

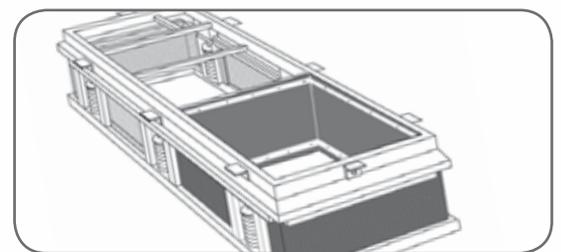
# Vibration Control Products for HVAC Equipment



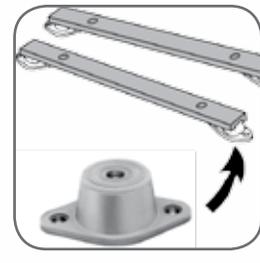
## Mechanical Control Systems

Product Catalog

**Seismic Design**



**Vibration Control**



**Roof Curbs**



THE VMC GROUP

## VMC Vibration Control Products for HVAC Equipment

The VMC group is comprised of four leading global brands that together represent the state of the art in shock, vibration seismic and noise control.

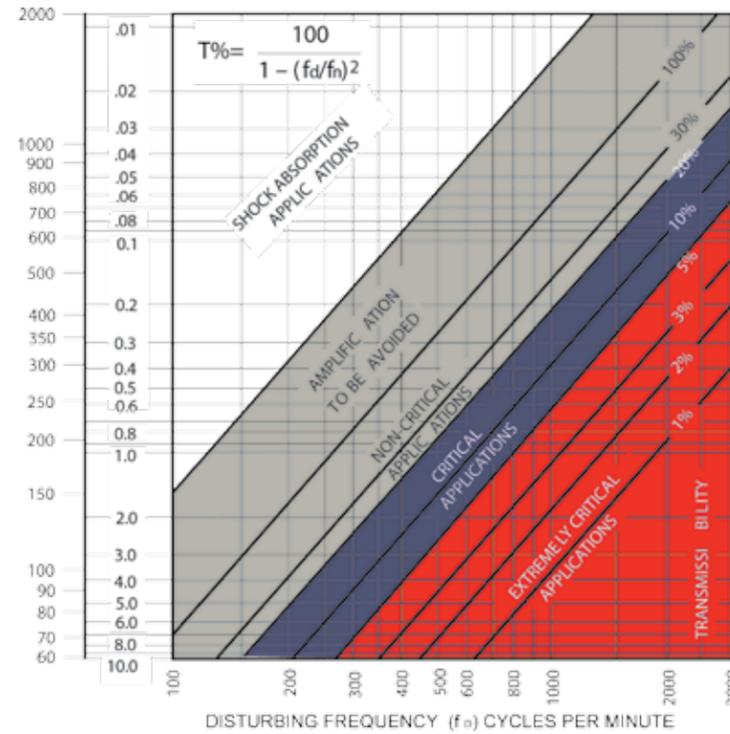
Vibration Mountains & Controls has delivered innovative vibration isolation products and solutions to the HVAC industry for 65 years.

Aeroflex international isolators has provided mission critical products and solutions to leading military, aerospace and defense companies for more than 35 years.

Korfund dynamics has delivered cutting edge products and solutions to global leaders in the industrial machinery, construction equipment, and power generation industries for over 100 years.

Amber/Booth has provided quality products to the HVAC, defense, transportation and OEM markets for over 60 years. Amber/Booth is a member of the vibration isolation and seismic control manufacturers association and the American society of heating, refrigerating, and air-condition engineers, inc.

We offer one of the most extensive product lines in the industry. Our engineering staff includes leading mechanical and structural engineers with industry recognized credentials in structural analysis, elastomer development, machine design and system dynamics. We are headquartered in a 70,000 sq. ft. state of the art facility in Bloomington, New Jersey.



The chart above illustrates graphically the static deflection required of a vibration isolation mounting to limit the transmission of vibration to a given percentage of the total vibratory force of the equipment. The chart also suggests the maximum permissible transmissibility for various conditions encountered in HVAC equipment installations.

To use the chart, determine the lowest rotational speed of the equipment - consider this as the disturbing frequency. Move vertically to the slanted line corresponding to the % of transmissibility which can be tolerated. Then move horizontally to the left to determine the natural frequency and static deflection required of the mounting.

See the following brochure pages for a wide variety of VMC products and selection guide which provide the static deflections called for in the chart.



