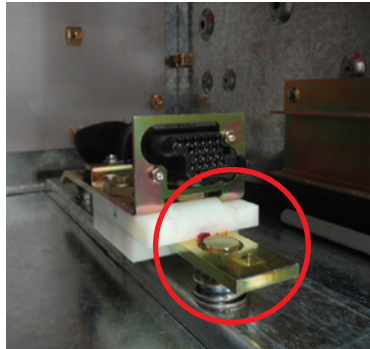
In order to ensure proper engagement without damage of the control connections of the controller, it shall be reviewed the condition of the secondary connection mechanism ensuring that is aligned with the correspondent parts on the controller truck.

To follow this simple instructions helps to eliminate risk of crashing the mechanism causing damage in the connectors that finally can produce loss of the control signals.

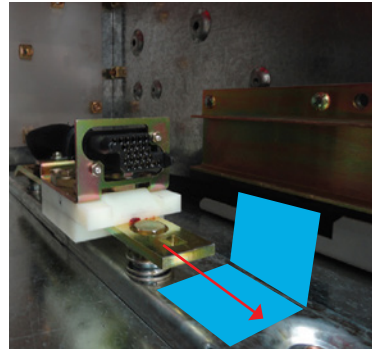
Please review following instructions previous to insert the controller into the MCC cell:



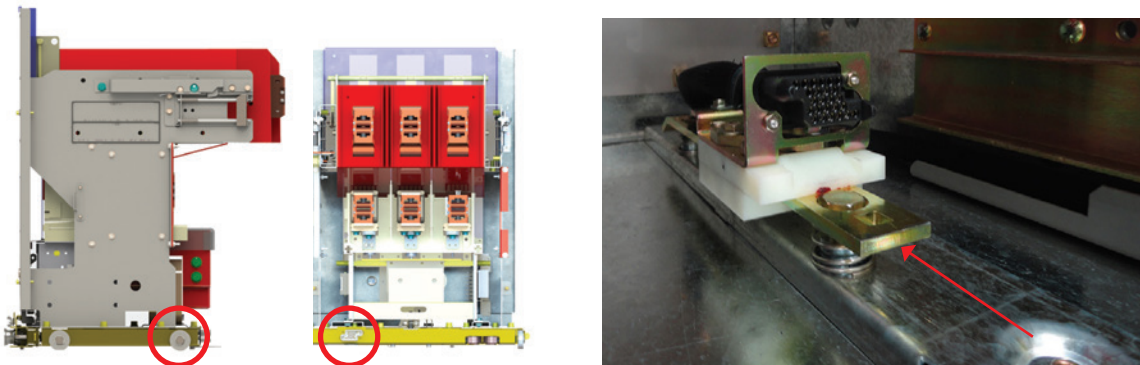
1. Identify the secondary connection mechanism on the floor of the controller module.



2. Review that frontal tongue is not damaged or folded during any commissioning or maintenance activities, also review good condition of the spring bellow of the tongue.



3. The tongue of the secondary connections mechanism shall be aligned coming to the front of the MCC cell, it means being parallel to the sides and floor planes just as indicated.



4. Finally, check that thinner tongue below of the secondary connector on the controller truck is also aligned according to the instructions above.
5. This tongue shall be aligned to be received in the female part located just below of the secondary connector inside of the module.

Racking-in the contactor

The contactor has a mechanical lock that interacts with the door to start the racking.



CAUTION

Do not attempt to rack the contactor with the door open, this may create a risk of electrical arcing and damage the equipment.

1. Close the door bolting all the screws.
2. Ensure that the contactor is open "OPEN".
3. Turn the door shutter to insert the lever.
4. Insert the handle and turn clockwise 10 complete cycles. Continues until the mechanical stop position is activated.

The contactor is now in the inserted position "CONN.", connected to the main bus through the line side bus. The load side bus is energized when the contactor is closed "CLOSED".

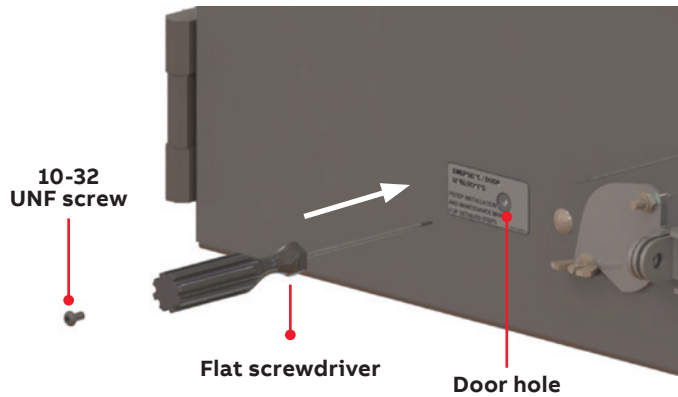
Racking-out the contactor

1. Open the contactor "OPEN".
2. Turn the door shutter to insert the lever.
3. Insert the handle and turn counter-clockwise 10 complete cycles. Continues until the mechanical stop position is activated.
4. The contactor position is "DISCONN." again.

Emergency door unlocking

To open the door using the emergency door lock, follow the steps below:

1. Remove the 10-32 UNF round head screw that is at the bottom of the contactor compartment door.
2. Using a slim screwdriver tool, introduce it through the door hole until it reaches the pin that is locking the door.
3. Move up the tool to release the locking pin that is locking the door.



NOTICE

Put the 10-32 UNF screw in place after unlocking the door

Fig. 18 Door locking mechanism

Maintenance

Overview

Inspect all MCC installations at frequent intervals. Visually inspect the front and back to note any warped piece, loose bolts or screw undue vibration. Take corrective actions if any of these conditions is found.

Keep the MCC covered to prevent any dripping liquids from falling on it, but do not cover the air vents.



DANGER

There are risks of electrocution and/or burns every time you work on or around electrical equipment.

Disconnect power from the board before performing any maintenance.

Check the terminals of the input line to verify that the equipment is disconnected.

Check the output terminals to verify that there is no feedback.



CAUTION

Limit the using of solvents to remove grease and contaminants to the primary conductors, insulators and metal surfaces without paint. Do not use alcohol or freon. Use OSHA approved solvents according to local regulations. Use a nonflammable solvent equal to 300 PPM.

Use solvents in well ventilated areas.

Removing the contactor with ramp (lower compartment only)

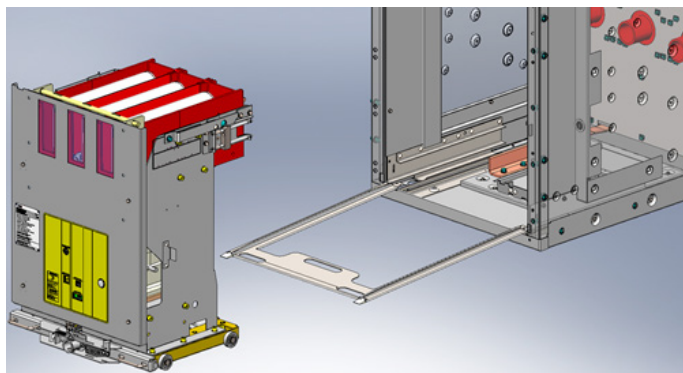


Fig. 19 Contactor ramp for lower contactor compartment

Safegear® MCC has provisions to put a ramp in front of the contactor compartment to withdraw the contactor, instead of using a crane or lift truck. This ramp carries the contactor outside the contactor compartment for maintenance or servicing.

Semi annual inspection

Perform a thorough inspection of the MCC at least semiannually. Emphasize the following points:

- Perform an overall visual inspection.
- Check all indicators, meters and instruments for proper operation.
- Make sure all bolted connections are secure.
- Verify operation of heaters and thermostats, if used.
- Check for undue noise and or vibration that might cause loosened bolted connections.
- Look for evidence of moisture in the MCC.
- Note any unusual amount of ozone odor (distinctively pungent smell).

Annual inspection

In addition to the semi-annual inspection, perform the following recommended inspection and maintenance once a year, or sooner.

If required by local conditions or regulations.

- Bolted connections should be properly tight. Discoloration, excessive corrosion and discolored insulation may indicate an overheated connection. If found, follow the procedure described under section "suspect joint maintenance". Verify the existence of safety connections and spacing adapted in the wiring.
- Check the control wiring for signals of damage or wear. Change the wires that present doubtful conditions.
- Check the resistors and other devices prone to over-heating.
- Open all hinged doors and remove bolted panels.
- Clean insulation thoroughly.
- Withdraw and clean all removable components.
- Clean the stationary portion of the MCC by wiping with a clean cloth. Use dry, compressed air for inaccessible areas.
- Remove the covers of all panel devices where possible. Check wiring for secure connections. Clean contacts on relays and switches wherever necessary. Replace covers.
- Remove air filters when used. Flush with clean water if necessary.
- Follow the recommendations of any individual device instructions furnished for maintenance of the device.
- Perform maintenance of contactors as recommended in contactor instruction manual, furnished with the MCC.

24 months inspection

In addition to the annual inspection, perform the following recommended inspection and maintenance at 24 month intervals, or sooner, if required by local conditions or regulations.

- Perform maintenance of contactors as recommended in instructions furnished with the MCC
- Check wiring for signs of discoloration of the secondary disconnect the plug due to heating or wear. Check if the insulation is cracked or fissured. Replace the wire with doubtful condition
- Inspect the insulation system for the accumulation of contaminants. Wipe with a dry cloth or blow with compressed air and if necessary, wipe with a solvent approved by OSHA.
- Check calibration of protective relays every two years.

10 years maximum inspection

In addition to the annual inspections and maintenance, perform the following recommended inspections and maintenance every ten years, or sooner, if required by local conditions or regulations.

- Disassemble, inspect, clean, lubricate, adjust and calibrate contactor mechanisms.
- Torque all primary conductor connection bolts to recommended values. See table Torque values.
- Tighten all secondary control wire connections. Check for loose lug crimps and broken wire strands.

