

EXEMPTIONS FOR PIPING SYSTEMS

D2.1 – 5.1 Introduction:

The exemptions that apply specifically to piping are covered in Section 9.6.3.11.4 of ASCE 7-98/02 and Section 13.6.8 of ASCE 7-05. The provisions of this section do not cover elevator system piping which is covered in Section 9.6.3.16 of ASCE 7-98/02 and Section 13.6.10 of ASCE 7-05. The piping considered in this section is assumed to be high-deformability piping. This implies pipes made from ductile materials that are joined by welding, brazing, or groove type couplings, similar to VICTAULIC couplings, where the grooves in the pipe have been roll formed rather than cut. Limited deformability piping on the other hand, would be pipes made of ductile materials that are joined by threading, bonding, or the use of groove type couplings where the grooves in the pipe have been machine cut. Low deformability piping would be comprised of pipes made from relatively brittle materials such as cast iron or glass. Also not covered in this section is fire protection piping. Fire protection piping will be covered in a separate publication.

D2.1 – 5.2 The 12" Rule (9.6.3.11.4-c) [Section 13.6.8-1]¹:

No restraints will be required for piping that meets the requirements of the 12" Rule for the entire piping run. The 12" Rule will be said to apply to a piping run if:

1. The piping is supported by rod hangers.
 - a. For single clevis supported pipe, all of the hangers in the piping run are 12 in. (305 mm) or less in length from the top of the pipe to the supporting structure.
 - b. For trapeze supported pipe, all of the hangers in the piping run are 12 in. (305 mm) or less in length from the top of the trapeze bar to the supporting structure.
2. For 2000/2003 IBC The hanger rods and their attachments are not to be subjected to bending moments. For 2006 IBC the hangers are to be detailed to avoid bending of the

¹ References in brackets (9.6.3.11.4-c) [Section 13.6.8-1] apply to sections, tables, and/or equations in ASCE 7-98/02 and ASCE 7-05 respectively which forms the basis for the seismic provisions in 2000/2003 IBC and 2006 IBC respectively.

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hangers and their attachments. This statement very is ambiguous. It does not clearly define the phrase “significant bending”, and leaves it up to the design professional responsible for the piping system, or worse, the contractor responsible for installing the piping system. The past practice by SMACNA and other recognized authorities in the industry to call for the connection between the hanger and the supporting structure to be “non-moment generating”. This means that the connector must be one that allows the piping run to swing freely on its hangers without introducing a bending moment in the hanger.

3. There must be sufficient space around the piping run to accommodate the expected motion of the pipe as it sways back and forth with the earthquake motion in the building.
4. Connections between the piping and the interfacing components must be designed and/or selected to accept the full range of motion expected for both the pipe and the interfacing component.

D2.1 – 5.3 Single Clevis Supported Pipe in Seismic Design Categories A and B (Sections 9.6.1-1 and 9.6.1-3) [Sections 13.1.4-1 and 13.1.4-2]

No seismic restraints are required for piping in building assigned to Seismic Design Categories A and B. This is implied by the general exemptions found in Section 9.6.1 of ASCE 7-98/02 and Section 13.1.4 of ASCE 7-05.

D2.1 – 5.4 Single Clevis Supported Pipe in Seismic Design Category C (Sections 9.6.1-1 and 9.6.3.11.4-d2) [Sections 13.1.4-3 and 13.6.8-2b]

1. For single clevis supported piping in buildings assigned to Seismic Design Category C for which the Component Importance Factor is equal to 1.0, no seismic restraint is required.
2. For piping in Buildings assigned to Seismic Design Category C, for which the Component Importance Factor is equal to 1.5, and for which the nominal size is 2 in. (51 mm) or less; no seismic restraint is required.

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D2.1 – 5.5 Single Clevis Supported Pipe in Seismic Design Categories D, E, and F (Sections 9.6.3.11.4-d1 and 9.6.3.11.4-d3) [Sections 13.6.8-2a and 13.6.8-2c]

1. For single clevis supported piping in buildings assigned to Seismic Design Categories D, E, and F, for which the Component Importance Factor is equal to 1.5, and for which the nominal size is 1 in. (25 mm) or less; no seismic restraint is required.
2. For single clevis supported piping in buildings assigned to Seismic Design Categories D, E, and F, for which the Component Importance Factor is equal to 1.0, and for which the nominal size is 3 in. (76 mm) or less; no seismic restraint is required.

D2.1 – 5.6 Exemptions for Trapeze Supported Pipe per VISCMA Recommendations:

Neither ASCE 7-98/02 nor ASCE 7-05 specifies how the piping is to be supported. The point is that many pipes of the exempted size may be supported on a common trapeze bar using hanger rods of the same size as would be specified for a single clevis supported pipe. Keep in mind that the purpose of the seismic restraints is to make sure the pipe moves with the building. The amount of force that the hanger rod must carry will be a direct function of the weight of pipe being supported. It is apparent that there must be some limit to how much weight a trapeze bar can support for a given hanger rod size before seismic restraint is required. VISCMA (Vibration Isolation and Seismic Control Manufacturer's Association) has investigated this issue and can make the following recommendations on the application of the exemptions in Sections 5.4 and 5.5 above to trapeze supported pipe, www.viscma.com.