### Type 1 Series "RD" Mountings

VMC Series R/RD neoprene isolators are molded in four sizes and can support up to 4000 lb. per isolator. They offer up to .5 inches of static deflection for excellent vibration isolation. All of our R/RD series isolators are molded completely in color for ease of identification, and all metal parts are completely embedded in neoprene for corrosion resistance. A tapped hole in the center of the mounting enables it to be securely bolted to the equipment. The mountings can also be furnished with a positioning pin (Series RP/RDP) for use with equipment that has inaccessible bolt holes.



### Type 2 Series "AC" Spring-Flex Mountings

VMC Series AC Spring-Flex mountings are free standing and laterally stable spring mountings. The coils are designed with an excellent ratio between the coil O.D. and operating height insuring lateral stability. In all of our designs, this ratio is a minimum of 0.80 and many have approximately a 1 to 1 ration. In addition, our coils are designed with low operating stresses thus insuring a long operating life of the mounting. All of our open spring mounts have leveling capability and include a bolt hole in the bottom cup or a two hole rectangular baseplate for bolting to the structure. They are available with deflections up to 5 inches (127 mm) and are recommended for use directly under most HVAC equipment and in conjunction with structural steel bases and concrete inertia blocks.

#### Series "C" Spring-Flex Mountings

Recommended for applications requiring up to 1' of static deflection. Neoprene stabilizers provide lateral control without binding. All mountings have leveling bolts. Non-skid neoprene acoustical pad eliminates bolting. Standard capacities 50 to 26,000 lbs.



### Type 3 Series "AWRS" Spring-Flex Mountings

VMC Series AWRS Spring-Flex Mounts utilize our open spring isolators within a welded steel housing. The housing is designed to limit vertical movement when used under equipment with large variations in mass such as chillers, or to prevent excessive motion of outdoor equipment, such as cooling towers, due to high wind loads. The AWRS design also acts as a secure blocking during equipment installation and offers full leveling capability. These mountings are available with up to 5 inches of static deflection and can be designed to support virtually any load.

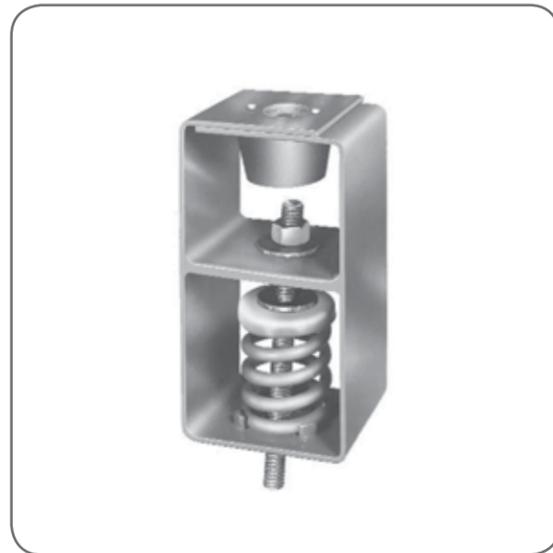
## Type 4 Series "RSH" Spring-Flex Hangers

VMC Series RSH Spring Flex hangers provide optimum vibration isolation for suspended piping and equipment. They incorporate a color coded steel spring in series with a neoprene rubber element. This combination is excellent for critical applications where it is important to isolate both vibration and structure-borne noise. Load ranges from 21 lb. to 5000 lb. and up to 5 inches of static deflection offer a wide variety of choices to insure proper support. Series RSH-30A offers all of the above features plus the capability for the lower hanger rod to swing approximately 30 to compensate for rod misalignment. The 30 misalignment capability insures that the rod does not short circuit the hanger by coming in contact with the hanger box.



