

# Low voltage metal-enclosed switchgear seismic application guidelines

## Overview

Equipment representing the products listed below were subjected to seismic testing in accordance with the 2012 International Building Code (IBC) and the 2013 California Building Code (CBC). The results of these tests exceeded the requirements as stated within the IBC and CBC and demonstrated the ability to function after the test. All installation guidelines covered in this document, as well as the instruction and operations literature provided with the equipment, must be followed to ensure installation suitable for a seismic application.

Certificates for various types of distribution and control equipment along with an application paper, "Earthquake Requirements and Seismic Capabilities for Eaton's Electrical Distribution and Control Equipment," can be found at [www.eaton.com/seismic](http://www.eaton.com/seismic).

## Guidelines

### Foundation plan and mounting requirements

Proper mounting of the equipment is the single most important factor in withstanding a seismic event. The foundation must be level and continuous under the assembly. The foundation must be designed to withstand the reaction loads imposed on it by the equipment during a seismic event. The mounting bolts, quantity, and torque values contained in **Table 1** represent the mounting characteristics for the specimens tested. The anchoring system should be put in place prior to equipment installation to reduce effort associated with anchoring. Floor plan drawings provided for the specific project should be used to identify anchoring locations. The foundation drawings noted below are generic in nature and do not reflect the actual configuration of vertical sections for a specific project. It is recommended that the equipment foundation and anchor arrangements be evaluated by a registered professional structural engineer to ensure that the mounting meets the requirements of the seismic application.

**Table 1. Equipment Hardware and Floor Plan Information**

Type	Bolt Type and Size	Torque	Quantity	Accessibility	Foundation Floor Plan
Indoor, Type Magnum DS® or SB	SAE Grade 5, 1/2-13	75 ft-lbs	Six per vertical section Four per vertical section	Rear Front	4A37896
NEMA® 3R, Type Magnum DS or SB	SAE Grade 5, 3/4-11	150 ft-lbs	Four per shipping section (seven per shipping section if shipping section includes the end of the lineup)	Rear	9255C35 (walk-in) 9259C06 (non-walk-in)
				Front	8652C19 (walk-in) 8652C25 (non-walk-in)
Indoor, Type DSII	SAE Grade 5, 1/2-13	75 ft-lbs	Six per vertical section	Rear	114B458
NEMA 3R, Type DSII	SAE Grade 5, 3/4-11	150 ft-lbs	Four per shipping section	Rear	8643C38



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**Displacement**

The horizontal displacement of the top of the equipment is listed in **Table 2**. The horizontal displacements given in the table are plus/minus values. The equipment must be at the minimum distance listed in the following table to avoid contact with other stationary objects during a seismic event. These displacement values correlate to the highest ground level acceleration value that the equipment has been tested to. Refer to the appropriate seismic certificate to determine seismic withstand level.

**Table 2. Equipment Displacement**

Type	Front to Back	Side to Side
Indoor, Type Magnum DS or SB	± 6.00 inches	± 6.00 inches
NEMA 3R, Type Magnum DS or SB, front and rear accessible	± 6.00 inches	± 6.00 inches
Indoor, Type Magnum DS or SB, front accessible	± 6.00 inches	± 6.00 inches
Indoor, Type DSII	± 6.00 inches	± 6.00 inches
NEMA 3R, Type DSII	± 6.00 inches	± 6.00 inches

Consideration must be given to attachments (conduits, bus duct, etc.) made to the top of the equipment. Attachments must have provisions to accommodate the displacement of the equipment indicated above. Entry from the bottom of the equipment eliminates the need for accommodating this motion for attachments.

**Center of gravity**

For seismic calculations, the following dimensions should be used to locate the center of gravity for the equipment. These dimensions are applicable for all structures.

**Table 3. Equipment Center of Gravity**

Type	Vertical	Left to Right	Front to Back
Indoor, Type Magnum DS or SB	60.00 inches from base	Geometric center of lineup	1/2 of the depth
NEMA 3R, Type Magnum DS or SB, front and rear accessible	66.00 inches from base	Geometric center of lineup	1/2 of the depth
Indoor, Type Magnum DS or SB, front accessible	60.00 inches from base	Geometric center of lineup	1/2 of the depth
Indoor, Type DSII	60.00 inches from base	Geometric center of lineup	1/2 of the depth
NEMA 3R, Type DSII	66.00 inches from base	Geometric center of lineup	1/2 of the depth

**Loose equipment and removable devices**

Removable devices should always remain in the “Connected” position or be stored remote from the equipment. The user should provide storage means to secure mobile pieces of equipment to avoid damage during a seismic event. Refer to the instruction and operation manual provided with the equipment for details.

**Enclosure tie bolts and attachment of shipping sections**

If equipment is provided in separate groups of vertical sections for purposes of shipping or handling, the installer must install all of the shipping section tie bolts. (See instruction and operations manual provided with equipment.) Failure to properly join shipping groups could result in damage to the equipment during a seismic event. All switchgear sections must be tied together using (15) 3/8-inch bolts.

**Doors**

All doors should be secured with attachment means provided.

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