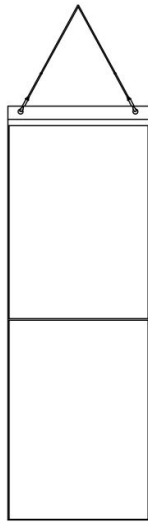
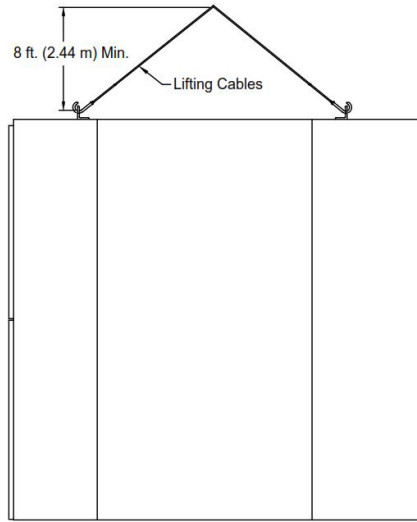


Instructions for receiving, handling, storing, and installation of medium voltage switchgear



FRONT VIEW



SIDE VIEW

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Powering Business Worldwide

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Read and understand these instructions upon immediate receipt of this document. All of the encompassed information captured within is critically important information to know prior to receiving equipment. This document should be reviewed in conjunction with the customer drawing package. Receiving, handling, storing and installing this equipment should only be accomplished by qualified electrical personnel.

Additional installation information regarding installation procedures following the equipment placement, is covered in the equipment's specific Instruction Booklet. A hardcopy of the booklet can be found on the inside door of the first equipment structure of a line up, in addition to another hardcopy supplied in the detail box of the order. Detailed Instruction Booklet numbers specific to the purchased equipment can be found in section 6.4. Digital copies can be obtained on www.eaton.com.

⚠ CAUTION

THE METAL-CLAD SWITCHGEAR DESCRIBED IN THIS BOOK HAS BEEN DESIGNED AND TESTED TO OPERATE WITHIN ITS NAMEPLATE RATINGS. OPERATION OUTSIDE OF THESE RATINGS MAY CAUSE THE EQUIPMENT TO FAIL, RESULTING IN BODILY INJURY AND PROPERTY DAMAGE.

⚠ PURPOSE

THIS INSTRUCTION BOOK HAS BEEN PREPARED TO HELP ENGINEERS AND TECHNICIANS INSTALL, OPERATE, AND MAINTAIN TYPE VAC-CLAD-W SWITCHGEAR. FOR INFORMATION ON THE APPLICATION OF THIS TYPE OF SWITCHGEAR, REFER TO THE PERTINENT ANSI STANDARDS AND TO EATON'S APPLICATION DATA 32-265.

⚠ DANGER

ALL SAFETY CODES, SAFETY STANDARDS, AND SAFETY REGULATIONS MUST BE STRICTLY ADHERED TO WHEN INSTALLING, OPERATING, OR MAINTAINING THIS EQUIPMENT.

⚠ DANGER

THE ONLY PEOPLE WHO SHOULD BE ALLOWED TO INSTALL, OPERATE, OR MAINTAIN THIS EQUIPMENT ARE THOSE WHO MEET THE QUALIFICATION REQUIREMENTS DESCRIBED IN THE NATIONAL ELECTRICAL SAFETY CODE.

TO PERFORM WORK ON THIS TYPE OF EQUIPMENT, ONE MUST BE TRAINED AND EXPERIENCED IN WORKING WITH HIGH VOLTAGE CIRCUITS. THEY SHOULD BE FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THIS EQUIPMENT AND BE AWARE OF THE HAZARDS INVOLVED.

BEFORE ATTEMPTING TO DO ANY MAINTENANCE, ALWAYS BE SURE TO DE-ENERGIZE BOTH THE PRIMARY AND SECONDARY CIRCUITS. BEFORE REMOVING A BOLTED-ON COVER, FIRST MAKE SURE THAT ALL THE CIRCUITS HAVE BEEN DE-ENERGIZED.

Section 1: Introduction

1.1 Purpose

The following instructions are to be used for the receiving, handling, storing, and installation of indoor and outdoor assemblies. It does not cover all possible contingencies, variations, and details that may arise during any aspect of receiving, handling, storing, and installing this equipment.

1.2 Recommended safety practices

⚠ DANGER

ALL SAFETY CODES, SAFETY STANDARDS, AND/OR REGULATIONS MUST BE STRICTLY OBSERVED IN THE INSTALLATION, OPERATION, AND MAINTENANCE OF THIS EQUIPMENT.

⚠ DANGER

THE ONLY PEOPLE WHO SHOULD BE ALLOWED TO INSTALL, OPERATE, OR MAINTAIN ITS EQUIPMENT ARE THOSE WHO MEET THE QUALIFICATION REQUIREMENTS DESCRIBED IN THE NATIONAL ELECTRICAL SAFETY CODE.

TO PERFORM WORK ON THIS TYPE OF EQUIPMENT, ONE MUST BE TRAINED AND EXPERIENCED IN WORKING WITH HIGH VOLTAGE CIRCUITS. THEY SHOULD BE FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THIS EQUIPMENT AND BE AWARE OF THE HAZARDS INVOLVED.

BEFORE ATTEMPTING TO DO ANY MAINTENANCE, ALWAYS BE SURE TO DE-ENERGIZE BOTH THE PRIMARY AND SECONDARY CIRCUITS. BEFORE REMOVING A BOLTED-ON COVER, FIRST MAKE SURE THAT ALL THE CIRCUITS HAVE BEEN DE-ENERGIZED .

The exposure to the elements of internal components of any equipment should not be permitted.

Where applicable, NEVER leave a breaker in an intermediate position in its compartment. Always crank the breaker into the fully connected, the "TEST" position, or fully withdrawn position.

Never try to disconnect or open the secondary circuit of a current transformer that is carrying load current. In this situation, the transformer develops a dangerous high voltage. Before attempting work, either de-energize the circuit by opening the breaker or short-circuit the secondary of the current transformer.

⚠ CAUTION

READ THIS ENTIRE BOOKLET AND REVIEW THE CUSTOMER DRAWING PACKAGE BEFORE ATTEMPTING TO RECEIVE, HANDLE, STORE OR INSTALL EQUIPMENT.

Section 2: Executive summary

⚠ WARNING

FAILURE TO REVIEW AND UNDERSTAND THE FOLLOWING CRITICAL NOTES MAY RESULT IN POSSIBLE VOID OF WARRANTY, CAUSE DEATH, SEVERE PERSONAL INJURY, OR PROPERTY DAMAGE WHEN EQUIPMENT IS ENERGIZED.

Environmental conditions during storage

Switchgear assemblies contain insulating materials, electrical connections, electrical components, and operating mechanisms which must be protected against dirt, moisture, cement dust, other foreign materials, corrosive atmospheres, and extreme temperature change. Packaging for shipping is not suitable for storage.

⚠ WARNING

FAILURE TO PROPERLY STORE AND PROTECT THE SWITCHGEAR MAY CAUSE DAMAGE TO THE EQUIPMENT. SUCH DAMAGE COULD CAUSE DEATH, SEVERE PERSONAL INJURY, OR PROPERTY DAMAGE WHEN EQUIPMENT IS ENERGIZED.

Floor requirements

The equipment must be placed on a true and level surface to allow for proper functioning of the doors and drawout components. The finished foundation surface is defined as flat and level within 0.06 inch (1.6 mm) in 36 inches (914 mm) in any direction, left to right, front to back, and diagonally. Alternatively, a local flatness "FF" value of 50 or higher and an accompanying "FL" value of 37 to 40 as defined in industry standard American Society for Testing and Materials (ASTM) E1155-96 and industry standard American Concrete Institute (ACI) 117-90 may be used to establish the flatness and levelness of the finished foundation.

Design the foundation so it will be strong enough to support the weight of the switchgear without sagging. Table 3 gives the maximum weights of the various ratings of switchgear and breakers. Be sure to take into account the shock or impact weight that occurs when the breaker trips and when it closes. The impact weight is 1.5 times the weight of the breaker.

The maximum weights in the table are only an approximation. The actual weight will vary, depending on the type and the amount of equipment in the switchgear. Refer to the customer drawing package for specific weights of switchgear and breakers. Use adequate safety factors.