## Type 5 Series "RSHP" Spring-Flex Hangers

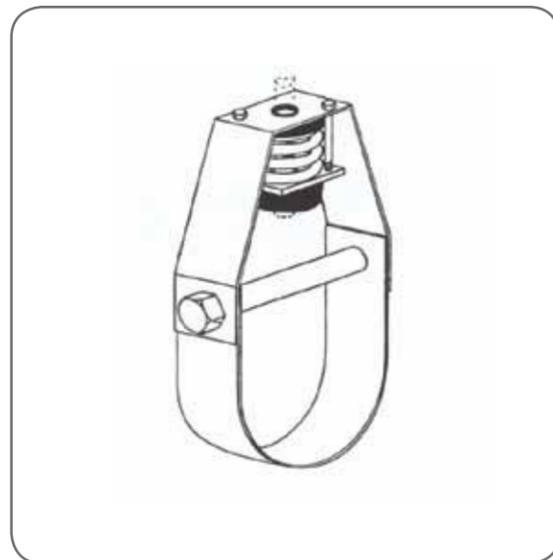
To prevent load transfer to the equipment flanges when the piping system is filled, VMC has designed pre-positioning hangers which should be installed at the first three hanger locations adjacent to the equipment. Series RSHP incorporates a load bearing plate within the hanger box which keeps suspended piping at a fixed elevation during installation and start-up. Once the system is filled, the load is transferred from the plate to the spring insuring minimal movement in the piping. This design insures that the weight of the piping is kept off isolated equipment in order to maintain alignment, protect flexible connectors, and keep equipment isolators from becoming overloaded. Series RSHP is capable of supporting loads up to 5000 lbs. and offers up to 2 inches of static deflection.



## Type 6 Series "CIH" Clevis Isolation Hanger

The VMC Series CIH, CIR, TIH and TIR isolation hangers are revolutionary designs that incorporate a clevis or trapeze pipe support combined with vibration isolation in one product.

The built-in spring and neoprene pre-compression system coupled with flanged bushings on neoprene parts hold the isolation components into the pipe clevis assembly. You can now hang and pipe and isolate it in one labor saving step. Gone is the old method of hanging a pipe and then going back to cut the rod and install the isolation hanger.



## Type 7 Series "RSHPR" or "RSHPR-30A" Spring-Flex Hangers

The RSHPR line of hangers offers a pre-compressed spring designed to keep suspended equipment and piping at a fixed elevation during installation.



## Type 8 Series "SH" and "SHSC" Spring-Flex Hangers

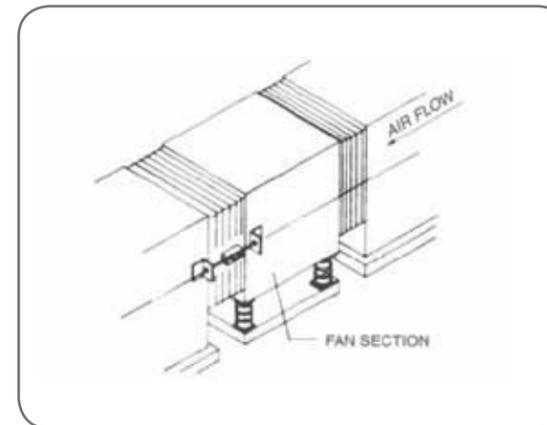
VMC Series SH Spring-Flex hangers provide excellent vibration isolation for suspended piping and equipment. They incorporate a color coded steel spring for ease of identification in the field. Load ranges from 21 lb. to 5000 lb. and up to 5 inches of static deflection offer a wide variety of choices to insure proper support.

Series SH-30A offers all of the above features plus the capability for the lower hanger rod to swing approximately 30 to compensate for rod misalignment. The 30 misalignment capability insures that the rod does not short circuit the hanger by coming in contact with the hanger box.



## Type 9 Series "SA" Spring-Flex Hangers

The SA hanger incorporates a color coded steel spring seated in a neoprene cup with an integral bushing to insulate the lower support rod from the hanger box. The hanger box is hinged to allow for a minimum of 30 misalignment between the rod attachment to the structure and the connection to the supported equipment.

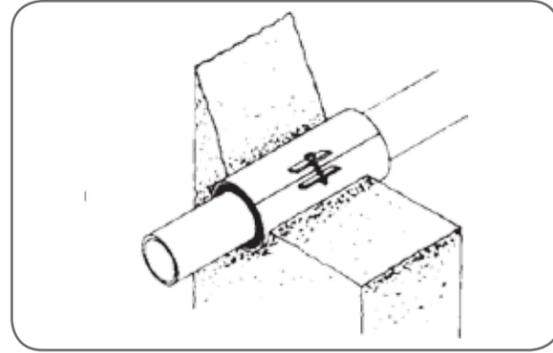


## Type 10 Series "HTR" Thrust Restraints

Excessive movement of air handling equipment can be controlled with our series HTR Horizontal Thrust Restraints. Motion resulting from high starting torque or air thrust will be limited to 1/4 inch.

