

Assessing Seismic Standards for Forklift Battery Handling Equipment

In 2014, the United States Geological Survey (USGS) released a new round of Seismic Hazard Maps. According to these documents, the general risk of earthquake damage is far more widespread than previously supposed. Forty-two of the 50 states “have a reasonable chance of experiencing damaging ground shaking from an earthquake in 50 years,” according to a report from the USGS that accompanied the latest maps.

Warehouse managers should pay attention to these findings. Earthquakes can be especially harmful to forklift battery rooms. Businesses that depend on electric forklifts must choose battery handling equipment that can withstand the force of an earthquake, even in regions that are not traditionally associated with heavy seismic risk.

Identifying the most durable battery handling equipment, however, is not always a simple task. Manufacturers of battery room infrastructure depend on ratings for a wide variety of industrial structures — including steel racking, buildings themselves, and mechanical equipment — to develop a meaningful rating system for their products. This approach is not unusual for industrial equipment with highly targeted applications, but, given the unique qualities of battery charging environments, the ability to withstand a seismic event is absolutely crucial.

In this article, we will present the seismic standards that functionally create a clear industry guideline for Operator Aboard Battery Extractor Systems. First, though, we will review the earthquake hazards that industrial facilities face.

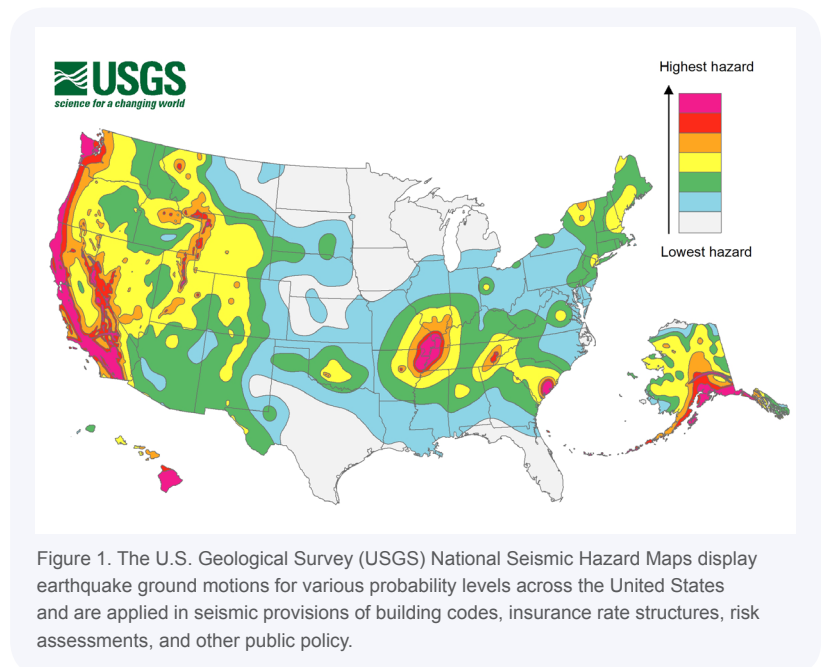
Finally, we will offer consumer-level guidance for evaluating battery stands and changers based on existing standards from all major regulating agencies. Our goal is to prepare purchasers of forklift battery handling equipment to determine the appropriate level of seismic resistance in battery room infrastructure so that they can make wise investments based on their facility's proximate earthquake risk.

Why Seismic Ratings are Important for Battery Handling Equipment

Most of the 20,000 earthquakes that take place annually in the United States are small and cause limited damage, but risks are spread across a larger area than previously supposed. Based on current data, Missouri, South Carolina, and Illinois join California, Alaska, and Hawaii as high-risk areas. Ten other states stand at the forefront of seismic danger according to the latest USGS maps; Arkansas, Idaho, Kentucky, Montana, Nevada, Oregon, Tennessee, Utah, Washington, and Wyoming are among the 16 states that face the highest risk of damaging earthquakes over the next 50 years.

Globally, earthquakes are becoming more costly in terms of loss of life and dollar-value. In 2014, quakes drained insurers around the world of about \$313 million. The most costly year of earthquakes on record was 2011; that year, insurance losses worldwide amounted to a staggering \$54 billion, reports the Insurance Information Institute. Total losses in the U.S. alone add up to several billions of dollars per year, according to the USGS.

Repairing earthquake damage in forklift battery rooms can range into the hundreds of thousands of dollars — at the very least. Given the high volume of acidic electrolyte and the heavy metal content of batteries, cleanup after a devastating earthquake can be especially problematic in battery charging areas. In order to protect valuable investments in this crucial part of a warehousing operation, buyers must choose battery stands, changers, and maintenance devices that are designed to withstand the force of potential earthquakes.



Seismic Regulations Used in Forklift Battery Rooms

- **OSHA Standards** - As with any safety issue in the workplace, OSHA standards are a rational place to start the search for earthquake-resistance regulations. However, U.S. OSH law is silent on the subject, at least in the official standards.

In broad terms, the General Duty Clause of the OSH Act of 1970 requires employers to ensure that workplaces are “free from recognized hazards that are causing or are likely to cause death or serious physical harm to...employees.” Furthermore, OSHA Standard 1910.176, which covers material handling, warns that “storage of material shall not create a hazard.”