Careful preparation of the foundation is important for simplicity of erection, ease of operation, and good performance. The recommended foundation consists of steel channels embedded in a level concrete floor. The channels shall be level within 0.06 in. over 36 in. (0.318 mm in 914.4 mm) left to right, front to rear, and diagonally, as measured by a laser level. In no case may the nonsupporting areas of the concrete floor be higher than the tops of the steel channels.

The anchor bolts, channels, and other materials are to be furnished by the purchaser of the switchgear. A 4 in. (106.6 mm) structural channel is recommended as the minimum size for the average indoor switchgear system.

Install the conduits in the foundation. When the primary and secondary cables enter the switchgear from below, the conduits that carry them are embedded in the foundation. A floor plan drawing is furnished with each order. Use this drawing to determine the conduit locations. Avoid circling of steel around single-phase cables rated over 600 A to prevent heating of steel due to induced currents.

Shop order drawings

Customer drawing information should be reviewed first and takes precedent to the information outlined in this document.

Order of installation

The order of structure placement during the installation is critically important to the proper fit and functionality of the equipment.

⚠ WARNING

FAILURE TO PROPERLY PLACE EQUIPMENT IN THE CORRECT ORDER MAY CAUSE DAMAGE TO THE EQUIPMENT. SUCH DAMAGE COULD CAUSE DEATH, SEVERE PERSONAL INJURY, OR PROPERTY DAMAGE WHEN EQUIPMENT IS ENERGIZED.

Recommended handling and lifting procedures

The preferred method of handling all switchgear assemblies is by crane.

Lifting methods other than the use of an overhead crane are possible. Consult Eaton for other possible methods and guidelines.

Power Cable Installation or Close-coupling with other equipment

When connecting power cables to switchgear, or when connecting switchgear to other equipment (for example, MV MCC, power transformer, non-seg bus duct), all connection points must be insulated after the connections are made (refer to the section on Field taping procedure of the equipment's specific instruction booklet, for general guidance), and minimum electrical clearances between live parts in adjacent phases (phase-to-phase) and from live parts to ground (phase-to-ground) as recommended in Table 1 and 2, must be maintained to preserve dielectric withstand capability of the switchgear.

Note: The minimum electrical clearances vary for insulated and non-insulated connections. Table 1 and 2 show the differences in these clearances.

Table 1. Minimum Clearance Chart for Insulated Connections

kV Rating of the Switchgear	Phase-to-Phase in. (mm)	Phase-to-Ground in. (mm)
5	3 (76.2)	3 (76.2)
15	3.5 (88.9)	3.5 (88.9)
27	6 (152.4)	6 (152.4)
38	8.25 (209.6)	8.25 (209.6)

Table 2. Minimum Clearance Chart for Non-Insulated Connections

kV Rating of the Switchgear	Phase-to-Phase in. (mm)	Phase-to-Ground in. (mm)
5	3.5 (88.9)	3.5 (88.9)
15	6 (152.4)	6 (152.4)
27	8 (203.2)	8 (203.2)
38	10.5 (266.7)	10.5 (266.7)

Section 3: Receiving

The switchgear is shipped to the customer as a complete assembly. Depending on the number of switchgear vertical sections, it may be necessary to ship the switchgear in several shipping sections to facilitate handling. Each switch gear assembly ships from the factory wrapped in water-resistant material.

A visual inspection, inside and out, should be performed immediately upon receipt of the switchgear assembly before removing it from the truck. After visual inspection, check to make sure that all the parts described on the shipping list have been received. These parts will be in a separate box labeled "detail box." Each detail box will be labeled with its respective general order (G.O.) and item number. Do this before discarding the packing material to prevent losing parts. If the switchgear has been damaged, file a claim as soon as possible with the carrier and notify the nearest Eaton representative.

All medium voltage drawout breakers will be shipped in individual shipping crates. See specific breaker Instruction Booklets below for information on receiving, handling, and storage instructions.

5/15/27 kV VCP-W: IB131006EN

38 kV VCP-W and VCP-WR: IB3A74792

If the switchgear is going to be installed when it has been received, unpack it and handle it according to the procedure outlined in the following sections. If the switchgear is to be stored, follow the instructions in the "Storing" section for the proper storage procedures.

Section 4: Handling

4.1 Weight

Refer to the customer drawing package for specific switchgear weight. Refer to Table 3 for the maximum weight that could be seen for a vertical equipment section (without circuit breakers) and the maximum weight potential for Eaton's medium voltage circuit breakers.

Table 3. Maximum Weights.

Type	Maximum Weight lbs (kg)
Vertical Equipment Section	4500 (2041)
Circuit Breaker	2000 (907)

4.2 Lifting

The preferred method of handling all switchgear assemblies is by crane. Lifting points are provided at the top of each shipping group. Insert a crane hook through each of the four points to lift and move the shipping group. Refer to the figures below for lifting applicable equipment:

- Figure 1: Indoor Metal-Clad Switchgear
- Figure 2: Indoor Arc-Resistant Metal-Clad Switchgear
- Figure 3: Outdoor Aisleless and Outdoor Common Aisle Metal-Clad Switchgear
- Figure 4: Outdoor Sheltered Aisle Metal-Clad Switchgear
- Figure 5: MVS, MEB, and MSB Metal-Enclosed Switchgear
- Figure 6: Indoor Arc-Resistant MVS Metal-Enclosed Switchgear
- Figure 7: Indoor MVS Narrow Design Metal-Enclosed Switchgear
- Figure 8: Indoor Mini-MVS Metal-Enclosed Switchgear
- Figure 9: Unitized Power Center
- Figure 10: MEF Metal-Enclosed Front Accessible Switchgear

The inside angle of the cables, measured from the top of the equipment to the cable itself, must be greater than 60°. If this configuration is not possible the use of spreader bars is required.

Note: The assembly will tilt at a slight angle due to the variation in the center of gravity.

Consult the factory ahead of time for particular applications where the use of a crane is limited.

Refer to Table 4 for the maximum width of equipment shipping groups. Each group may have multiple sections joined together and can be lifted using the conjoining lifting angles, or the end lifting provisions. These widths should be consulted for choosing the correct lifting cables.

Table 4. Maximum Widths of Equipment Shipping Groups.

Equipment Type	Maximum 5/15 kV Width in. (m)	Maximum 27 kV Width in. (m)	Maximum 38 kV Width in. (m)
Indoor Metal-Clad Switchgear	198 (5.03)	198 (5.03)	108 (2.74)
Indoor Arc-Resistant Metal-Clad Switchgear	198 (5.03)	126 (3.20)	108 (2.74)
Outdoor Aisleless and Outdoor Common Aisle Metal-Clad Switchgear	180 (4.57)	180 (4.57))	108 (2.74)
Outdoor Sheltered Aisle Metal-Clad Switchgear	180 (4.57)	N/A)	108 (2.74)
MVS, MEB, and MSB Metal-Enclosed Switchgear	92 (2.34)	126 (3.20)	126 (3.20)
Indoor Arc-Resistant MVS Metal-Enclosed Switchgear	180 (4.57)	N/A)	N/A)
MVS Narrow Design Metal-Enclosed Switchgear	54 (1.37)	N/A)	N/A)
Indoor Mini-MVS Metal Enclosed Switchgear	26 (0.66)	N/A)	N/A)
MEF Metal-Enclosed Front-Accessible Switchgear	104 (2.64)	N/A)	N/A)
Unitized Power Center	96 (2.44)	N/A)	N/A)

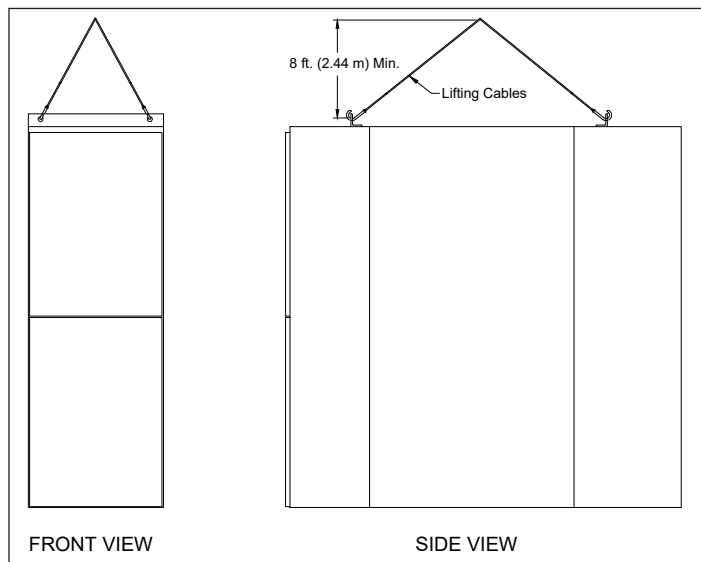


Figure 1. Lifting Angles for Indoor Metal-Clad Switchgear.