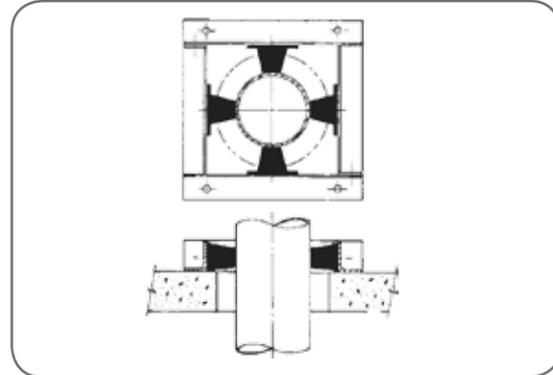
## Type 11 Series "VCS" Sleeves

VMC Series VCS wall, floor, and ceiling sleeves provide an acoustical barrier that fits tightly around piping where it must penetrate floors, walls, or ceilings. If such penetrations are not properly sealed, they provide a path for airborne noise which can destroy the integrity of the occupied space.



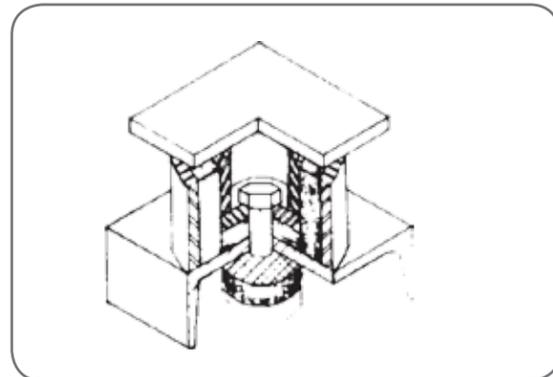
## Type 12 Series "RPG" Pipe Guide

Where vertical piping runs between support points, a resilient pipe guide should be provided. The guide consists of an angle frame and four double deflection neoprene mountings molded in specific colors for proper identification of rated load capacity.



## Type 13 Series "MDPA" Pipe Anchors

VMC Series MDPA pipe anchors are designed to eliminate or guide pipe movement, and must be rigidly attached to the structure.



## Type 14 Series "VMS," "VMT," and "VMU" QuietSphere Flexible Connectors

Single-sphere (VMS), twin-sphere (VMT), and union (VMU) connectors are molded of neoprene and synthetic fiber and furnished with corrosion resistant floating steel flanges. Operating temperature to 240 F and operating pressure to 214 psi. Compensates for expansion, compression, transverse movement, and angular deflection. Reduces vibration and noise transmission. Size 1 1/4" to 20" I.D.



## Type 15 Series "AEQM" Spring-Flex Mountings

Designed for seismic and restrained applications, these mountings are capable of withstanding a minimum of 1.0g accelerated force in all directions and provide static deflections up to 2" and loads to 2500 lbs. They also incorporate an all-directional neoprene grommet and an adjustable upward rebound plate. These mountings have been tested by an independent test laboratory and results are available on request.



### Series "AWMR" Restrained Spring-Flex Mountings

The design incorporates a rugged welded steel housing with vertical and horizontal limit stops able to withstand a minimum of 1.0g accelerated force in all directions. Loads to 10,000 pounds and static deflections to 2". They are particularly recommended for equipment with differing installed and operating loads such as cooling towers and chillers or equipment subjected to severe wind loads.

### Series "ASCM" Restrained Spring-Flex Mountings

Designed for seismic and restrained applications, these mountings when properly installed and adjusted will restrain mechanical equipment during a seismic event. For equipment that requires restrained isolators due to change in load, the ASCM incorporates a vertical limit stop to reduce motion.

## Type 16 Series "SR" Seismic Restraints

Fabricated of welded steel components incorporating thick neoprene elastomer pads molded to Bridge Bearing quality specifications, the design of these restraints allows for the removal and replacement of the neoprene elements. These restraints are designed for a minimum of 1.0g accelerated force in all directions. Series SR for loads from 250 to 12,000 lbs.



## Type 17 Series "SCR" Seismic Cable Restraints

VMC Series SCR Seismic Cable Restraints are recommended for use to restrain suspended piping, equipment, and ductwork during a seismic event. Our cable restraint kits are manufactured from 7 x 19 galvanized aircraft cable, and are available in 1/8", 1/4", and 3/8" diameters.

One cable restraint kit consists of the following components:  
2 cable lengths swaged at one end; 4- cable restrain angle brackets; 4-shackles; 4- cable clips; 2- thimbles.



