Table 13.6-1 (*Continued*)

Distribution Systems		
Electrical conduit and cable trays	2.5	6.0
Bus ducts	1.0	2.5
Plumbing	1.0	2.5
Manufacturing or process conveyors (nonpersonnel)	2.5	3.0

[a]A lower value for a_p is permitted where justified by detailed dynamic analyses. The value for a_p shall not be less than 1.0. The value of a_p equal to 1.0 is for rigid components and rigidly attached components. The value of a_p equal to 2.5 is for flexible components and flexibly attached components.

[b]Components mounted on vibration isolators shall have a bumper restraint or snubber in each horizontal direction. The design force shall be taken as $2F_p$ if the nominal clearance (air gap) between the equipment support frame and restraint is greater than 0.25 in. (6 mm). If the nominal clearance specified on the construction documents is not greater than 0.25 in. (6 mm), the design force is permitted to be taken as F_p.

force and relative displacement requirements provided they meet all of the following criteria:

1. The design load for such items shall be equal to 1.4 times the operating weight acting down with a simultaneous horizontal load equal to 1.4 times the operating weight. The horizontal load shall be applied in the direction that results in the most critical loading for the design.
2. Seismic interaction effects shall be considered in accordance with Section 13.2.3.
3. The connection to the structure shall allow a 360° range of motion in the horizontal plane.

Where design of mechanical and electrical components for seismic effects is required, consideration shall be given to the dynamic effects of the components, their contents, and where appropriate, their supports and attachments. In such cases, the interaction between the components and the supporting structures, including other mechanical and electrical components, shall also be considered.

13.6.2 Component Period

The fundamental period of the nonstructural component (including its supports and attachment to the structure), T_p, shall be determined by the following equation provided that the component, supports, and attachment can be reasonably represented analytically by a simple spring and mass single degree-of-freedom system:

$$T_P = 2\pi\sqrt{\frac{W_p}{K_p g}} \qquad (13.6\text{-}1)$$

where

T_p = component fundamental period
W_p = component operating weight
g = gravitational acceleration
K_p = combined stiffness of the component, supports and attachments, determined in terms of load per unit deflection at the center of gravity of the component

Alternatively, the fundamental period of the component, T_p, in seconds is permitted to be determined from experimental test data or by a properly substantiated analysis.

13.6.3 Mechanical Components

HVAC ductwork shall meet the requirements of Section 13.6.7. Piping systems shall meet the requirements of Section 13.6.8. Boilers and vessels shall meet the requirements of Section 13.6.9. Elevators shall meet the requirements of Section 13.6.10. All other mechanical components shall meet the requirements of Section 13.6.11. Mechanical components with I_p greater than 1.0 shall be designed for the seismic forces and relative displacements defined in Sections 13.3.1 and 13.3.2 and shall satisfy the following additional requirements:

1. Provision shall be made to eliminate seismic impact for components vulnerable to impact, for components constructed of nonductile materials, and in cases where material ductility will be reduced due to service conditions (e.g., low temperature applications).
2. The possibility of loads imposed on components by attached utility or service lines, due to differential movement of support points on separate structures, shall be evaluated.
3. Where piping or HVAC ductwork components are attached to structures that could displace relative to one another and for isolated structures where such components cross the isolation interface, the