Suspect joint maintenance

1. Open the equipment and inspect the mounting surfaces.
2. Clean surfaces with a solvent approved by OSHA, restore contact surfaces from corrosion rubbing lightly with a cloth to polish as “3M Scotch Brite”. Take care to remove as little as possible the silver contact finish.
3. Replace parts that show signs of excessive corrosion, bowing, or casting.
4. Change contact jaws after being exposed to overheating in the failure of the contactor.
5. Protect the mating surfaces before assembly, with “NO-OX-ID A-Special Electrical Grade” a product of Sanchem Chemical Co., or equivalent.
6. Use proper torque to tighten the bolts

Torque values	
Screw (in)	Torque (lb-in)
3/8	15 min - 35 max
1/2	30 min - 80 max

Care of finish

The finished MCC is strong and durable. Always keep the MCC clean. Cleaning with a dry cloth is usually sufficient. To remove oil and grease stains, use soap and warm water, drying with a soft clean cloth.

Because the color and finish can vary, see the Materials List before touching up with paint. Standard color is ANSI 61, light gray.

A 12-ounce aerosol ANSI 61 ABB touch-up paint is available under part number 3A31540G03.

Spare parts

Previous experience and the number of vertical sections in service are the best guidelines for determining the stocking of replacement parts. Order factory original replacement parts from ABB only. Specify quantity, part numbers, description, and nameplate data of the device requiring the replacement parts. For replacement parts, call your nearest ABB office or representative.

End of life of product

ABB products are manufactured to meet or exceed the standards of compliance for quality and environmental management systems in accordance with ISO 9001 and ISO 14001. All of these items can be supplied with a certificate of quality.

ABB is committed to complying with all legal and other relevant requirements for environmental protection in accordance with the ISO 14001 standards.

The responsibility of the company is to facilitate subsequent recycling or disposal at the end of the product's life. During disposal of the product, it is always necessary to act in accordance with all local and national legal requirements that are in effect at the time of disposal.

Methods of disposal

Disposal can either be carried out in a manner of ways depending upon material of product. Below is the recommended method of disposal for various raw materials.

ABB is committed to complying with the relevant legal and other requirements for environmental protection according to the ISO 14001 standard. The duty of the company is to facilitate subsequent recycling or disposal at the end of product life. During disposal of the product, it is always necessary to act in accordance with local legal requirements in force.

Raw material	Recommended method of disposal
Metal material (Fe, Cu, Al, Ag, Zn, W, etc.)	Separation and recycling
Thermoplastics	Recycling or disposal
Epoxy Resin	Separation of metal and disposal of remains
Rubber	Disposal
Oil (transformer oil)	Draining and recycling or proper disposal
SF6 gas	Discharging from equipment
Packing material	Recycling or disposal

Disclaimer of warranties and limitation of liability

There are no understandings, agreements, representations of warranties, expressed or implied, including warranties of merchantability or fitness for a particular purpose, other than those specifically set out by an existing contract between the parties. Any such contract states the entire obligation of the seller.

The contents of this document shall not become part of or modify any prior or existing agreement, commitment or relationship.

The information, recommendations, descriptions and safety notations in this document are based on ABB experience and judgment with respect to Motor Control Center. This information should not be considered to be all inclusive or covering all contingencies.

No warranties, expressed or implied, including warranties of fitness for a particular purpose or merchantability, or warranties arising from course of dealing or usage of trade, are made regarding the information, recommendations, descriptions and safety notations contained herein.

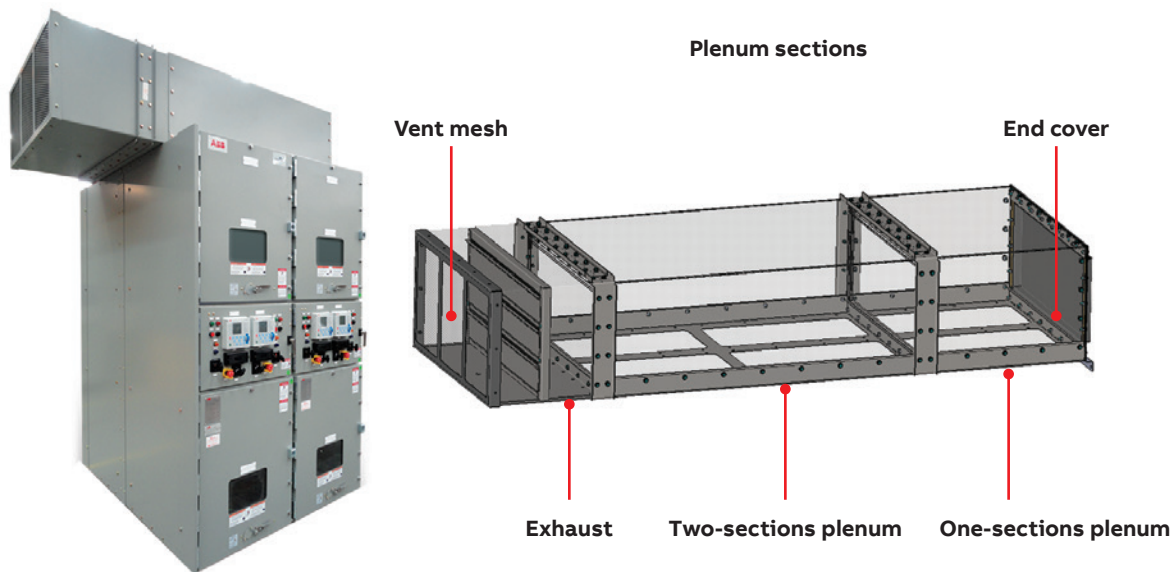
In no event will ABB be responsible to the user in contract, in tort (including negligence), strict liability or otherwise for any special, indirect, incidental or consequential damage or loss whatsoever including but not limited to damage to or loss of use of equipment, plant or power system, cost of capital, loss of profits or revenue, cost of replacement power, additional expenses in the use of existing power facilities, or claims against the user by its customers resulting from the use of information, recommendations, descriptions and safety notations contained herein.

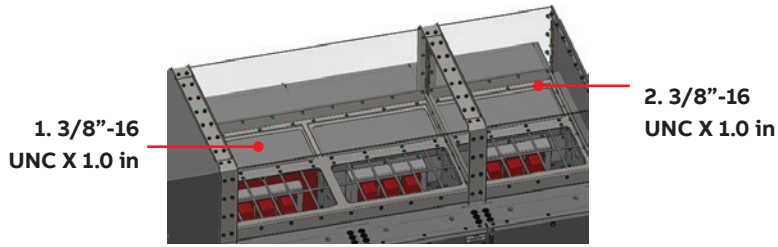
Plenum installation

General instructions

Refer to the specific applicable General Arrangement and Floor Plan drawings for the plenum location. Follow the specific applicable plenum routing shown on the floor plan. Instructions are the same for 1200, 2000, 3000 A main bus.

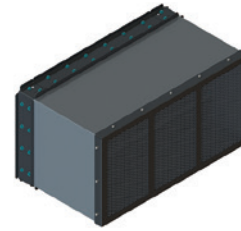
1. Install plenum sections on MCC roof as shown on the General Arrangement drawing. Each section is bolted to the roof base and also to the adjoining plenum section.
2. Install additional plenum sections for venting outside of the building, in accordance with the field boundary. See Figure 4 and 5.
3. As each section installed is supported by the adjoining section and roofs, start with the first plenum section. The plenum bases should be able to support the weight of each section, in accordance with local building code requirements.
4. The exhaust vent section, shown in Figure 3, should be installed in the building wall and connected to the last plenum section as shown in Figure 4. The opening of the exhaust vent section cannot be installed pointing upwards due to environmental considerations.
5. The area outside the plenum exhaust vent needs to be kept clear of personnel and equipment due to the potential for pressurized exhaust gasses that would be expelled in the area in case of an arc fault in the MCC. Specifically, a horizontal cylindrical volume, with an 8 foot diameter, centered on the plenum exhaust vent and extending out 15 feet, as shown in Figure 5, needs to be clear all the time.
6. Ensure that all bolts are correctly installed; a wrong assembly could allow toxic gas to escape through any given space left.
7. Do not remove exhaust mesh; incandescent particles might go outside the MCC in case of an arc fault.





