

## VISCMA 102-12

### **VIBRATION ISOLATION SPECIFICATION GUIDELINES FOR MECHANICAL, ELECTRICAL AND PLUMBING SYSTEMS**

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#### **1.0 General**

##### **1.01 Related Work Specified Elsewhere**

- 1) VISCMA 101-12: Seismic Restraint Specification Guidelines for Mechanical, Electrical and Plumbing Systems
- 2) *(Applicable Seismic Restraint portion of specs - fill in as required)*

##### **1.02 Definitions and Referenced Standards**

- 1) FEMA: Federal Emergency Management Agency
- 2) FEMA Seismic Restraint Installation Manuals 412, 413 & 414
  - A. FEMA 412: Installing Seismic Restraints for Mechanical Equipment
  - B. FEMA 413: Installing Seismic Restraints for Electrical Equipment
  - C. FEMA 414: Installing Seismic Restraints for Duct and Pipe
- 3) VISCMA: Vibration Isolation and Seismic Control Manufacturers Association
- 4) ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- 5) ASHRAE Applications Handbook; Vibration Isolation Chapter
- 6) ASHRAE: A Practical Guide to Seismic Restraint

##### **1.03 Performance Requirements**

- 1) All equipment requiring isolation shall be isolated per Table 47, Sound and Vibration Control Chapter 48 of the 2011 ASHRAE Handbook HVAC Applications.

- 2) Provide vibration isolators, base frames and inertia bases of sufficient size and design to assure that deflection and stability requirements are met. Isolators shall be provided to deflect uniformly under operating loads.
- 3) Steel springs shall be selected to perform their function without undue stress or overloading. All isolators shall have a minimum  $\frac{1}{4}$ " thick elastomeric or fiber glass acoustical pad within the vertical load path.
- 4) Stable steel springs shall be designed to operate in the linear portion of their load versus deflection curve and must be linear over a deflection range of not less than 50 percent above the specified deflection. The ratio of lateral to vertical stiffness shall be not less than 0.8. The designed deflection of each spring must be at least 75% of specified deflection.
- 5) Where called for in the specifications or on the drawings, all structural steel bases supporting vibration isolated equipment, including concrete filled inertia bases, shall be designed and fabricated by the vibration isolation manufacturer.
- 6) Unless otherwise indicated, all equipment mounted on vibration isolated bases shall have a minimum operating clearance of 2" between the base and floor or support beneath.

#### **1.04 Submittals**

- 1) Submittals that document that the specific vibration isolators utilized are in compliance with the specifications. Submittals shall include all information required per Section 1.03.
- 2) Submittal Drawings shall include the following:
  - A. Vibration Isolation Bases: Dimensional drawings, including member sizes, attachments to isolators and supported equipment. Include auxiliary motor slide bases and rails, base weights, concrete weights, equipment static loads, support points and vibration isolators.
  - B. Detailed layout of the isolator orientation.

### **1.05 Coordination**

- 1) Contractor shall coordinate size of all housekeeping pads supporting equipment with the vibration isolation manufacturer.
- 2) Contractor shall coordinate with vibration isolation manufacturer, equipment manufacturer and structural engineer to locate and size structural supports underneath equipment (e.g. roof curbs, cooling towers and other similar equipment).

### **1.06 System Design**

- 1) Vibration isolation manufacturer shall be responsible for the selection of the attachment hardware as required to attach vibration isolators to both the equipment and supporting structure. Caution shall be taken regarding anchorage in wind and seismic areas as required. Refer to VISCMA Document 101-12 for seismic anchorage.
- 2) The contractor shall furnish to the vibration isolation manufacturer a complete set of approved shop drawings of all equipment which is to be isolated. From these drawings the selection and design of isolation devices and/or attachment hardware will be completed. The shop drawings furnished shall include, at a minimum, basic equipment layout, length and width dimensions, and installed operating weights of the equipment to be vibration isolated.

### **1.07 Installation**

Vibration isolation materials specified herein shall be installed following the manufacturer's written instructions. Installation instructions shall be submitted to the engineer of record for approval prior to the beginning of the work.

## **2.0 Materials**

### **2.01 Source of Materials**

- 1) The materials and systems specified in this section should be purchased from a VISCMA member to assure professional responsibility for the performance of the vibration isolators. See Appendix A or [www.viscma.com](http://www.viscma.com) for a list of current members.
- 2) Materials and systems specified herein and detailed or scheduled on the drawings are not specific to any one VISCMA member. Materials and systems provided must meet all requirements as listed in this specification.

