PART 1 - GENERAL

1.1 APPLICABLE REQUIREMENTS

A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, and Section 220500 - Basic Plumbing Materials and Methods, and other Sections in Division 22 specified herein.

1.2 SUMMARY

A. This Section includes the following:
1. Seismic restraint and support of piping and plumbing equipment as required by code and as designed by project registered professional Structural Engineer.

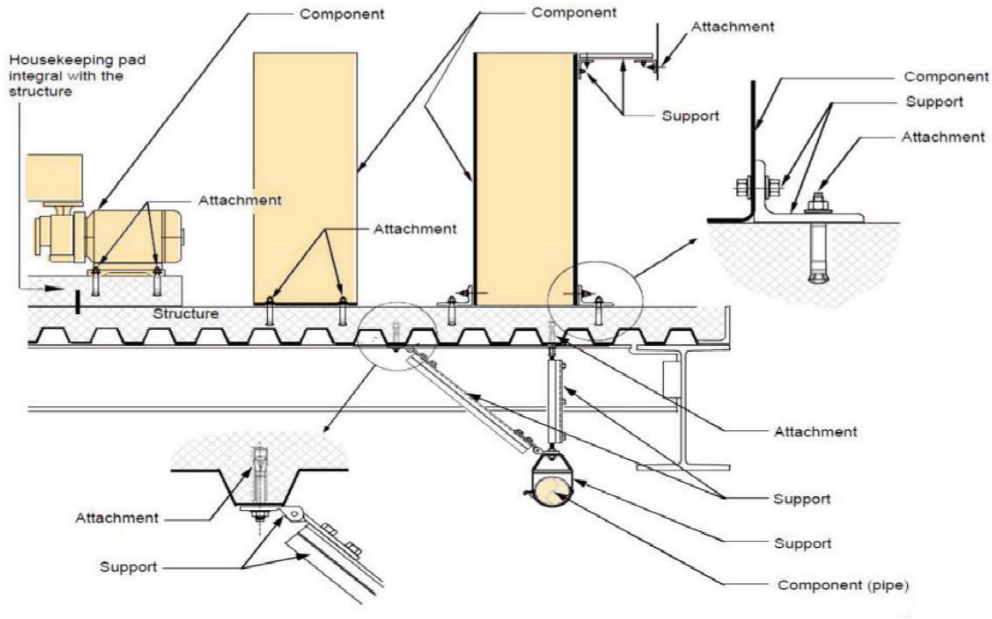
1.3 DEFINITIONS

A. AHJ: Authority Having Jurisdiction

B. CBC: California Building Code

C. ICC-ES: ICC-Evaluation Service

D. Mechanical Components: Examples of attachments and supports for a variety of mechanical components are shown as follows:



E. Mechanical Supports: Those members, assemblies of members, or manufactured elements, including braces, frames, legs, lugs, snubbers, hangers, saddles, or struts, and associated fasteners that transmit loads between nonstructural components and their attachments to the structure.

F. Mechanical Attachments: Means by which components or supports of nonstructural components are secured or connected to the seismic force-resisting system of the structure. Such attachments include anchor bolts, welded connections, and mechanical fasteners.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. Section 220500: Basic Plumbing Materials and Methods

B. Section 220548: Vibration Isolation for Piping and Equipment

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide systems that are the standard product of an equipment manufacturer regularly engaged in the production of such units who issues complete catalog information on such products. Units shall not be fabricated by the Contractor.

B. Structural Performance: Restraint devices and systems shall withstand the effects of locally defined gravity loads, seismic loads, dead loads, live loads, winds loads and stresses within limits and under conditions indicated according to the Building Code and ASCE 7. Coordinate all support structures and restraint systems with project registered professional Structural Engineer.

C. Codes and Standards: Provide components conforming to the seismic load requirements of the latest addition of the local building code and the following:
   1. International Building Code with State Amendments
      a. Section 1613: Standard Occupancies
      b. Section 1616: Schools (DSA-SS/CC Projects in California)
      c. Section 1616A: Healthcare (OSHPD and DSA-SS Projects in California)
   2. American Society of Civil Engineers (ASCE):
      a. ASCE 7-10 - Minimum Design Loads for Buildings and Other Structures
   3. Mason West Inc., Seismic Restraint Guidelines
      a. OPM-0043-13 for all suspended piping.