SAE grade 5 screws, 30-40 lb-ft torque to bolt MCC Plenum

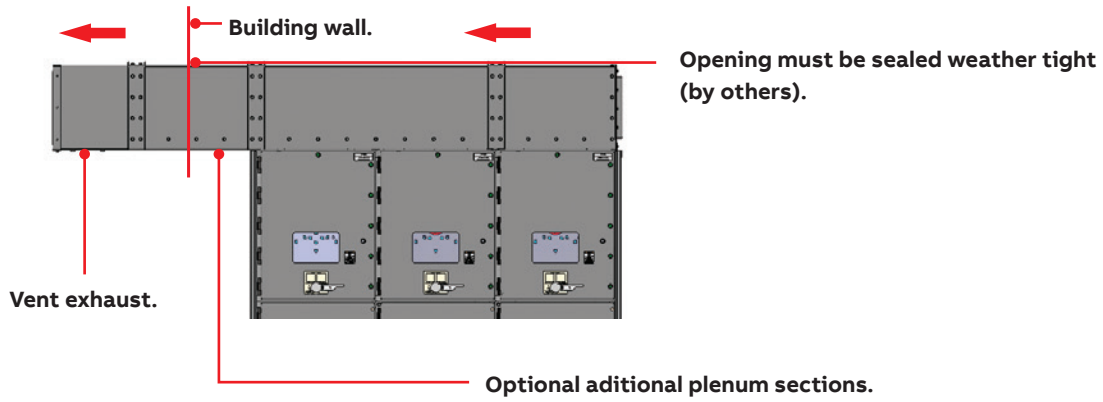
02



Exhaust vent assembly

03

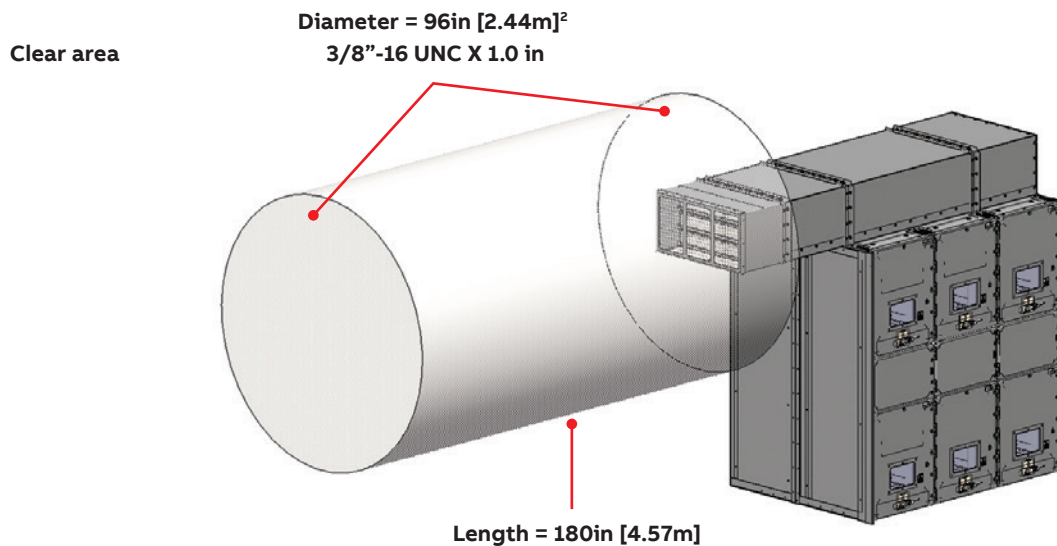
Front View. The exhaust vent can be right side exit or left side exit (as shown).



04

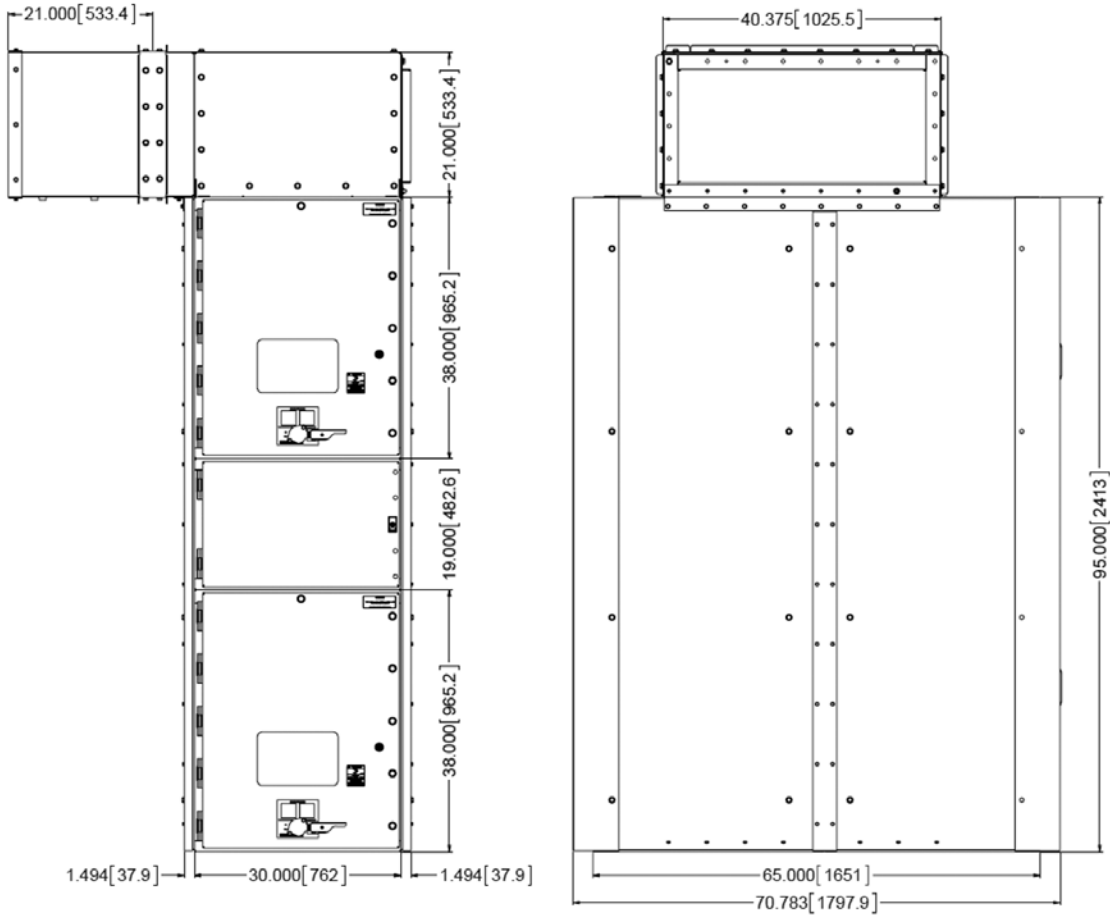
Note:
All bolts must be tightened; a loose section could let toxic gases escape into the building.
Do not remove exhaust mesh; incandescent particles might escape the MCC in case of an arc fault.

Recommended plenum exhaust “keep clear area”



05

General dimensions



(in[mm])

Appendix A Frames Assembly

DANGER

DETAILED DESCRIPTIONS OF STANDARD REPAIR PROCEDURES, SAFETY PRINCIPLES AND SERVICE OPERATIONS ARE NOT INCLUDED. IT IS IMPORTANT TO NOTE THAT THIS DOCUMENT CONTAINS SOME WARNINGS AND CAUTIONS AGAINST SOME SPECIFIC SERVICE METHODS WHICH COULD CAUSE PERSONAL INJURY TO SERVICE PERSONNEL OR COULD DAMAGE EQUIPMENT AND RENDER IT UNSAFE. PLEASE UNDERSTAND THAT THESE WARNINGS COULD NOT COVER ALL CONCEIVABLE WAYS IN WHICH SERVICE, WHETHER OR NOT RECOMMENDED BY ABB, MIGHT BE DONE OR OF THE POSSIBLE HAZARDOUS CONSEQUENCES OF EACH CONCEIVABLE WAY, NOR COULD ABB INVESTIGATE ALL SUCH WAYS. ANYONE USING SERVICE PROCEDURES OR TOOLS, WHETHER OR NOT RECOMMENDED BY ABB, MUST SATISFY HIMSELF THOROUGHLY THAT NEITHER PERSONAL SAFETY NOR EQUIPMENT SAFETY WILL BE JEOPARDIZED BY THE SERVICE METHOD OR TOOLS SELECTED. INFORMATION CONTAINED IN THIS MANUAL IS BASED ON THE LATEST PRODUCT INFORMATION AVAILABLE AT THE TIME OF PRINTING. THE RIGHT IS RESERVED TO MAKE CHANGES AT ANY TIME WITHOUT NOTICE.

FAILURE TO FOLLOW THE INSTRUCTIONS AND/OR WARNINGS PROVIDED HEREIN COULD RESULT IN SERIOUS BODILY INJURY AND/OR DEATH.

CAUTION

DO NOT REMOVE THE GASKET BETWEEN THE ADJOINING FRAMES. IT MUST REMAIN IN PLACE.



1. Scope/Introduction

This procedure applies to the assembly of the ABB MCC 2.5 frames at the customer site.

2. Disclaimer

This document was created with the intent of providing a general instruction guide. Models shown in this document may not match exactly with the product you received.

3. Safety practice

Safety glasses, gloves, and steel toe shoes should be used as standard safety practice.

4. Target result**5. Tools required (not supplied)**

**(8" or longer)
Extension- 1**



(9/16") Socket- 1



Ratchet- 1

6. Parts required

1" Bolts



**Universal joint socket-1
(not supplied)**



**Pry bar-1
(not supplied)**

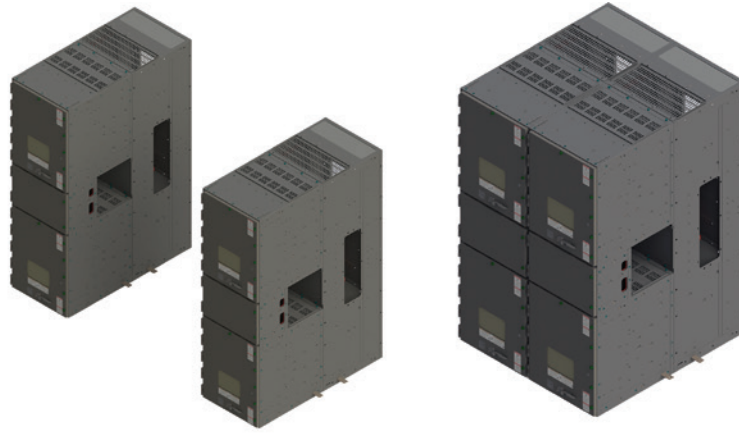
Colors of parts in this document do not represent actual colors; it is for illustration purposes only.

7. Procedure

—
 01 Put the two frames to be assembled in place next to each other. Make sure all doors and panels are secured while moving the frames. Use the pry, bar if required, for alignment.

