

## SECTION 23 0548

### VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Equipment support bases.
- B. Vibration isolators.
- C. Roof curbs.

##### 1.02 RELATED REQUIREMENTS

- A. Section 01 4533 - Code-Required Special Inspections.
- B. Section 03 3000 - Cast-in-Place Concrete.

##### 1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; 2015.

##### 1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
- C. Shop Drawings:
  - 1. Provide schedule of vibration isolator type with location and load on each.
  - 2. Fully dimensioned fabrication drawings and installation details for vibration isolation bases, member sizes, attachments to isolators, and supported equipment.
  - 3. Include auxiliary motor slide bases and rails, base weights, inertia bases, concrete weights, equipment static loads, support points, vibration isolators, and detailed layout of isolator location and orientation with static and dynamic load on each isolator.

##### 1.05 QUALITY ASSURANCE

- A. Perform design and installation in accordance with applicable codes.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Kinetics Noise Control, Inc; \_\_\_\_\_: [www.kineticsnoise.com](http://www.kineticsnoise.com).
- B. Mason Industries; \_\_\_\_\_: [www.mason-ind.com](http://www.mason-ind.com).
- C. Vibration Eliminator Company, Inc; \_\_\_\_\_: [www.veco-nyc.com](http://www.veco-nyc.com).
- D. Substitutions: See Section 01 6000 - Product Requirements.

##### 2.02 PERFORMANCE REQUIREMENTS

- A. General:
  - 1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
  - 2. Steel springs to function without undue stress or overloading.
  - 3. Steel springs to operate in the linear portion of the load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
  - 4. Lateral to vertical stiffness ratio to not exceed 0.08 with spring deflection at minimum 75 percent of specified deflection.
  - 5. All equipment mounted on vibration isolated bases to have minimum operating clearance of 2 inches between the base and floor or support beneath unless noted otherwise.

##### 2.03 EQUIPMENT SUPPORT BASES

- A. Structural Bases:

1. Construction: Engineered, structural steel frames with welded brackets for side mounting of the isolators.
  2. Frames: Square, rectangular or T-shaped.
  3. Design: Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.
  4. Applications: Adjustable motor slide rails for centrifugal fans.
- B. Concrete Inertia Bases:
1. Construction: Engineered, steel forms, with integrated isolator brackets and anchor bolts, welded or tied reinforcing bars running both ways in a single layer.
  2. Size: 6 inches minimum depth and sized to accommodate elbow supports.
  3. Mass: Minimum of 1.5 times weight of isolated equipment.
  4. Connecting Point: Reinforced to connect isolators and snubbers to base including template and fastening devices for equipment.
  5. Concrete: Filled on site with minimum 3000 psi concrete. See Section 03 3000 for additional requirements.
  6. Applications: Adjustable motor slide rails for centrifugal fans.

## 2.04 VIBRATION ISOLATORS

- A. Non-Seismic Type:
1. All Elastomeric-Fiber Glass Pads:
    - a. Configuration: Flat or molded.
    - b. Thickness: 0.25 inch minimum.
    - c. Assembly: Single or multiple layers using bonded, galvanized sheet metal separation plate between each layer with load plate providing evenly distributed load over pad surface.
  2. Elastomeric Mounts:
    - a. Material: Oil, ozone, and oxidant resistant compounds.
    - b. Assembly: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
  3. Steel Springs:
    - a. Assembly: Freestanding, laterally stable without housing.
    - b. Leveling Device: Rigidly connected to equipment or frame.
  4. Restrained Steel Springs:
    - a. Housing: Rigid blocking during rigging prevents equipment installed and operating height from changing during temporary weight reduction.
    - b. Equipment Wind Loading: Adequate means for fastening isolator top to equipment and isolator base plate to supporting structure.
  5. Elastomeric Hangers:
    - a. Housing: Steel construction containing elastomeric isolation element to prevent rod contact with housing and short-circuiting of isolating function.
    - b. Incorporate steel load distribution plate sandwiching elastomeric element to housing.
  6. Thrust Restraints:
    - a. Housing: Steel construction containing stable steel spring and integral elastomeric element installed in pairs to resist air pressure thrusts.
    - b. Bottom Openings: Sized to allow plus/minus 15 degrees rod misalignment.

## 2.05 ROOF CURBS

- A. Vibration Isolation Curbs:
1. Non-Seismic Curb Rail:
    - a. Location: Between existing roof curb and rooftop equipment.
    - b. Construction: Aluminum.
    - c. Integral vibration isolation to conform to requirements of this section.
    - d. Weather exposed components consist of corrosion resistant materials.
  2. Non-Seismic Curb:
    - a. Location: Between structure and rooftop equipment.

- b. Construction: Aluminum.
- c. Weather exposed components consist of corrosion resistant materials.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION - GENERAL**

- A. Install in accordance with manufacturer's instructions.
- B. Bases:
  - 1. Set steel bases for one inch clearance between housekeeping pad and base.
  - 2. Set concrete inertia bases for 2 inches clearance between housekeeping pad and base.
  - 3. Adjust equipment level.
- C. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- D. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.
- E. Provide pairs of horizontal limit springs on fans with more than 6.0 inches WC static pressure, and on hanger supported, horizontally mounted axial fans.
- F. Support piping connections to equipment mounted on isolators using isolators or resilient hangers for scheduled distance.
  - 1. Up to 4 Inches Pipe Size: First three points of support.
  - 2. 5 to 8 Inches Pipe Size: First four points of support.
  - 3. 10 inches Pipe Size and Over: First six points of support.
  - 4. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

#### **3.02 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect isolated equipment after installation and submit report. Include static deflections.
- C. Perform testing and inspections of the installation in accordance with Section 01 4533.

#### **3.03 SCHEDULE**

- A. Pipe Isolation Schedule.
  - 1. 1 Inch Pipe Size: Isolate 120 diameters from equipment.
  - 2. 2 Inch Pipe Size: Isolate 90 diameters from equipment.
  - 3. 3 Inch Pipe Size: Isolate 80 diameters from equipment.
  - 4. 4 Inch Pipe Size: Isolate 75 diameters from equipment.
  - 5. 6 Inch Pipe Size: Isolate 60 diameters from equipment.
  - 6. 8 Inch Pipe Size: Isolate 60 diameters from equipment.
  - 7. 10 Inch Pipe Size: Isolate 54 diameters from equipment.
  - 8. 12 Inch Pipe Size: Isolate 50 diameters from equipment.
- B. Equipment Isolation Schedule.
  - 1. HVAC Pumps.
    - a. Base: Structural steel base.
    - b. Isolator Type: Open spring isolators.
  - 2. Direct Fired Air Units.
    - a. Base: Structural steel base.
  - 3. Modular Water Chillers.
    - a. Base: Structural steel base.
  - 4. Air Cooled Condensing Units.
    - a. Base: Structural steel base.
  - 5. Rotary-Screw Water Chillers.
    - a. Base: Structural steel base.

6. Centrifugal Water Chillers.
  - a. Base: Structural steel base.
7. Induced Draft Cooling Tower.
  - a. Base: Structural steel base.
8. Air Cooled Refrigerant Condensers.
  - a. Base: Structural steel base.
9. Packaged Roof Top Air Conditioning Units.
  - a. Base: Structural steel base.

**END OF SECTION 23 0548**