

A Restraint Is Not a Brace

There are many elements of seismic protection for a fire sprinkler system that can cause confusion, at least until the user is familiar with the details. One item in this category is the difference between a sway brace and a seismic restraint. Both are required components for a fire sprinkler system installed in an area subject to earthquakes.

First, it is important to understand this terminology is unique to the fire sprinkler industry. Other mechanical systems also employ protection for earthquake motion, but they use “brace” and “restraint” as synonyms for devices installed in this capacity. Following NFPA 13, a brace and a restraint are both used in protection against seismic motion, but they are different devices serving different functions. When discussing seismic protection with people from other trades, it is necessary to be aware of this distinction.

What is a seismic restraint? Section 9.3.6.1 in NFPA 13, 2016 Edition, states, “Restraint is considered a lesser degree of resisting loads than bracing...” A restraint is intended to help keep the piping in its original location, but it is not a device that requires specific load calculations. Standardized locations are included in NFPA 13 including the ends of branch lines, sprigs 4 feet (1.2 m) or longer, and along the branch lines in accordance with the seismic coefficient, C_p .

A restraint is one of very few items in a fire sprinkler system that is not required to be listed. Six (6) options are presented in NFPA 13. The first is to use a listed sway brace assembly. Since a sway brace provides more resistance to the earthquake forces, it can undoubtedly suffice for a restraint. The second option is a wraparound U-hook that complies with Section 9.3.5.5.11, which requires the legs to be at least 30 degrees from vertical and meet the rod sizes in one of the tables in Section 9.3.5.11.8. These qualifications ensure that the U-hook will offer some resistance to horizontal forces. The third option is No. 12 440 lb (200 kg) wire. Wire needs to be installed on both sides of the pipe it is protecting. This is done since wire does not resist the forces in compression. When using CPVC pipe, the fourth option may be viable. This option is for CPVC hangers that are listed to provide restraint. Typically, this would be hangers with two points of attachment so that there is the ability to counteract the horizontal forces. The fifth option is to use a hanger installed at 45 degrees from vertical. This can be done as long as the slenderness ratio (l/r) of the rod in the hanger does not exceed 400. Should a longer rod be needed, then a hanger would have to be installed on both sides of the pipe it is protecting similar to wire. Lastly, there is an option for “other approved means.” This indicates that other devices and arrangements could be used as long as they are acceptable to the authority having jurisdiction (AHJ).

In summary, restraints are valuable components in assisting to keep the fire sprinkler system piping in place during and following an earthquake. This is especially true as the restraints can help to reduce the risk of impact with nearby equipment or systems. There are many options available that can be used to fulfill the restraint requirement. Yet it is also important to note that a restraint is not a brace and could not replace sway bracing protection.