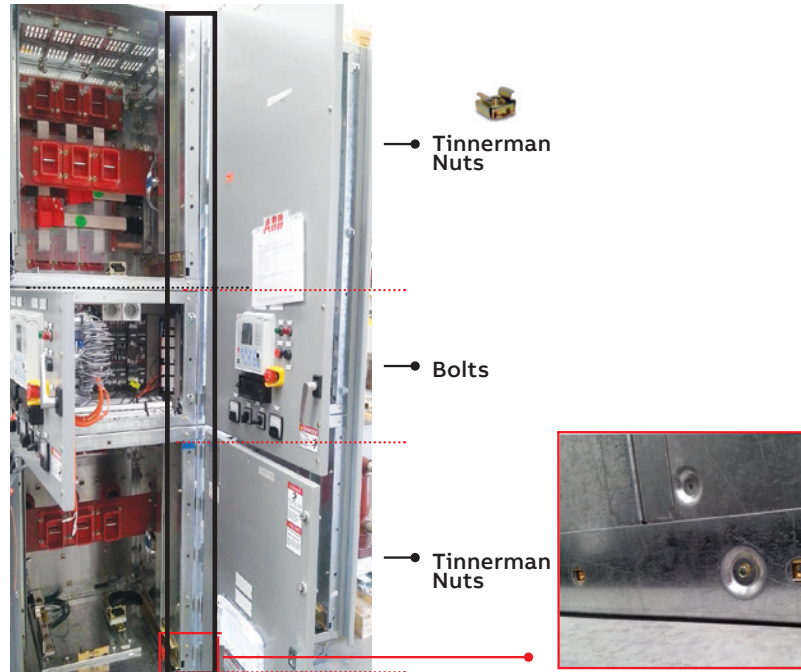
The line-up you received might include more than one frame on either side, the rest of the frames are assembled together in the plant and excluded from the pictures in this manual for simplicity.

—
 02 Open the LV compartment door and the controller door in the left frame. Look inside the left frame on the right and notice the Tinnerman nuts installed (highlighted in green).



—
 01

View front (right frame)



—
 02

—
03 Notice the Tinnermen nuts installed along the frame wall (except in the part marked “Bolts”). That means, that the bolts will be screwed where it is marked “Bolts” (from the left frame to the right frame). Notice the Tinnermen nuts installed along the frame wall that is highlighted in green. (Except in the part where says “Bolts”). That means, that the bolts will be screwed from the right frame to the left frame.

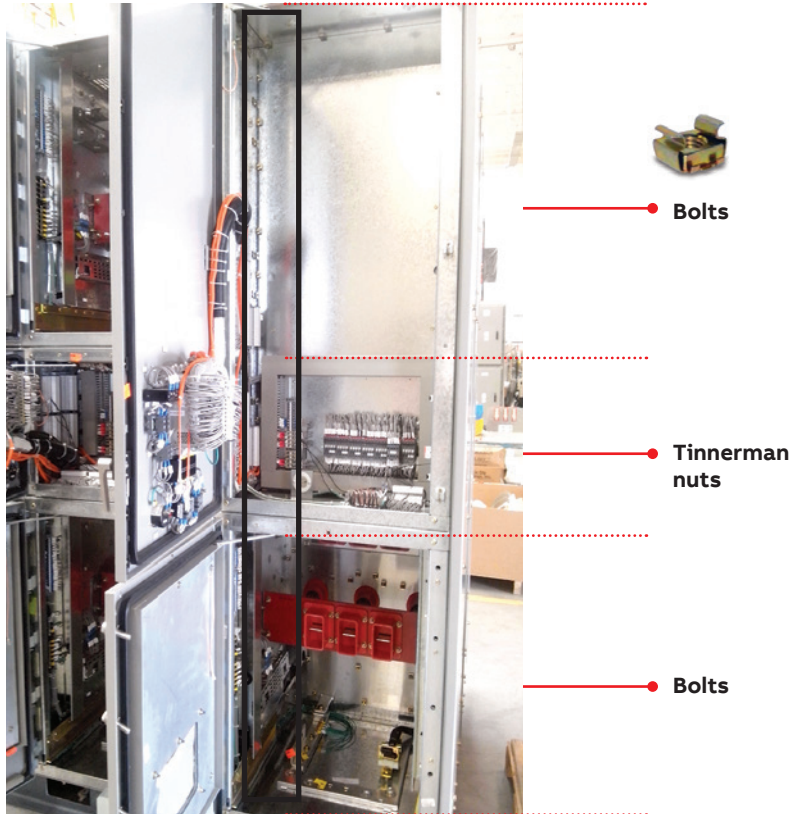
—
04 This diagram is for illustration purposes only, it may not fully represent all or any of the frames you received.

—
05 The picture shows a side view of the frame indicating the holes for each bolt.

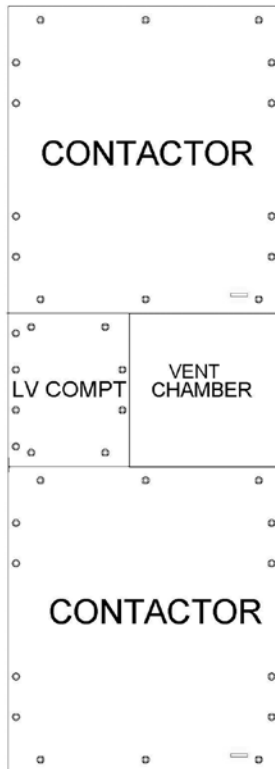
—
06 The next picture shows the location of the Tinnerman nuts and where the bolts will be installed.

—
The picture shows a front view of the frames. If the Low Voltage compartment is 57 in, the same rule applies.

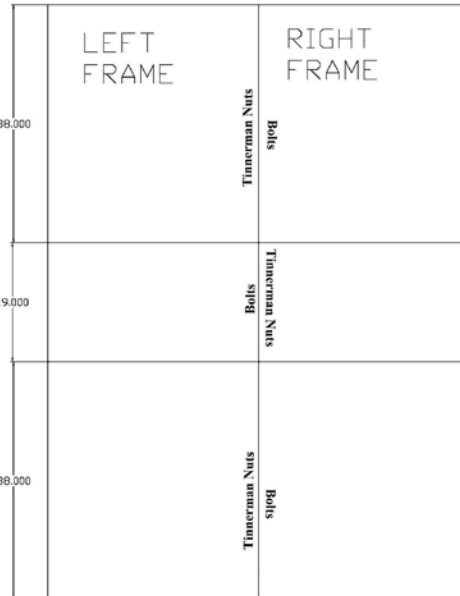
View front (left frame)



03



04



05



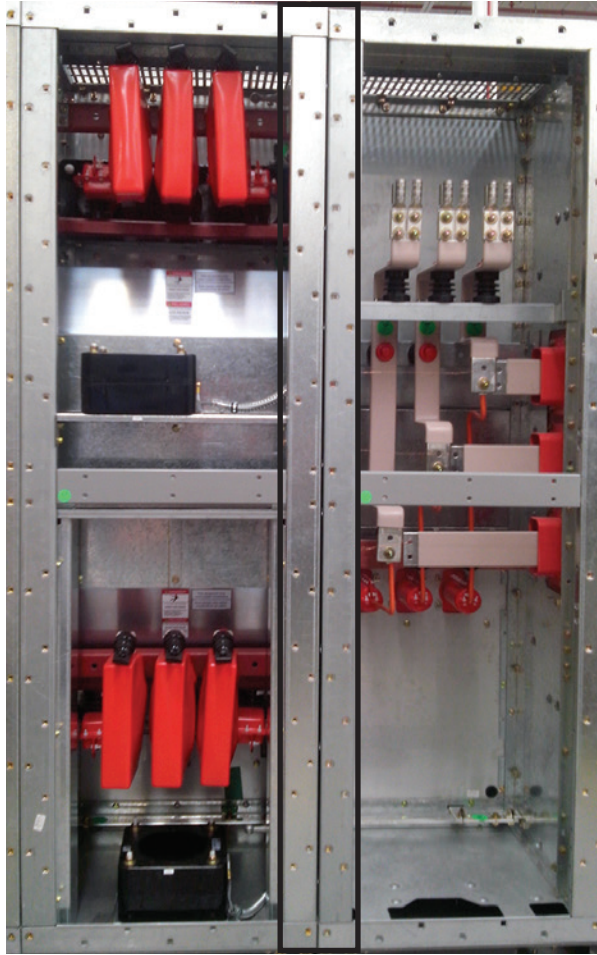
06

07 Remove the rear covers of the back frame. Looking at the frames from the back, the Tinnerman nuts are installed in the left frame. Insert a bolt in every hole in the right frame at the left side that is aligned with a Tinnerman nut on the left side.

Notice the Tinnerman nuts behind the highlighted panel.

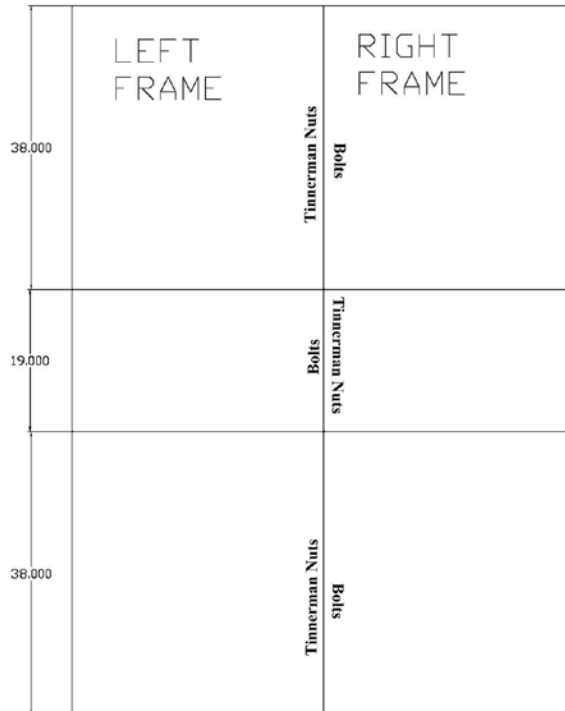
NOTE: For main bus installation, consult "10 Main Bus Assembly Manual".