## 2.02 Factory Finishes

All steel components shall be cleaned of welding slag and coated with an approved primer. All steel components (excluding springs) on projects exposed to the weather, shall be hot dip galvanized or powder coated. Springs shall be cadmium or zinc plated, powder-coated, epoxy or PVC finished.

## 2.03 Vibration Isolation Types

Vibration Isolators contained herein are per Table 47, Sound and Vibration Control Chapter 48 of the 2011 ASHRAE Handbook HVAC Applications.

See Appendix A for manufacturers' model designations.

### 1) Type 1: Elastomeric/ Fiber Glass Pads

- A. Elastomeric isolators are available in pads and molded configuration.
- B. Pads are used in single and multiple layers. When using multiple layers, use a bonded, galvanized sheet metal separation plate between each layer.
- C. A load distribution plate may be required to evenly distribute the load over the surface of the pad.

### 2) Type 2: Elastomeric Mounts

- A. Vibration Isolators shall be elastomeric, molded from oil, ozone and oxidant resistant compounds, designed to operate within the strain limits of the material.
- B. Isolators shall include encapsulated load transfer plate for bolting to equipment and a base plate with anchor holes for bolting to the supporting structure.

### 3) Type 3: Steel Spring Isolators

- A. Freestanding and laterally stable spring assembly without a housing, complete with elastomeric acoustical friction pads.
- B. Provide leveling device rigidly connected to the equipment or frame above.

**4) Type 4: Restrained Spring Isolators**

- A. Spring Isolator equipped with a restrained steel housing to prevent the equipment's operating height from changing should it be necessary to temporarily remove a portion of its weight.
- B. The housing will also function as rigid blocking during rigging so that the installed height and the operating height of the isolated equipment remains the same.
- C. Isolator top shall have adequate means for fastening to the equipment, and baseplate shall have adequate means for fastening to the supporting structure, when the equipment is subject to wind loading.

**5) Type H1: Elastomeric Hanger**

- A. An elastomeric isolation element contained in a steel hanger housing.
- B. The elastomeric element/hanger shall be shaped to prevent the rod from contacting the housing and thereby short-circuiting the isolation.
- C. A steel load-distribution plate shall be incorporated/furnished sandwiching the elastomeric element to the hanger housing.

**6) Type H2: Spring Hanger**

- A. A stable steel spring contained in a steel hanger housing, with an integral elastomeric element to prevent metal to metal contact.
- B. The bottom hole must be large enough to allow a +/- 15 degree (30 degree total) rod misalignment.

**7) Type H3: Combination Elastomeric/Spring Hanger**

- A. A stable steel spring contained in a steel hanger housing.
- B. An elastomeric element is added in series to isolate the upper connection of the hanger box to the structure.
- C. The bottom hole must be large enough to allow a +/- 15 degree (30 degree total) rod misalignment.

**8) Type 5: Thrust Restraints**

- A. Type H2 Spring Hangers installed in pairs to resist the thrust caused by air pressure.

**2.04 Equipment Support Base Types**

Equipment Support Bases contained herein are per Table 47, Sound and Vibration Control Chapter 48 of the 2011 ASHRAE Handbook HVAC Applications. See Appendix A for manufacturers' model designations.

**1) Type B: Structural Bases**

- A. Engineered steel frames manufactured from structural steel shapes with welded height-saving brackets as required for side mounting of the isolators.
- B. Frames may be square, rectangular or T-shaped.
- C. Adjustable motor slide bases shall be included when required for centrifugal fan applications.

**2) Type C: Concrete Inertia Bases**

- A. Engineered steel forms with integrated isolator brackets.
- B. Bases shall be shipped ready to be filled with concrete on job site by the contractor.
- C. Bases shall include welded or tied reinforcing bars running both ways in a single layer.
- D. The bases shall include a template and fastening devices for the equipment.
- E. Weight of concrete and frame shall not be less than the weight of the equipment it supports.
- F. Depth of the inertia base shall be at least six inches.
- G. The inertia base shall be sized to accommodate the elbow support(s).
- H. Adjustable motor slide bases shall be included when required for centrifugal fan applications.

**3) Type D-1: Curb Isolation Rails**

- A. Vibration isolation curb element inserted between rooftop equipment and existing roof curbs. It shall be of aluminum or steel construction and shall be attached to the equipment as specified by the curb isolation manufacturer.
- B. Incorporated vibration isolators shall meet the specific characteristics described in Section 1.03.
- C. Components exposed to the weather shall be galvanized or manufactured out of corrosion resistant materials.
- D. Contractor is responsible for proper attachment of curb isolation to the existing curb.
- E. Contractor is responsible for verifying the adequacy of the existing curb and its anchorage to the roof structure.