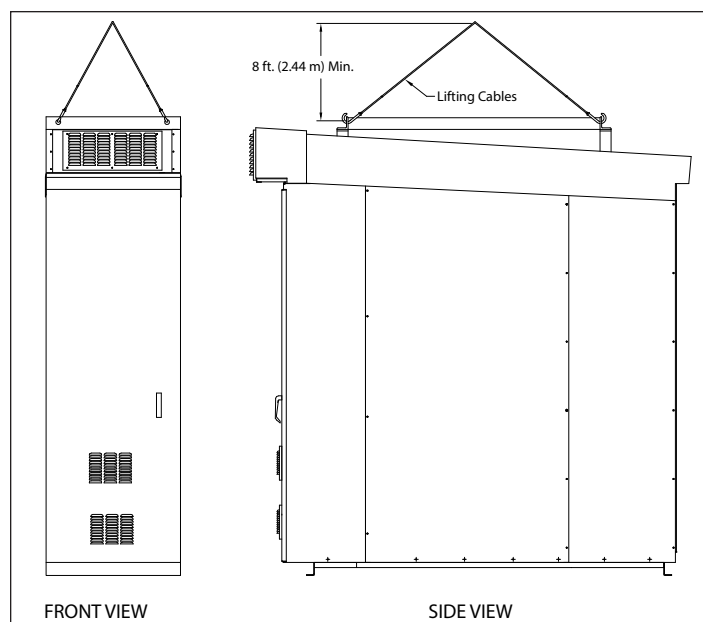


Figure 3. Lifting Angles for Outdoor Aisleless and Outdoor Common Aisle.

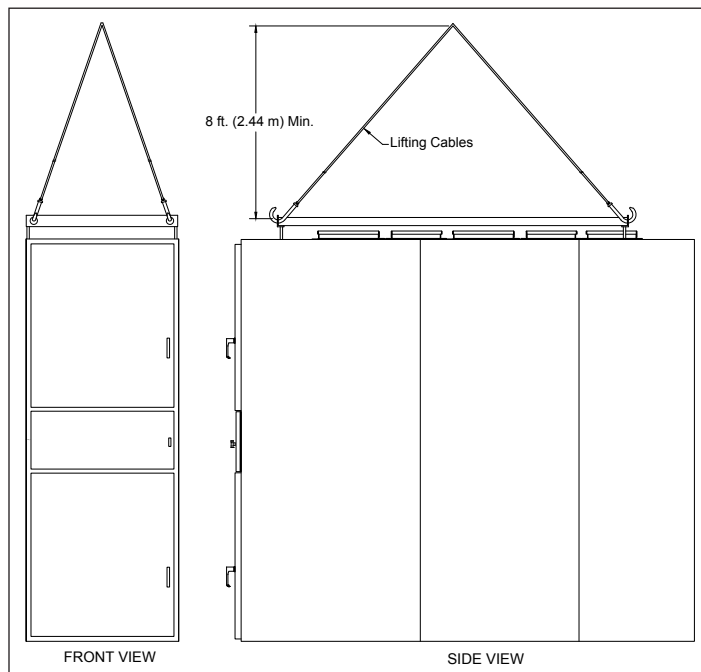


Figure 2. Lifting Angles for Indoor Arc-Resistant Metal-Clad Switchgear.



Figure 4. Lifting Angles for Outdoor Sheltered Aisle.

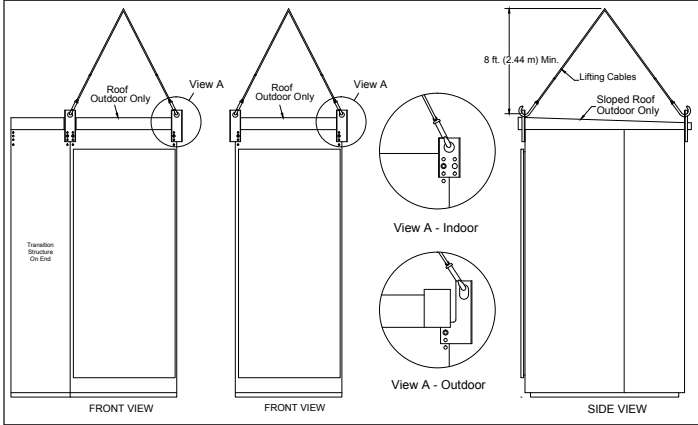


Figure 5. Lifting Provisions for MVS, MEB, and MSB Metal-Enclosed Switchgear.

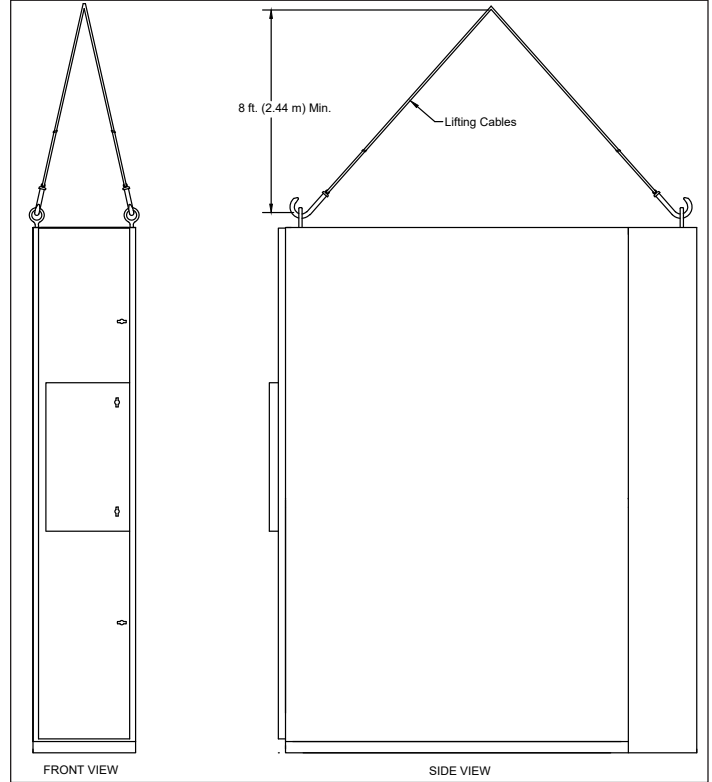


Figure 7. Lifting Provisions for Indoor MVS Narrow Design Metal-Enclosed Switchgear.

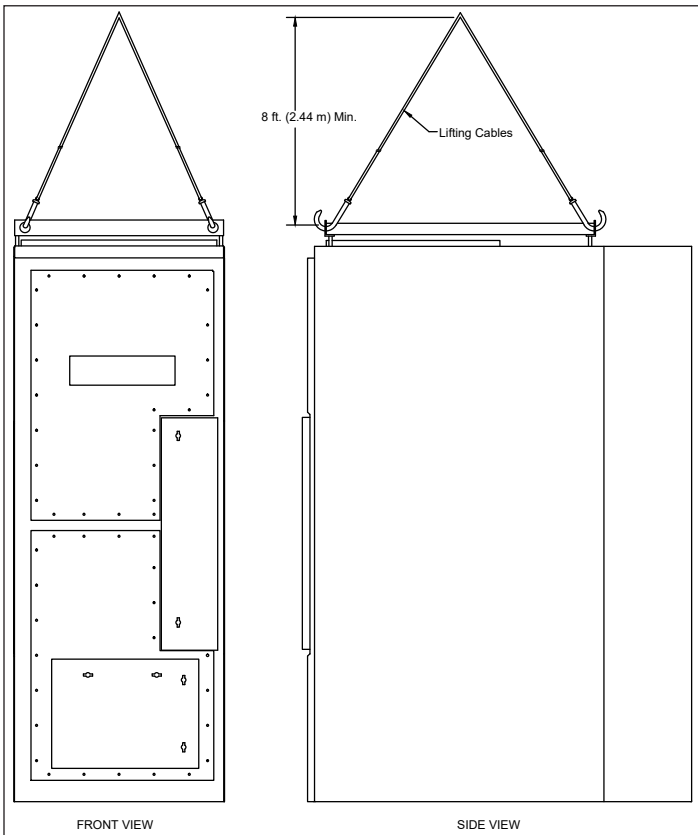


Figure 6. Lifting Provisions for Indoor Arc-Resistant MVS Metal-Enclosed Switchgear.