The following basic provisions must apply.

1. The hangers must be ASTM A36 all-thread rod.
2. The threads must be roll formed.
3. The pipes must be rigidly attached to the hanger rods.

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4. Provisions must be made to avoid impact with adjacent pipe, duct, equipment, or building structure, or to protect the pipe from such impact.

D2.1 – 5.6.1 Trapeze Supported Pipe in Seismic Design Categories A and B: (Sections 9.6.1-1 and 9.6.1-3) [Sections 13.1.4-1 and 13.1.4-2]

For trapeze supported piping in Seismic Design Categories A and B, no seismic restraint is required.

D2.1 – 5.6.2 Trapeze Supported Pipe in Seismic Design Category C: (Sections 9.6.1-1 and 9.6.3.11-d2) [Sections 13.1.4-3 and 13.6.8-2b]

1. For trapeze supported piping in buildings assigned to Seismic Design Category C, which have a Component Importance Factor equal to 1.0, and for which the nominal size is 2 in. (51 mm) or less, no seismic restraint is required.
2. For trapeze supported piping in buildings assigned to Seismic Design Category C, which have a Component Importance Factor equal to 1.5, and for which the nominal size is 2 in. (51 mm) or less, no seismic restraint is required if:
 - a. The trapeze bar is supported by 3/8-16 UNC, or larger, hanger rods.
 - b. The maximum hanger spacing is 10 ft. on center.
 - c. The total weight supported by the trapeze bar is 15 lbs/ft or less.

D2.1 – 5.6.3 Trapeze Supported Pipe in Seismic Design Category D: (Sections 9.6.1-6, 9.6.3.11.4-d2 and 9.6.3.11.4-d3) [Sections 13.1.4-5, 13.6.8-2a, and 13.6.8-2c]

1. For trapeze supported piping in buildings assigned to Seismic Design Category D, which have a Component Importance Factor equal to 1.5, and for which the nominal size is 1 in. (25 mm) or less, no seismic restraint is required if:
 - a. The trapeze bar is supported by 3/8-16 UNC, or larger, hanger rods.
 - b. The maximum hanger spacing is 7 ft. on center.

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- c. The total weight supported by the trapeze bar is 4 lbs/ft or less.
2. For trapeze supported piping in buildings assigned to Seismic Design Category D, which have a Component Importance Factor equal to 1.0, and for which the nominal size is 3 in. (76 mm) or less, no seismic restraint is required if:
 - a. The trapeze bar is supported by 1/2-13 UNC, or larger, hanger rods.
 - b. The maximum hanger spacing is 10 ft. on center.
 - c. The total weight supported by the trapeze bar is 25 lbs/ft or less.

D2.1 – 5.6.4 Trapeze Supported Pipe in Seismic Design Categories E and F: (Sections 9.6.1-6, 9.6.3.11.4-d2 and 9.6.3.11.4-d3) [Sections 13.1.4-5, 13.6.8-2a, and 13.6.8-2c]

1. For trapeze supported piping in buildings assigned to Seismic Design Categories E and F, which have a Component Importance Factor equal to 1.5, and for which the nominal size is 1 in. (25 mm) or less, no seismic restraint is required if:
 - a. The trapeze bar is supported by 3/8-16 UNC, or larger, hanger rods.
 - b. The maximum hanger spacing is 7 ft. on center.
 - c. The total weight supported by the trapeze bar is 4 lbs/ft or less.
2. For trapeze supported piping in buildings assigned to Seismic Design Category D, which have a Component Importance Factor equal to 1.0, and for which the nominal size is 3 in. (76 mm) or less, no seismic restraint is required if:
 - a. The trapeze bar is supported by 1/2-13 UNC, or larger, hanger rods.
 - b. The maximum hanger spacing is 10 ft. on center.
 - c. The total weight supported by the trapeze bar is 11 lbs/ft or less.

D2.1 – 5.7 Summary:

The exemptions and allowances outlined in this section can, with careful planning save a lot of time and money. They may also mean the difference between making a profit on a project and breaking even, or worse, losing money. In order to take proper advantage of these exemptions,

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the Seismic Design Category to which the project has been assigned must be known. This is readily available from the structural engineer. Also, the design professional who is responsible for the piping system must assign an appropriate Component Importance Factor to the system.

As a sidebar to the previous statement, it should be noted that the specification for the building may increase the Seismic Design Category in order to ensure an adequate safety margin and the continued operation of the facility. This is a common practice with schools, government buildings, and certain manufacturing facilities. Also, the building owner has the prerogative, through the specification, to require all of the piping systems to be seismically restrained. So, careful attention to the specification must be paid, as some or all of the exemptions in this section may be nullified by specification requirements that are more stringent than those provided by the code.

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