08 The following picture shows the location of the Tinnerman nuts and where the bolts will be installed.



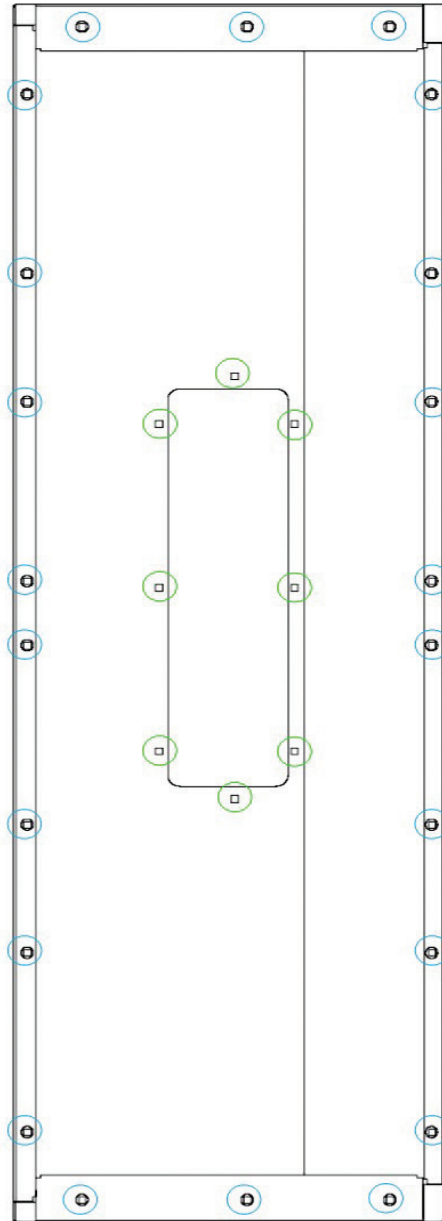
07

Rear view of the frames



—
09 Place a bolt in all holes. (22 shown, highlighted in blue).

Before to place the main bus bars, place a bolt for each hole through bus support (highlighted in green).



—
09

Appendix B Main bus assembly

1. Scope/Introduction

This procedure applies to the assembly of the SafeGear MCC main bus at the customer site.

2. Disclaimer

This document was created with the intent of providing a general instruction guide. Models shown in this document may not match exactly the product you received.

3. Safety practice

Safety glasses, gloves, and steel toe shoes should be used as standard safety practice.

4. Tools required (not supplied)



3/4" Wrench



3/4" Socket



Torque wrench



9/16" Socket



Ratchet



Socket head
Screwdriver 7/16"

5. Parts required (supplied)



(1/2" x 13) Bolt.
Length de-pends on
bus rating



(1/2 - 13) Hex nut



(1/2") Flat washer



(1/2") Lock washer



Seal putty



Cu bus spacer
(If required)



Cu bus bars

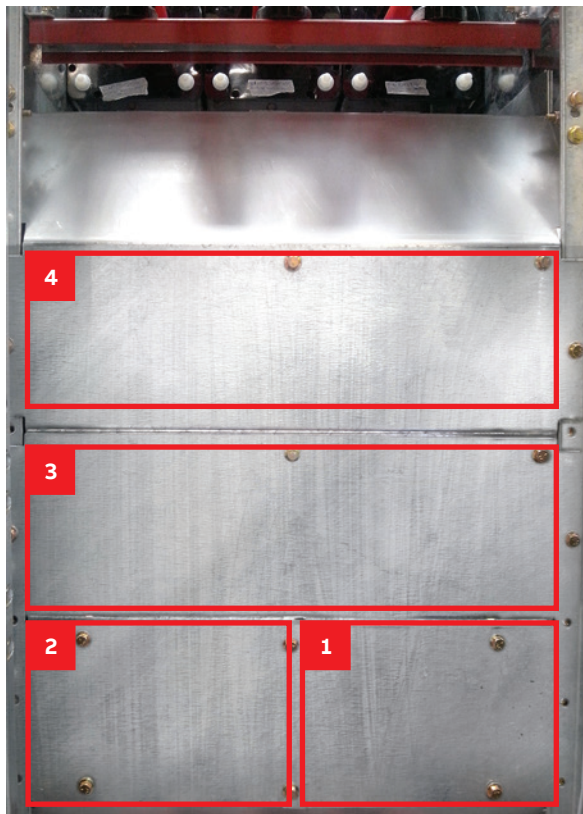
—
01 Open the compartment doors in the back of the two frames where the main bus is to be installed and remove the upper and lower bus barriers in both frames.

—
02 Start by removing the bus side cover in both frames (the number one first and then the number two).

—
03 Remove the top bus cover in both frames (the number three first and then the number four).

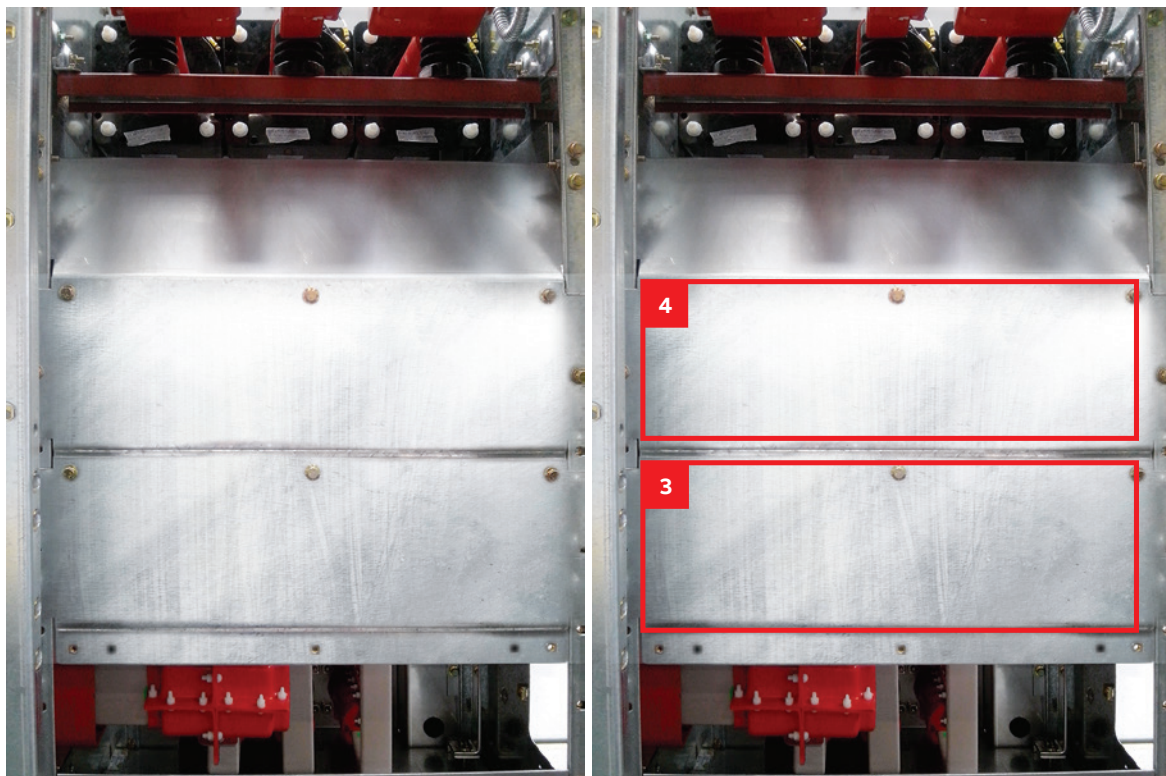
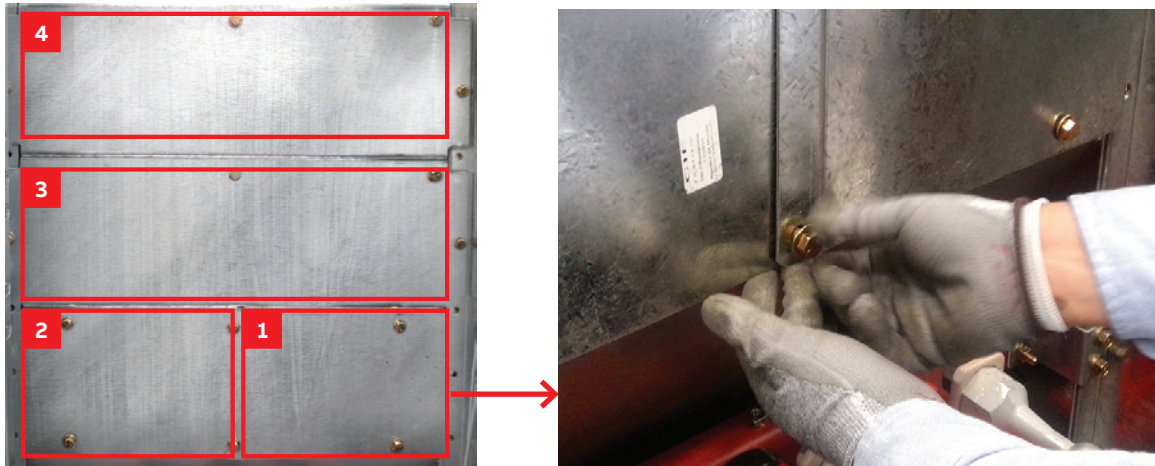