## Type 18 Series "RSM" Elastomer Mount

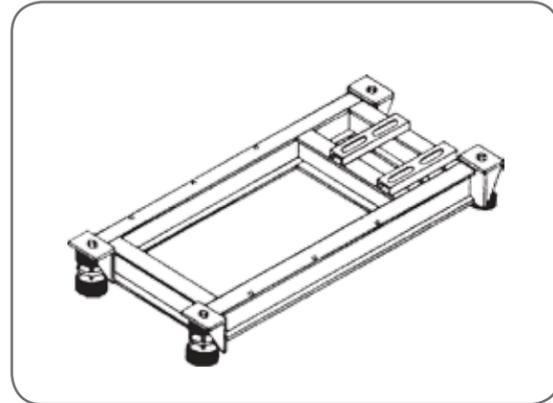
VMC Series RSM Elastomeric Seismic Mounts are available in two sizes and can handle loads from 60 lbs. to 1300 lbs. The rugged cast housing and high grade neoprene elastomer offers seismic restraint capability and vibration isolation in one complete mount.

The RSM Series is excellent for use under small mechanical equipment requiring seismic restraint.



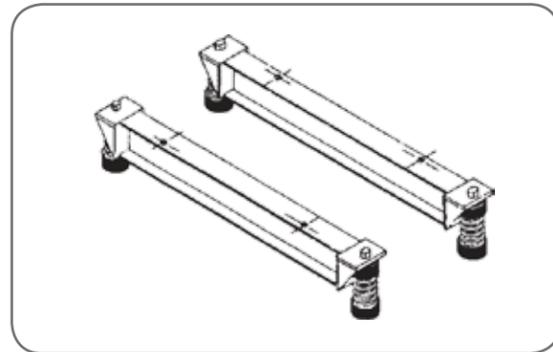
## Type A Type "WFB" Structural Steel Base

VMC manufactures a complete line of fan and motor bases which should be specified for all belt driven centrifugal fans that do not require a concrete inertia block. Available with an adjustable motor slide rail, VMC Series WFB bases are designed to maintain proper drive alignment and resist starting torque without the use of restraining snubbers.



## Type B Series "WFR" Structural Steel Rails

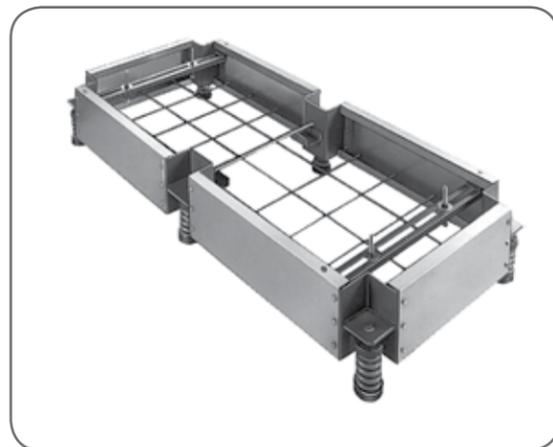
Whenever mechanical equipment lacks the proper rigidity for point support, VMC Series WFR rails should be utilized. Like our bases, Series WFR rails are available in wide flange, angle, or channel steel and can be designed for use with any isolator in our product line.



## Type C Types "MPF" and "WPF" Concrete Inertia Bases

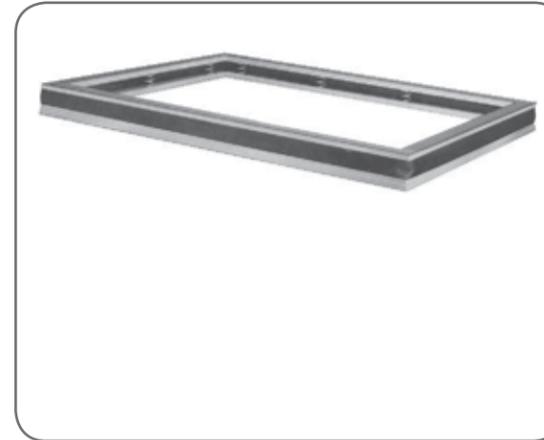
Mechanical equipment requiring a concrete inertia base can now be quickly and economically installed using VMC's modular pouring forms. These study lightweight bases, when filled with concrete, are an effective means to isolate vibration and limit motion of any equipment.

The added mass of WPF/MPF inertia bases lowers the center of gravity (Cg) of the equipment and allows a softer isolation system to be used. Greater isolation efficiencies can now be obtained while limiting the motion of supported equipment.