1.6 PERFORMANCE REQUIREMENTS

A. Component Importance Factor:
   1. Ip=1.0: Standard Occupancies and components associated with Risk Category I, II, and III, including offices and schools.

1.7 SUBMITTALS

A. Product Data:
   1. Include rated load, rated deflection, and overload capacity for each device or system.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an

evaluation service or agency acceptable to authorities having jurisdiction.

b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Seismic Restraint Calculations

1. Where seismic restraint sizes, spacing and anchorage are included in the Mason West Seismic Restraint of Suspended Distribution Systems OSHPD pre-approval OPM-0043-13 no further calculations are required.
2. Where additional information is required:
   a. Seismic restraint calculations must be provided for all connections to the structure.
   b. Calculations must be stamped by a registered professional Structural Engineer.

1.8 MANUFACTURER AND CONTRACTOR RESPONSIBILITIES

A. All seismic restraints shall be designed by a registered professional Structural Engineer.

B. Seismic restraint layouts for piping shall be added to the contractor's shop drawings and shall include:

1. Location of seismic braces.

C. Submit seismic restraint layout drawings and special details for approval of the project registered professional Structural Engineer Seismic restraint layout drawings shall bear the stamp and signature of the registered professional Structural Engineer who designed the layout of the braces.

1.9 LOADS ON STRUCTURE

A. The responsibility of determining allowable loads on the structure is the sole responsibility of the project registered professional Structural Engineer.

B. Maximum support loads and seismic brace loads on the structure must be less than the maximum allowable loads defined by the project registered professional Structural Engineer, as shown on the plans.

C. Where maximum loads are not listed on the plans or the maximum allowable loads cannot be met, any additional support steel required to reduce support and seismic bracing loads on the structure shall be designed by the project registered professional Structural Engineer and installed by others.

D. Mechanical component supports and the means by which that are attached to the component shall be designed for the forces and displacements determined in ASCI 7-10 Section 13.3.1 and 13.3.2. Such supports include structural members, braces, frames, skirts, legs, saddles, pedestals, cables, guys, stays, snubbers, and tethers, as well as elements forged or cast as a part of the mechanical component.

E. Mechanical supports are those members, assemblies of members, or manufactured elements, including braces, frames, legs, lugs, snubbers, hangers, saddles, or struts, and associated fasteners that transmit loads between nonstructural components and their attachments to the structure.

F. Mechanical attachments are the means by which components or supports of nonstructural components are secured or connected to the seismic force-resisting system of the structure. Such attachments include anchor bolts, welded connections, and mechanical fasteners.

PART 2 - PRODUCTS

2.1 INTENT

A. All seismic restraints described in this section shall be the product of a single manufacturer.

B. Mason Industries products are the basis of these specifications; products of other manufacturers may be submitted for review provided their systems strictly comply with the specifications.

2.2 SEISMIC SWAY BRACING

A. Seismic sway braces shall consist of galvanized steel aircraft cables, steel angles or steel struts.

B. Cables braces shall be designed to resist seismic tension loads and steel braces shall be designed to resist both tension and compression loads. Brace end connections shall be steel assemblies that swivel to the final installation angle.

C. Cable brace assemblies shall have published strength and stiffness ratings based on testing per FM-1950 standards.

D. Angle or strut bracket assemblies shall be FM Approved except as noted below.

E. Steel angles or struts, when required, shall be clamped to the threaded hanger rods at the seismic sway brace locations utilizing a minimum of two ductile iron clamps.

F. Cable brace bracket assemblies shall be Type SCB or SCBH. Solid brace bracket assemblies shall be Type SSB-FM, SSBS-FM or SHB-FM. All bracket assemblies shall have published strength and stiffness values based on testing per FM-1950.

G. Rod clamps shall be Type SRC or UCC.

PART 3 - EXECUTION

A. All seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.

B. Installation of seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

C. No connections between the piping and the building structure shall be made that degrades the seismic restraint system herein specified.

D. Any conflicts with other trades due to inadequate space or other unforeseen conditions should be brought to the attention of the Owner’s Representative prior to

installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.

END OF SECTION