—
01

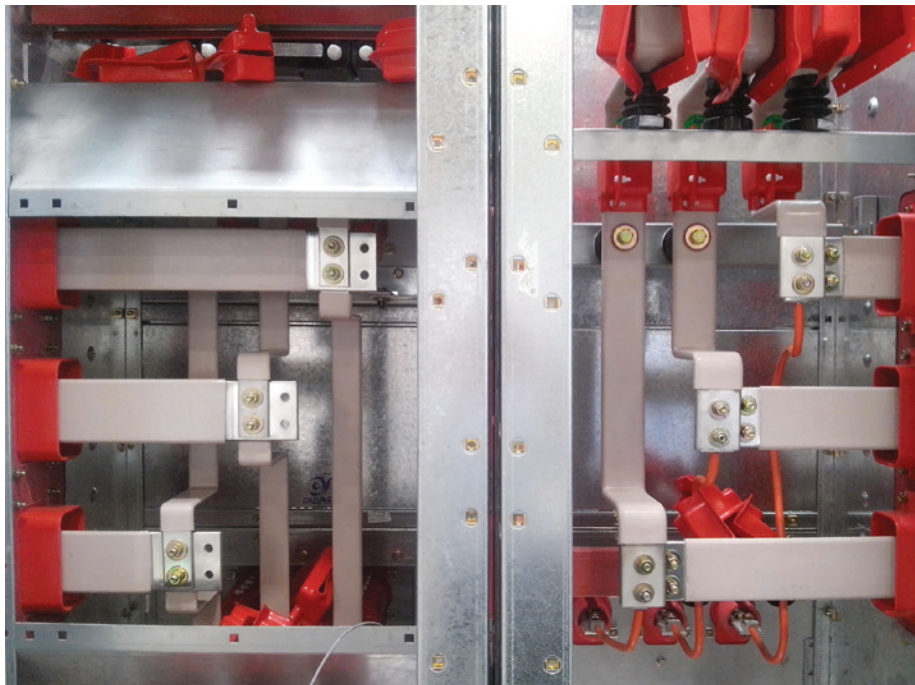
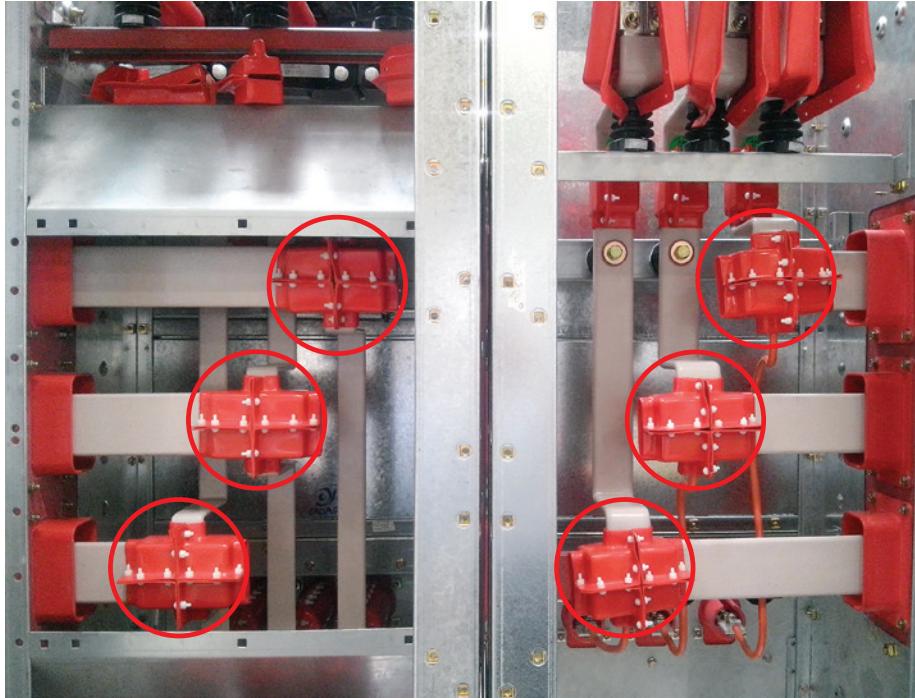


—
02

6. Procedure



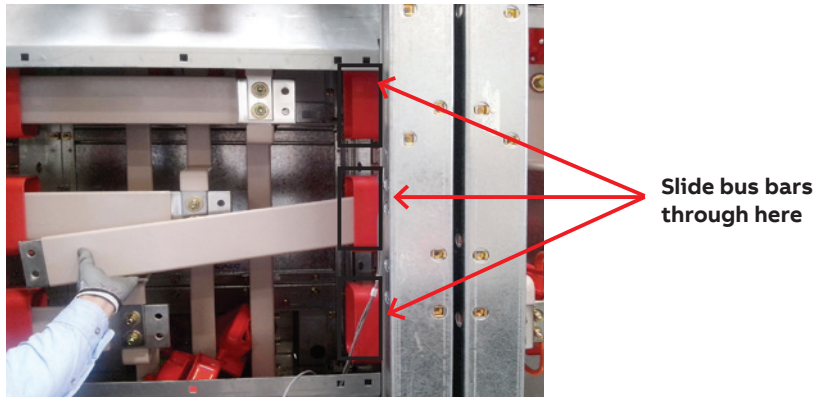
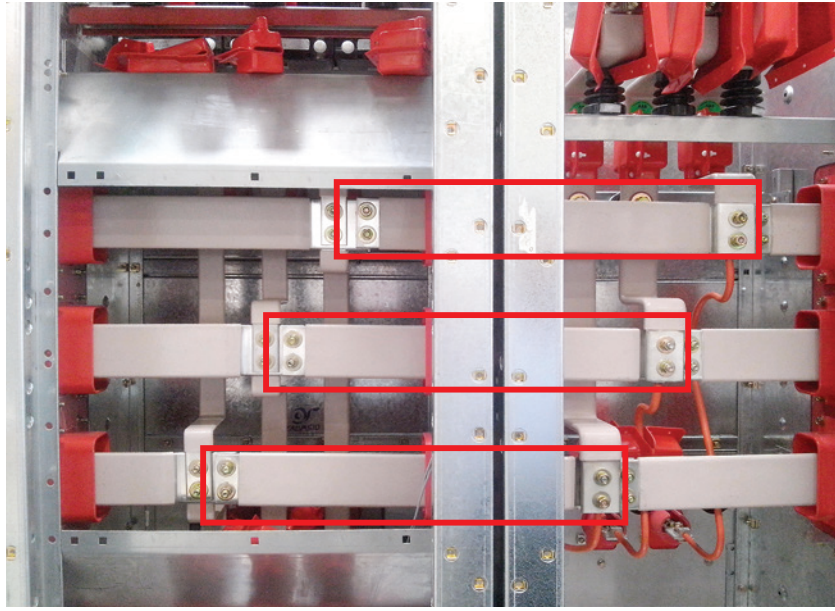
—
04 Remove the plastic bolts of the bus boots, in some cases, these bolts are not in the bus boots, but in a bag they are included. Remove all the bus boots. The bus boots must be reinstalled after the main bus is installed.



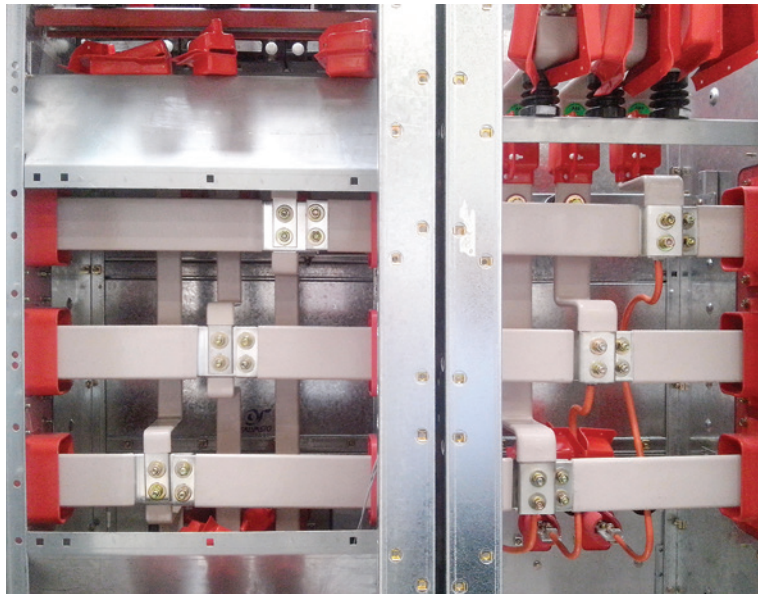
—
04

—
05 Slide the main bus bars through the through three openings in the bus support (red rectangular sheet installed between both frames).

—
06 The picture shows the bus with the boots removed.



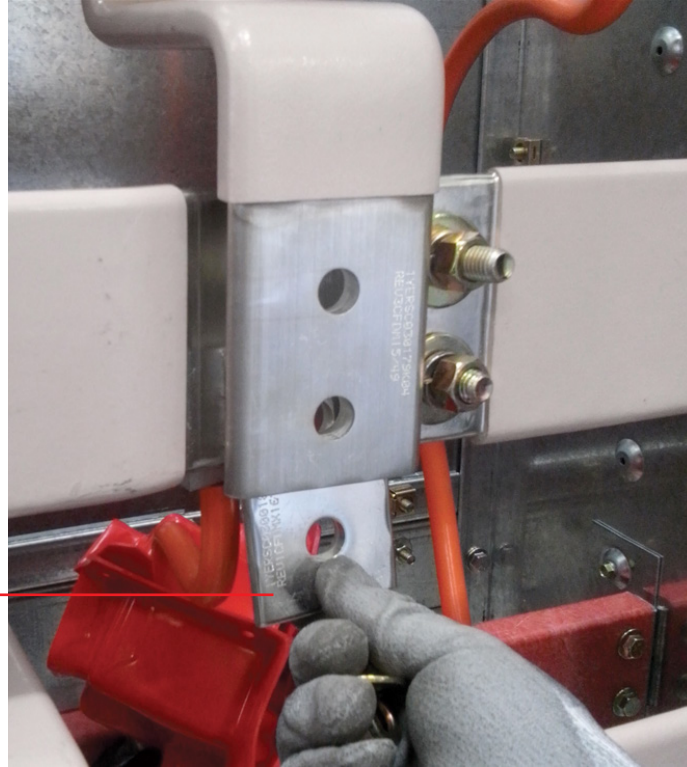
05



—
 07 Place bar spacers where needed. Insert a bolt in all four holes to secure the bus bar. Do not tighten any of the bolts before you place the main bus bar. Once the main bus bar is placed tighten the eight bolts. If spacers are needed, they are going to be supplied by the factory.

—
 08 This picture is for reference only it may not represent your actual setup. Please refer to the standard or special drawing provided to you by the project engineer for guidelines. Use the torque wrench to tighten all $\frac{1}{2}$ " – 13 UNC bolts, they must be tightened to ABB specifications - see Appendix D.