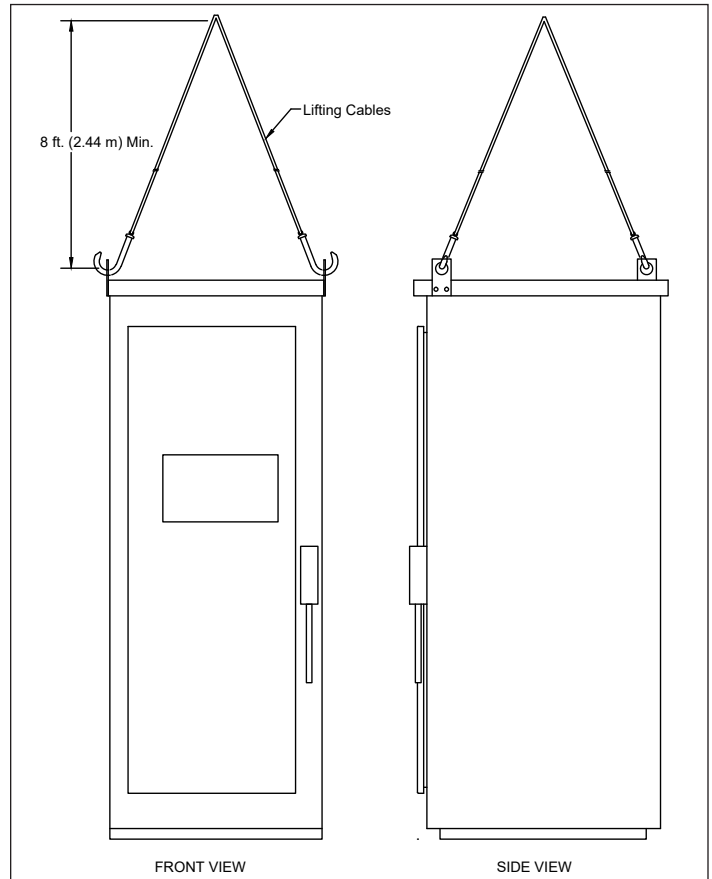


Figure 8. Lifting Provisions for Indoor Mini-MVS Metal-Enclosed Switchgear.

Section 5: Storing

⚠ WARNING

FAILURE TO PROPERLY STORE AND PROTECT SWITCHGEAR MAY CAUSE DAMAGE TO THE EQUIPMENT. SUCH DAMAGE COULD CAUSE DEATH, SEVERE PERSONAL INJURY, OR PROPERTY DAMAGE WHEN EQUIPMENT IS ENERGIZED.

Switchgear assemblies contain insulating materials, electrical connections, electrical components, and operating mechanisms which must be protected against dirt, moisture, cement dust, other foreign materials, corrosive atmospheres, and extreme temperature change. Packaging for shipping is not suitable for storage.

If it is necessary to store the equipment before installation, prepare a suitable storage space. Place the equipment on a true and level surface in order to reduce strain and distortion in the equipment. Be sure the space is well drained so that there is no standing water. Cover the equipment and keep it in a clean and dry location with ample air circulation and heat to prevent condensation. Switchgear bus runs, because of their open connection ends, are particularly vulnerable to moisture and dirt during storage.

Indoor switchgear should be kept indoors in a heated building that is both clean and dry. Outdoor switchgear can be stored outdoors. Refer to drawing 700B214 for outdoor storage requirements. Energize the switchgear heaters to keep moisture from forming inside the switchgear. A terminal block is factory wired for a customer-supplied power connection to the heaters.

Switchgear should be checked periodically for any signs of deterioration. It is the responsibility of the purchaser to ensure protection during storage.

Note: For detailed instructions on storing switchgear, refer to drawing 700B214. A copy of the drawing is attached to each group of switchgear.

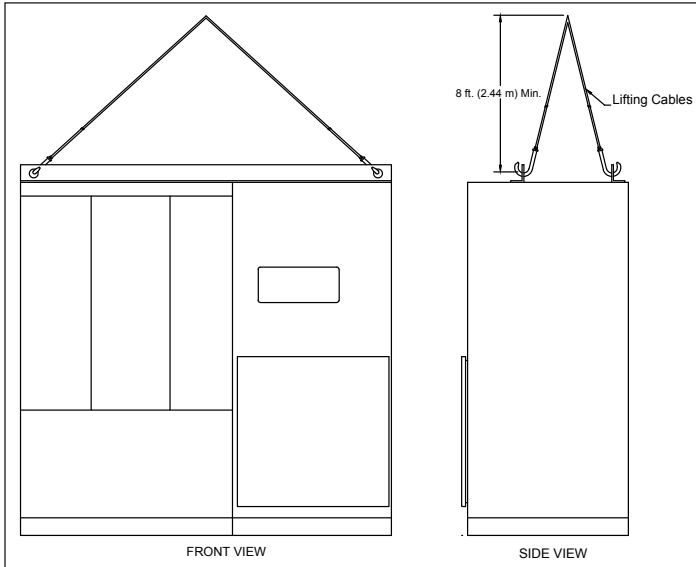


Figure 9. Lifting Angles for Unitized Power Center.

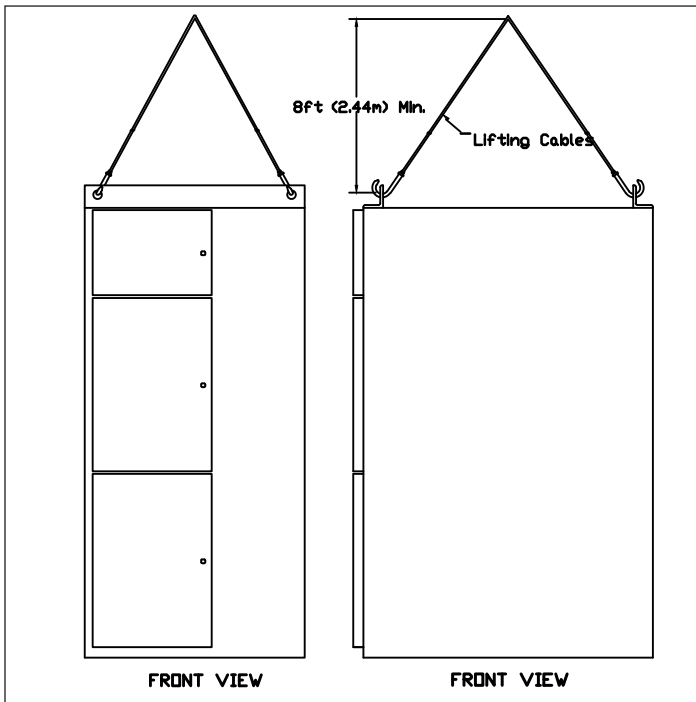


Figure 10. Lifting Angles for MEF Metal-Enclosed Front Accessible Switchgear.

Section 6: Installation of switchgear

This document outlines the installation procedures through placement and joining of switchgear structures.

Further installation instructions such as, but not limited to, tie bolting, and installing main bus, power conductors and control wiring across shipping groups, are covered in the equipment's specific instruction booklet as these are unique to each type. Consult Section 6.4 for reference of equipment documentation identification numbers.

6.1 Customer drawings

Each general order (G.O.) of medium voltage switchgear comes with a customer drawing package. It is critical to refer to and use the customer drawing package for order specific information. Installation specific information outlined in the package includes, but is not limited to:

- Anchoring provisions;
- Pad/Floor requirements;
- Conduit locations;
- Structure line-up order; and
- Internal connections.

Customer drawing information should be reviewed first and takes precedent to the information outlined in this document.

6.2 Indoor structures

6.2.1 Aligning and mating indoor shipping groups

1. Remove the packaging material from the shipping groups of switchgear that are going to be installed.

Note: Metal-enclosed or metal-clad switchgear may be equipped with a pallet for shipping purposes. Remove this pallet before moving to Step 2.

