

## SECTION 23 05 48

### VIBRATION AND SEISMIC CONTROL

#### PART 1 GENERAL

- 1.01 All vibration isolation and seismic control materials specified herein shall be provided by a single manufacturer to assure single responsibility for their proper performance. Installation of all vibration and seismic control materials specified herein shall be accomplished following the manufacturer's written instructions.
- 1.02 The Contractor shall furnish a complete set of shop drawings and other necessary information, of all mechanical equipment to receive vibration isolation and seismic devices, to the vibration isolation and seismic control materials manufacturer. The information to be furnished shall include operating weight of the equipment to be isolated, distribution of weight to support points and dynamic characteristics along with any internal isolation systems to be analyzed. The Contractor shall also furnish a complete layout of piping and ductwork to be isolated, including vertical risers, showing size or weight and support points of the piping and ductwork system, to the vibration isolation and seismic control materials manufacturer, for selection and layout of mountings.
- 1.03 The vibration and seismic control materials manufacturer shall use the above listed information to design a complete system of vibration and seismic mounts in accordance with the contract documents along with the International Building Code with date as indicated on the code analysis section of the contract documents, SMACNA "Seismic Restraint Manual" latest edition, and ASHRAE HVAC Applications handbook, Sound and Vibration Control section, latest edition. The vibration and seismic control materials Contractor shall analyze all "multiple degrees of freedom" systems, and provide properly designed isolation systems avoiding all resonance frequencies. To accomplish this, the vibration and seismic control materials supplier shall employ an Engineer registered in the State of South Carolina to design all isolation and restraint systems and prepare a complete set of calculations and shop drawing submittals with his professional Engineer's seal certifying that the design meets all requirements of these contract documents. A seismic design "errors and omissions" insurance certificate must accompany submittals from the vibration and seismic Engineer. Manufacturer's product liability insurance certificates are not acceptable.
- 1.04 The vibration and seismic control Engineer or his designated representative shall inspect the project upon completion of the applicable work and provide written certification that the installation is in compliance with the approved shop drawing submittals. This certification shall also bear the professional Engineer's seal and shall become part of the contract closeout documents. All seals shall be signed and dated appropriately.
- 1.05 Vibration and seismic control systems shall be provided by Vibration Mounting and Controls, Mason Industries, Consolidated Kinetics, or prior approved equal.

## PART 2 PRODUCTS AND EXECUTION

### 2.01 VIBRATION ISOLATION

- A. All mechanical equipment shall receive external vibration isolation. Internal component isolation of equipment shall not be considered equivalent, but shall be considered when analyzing systems with multiple degrees of freedom.
- B. Vibration isolators shall be selected based upon known operating weight distributions and dynamic characteristics of the isolated equipment, with the quantity and location as required by the component drawing. Isolator type shall be tabulated for each isolated piece of equipment. Complete calculations of vibration analysis shall be included with submittals, including but not limited to fundamental and harmonic frequencies.
- C. Isolators shall have either known non-deflected heights of spring element or calibration markings so that, after adjustment, when carrying their load, the deflection under load can be verified to determine if the load is within the proper range of the isolator and if the correct degree of vibration isolation is being provided.
- D. Isolators shall function in the linear portion of the load versus deflection curve. Theoretical vertical natural frequency shall not differ from the design objectives by more than + 10%.
- E. Spring mounts shall have seismic housings as required by Paragraph 2.02.
- F. Isolation of equipment shall be as follows:
  - 1. Suspended equipment shall be isolated from the building structure by means of noise and vibration isolators. Units shall be supported with spring and neoprene type isolators, springs to be as described above. Isolators shall be VMC Series RSH.
  - 2. Roof mounted equipment shall be isolated from the building structure by means of a structural aluminum or hot dipped galvanized structural steel isolation curb. The structural spring isolation curbs shall bear directly on the roof support structure and be flashed and waterproofed into the roof's membrane waterproofing system. Roof curbs shall be installed to accommodate the pitch of roof. Contractor shall provide and install all supplemental steel required for seismic attachment of curb to structure as designed by manufacturer. Field fabricated curbs shall not be used. Curb shall come factory assembled. No bolt together corners will be allowed. The curb shall consist of a rigid lower section containing properly spaced pockets with fully adjustable spring isolators. All springs shall be color coded for proper identification and spring pocket shall allow for easy removal or replacement of any spring without disturbance of the supported equipment. Pockets shall have removable waterproof covers to allow for spring adjustment. Spring pockets shall contain combination vertical and horizontal restraint in conjunction with a 1/4 inch thick neoprene rubber bushing which will resist wind and seismic forces. All springs shall be installed in series

with a 1/4-inch-thick neoprene acoustical cup or pad. Curbs supplied shall be factory acoustically lined with 1 inch 3 PCF duct liner. An air tight neoprene seal shall be incorporated into the curb design to prevent air leakage or infiltration. Air seal must not be exposed so that it could be damaged or that in the event of the air seal failure, water could leak into the curb's interior. Wood nailer and flashing shall be provided and curbs shall be manufactured to NRCA standards. Curbs shall include a means of incorporating a sound barrier package, consisting of two layers of waterproof gypsum board furnished and installed by the Mechanical Contractor. Individual pier supported curbs are not acceptable. Roof equipment supports to be VMC type P or R. For units installed on existing seismic curbs, provide new, hot dipped galvanized, seismically rated, adaptor curbs complete with integral duct transitions to match new equipment with existing configuration. Coordinate with existing conditions.

3. Mechanical equipment as noted shall be mounted on a rigid structural steel base. The equipment including the base shall be mounted on or suspended from vibration isolators as applicable. Base shall be VMC Type WFB.
4. Floor mounted equipment as noted shall be provided with a noise and vibration isolated structural steel concrete slab inertia base mounted on isolators. Spring mounts shall be recessed at corners. Inertia base shall be VMC Type MPF or WPF as applicable.

## 2.02 SEISMIC CONTROL:

- A. All mechanical equipment, piping, ductwork, etc. shall be provided with seismic restraints in accordance with the 2006 International Building Code, 2006 International Mechanical Code, and SMACNA Seismic Restraint Manual, Latest Edition requirements, as a minimum.
  1. All equipment isolated or not, shall be bolted to the structure to allow for seismic acceleration with no failure or displacement. All connections shall be positive bolted type; no friction clamps of any kind are allowed.
  2. Provide cable and connection sets for suspended equipment at each of four corners secured to the building structure.
  3. Provide seismic roof curb systems fastened to roof structure for roof top equipment.
  4. Floor mounted equipment shall be provided with seismically housed springs or springs with seismic snubbers as determined by the equipment to be isolated.

## END OF SECTION