These rules are generally interpreted to mandate protection against seismic events for industrial facilities, but for specifics, providers of battery handling equipment will have to look to other regulating bodies, such as the National Earthquake Hazards Reduction Program (NEHRP), the American Society of Civil Engineers (ASCE), and the National Fire Protection Association (NFPA).

- **NEHRP Recommended Seismic Provisions for New Buildings and Other Structures (FEMA P-750)** - The NEHRP, in cooperation with the Federal Emergency Management Agency, publishes building codes designed to withstand earthquake damage for buildings as well as infrastructure. Steel storage racks — even specialized storage systems for forklift batteries — are considered non-building structures in this central document.

Interested parties that consult Section 15.5.3 of FEMA P-750, which covers Steel Storage Racks, will find themselves redirected to yet another standard: ANSI/RMI MH16.1, Specification for the Design, Testing, and Utilization of Industrial Steel Storage Racks. According to the NEHRP, steel shelving systems should conform to the force and displacement requirements listed in this publication from the American National Standards Institute and the Rack Manufacturer’s Institute.

- **ASCE/SEI 7-10** - Minimum Design Loads for Buildings and Other Structures - The American Society of Civil Engineers worked with the Structural Engineering Institute to design publication ASCE/SET 7-10, which devotes considerable space to the problem of buildings and nonbuilding structures subjected to earthquakes.

While these provisions are only enforceable where adopted by law, they carry accreditation from the American National Standards Institute, which signifies a high standard of consensus, balance, openness, and due process in the creation of their recommendations.

Manufacturers of infrastructure for forklift battery rooms rely on Chapter 15 of this publication, titled Seismic Design Requirements for Nonbuilding Structures. The chapter defines nonbuilding structures in part as “all self-supporting structures that carry gravity loads and that may be required to resist the effects of the earthquake.” Forklift battery System Stands, such as those used in BHS battery rooms, certainly meet this definition.

- **NFPA 5000** - Building Construction and Safety Code - The NFPA represents some of the most in-depth research on building safety in the United States. In publication NFPA 5000, the NFPA limits the use of steel in constructions based on Seismic Design Category. Organization by Seismic Design Category is perhaps the most useful standard for consumers to look at, because it distills much of the complexity of the above rules into a simple measurement of earthquake preparedness.

In Chapter 44, NFPA 5000 also covers industrial steel storage racks. They should, the publication states, adhere to the rules set forth in ASCE/SEI 7-10, with which we are already familiar.

- **Seismic Design Categories** - All of the above-listed regulatory bodies adjust seismic design requirements by geographic area. After all, Minnesota is not California. Each Seismic Design Category (SDC) differs based on “the intensity of ground shaking and other earthquake effects the structure is likely to experience” as well as “the structure’s use, including consideration of the number of people who would be affected by the structure’s failure and the need to use the structure for its intended purpose after an earthquake,” according to FEMA’s explanation.

This concept of SDCs can be used as a sort of shorthand for consumers. Non-building structures that meet requirements for the most stringent category are generally perceived as safer and more prepared to stand up to the effects of an earthquake than products that are rated safe for less-demanding SDC.

How to Choose Forklift Battery Handling Equipment with Appropriate Seismic Ratings

Standards for earthquake-resistant equipment depend on a facility’s SDC. There are six total categories, rated A through F. Category SDC F represents the highest seismic risk, while SDC A covers areas in which earthquake damage is not very likely at all.

However, the designation is not entirely based on location. There are also four categories of buildings, differentiated by occupancy, the presence of hazardous materials, and the importance of the structure to post-earthquake recovery. Buildings in Category IV, for instance, will end up in a different SDC than Category I structures, which are usually not occupied at all.



Figure 2. BHS Battery System Stands are constructed with heavy-duty steel and include large 6" x 8" footpads for greater stability.

For consumers who need less complicated shorthand to determine general earthquake preparedness in battery room equipment, the United States Seismic Zones Map can still be a useful guide. While the simpler geographic areas outlined in this document haven't been used by the USGS since 1969, the general precepts of numbered Seismic Zones still function as an adequate basis of comparison for nonbuilding structures, such as battery room infrastructure.

Essentially, the Seismic Zones Map divides the nation by seismic risk. Zone 4, which covers the earthquake-prone California Coast, along with parts of Central and Western Nevada, stands the greatest risk of damage from earthquakes. Manufacturers of industrial equipment often rate their products based on these Earthquake Zones. For the greatest level of seismic protection, buyers of battery room equipment should ask for a Seismic Zone 4 rating.

Operator Aboard Battery Extractor Systems are rated safe for Zone 4, thanks to heavy duty steel construction and durable, damage-resistant design. Battery System Stands include large 6" x 8" footpads for even greater stability.

When it is time to update the battery room, make sure that your facility is prepared by choosing battery handling equipment with a Zone 4 rating. If disaster strikes, proper preparation can prevent material damage, injuries, and loss of life. Furthermore, properly rated equipment may be salvageable, even after extreme earthquakes, and can allow your facility to quickly resume operation. In the logistics industry, this type of advantage is extraordinarily valuable and can provide excellent peace of mind.

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