## Type D Type "AXR" Spring Isolation Base

Type AXR Spring-Flex Bases are designed to isolate curb mounted rooftop equipment from the building structure. The 'Unitized' base is fabricated from extruded aluminum upper and lower members, with electro-zinc plated springs designed for 1" static deflection. The springs are mechanically fastened, sized and positioned within the frame to ensure uniform deflection for the entire system. A continuous flexible "Hydro-Gard" seal is factory attached between the upper and lower members, and a continuous closed cell neoprene gasket bonded to the top and bottom surfaces provides an air and water-tight seal.

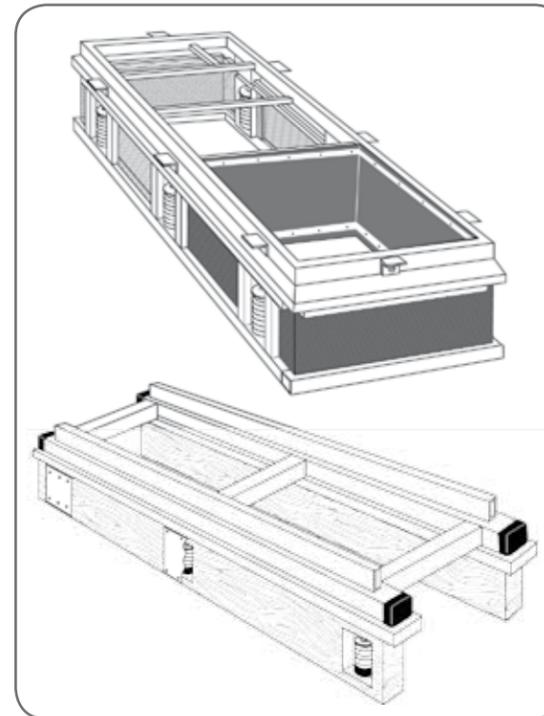


## Type E Type "P" Series Isolation Curbs Type "R" Series Isolation Rails

VMC's "P" series curbs and "R" series rails are high quality, fully adjustable support systems specifically designed for rooftop unit vibration isolation and seismic/wind restraint. Each custom built unit incorporates both the roof curb and spring isolation into one complete structure. VMC engineers design each curb and rail to custom fit any rooftop mechanical equipment.

Spring deflections up to 3 inches can be specified to compensate for large floor spans, and spring pockets are positioned within the curb at the correct load points for proper support and seismic restraint.

All spring pockets incorporate a minimum 1/4" neoprene cup or pad in series with the spring to provide optimum isolation efficiency.



## Type 19 Series "VLM" Level-Flex Leveling Mounts

Series VLM Mountings utilize oil-resistant neoprene elastomers to provide effective shock and vibration control for all types of general metal working and processing machinery. Built-in-Leveling feature provides height adjustment to compensate for unequal mounting deflection or floor irregularities. Ribbed design of mounting base provides non-skid surface, eliminating the need for bolting to floor. Cuts machine installation time from hours to minutes.

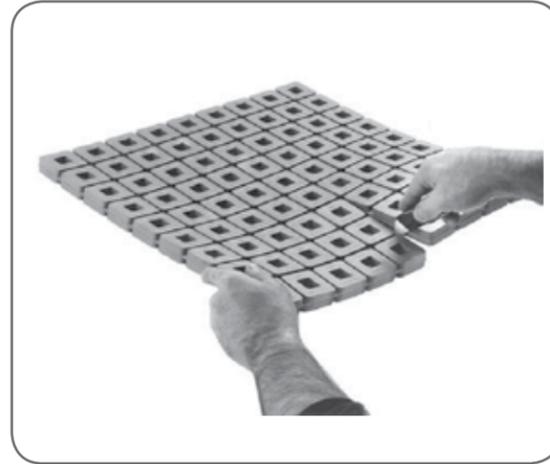
Four sizes provide load capacities up to 12,000 pounds.



## Type 20 Maxi-Flex "E-Z Cut" Neoprene Mounting Pads

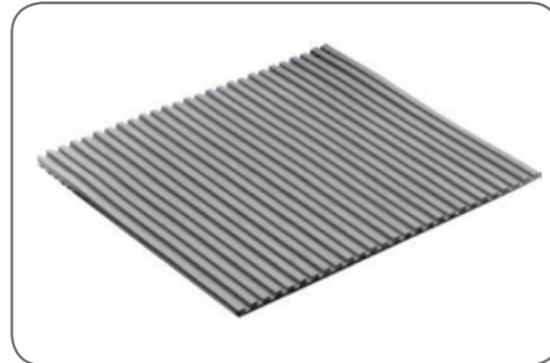
VMC's Maxi-Flex Neoprene Pads are molded in standard size sheets 18"X18"X3/4" thick (457X457 X 19mm) consisting of 81-2" (51 mm) square segments.

