Seismic Certification for Low Voltage Dry-Type Transformers

Why Codes?

The International Code Council is an association dedicated to developing codes to create uniform standards for the design and construction of safe structures without regional limitations. This organization has prepared International Building Codes (IBC) to provide minimum safeguards for people at home, at school and in the workplace

Why Seismic Codes?

IBC has codes that require critical systems and components to not only maintain structural integrity during an earthquake, but also remain operational and continue to carry out their primary functions post-event. The goal is to ensure that essential facilities (hospitals, police and fire, shelters, data centers, nuclear, etc.) are able to provide services and protect the public following a seismic event.

The state of California has developed many of the standards and tests for safe buildings. As a leader in the field, OSHPD, the Office of Statewide Health Planning and Development (California Health and Human Services Agency) has defined the code for active components (moving or rotating parts) and energized components (carrying electrical charge) to be certified exclusively through shake table testing or experience data.

What is Seismic Qualified?

Seismic Certification by OSHPD is a voluntary program for equipment manufacturers. Special Seismic Certification (SSC) is an approval process in which equipment and nonstructural components are evaluated for their ability to withstand the effects of earthquakes and meet functional requirements following these events.

Many construction projects require components to be “Seismic Qualified.” In addition to requiring structural components to meet specific seismic regulations many jurisdictions also require nonstructural building systems, including electrical systems, to be “Seismic Qualified.”

OSHPD requires actual “shake-testing” of product prior to allowing products to be specified for construction or retrofit projects in the state of California. This testing must be reviewed by a California state certified engineer. Many other jurisdictions nationwide require the OSHPD Special Seismic Certification Preapproval (OSP) for projects.

By meeting the strict OSHPD standards, our transformers are qualified for any project throughout our sales area. Customers should specify that their use requires this certification, and special features will be included in the design. For applications where we have not yet tested the unit, a test may be ordered to verify the quality. Typically this is done at the customer’s expense.

How are Seismic units rated?

Three criteria are typically defined for seismic units: S_{DS}, I_p, z/h. For generic certification, these numbers are documented and must be less than site-specific demands for a given installation.

S_{DS} = Short period design acceleration, design ground motion coefficient

The required motion coefficient is dependent on the location of the facility. Most of the United States requires S_{DS} =0.05 to 1.5g. For the 2009 IBC, the maximum demand across the country is in Tennessee at a 2.28g. Updates to the seismic hazard have increased this level to 2.49g in California for the 2012 IBC.

I_p = Importance Factor, nonstructural component

For dry-type transformers the I_p must equal 1.0 minimum or better.

z/h = Installation height factor, ratio dealing with the horizontal force verses the vertical force

For dry-type transformers the z/h will always be 1.0.

continued on next page

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What about Zones?

Previous versions of seismic standards classified areas range from zone 0 to zone 4, where zone 0 is indicating the weakest earthquake ground motion and 4 indicating the strongest. The zone classification is no longer used. The current standard specifies the S_{DS} Design ground motion coefficient as described above. To determine the S_{DS} criteria, for a specific location, the U.S. Geological Survey provides a utility on their website. See this link: https://earthquake.usgs.gov/hazards/hazmaps/

Who needs Seismic?

Healthcare facilities, emergency response locations including fire stations, police stations and other critical government facilities will often include a seismic qualification requirement. The goal of the standards is to ensure that essential facilities will be able to provide service and protect the public following a seismic event.

How did Jefferson Electric complete the qualification?

As required by OSHPD, the testing has been completed by an independent laboratory. We chose **Tobolski Watkins Engineering, Inc.** as our approved firm. All testing information has been filed with OSHPD per OSP-0109-10.

For properly executed testing, all system options, mounting details, connections and details of construction must be included. To obtain an OSP number, at least two tests are required per mounting configuration. These items must be accounted for in the certification and appropriately documented so users understand certification limitations and ensure a valid seismic certification for a given installation.

Check out the video of one our units getting tested link here

What Jefferson Electric products meet the Seismic requirements?

Product Line	*Seismic rating*
Single and three phase encapsulated Wall mount 1 kVA to 25 kVA Floor mount 30 kVA to 75 kVA NEMA 3R enclosures	S_{DS}=2.00g ; z/h = 1.00 ; I_p = 1.5
Low voltage single phase ventilated Floor mount 1 kVA to 333 kVA NEMA 1 or 3R enclosures	S_{DS} = 2.00g ; z/h = 1.00 ; I_p = 1.5
Low voltage three phase ventilated Floor mount 1 kVA to 1000 kVA NEMA 1 or 3R enclosures	S_{DS} = 2.00g ; z/h = 1.00 ; I_p = 1.5
Low voltage totally enclosed non-ventilated Floor mount, single phase 1 kVA to 250 kVA Floor mount, three phase 1 kVA to 500 kVA NEMA 3R enclosures	S_{DS} = 2.00g ; z/h = 1.00 ; I_p = 1.5

The product nameplate on Jefferson Electric's qualified products will show the following labels.

continued on next page

Why are your larger kVA low voltage and medium voltage units not approved?

Due to the customized nature of larger units we have not tested the high kVA and medium voltage units at this time. We can supply detailed drawings of these units showing center of gravity to be used in the analysis of seismic operation. Testing is available if needed. Customers will be billed for the expense unless otherwise negotiated.

Is there more information on the certified units?

Our website will have the most updated information and product downloads. Visit JeffersonElectric.com or contact us at Customer_Service@jeffersonelectric.com.