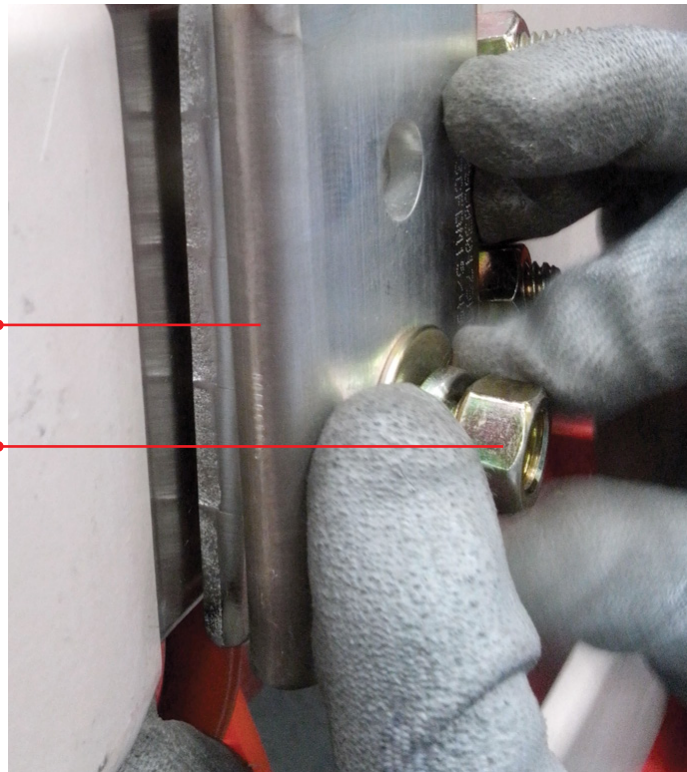
**Bar
 spacer**



—
 07

**Bar
 spacer**

Bolts



—
 08

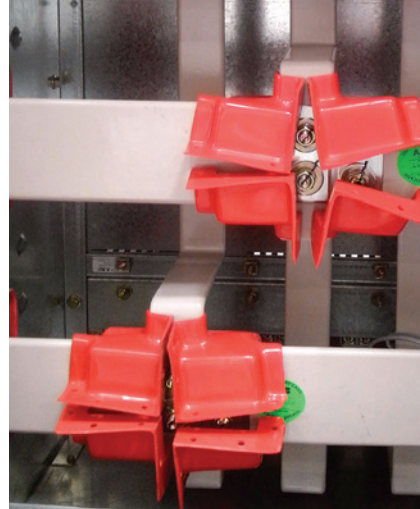
—
09 Reinstall all the bus boots.

—
10 Place the plastic bolts and tighten them.

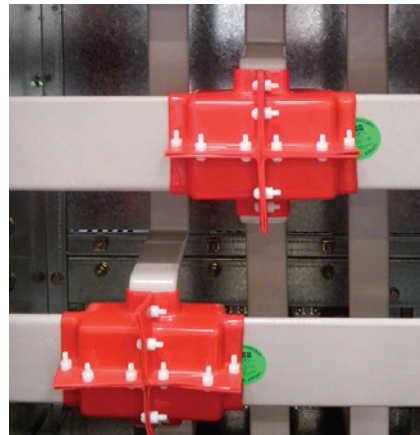
—
11 Apply the provided seal putty around the inside rim of the through bus support in the right frame. Cut any excess putty.



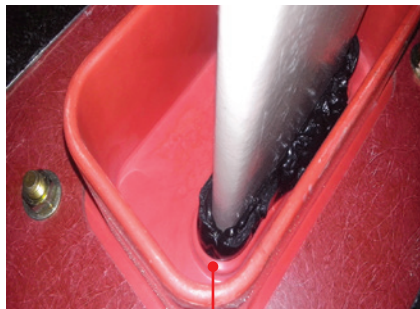
10



11



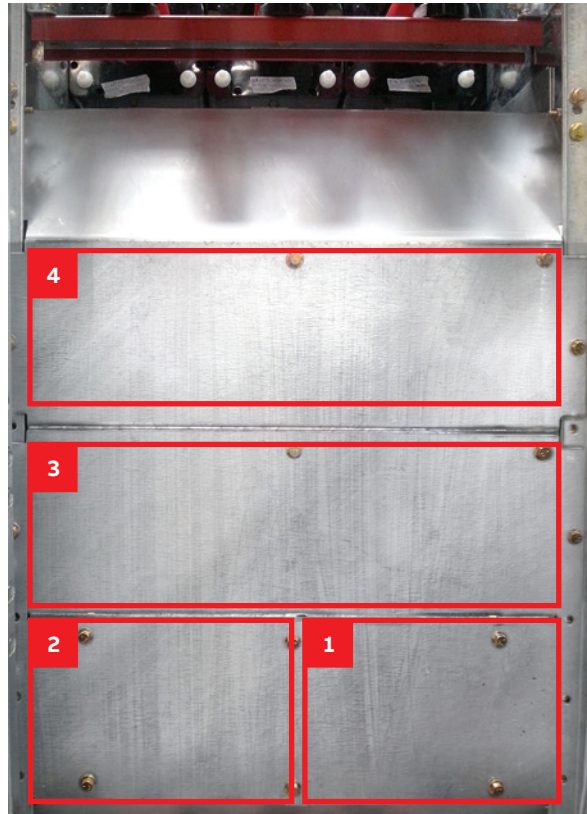
12



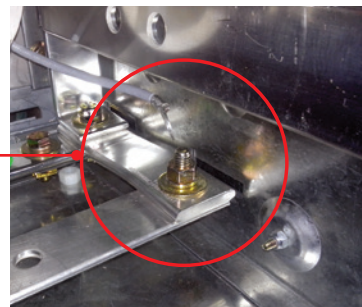
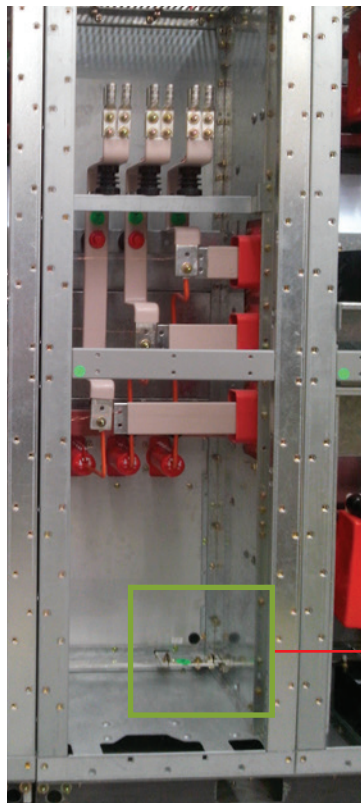
Seal Putty

—
13 Reinstall the bus barriers, start by reinstalling the top bus cover (the number four first followed by the number three) followed by the side bus covers (the number one followed by number two).

—
14 Connect the ground bus bar from frame to frame. It is located in the back frame. (highlighted in green).



—
13



—
14

Appendix C Wiring interconnections

1. Scope/Introduction

This procedure applies to the installation of wiring interconnects for SafeGear MCC at the customer site.

2. Disclaimer

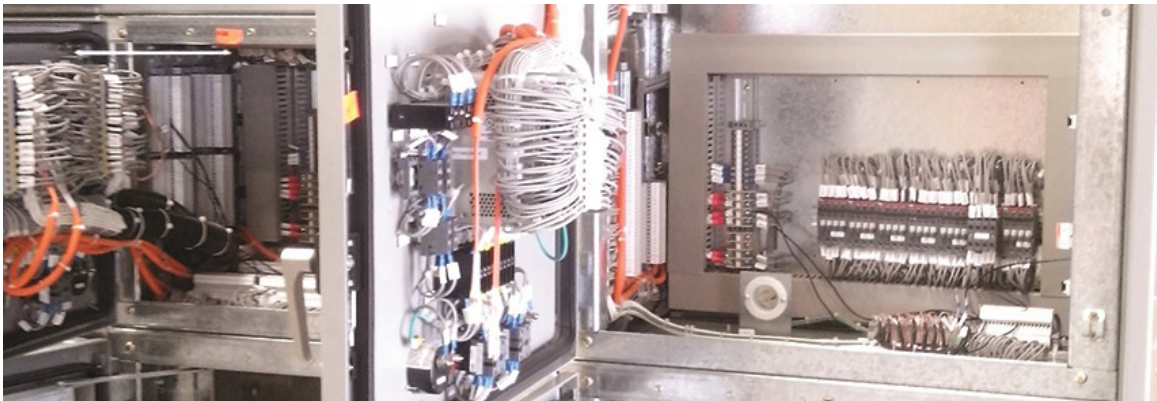
This document was created with the intent of providing general instructions. Models shown in this document may not match exactly the product you received.

3. Safety practice

Safety glasses, gloves, and steel toe shoes should be used as standard safety practice.

