

ducts or mechanical components or to protect the ducts in the event of such impact; and HVAC ducts have a cross-sectional area of less than 6 ft<sup>2</sup> (0.557 m<sup>2</sup>), or weigh 17 lb/ft (248 N/m) or less.

HVAC duct systems fabricated and installed in accordance with standards approved by the authority having jurisdiction shall be deemed to meet the lateral bracing requirements of this section.

Components that are installed in-line with the duct system and have an operating weight greater than 75 lb (334 N), such as fans, heat exchangers, and humidifiers, shall be supported and laterally braced independent of the duct system and such braces shall meet the force requirements of Section 13.3.1. Appurtenances such as dampers, louvers, and diffusers shall be positively attached with mechanical fasteners. Unbraced piping attached to in-line equipment shall be provided with adequate flexibility to accommodate the seismic relative displacements of Section 13.3.2.

### 13.6.8 Piping Systems

Unless otherwise noted in this section, piping systems shall be designed for the seismic forces and seismic relative displacements of Section 13.3. ASME pressure piping systems shall satisfy the requirements of Section 13.6.8.1. Fire protection sprinkler piping shall satisfy the requirements of Section 13.6.8.2. Elevator system piping shall satisfy the requirements of Section 13.6.10.

Where other applicable material standards or recognized design bases are not used, piping design including consideration of service loads shall be based on the following allowable stresses:

- For piping constructed with ductile materials (e.g., steel, aluminum, or copper), 90 percent of the minimum specified yield strength.
- For threaded connections in piping constructed with ductile materials, 70 percent of the minimum specified yield strength.
- For piping constructed with nonductile materials (e.g., cast iron or ceramics), 10 percent of the material minimum specified tensile strength.
- For threaded connections in piping constructed with nonductile materials, 8 percent of the material minimum specified tensile strength.

Piping not detailed to accommodate the seismic relative displacements at connections to other components shall be provided with connections having sufficient flexibility to avoid failure of the connection between the components.

#### 13.6.8.1 ASME Pressure Piping Systems

Pressure piping systems, including their supports, designed and constructed in accordance with ASME B31 shall be deemed to meet the force, displacement, and other requirements of this section. In lieu of specific force and displacement requirements provided in ASME B31, the force and displacement requirements of Section 13.3 shall be used. Materials meeting the toughness requirements of ASME B31 shall be considered high-deformability materials.

#### 13.6.8.2 Fire Protection Sprinkler Piping Systems

Fire protection sprinkler piping, pipe hangers, and bracing designed and constructed in accordance with NFPA 13 shall be deemed to meet the force and displacement requirements of this section. The exceptions of Section 13.6.8.3 shall not apply.

#### 13.6.8.3 Exceptions

Design of piping systems and attachments for the seismic forces and relative displacements of Section 13.3 shall not be required where one of the following conditions apply:

- Trapeze assemblies are used to support piping whereby no single pipe exceeds the limits set forth in 3a, 3b, or 3c below and the total weight of the piping supported by the trapeze assemblies is less than 10 lb/ft (146 N/m).
- The piping is supported by hangers and each hanger in the piping run is 12 in. (305 mm) or less in length from the top of the pipe to the supporting structure. Where pipes are supported on a trapeze, the trapeze shall be supported by hangers having a length of 12 in. (305 mm) or less. Where rod hangers are used, they shall be equipped with swivels, eye nuts, or other devices to prevent bending in the rod.
- Piping having an  $R_p$  in Table 13.6-1 of 4.5 or greater is used and provisions are made to avoid impact with other structural or nonstructural components or to protect the piping in the event of such impact and where the following size requirements are satisfied:
  - For Seismic Design Category C where  $I_p$  is greater than 1.0, the nominal pipe size shall be 2 in. (50 mm) or less.
  - For Seismic Design Categories D, E, or F and values of  $I_p$  are greater than 1.0, the nominal pipe size shall be 1 in. (25 mm) or less.
  - For Seismic Design Categories D, E, or F where  $I_p = 1.0$ , the nominal pipe size shall be 3 in. (80 mm) or less.