**4) Type D-2: Vibration Isolated Roof Curbs**

- A. Curbs used to attach rooftop equipment to the structure shall be of aluminum or steel construction and shall be attached to the equipment as specified by the curb manufacturer.
- B. Incorporated vibration isolators shall meet the specific characteristics described in Section 1.03.
- C. Components exposed to the weather shall be galvanized or manufactured out of corrosion resistant materials.
- D. Contractor is responsible for proper attachment of rooftop curb to building structure.
- E. Contractor is responsible for coordinating the location of adequate structural support for the rooftop curb with the general contractor.

### **3.0 Installation and Inspection**

#### **3.01 Installation**

- 1) Installation of all vibration isolation materials specified in this section shall be as per the manufacturer's written instructions. Vibration isolators must not be installed in a manner that will result in piping stress or misalignment.
- 2) Upon completion of installation of all equipment and vibration isolation materials and before adjusting the isolators, all debris shall be cleaned from beneath the isolated equipment, to avoid the possibility of short-circuiting the isolation system.
- 3) The contractor shall notify the local representative of the vibration isolation manufacturer prior to installing any vibration isolation devices. The contractor shall seek the representative's guidance in any installation procedures with which he is unfamiliar.

#### **3.02 Inspection**

- 1) Upon completion of the installation of all vibration isolation devices herein specified, the local representative of the vibration isolation manufacturer shall, at the contractor's request, inspect the completed system and report in writing any installation errors or other fault in the system which could affect the performance of the system.
- 2) The installing contractor shall submit a report upon request to the building architect and/or engineer, including the manufacturer's representative's final report, indicating that all vibration isolation material has been properly installed, or steps that are to be taken by the contractor to properly complete the vibration isolation work as per the specifications.



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VISCMA is a non-profit association representing the manufacturers of seismic restraint, vibration isolation and noise control equipment. The primary objectives of the organization are to educate the construction industry on the proper use and application of vibration isolation and seismic restraint and to develop standards to continually improve the industry.

In partnership with FEMA and ASCE, VISCMA also publishes three Seismic Installation and Inspection Manuals designed to assist field personnel.

The association office is located at 994 Old Eagle School Road, Suite 1019, Wayne, PA 19087-1866 and can be reached at 610-971-4850 or [info@viscma.com](mailto:info@viscma.com).

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### Appendix A. Vibration Isolation Type and Manufacturer

Vibration Isolation Type	Product Description	Product Manufacturer	VISCMA Member Model(s)
1	Elastomeric / Fiberglass Pads	CalDyn/California Dynamics	RP ECPR VT FP EP
		Kinetics Noise Control, Inc., Inc.	KIP/RSP/NPS/NGS/ NPD/NGD
		M.W. Saussé & Co., Inc.	R/RP/IC/ICP
		Mason Industries, Inc.	W/SUPER W
		Thybar Corporation	
		TOLCO	RP ECPR VT FP EP
		Vibration Eliminator Co., Inc.	100N/200N/400N (NP)
		Vibro-Acoustics	N/NS/NSN/NSNS
	The VMC Group	MAXIFLEX/NRC/ SHEARFLEX/NR FABRIFLEX/NDB	
2	Elastomeric Mounts	CalDyn/California Dynamics	RM-D JQTQN
		Kinetics Noise Control, Inc.	KLM/RDA/RDB/RDC/ RDD/RQ/AC
		M.W. Saussé & Co., Inc.	SD/DD/FU/FUD
		Mason Industries, Inc.	BRA/BRB/BRC/BRD RAA, RBA, RCA, RDA
		Thybar Corporation	
		TOLCO	RM-D JQTQN
		Vibration Eliminator Co., Inc.	T44/D44/T54/3865 (TD)
		Vibro-Acoustics	R/RD/SRD
	The VMC Group	RSM/RDC/MB R/RD/RVD	
3	Steel Spring Isolators	CalDyn/California Dynamics	SSL SSK
		Kinetics Noise Control, Inc.	FDS
		M.W. Saussé & Co., Inc.	RMS
		Mason Industries, Inc.	SLF
		Thybar Corporation	
		TOLCO	SSL SSK
		Vibration Eliminator Co., Inc.	OST
		Vibro-Acoustics	FS/FST/SFS/CM
	The VMC Group	A-SERIES/SW/AW	
4	Restrained Spring Isolators	CalDyn/California Dynamics	JQ OS DLK RJJEQ GENX
		Kinetics Noise Control, Inc.	FLS/FLSS/FTS/FRS/ FHS
		M.W. Saussé & Co., Inc.	RMU/RMLS
		Mason Industries, Inc.	SLR/SLRS
		Thybar Corporation	
		TOLCO	JQ OS DLK RJJEQ GENX
		Vibration Eliminator Co., Inc.	KW
		Vibro-Acoustics	CSR/SCSR/SFS
	The VMC Group	MS/MSS/AWRS/M SWSR/AMSR/AEQM/ ASCM	