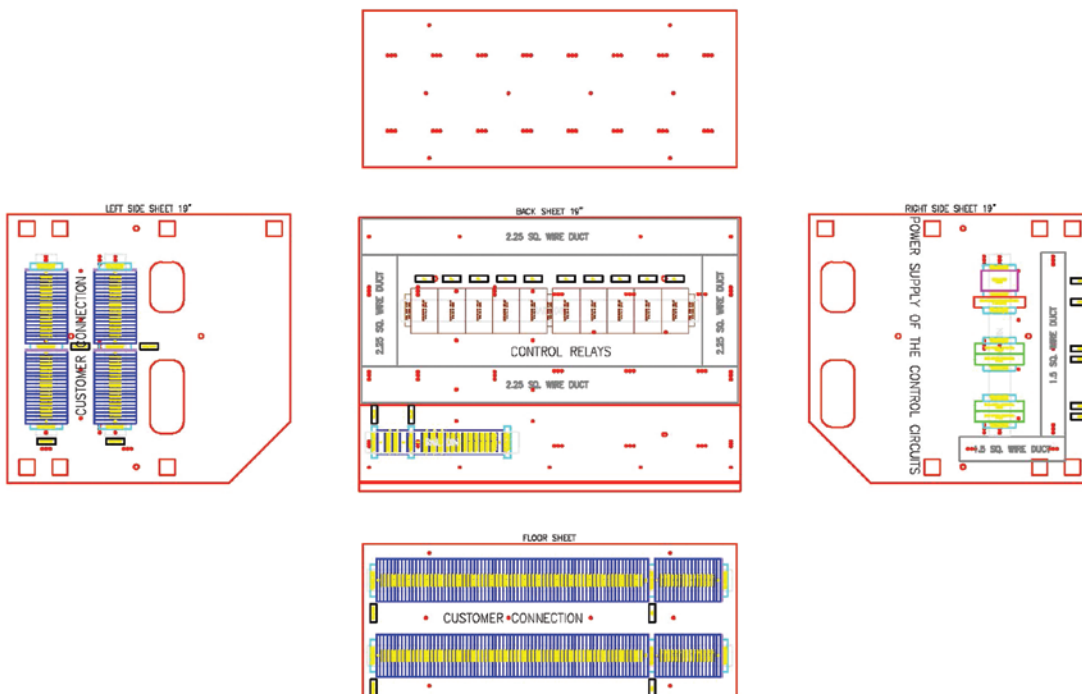
4. Tools required (not supplied)

Philips screwdriver – 1



5. Distribution of the electrical connections

The picture shows the distribution of the electrical connections, such as: customer connection, control relays and power supply of the control circuits.



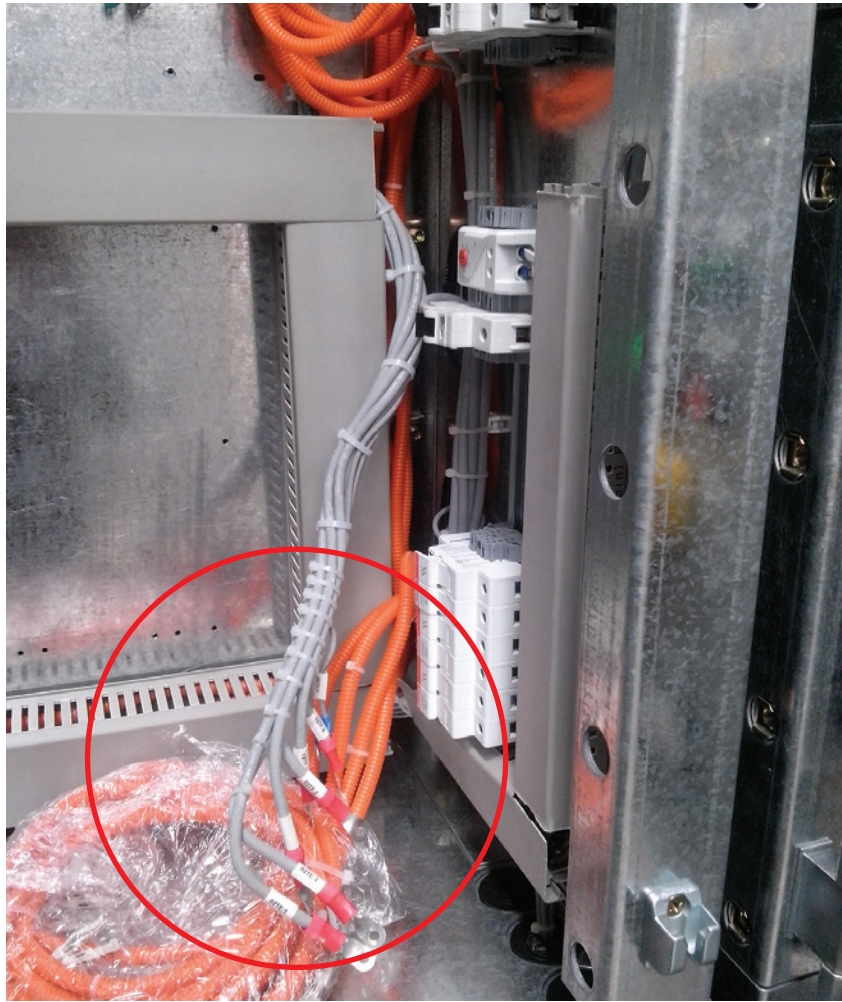
6. Procedure

This manual will show you how to reinstall the wires across the shipping splits or wiring Interconnects.

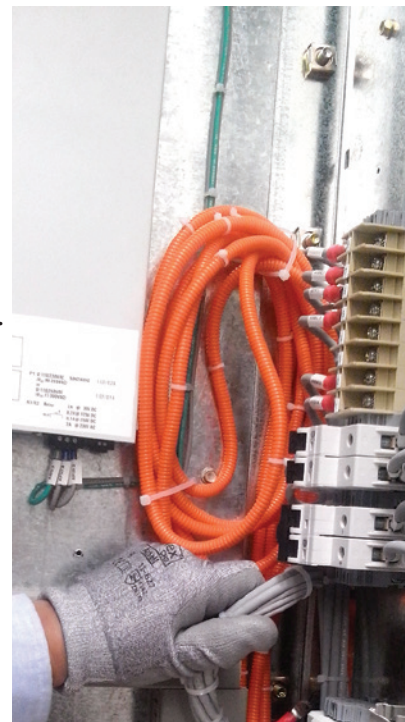
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01 Refer to the interconnect diagram provided to you by the project engineer to find the shipping splits and exact frames where rewiring is necessary.

Locate the wires to be interconnected. (Refer to the interconnect diagram to find the frame housing the wires to be interconnected).

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02 Transfer all the wires to be interconnected from one frame to the next frame through the opening provided in the LV compartment.



Opening provided in the LV compartment.

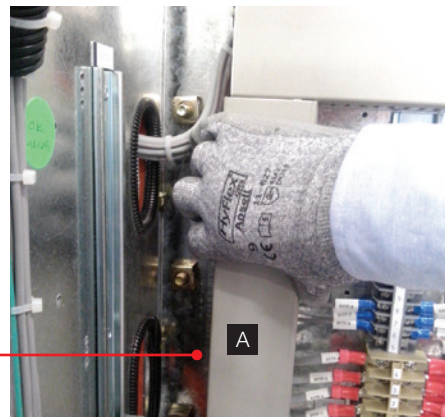


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03 Route the wires according to the interconnect diagram.

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04 Remove the plastic cover for to place the wires.



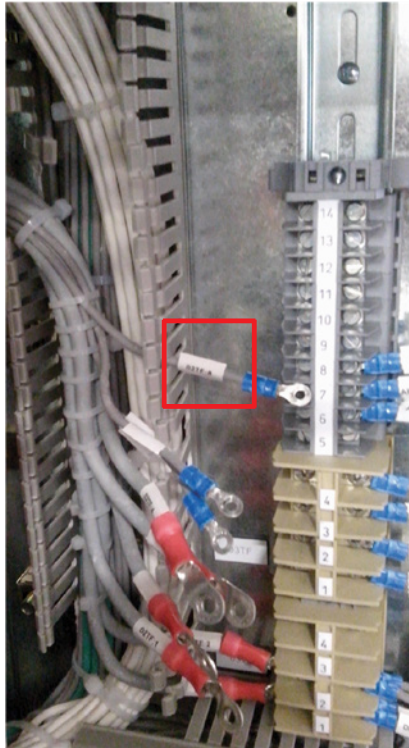
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03



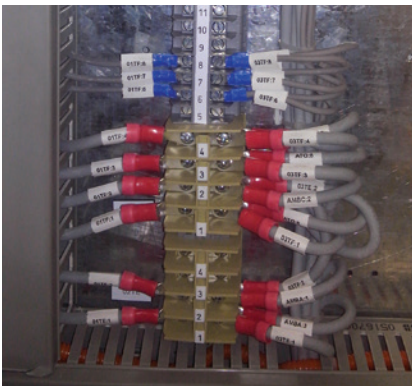
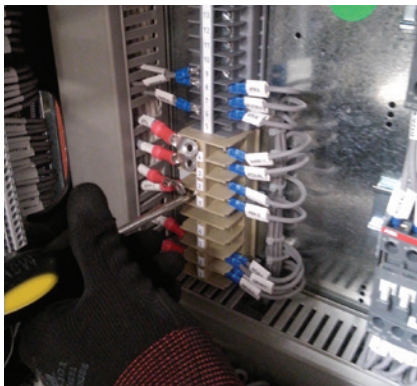
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04

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05 All the wires are shipped tagged and lugged from the factory and are ready to be connected. Place the wires across the shipping splits or wiring Interconnects like in the green square that's shown.

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06 Place the plastic cover and connect the wires according to the connection diagram.



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05



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06

Appendix D Torque requirements for SAE grade 5 steel hardware

The table below applies to SAE Grade-5 unlubricated steel hardware into unlubricated, threaded steel material unless otherwise stated. Torque hardware within the maximum/minimum tolerance.

SAE Grade 5 steel hardware

Hardware Size (inch.)	Torque value
5/16 - 18 (hex head)	20 lb-ft-Max Target = 17 lb - ft 13 lb - ft - Min
3/8 - 16 carriage bolt	40 lb - ft - Max Target = 35 lb - ft 30 lb - ft - Min
3/8 - 16 hex bolt	40 lb - ft - Max Target = 35 lb - ft 30 lb - ft - Min
3/8 - 16 steel threaded stud - (CT mounting)	20 lb-ft-Max Target = 19 ft - lb 18 ft.lb - Min
3/8 - 16 fiberglass threaded stud - (CT mounting)	12 lb.ft - Max Target = 11 ft - lb 10 ft.lb - Min
1/2 - 13 hex bolt	75 lb - ft - Max Target = 67 lb - ft 60 lb - ft - Min
5/8 - 11 hex bolt - (for polyester stand-off insulator)	75 lb - ft - Max Target = 67 lb - ft 60 lb - ft - Min



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Your sales contact:

www.abb.com/contacts

abb.com/mediumvoltage

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