These segments are separated by a thin web that can easily be cut to fit required loading and shape of equipment base. They provide excellent high frequency sound attenuation and can be used effectively to prevent shock and vibration transmission in non-critical installations. Maxi-Flex Pads are available in four color coded loading types, which will satisfy a wide range of load/deflection requirements.



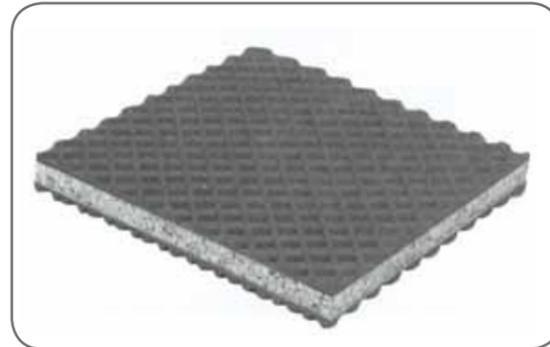
## Type 21 Shear Flex Pads

A resilient cross ribbed neoprene pad with an extremely high deflection rate. Alternately raised ribs, an exclusive VMC feature, provide effective vibration isolation in both high and low load ranges. May be used in multiple layers for greater deflection. Shear-Flex requires no bolting or cementing as gripping action of ribs prevents "walking". Maximum capacity 120 psi. Standard size sheets 18"x18" x 3/8" and 18"x 36" x 3/8".



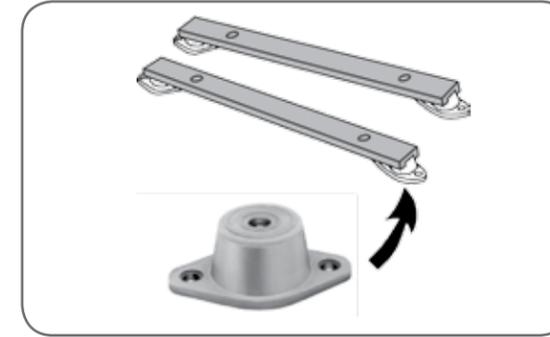
## Type 22 Cork Rib Pads

Laminated isolation pad combining the effective qualities of neoprene and cork. Made by bonding 1/2" thick close grained cork core securely between two 1/4" thick layers of ribbed oil resistant neoprene to form an integral pad. Maximum load capacity 60 psi. Standard size sheet 36"x 36" x 1". Heavy duty Cork-Rib also available for loads up to 120 psi.



## Type 23 Series "RH" and "RHD" Neoprene Hangers

Rectangular steel housing incorporating neoprene element. Design permit installation in the hanger rods or at the ceiling. Four standard sizes and five durometers. Colored neoprene stocks identify capacity and simplify selections thereby avoiding installation errors. Load range 10 to 4,000 lbs. per hanger. Static deflections to 0.5"



## Type 24 Type "DRB" Vibration Rails

Structural steel members with neoprene mountings as the isolating medium. Two or more rails used to support equipment such as pumps, cooling towers, compressors or other equipment which lack sufficient rigidity for point support. Static deflections to 0.5"



## Type 25 Type "ANFF" Neoprene Jack-up Mount

- Neoprene jack up floating floor system.
- Floor thickness from 3' to 24"
- Tested Long life neoprene elements
- VMC "easy lift" jacking mechanism accommodates air spaces from 1/4" to 4"
- Jacking design insures free floating resilient barrier Seismic capability to meet all building codes



## Type 26 Type "ASFF" Spring Jack-up Mount

- Type "ASFF" Spring Jack-up Mount
- Spring jack up floating floor system
- Floor thickness from 3" to 24"
- Housing design allows interchangeability between spring or neoprene elements
- Excellent for future building renovation
- Unique housing design allows for change in future space usage and occupancy for both frequency and load



## Type 27 Type "QFFG" Glass Fiber Mount

- Neoprene coated fiberglass floating floor system
- Low cost installation
- 1" to 4" air gap
- Constant natural frequency over entire load range