2. If a unit substation or a power center is being installed, install the power transformer and the adjacent switch gear group first. Set them in the position called for on the drawing of the base plan. Then install the rest of the groups according to the steps below.

3. If a unit substation or a power center is not being installed, install the middle shipping group of the switchgear line up first. Handling the switchgear by crane is the preferred method.

Move the middle group into the desired position. Using the front side of the line up, draw a baseline along the length of the intended location of switchgear. Ensure that the line is parallel to the chassis of the first group of switchgear. A chalk line, laser or other means of accurate marking should be used to create a parallel baseline. As the groups are maneuvered into place, keep the front chassis of each group parallel to the baseline.

⚠ CAUTION

SMALL ANGLE DISCREPANCIES MAY LEAD TO SIGNIFICANT ANGLE DISCREPANCIES FURTHER DOWN A MULTI-UNIT LINE UP.

Note: For Metal-Clad, MEF Metal-Enclosed Front Accessible, and Unitized Power Center structures, do not remove the lifting angles until all shipping groups have been set in place and tie bolted together. For MVS, MEB, MSB, and other Metal-Enclosed structures, remove the lifting provisions after each shipping group has been placed. Failure to remove the provisions before placing the next shipping group alongside of it may result in alignment issues and interference of adjacent lifting provisions.

4. If an odd number of groups is to be installed, install the other groups, working out from the middle. If an even number of groups is to be installed, start with either group on either side of the middle shipping break.

Set the group into its installation position while referencing the parallel baseline. Shipping groups should be set and mated next to one another so that they are physically touching through the entire vertical. Use a level to make sure the group is level both across its width and along its length.

5. Bolt the groups together through the tie bolt holes. The tie bolts should be inserted into the tie bolt holes and should be loosely tighten, **ONLY**. Refer to Figures 11 and 12 for typical tie bolt locations.
 - a. Remove the back covers from the vertical sections on each side of the shipping group. Install tie bolts between shipping groups. After all tie bolts are installed, loosely tighten the tie bolts down.
 - b. Open the front panels on the vertical sections. Insert and loosely tighten tie bolts between the front upright members.

Note: Leaving the tie bolts loose will minimize alignment issues in the other shipping groups placed later.

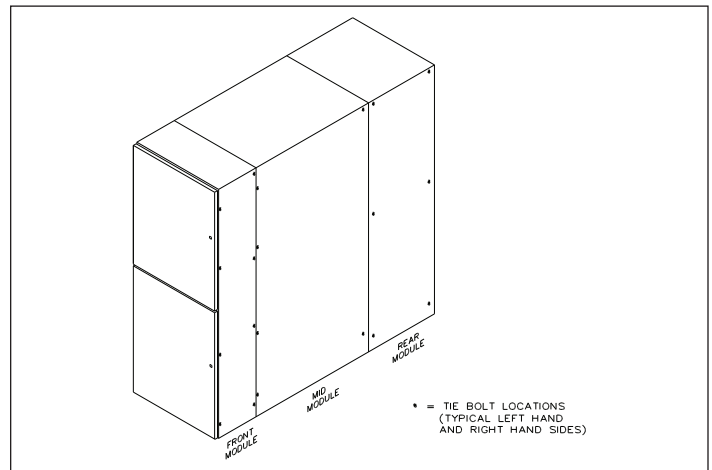


Figure 11. General Tie Bolt Locations for 5 kV through 27 kV Structures. Refer to Operation IB for Locations.

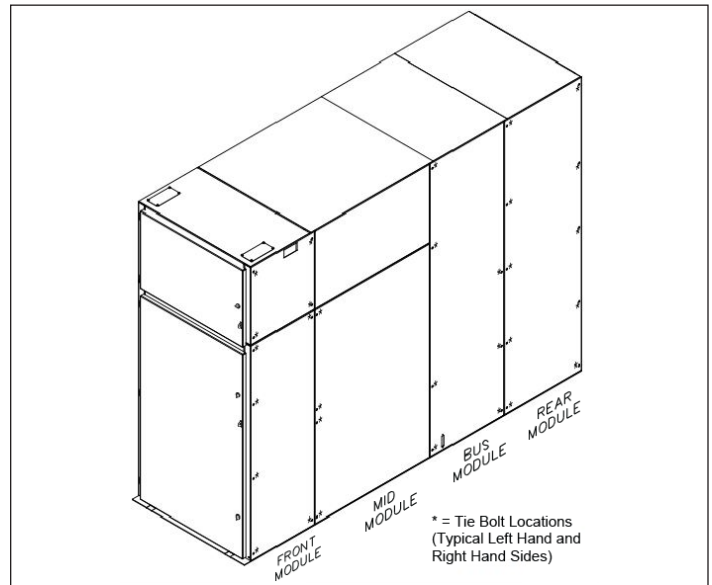


Figure 12. General Tie Bolt Locations for 38 kV Structures. Refer to Operation IB for Locations.

6. Follow Steps 4 & 5 for each remaining shipping group until all sections have placed.

Instructions for receiving, handling, storing, and installation of medium voltage switchgear

7. Once all sections have been set in place, leveled, and all the chassis are parallel along the front of the line up, tighten all tie bolts between each shipping split.
8. Examine all the meters, relays, etc. and remove any shipping blocks or braces.
9. Remove lifting angles from top of the units and discard them.

6.3 Outdoor structures

Reference the following sections for the appropriate equipment installation:

- 6.3.1 – Aligning and mating outdoor aisleless shipping groups;
- 6.3.2 – Aligning and mating outdoor sheltered aisle shipping groups; and
- 6.3.3 – Aligning and mating outdoor common aisle shipping groups.

6.3.1 Aligning and mating outdoor aisleless shipping groups

1. Remove the packaging material from the shipping groups of switchgear that are going to be installed.

Note: Metal-enclosed or metal-clad switchgear may be equipped with a pallet for shipping purposes. Remove this pallet before moving to Step 2.

2. Remove any overhanging end caps, end trim, and seam covers from the groups of switchgear. These will be replaced at a later time. Figures 13 through 16 show the placement of the end caps, end trim, and seam covers that may need to be removed and replaced during assembly.

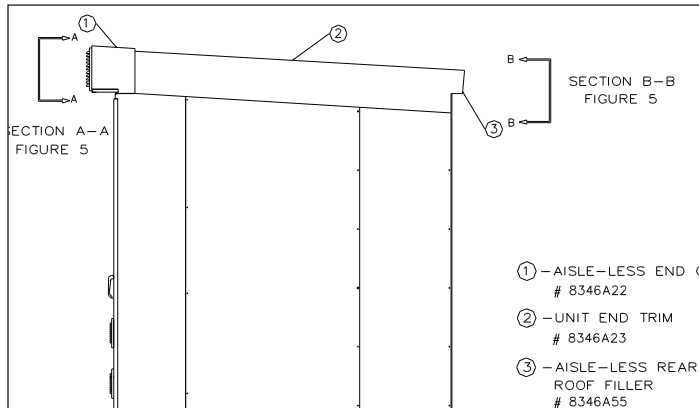


Figure 13. End Trim Cap and End Trim for 5 kV through 27 kV Structures.

Note: Provided style numbers are for hardware located within the detail box.

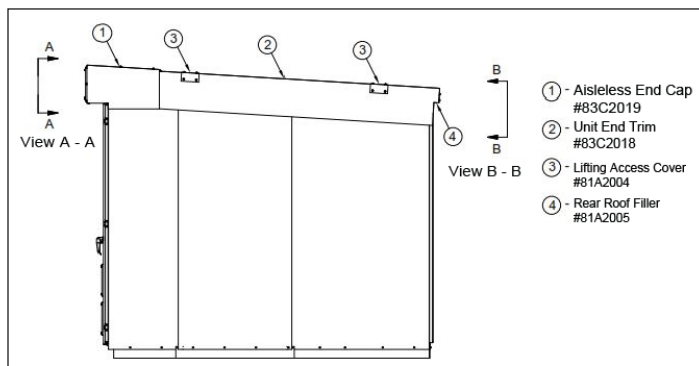


Figure 14. End Trip Cap and End Trim for 38 kV, 150 BIL Structures.