H1	Elastomeric Hangers	CalDyn/California Dynamics	RH RH-D
		Kinetics Noise Control, Inc.	RH/FH/AF/AR
		M.W. Saussé & Co., Inc.	HSS/HSSJ
		Mason Industries, Inc.	HD/CRCH
		Thybar Corporation	
		TOLCO	RH RH-D
		Vibration Eliminator Co., Inc.	1C/3C/3CTD
		Vibro-Acoustics	RH/RHD/NH
		The VMC Group	HR/RH/BRD/HRD
H2	Spring Hangers	CalDyn/California Dynamics	CH/30
		Kinetics Noise Control, Inc.	SH/SPH
		M.W. Saussé & Co., Inc.	RMXA/RMXA-1C
		Mason Industries, Inc.	30/CSCH
		Thybar Corporation	
		TOLCO	506 - CH/30
		Vibration Eliminator Co., Inc.	SNC
		Vibro-Acoustics	SH/SHC
		The VMC Group	HSA SH/BSA
H3	Combined Elastomeric/Spring Hangers	CalDyn/California Dynamics	HH/30
		Kinetics Noise Control, Inc.	SFH/SRH/ARS/SHAA/ SHAB/SRHL/SFPH/ SRPH
		M.W. Saussé & Co., Inc.	HXA/HMXA
		Mason Industries, Inc.	30N
		Thybar Corporation	
		TOLCO	506 – HH/30
		Vibration Eliminator Co., Inc.	SNRC
		Vibro-Acoustics	SHR/SHB/SHRB
		The VMC Group	HRSA RSH-30A/BSRA

Equipment Support Base Type	Product Description	Product Manufacturer	VISCMA Member Model(s)
B	Structural Bases	CalDyn/California Dynamics	WW SW XW
		Kinetics Noise Control, Inc.	SFB-W/SFB-C
		M.W. Saussé & Co., Inc.	RMSB/RMLSB/RMLS-SB
		Mason Industries, Inc.	MSL/WFSL
		Thybar Corporation	
		TOLCO	WW SW XW
		Vibration Eliminator Co., Inc.	UN-OST/UN-KW
		Vibro-Acoustics	CTB/BASIS/IFB
C	Concrete Inertia Bases	The VMC Group	SFB/WFB/WX/WSB
		CalDyn/California Dynamics	CW
		Kinetics Noise Control, Inc.	CIB-L/CIB-H
		M.W. Saussé & Co., Inc.	RMSBI
		Mason Industries, Inc.	BMK/KSL
		Thybar Corporation	
		TOLCO	CW
		Vibration Eliminator Co., Inc.	OST/KW Frames
D-1	Curb Isolation Rails	Vibro-Acoustics	BASE/CIB/TCIB/LCIB
		The VMC Group	MPF/CPF/WPF
		CalDyn/California Dynamics	JQ
		Kinetics Noise Control, Inc.	KSR
		M.W. Saussé & Co., Inc.	RMU-BRT
		Mason Industries, Inc.	CMAB
		Thybar Corporation	Vibro-Rail
		TOLCO	JQ
D-2	Roof Curbs (Isolated)	Vibration Eliminator Co., Inc.	'AR' Bases
		Vibro-Acoustics	RTR/ARTR
		The VMC Group	RTIR
		CalDyn/California Dynamics	MW YW
		Kinetics Noise Control, Inc.	KSCR/ESR/ KineticsCurb
		M.W. Saussé & Co., Inc.	VIC/VIC-SS
		Mason Industries, Inc.	RSC/ISC
		Thybar Corporation	Vibro-CurbIII, Vibro-MateII
		TOLCO	MW YW
		Vibration Eliminator Co., Inc.	VERC
		Vibro-Acoustics	VCR/ARTR
		The VMC Group	P-6100/P-6200/P-6300 P-7100/P-7200/P-7300

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