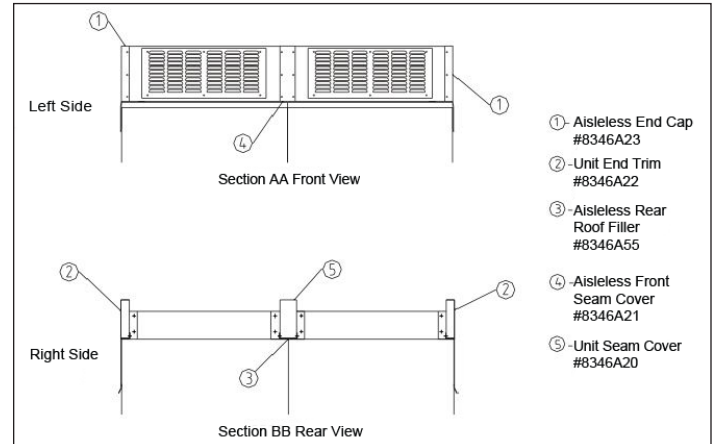


Figure 15. Front and Rear Filler Piece Locations for 5 kV through 27 kV Structures.

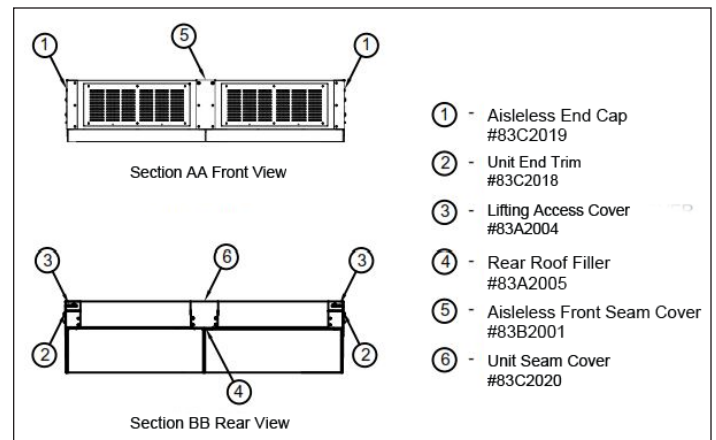


Figure 16. Front and Rear Filler Piece Locations for 38 kV, 150 BIL Structures.

3. If a unit substation or a power center is being installed, install the power transformer and the adjacent switch gear group first. Set them in the position called for on the drawing of the base plan. Then install the rest of the groups according to the steps below.
4. If a unit substation or a power center is not being installed, install the middle shipping group of the switchgear line up first. Handling the switchgear by crane is the preferred method. Move the middle group into the desired position. Using the front side of the line up, draw a baseline along the length of the intended location of switchgear. Ensure that the line is parallel to the chassis of the first group of switchgear. A chalk line, laser or other means of accurate marking should be used to create a parallel baseline. As the groups are maneuvered into place, keep the front chassis of each group parallel to the baseline.

CAUTION

SMALL ANGLE DISCREPANCIES MAY LEAD TO SIGNIFICANT ANGLE DISCREPANCIES FURTHER DOWN A MULTI-UNIT LINE UP.

Note: For Metal-Clad, MEF Metal-Enclosed Front Accessible, and Unitized Power Center structures, do not remove the lifting angles until all shipping groups have been set in place and tie bolted together. For MVS, MEB, MSB, and other Metal-Enclosed structures, remove the lifting provisions after each shipping group has been placed. Failure to remove the provisions before placing the next shipping group alongside of it may result in alignment issues and interference of adjacent lifting provisions.

- If an odd number of groups is to be installed, install the other groups, working out from the middle. If an even number of groups is to be installed, start with either group on either side of the middle shipping break.

Set the group into its installation position while referencing the parallel baseline. Shipping groups should be set and mated next to one another so that they are physically touching through the entire vertical. Use a level to make sure the group is level both across its width and along its length.

- Bolt the groups together through the tie bolt holes. The tie bolts should be inserted into the tie bolt holes and should be loosely tighten, ONLY. Refer to Figures 11 and 12 for typical tie bolt locations.
 - Remove the back covers from the vertical sections on each side of the shipping group. Install the tie bolts between shipping groups. After all tie bolts are installed, loosely tighten the tie bolts down.
 - Open the front panels on the vertical sections. Insert and loosely tighten tie bolts between the front upright members.

Note: Leaving the tie bolts loose will minimize alignment issues in the other shipping groups placed later.

- Follow Steps 4 and 5 for each remaining shipping group until all sections have placed.
- Once all sections have been set in place, leveled, and all the chassis are parallel along the front of the line-up, tighten all tie bolts between each shipping split.
- Examine all the meters, relays, etc. and remove any shipping blocks or braces.
- Remove lifting angles from top of the units and discard them.
- Attach tie down clamps to the foundation. For seismic applications, secure units to the foundation using tie down clamps. Secure the switchgear to the foundation with the supplied tie down clips per the outdoor aisleless base plan.
- Install the seam covers and roof fillers. Install the filler pieces and unit seam covers using proper hardware from the detail box. If unit end trim is not on each end of the shipping group, install at this time using proper hardware from the detail box. Refer to Figures 13 through 16 for the placement of these items.
- Install all skirts around the bottom of the unit.

6.3.2 Aligning and mating outdoor sheltered aisle shipping groups

The outdoor sheltered aisle is shipped as completely assembled as possible. The aisle is already attached to the switchgear groups for ease of assembly.

- Remove the packaging material from the shipping groups of switchgear that are going to be installed.

Note: Metal-enclosed or metal-clad switchgear may be equipped with a pallet for shipping purposes. Remove this pallet before moving to Step 2.

- Remove any overhanging end caps, end trim, and seam covers from the groups of switchgear. These will be replaced at a later time. Figures 13 through 16 show the placement of the end caps, end trim, and seam covers that may need to be removed and replaced during assembly.

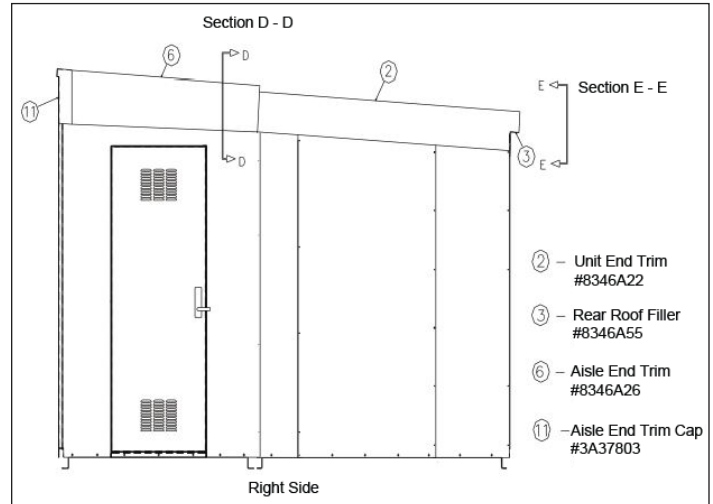


Figure 17. Unit and Aisle End Trim Locations for 5 kV through 27 kV Structures.

Note: Provided style numbers are for hardware located within the detail box.

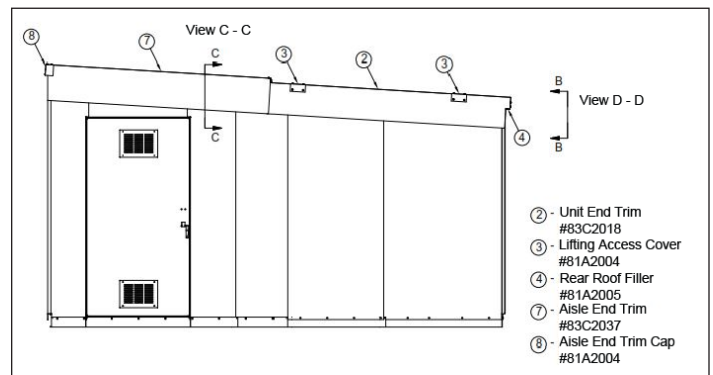


Figure 18. Unit and Aisle End Trim Locations for 38 kV, 150 BIL Structures.

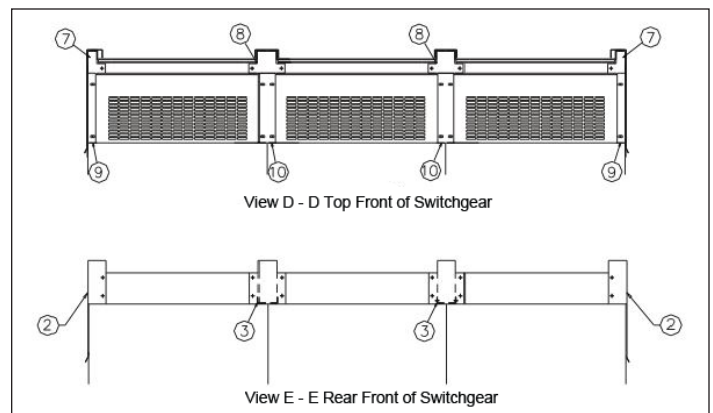


Figure 19. Filler Pieces and End Trim Locations for 5 kV through 27 kV Structures.

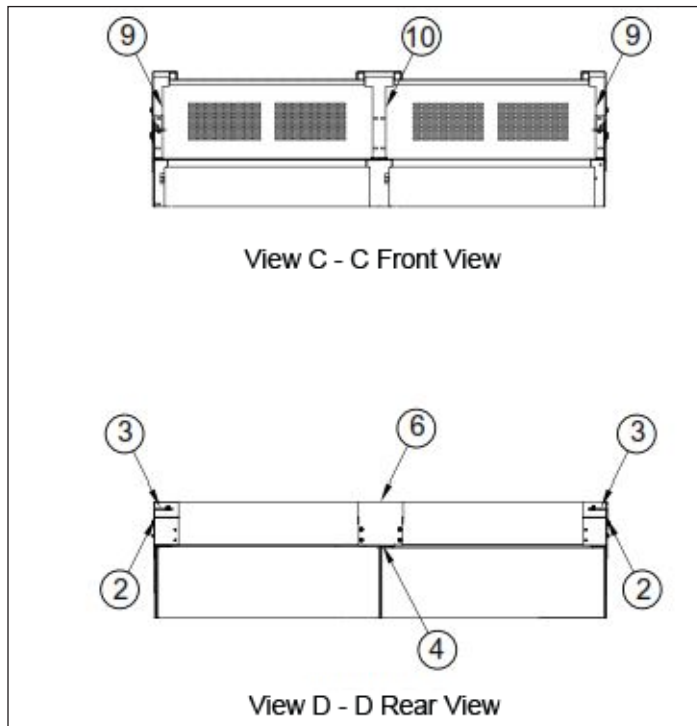


Figure 20. Filler Pieces and End Trim Locations for 38 kV, 150 BIL Structures.

3. If a unit substation or a power center is being installed, install the power transformer and the adjacent switch gear group first. Set them in the position called for on the drawing of the base plan. Then install the rest of the groups according to the steps below.
4. If a unit substation or a power center is not being installed, install the middle shipping group of the switchgear line up first. Handling the switchgear by crane is the preferred method .
Move the middle group into the desired position. Using the front side of the line-up, draw a baseline along the length of the intended location of switchgear . Ensure that the line is parallel to the chassis of the first group of switchgear. A chalk line, laser, or other means of accurate marking should be used to create a parallel baseline. As the groups are maneuvered into place, keep the front chassis of each group parallel to the baseline.

⚠ CAUTION

SMALL ANGLE DISCREPANCIES MAY LEAD TO SIGNIFICANT ANGLE DISCREPANCIES FURTHER DOWN A MULTI-UNIT LINE UP.

Note: For Metal-Clad, MEF Metal-Enclosed Front Accessible, and Unitized Power Center structures, do not remove the lifting angles until all shipping groups have been set in place and tie bolted together. For MVS, MEB, MSB, and other Metal-Enclosed structures, remove the lifting provisions after each shipping group has been placed. Failure to remove the provisions before placing the next shipping group alongside of it may result in alignment issues and interference of adjacent lifting provisions.

5. If an odd number of groups is to be installed, install the other groups, working out from the middle. If an even number of groups is to be installed, start with either group on either side of the middle shipping break.
Set the group into its installation position while referencing the parallel baseline. Shipping groups should be set and mated next to one another so that they are physically touching through the entire vertical. Use a level to make sure the group is level both across its width and along its length.

6. Bolt the groups together through the tie bolt holes. The tie bolts should be inserted into the tie bolt holes and should be loosely tighten, ONLY. Refer to Figures 11 and 12 for typical tie bolt locations.
 - a. Remove the back covers from the vertical sections on each side of the shipping group. Install the tie bolts between shipping groups. After all tie bolts are installed, loosely tighten the tie bolts down.
 - b. Open the front panels on the vertical sections. Insert and loosely tighten tie bolts between the front upright members.
- Note:** Leaving the tie bolts loose will minimize alignment issues in the other shipping groups placed later.
7. Follow Steps 4 and 5 for each remaining shipping group until all sections have placed.
 8. Once all sections have been set in place, leveled, and all the chassis are parallel along the front of the line-up, tighten all tie bolts between each shipping split as well as the aisle walls.
 9. Examine all the meters, relays, etc. and remove any shipping blocks or braces.
 10. Remove lifting angles from top of the units and discard them.
 11. Install the seam covers, end trims, and roof fillers. This includes the right- and left-hand end trim, right and left roof filler, right and left aisle unit filler unit seam cover, mid roof filler and rear filler. Refer to Figures 17 through 20 for the placement of these items.
 12. Install the aisle seam cap, right and left aisle end trim cap, and end trim. Refer to Figures 17 through 20 for the placement of these items.
 13. For seismic applications, secure the aisle to the foundation using clamps pre-attached to the aisle and unit base channels. The clamps can be accessed through the floor panels on the aisle base. Rear unit clamps are supplied in the detail box. Secure the switchgear to the installation pad per the base plan supplied.
 14. Install all skirts around the bottom of the unit.

6.3.3 Aligning and mating outdoor common aisle shipping groups

Common aisle switchgear must be installed in the following sequence:

- A. Installation of the first line-up of switchgear in the correct location on the installation pad;
- B. Installation of the aisle base to the first lineup of switchgear;
- C. Installation of the second lineup of switchgear to aisle base and first lineup of switchgear;
- D. Installation of aisle roof panels; and
- E. Installation of aisle walls.

1. Remove the packaging material from the shipping groups of switchgear that are going to be installed. Remove any overhanging filler pieces and seam covers from the groups of switchgear. Figures 19 and 20 show the placement of the filler pieces and seam covers that may need to be removed and replaced later during assembly.

Notes: Metal-enclosed or metal-clad switchgear may be equipped with a pallet for shipping purposes. Remove this pallet before moving to Step 2.

2. If a unit substation or a power center is being installed, install the power transformer and the adjacent switch gear group first. Set them in the position called for on the drawing of the base plan. Then install the rest of the groups according to the steps below.
3. If a unit substation or a power center is not being installed, install the middle shipping group of the switchgear line up first. Handling the switchgear by crane is the preferred method .

Move the middle group into the desired position. Using the front side of the line up, draw a baseline along the length of the intended location of switchgear. Ensure that the line is parallel to the chassis of the first group of switchgear. A chalk line, laser, or other means of accurate marking should be used to create a parallel baseline. As the groups are maneuvered into place, keep the front chassis of each group parallel to the baseline.

CAUTION

SMALL ANGLE DISCREPANCIES MAY LEAD TO SIGNIFICANT ANGLE DISCREPANCIES FURTHER DOWN A MULTI-UNIT LINE UP.

Note: For Metal-Clad, MEF Metal-Enclosed Front Accessible, and Unitized Power Center structures, do not remove the lifting angles until all shipping groups have been set in place and tie bolted together. For MVS, MEB, MSB, and other Metal-Enclosed structures, remove the lifting provisions after each shipping group has been placed. Failure to remove the provisions before placing the next shipping group alongside of it may result in alignment issues and interference of adjacent lifting provisions.

4. If an odd number of groups is to be installed, install the other groups, working out from the middle. If an even number of groups is to be installed, start with either group on either side of the middle shipping break.

Set the group into its installation position while referencing the parallel baseline. Shipping groups should be set and mated next to one another so that they are physically touching through the entire vertical. Use a level to make sure the group is level both across its width and along its length.

5. Bolt the groups together through the tie bolt holes. The tie bolts should be inserted into the tie bolt holes and should be loosely tighten, ONLY. Refer to Figures 12 and 13 for typical tie bolt locations.
 - a. Remove the back covers from the vertical sections on each side of the shipping group. Install the tie bolts between the shipping groups. After all tie bolts are installed, loosely tighten the tie bolts down.
 - b. Open the front panels on the vertical sections. Insert and loosely tighten tie bolts between the front upright members.

Note: Leaving the tie bolts loose will minimize alignment issues in the other shipping groups placed later.

6. Follow Steps 4 and 5 for each remaining shipping group until all sections have placed.
7. Once all sections have been set in place, leveled, and all the chassis are parallel along the front of the line up, tighten all tie bolts between each shipping split.
8. Examine all the meters, relays, etc., and remove any shipping blocks or braces.
9. Remove the lifting angles from top of the units and discard them.
10. Remove the 3/4 in. (86.4 mm) bolts from the front channels of each switchgear vertical section and discard. These will be replaced later by tie bolts that join the aisle bases to the switchgear.
11. Install the aisle floor. The floor is pre-assembled with three aisle bases per shipping group. Slide the aisle bases to the first switchgear lineup until both channels are touching. The two channels should now be forming a box.

Note: The aisle base has a 1/4 in. (6.4 mm) lip that sits on top of the switchgear unit channel. Be sure to lift the aisle bases up when sliding toward the switchgear channels.

Below the access panels on the aisle, line up the tie bolt holes. Install two tie down clips and four 3/4 in. (86.4 mm) bolts at each vertical switchgear section.

Continue installing aisle bases in the same manner until all are in place. Place the service covers over the openings.

12. Install the opposite side switchgear units.

Lift the aisle base assembly off the ground approximately 2.0 in. (50.8 mm) to allow the switchgear channels to sit under the 1/4 in. (6.4 mm) lip of the aisle base. The two channels should be forming a box like the opposite side. Align the tie bolt holes by moving the switchgear to the proper location. Install two tie down clips and four 3/4 in. bolts at each vertical switchgear section.
13. Install the aisle roofs. The aisle roofs are identical unless equipment has been attached, such as fans or heaters.
14. Install the aisle roof starting at unit one. Note the high side of the roofs are over the units opposite unit one. Secure the roof panels with the supplied hardware.
15. Install the aisle roof seam covers.
16. Install the aisle fillers. Refer to Figures 20 and 21.
17. Remove the three screws on the unit roof end trim and slide it toward the rear approximately 3.0 in. (76.2 mm). Do this on all four corners.
18. Install the aisle end walls. Identify the left end door frame (as seen while facing unit one). Place gasket material (if not already installed) on the two edges of the aisle end wall. Raise the wall up to the switchgear and raise the wall over the aisle roof sheet so that the wall end trim will slide over the lip on the roof panel. (It may be easier to remove the wall end trim prior to installation. Replace after the end wall has been secured to the switchgear units.) Align the weld studs on the aisle wall to fit in the openings on the switchgear side walls (refer to Figure 21). After weld studs are in the openings, place supplied hardware over weld studs and tighten.
19. Identify the right end wall and repeat Step 13.
20. Slide the unit roof end trims forward and install hardware removed earlier (all four corners). Refer to Figure 22 for the proper overlap.
21. Install unit seam covers and roof fillers. Refer to Figures 20 and 21.
22. Install tie down clips at the rear of both switchgear lineups. Rear unit clamps are supplied in the detail box. Secure the switchgear to the installation pad per the base plan supplied.
23. After installation is complete, close all doors and check for light seeping into aisle area. Use gutter seal or additional gasket material to fill in any areas light is coming in.

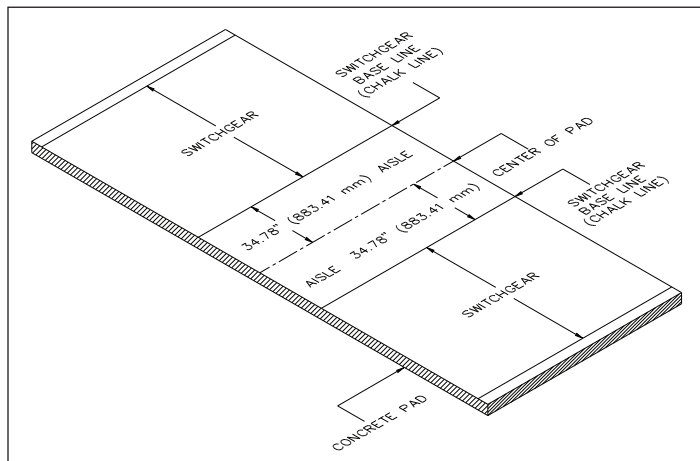


Figure 21. Openings for Wall Weld Studs.

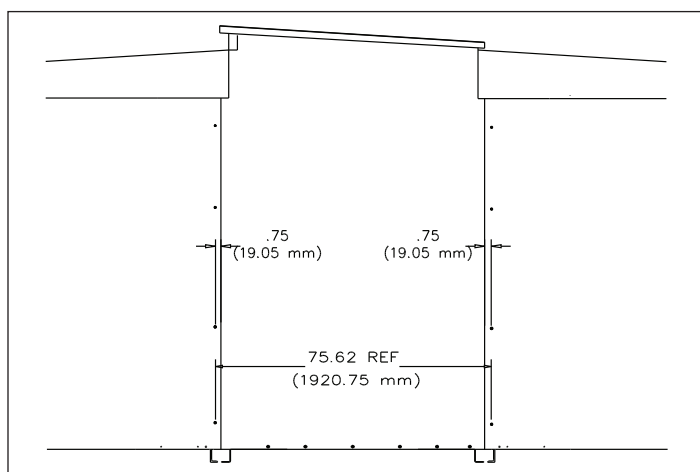


Figure 22. Proper Overlap of Unit and Aisle End Trim.

6.4 Additional installation procedures, document reference

This document outlines the installation procedures through placement and joining of switchgear structures.

Further installation instructions such as, but not limited to, tie bolting, and installing main bus, power conductors and control wiring across shipping groups, are covered in the equipment's specific instruction booklet as these are unique to each type.

Table 5. Additional Document References.

Description	Publication Number
Metal-Clad 5/15 kV	IB02200001E
Metal-Clad 27 kV	IB02201003E
Metal-Clad 38 kV 150 BIL	IB02201004E
Metal-Clad 38 kV 170 BIL	IB32267
Metal-Clad 5/15 kV Arc Resistant	IB02201001E
Metal-Clad 27 kV Arc Resistant	IB02200003E
Metal-Clad 38 kV Arc Resistant	IB32267ARC
Plenum	IB48077E
Metal-Clad Automatic Transfer Switch	IB140011EN
Metal-Enclosed Switchgear Front Accessible Type MEF	IB02100001E
Metal-Enclosed Switchgear Type MVS & MEB (5/15 kV)	IB02102001E
Metal-Enclosed Switchgear Type MVS - WLI	IB02102006E
Metal-Enclosed Switchgear Type MVS Narrow Design	IB022003EN
Metal-Enclosed Switchgear Type MVS 5/15 kV Arc Resistant	IB022002EN
Metal-Enclosed Switchgear Type Mini MVS	IB02102005E
Unitized Power Center 5/15 kV	IB02104001E

Section 7: Final inspection

7.1 Lifting angles and brackets

Each shipping split is equipped with lifting angles or lifting brackets. Once all the equipment has been set in place and bolted together, remove the lifting provisions.

7.2 Shipping braces

Shipping braces may be equipped within switchgear to aid shipping and handling of particular assemblies or parts. These braces must be removed once the equipment has been set in place and bolted together. Refer to the Instruction Booklet for details on possible shipping braces within the equipment.

7.3 Removal of excess material and tools

Prior to energizing the equipment inspect each compartment and areas where installation work has been completed. Ensure that there is no excess hardware, tools, etc. left behind. Be sure to meticulously look over parts of the equipment that are critically important to the equipment's functionality, such as the 3-phase bottle and contacts assemblies, busbar connections and circuit breakers, where applicable.

CAUTION

FAILURE TO REMOVE ALL EXCESS MATERIALS MAY CAUSE DAMAGE TO THE EQUIPMENT. SUCH DAMAGE COULD CAUSE DEATH, SEVERE PERSONAL INJURY, OR PROPERTY DAMAGE WHEN EQUIPMENT IS ENERGIZED.

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