## Type 28

### Type "QFFN" Neoprene Mount

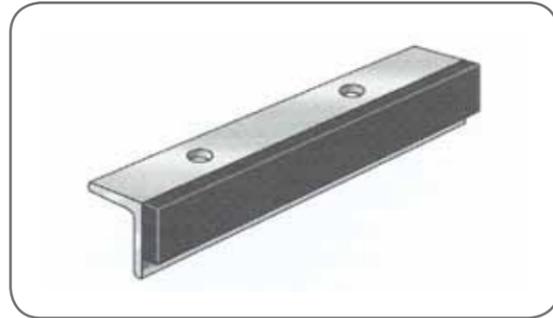
- Neoprene floating floor system
- Low cost installation
- Tested long life neoprene elements
- Low natural frequency



## Type 29

### Type "WAB" Wall Angle Brace

- Wall Support
- Eliminates acoustical flanking and noise path



## Type 30

### Type "WIB" Wall Isolation Brace

- Wall isolation brace
- Designed for compression, tension, or shear loading
- Simplified, inexpensive installation
- Strengthens the stud for drywall construction



## Type 31

### Type "TMRB" Neoprene Isolation Mount

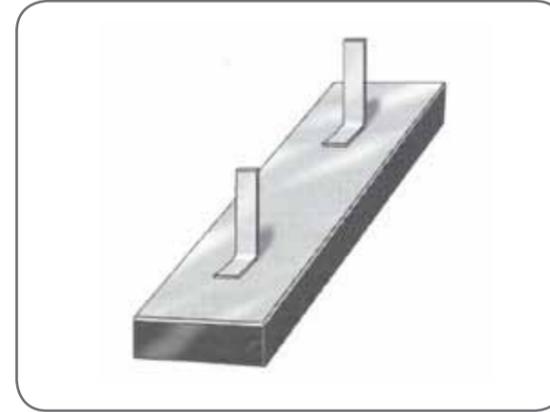
Track mounted ring and bushing  
Isolates floating walls



## Type 32

### Type "MWIP" Masonry Wall Isolation Pad

- Isolates floating block walls
- Eliminates noise transmission



## Type 33

### Type "LPNH" Hanger

- Low profile neoprene hanger
- Installation requires NO INCREASE in airspace for standard drywall ceiling construction
- Full range neoprene elements for high frequency or impact attenuation applications
- Neoprene element design insures no metal to metal contact
- Saves installation time
- Ceiling can be leveled after 1st. layer of drywall is installed
- Suspend sound barrier ceiling and finish ceiling from same hanger
- VMC ECS (engineered ceiling system), all services (excluding fire protection) can be suspended from a common hanger



## Type 34

### Type "LPRSH" Hanger

- Low profile combination neoprene and spring hanger.
- Installation requires minimal increase in airspace above 1" cold-rolled channel for standard drywall ceiling construction.
- Full range neoprene elements combined with 1" or 2" deflection springs (pre-compressed as required) for low frequency attenuation applications.
- Neoprene spring cup retainer insures no metal to metal contact.
- Saves installation time
- Ceiling can be leveled after 1st. layer of drywall is installed.
- Suspend sound barrier ceiling and finish ceiling from same hanger.
- VMC ECS (engineered ceiling system), all services (excluding fire protection) can be suspended from a common hanger.



## Type 35 Type "LPSH" Hanger

- Low profile spring hanger
- Installation requires minimal increase in airspace above 1<sup>1/2</sup>" cold-rolled channel for standard drywall ceiling construction
- 1" or 2" deflection springs (pre-compressed as required) for low frequency attenuation applications
- Neoprene spring cup retainer insures no metal to metal contact
- Saves installation time
- Ceiling can be leveled after 1st layer of drywall is installed
- Suspend sound barrier ceiling and finish ceiling from same hanger
- VMC ECS (engineered ceiling system), all services (excluding fire protection) can be suspended from a common hanger



## Type 36 Type "RSHSC" Hanger

When isolating ductwork and suspended ceilings, our standard hanger incorporates eye sockets to accommodate wire or duct strao.



## Vibration Control Selection Guide

Non-Seismic		Seismic	
Equipment Description	Mount Type	Equipment Description	Mount Type
Air Cooled Condensing Units (Floor Mounted)	3-B	Air Cooled Condensing Units (Floor Mounted)	15-B
Air Cooled Condensing Units (Roof Mounted)	E	Air Cooled Condensing Units (Roof Mounted)	E
Air Handling Units (Point Mounted)	2	Air Handling Units (Point Mounted)	15
Air Handling Units (Suspended)	4	Air Handling Units (Suspended)	4-1
Boiler Feed Pumps	1-B	Boiler Feed Pumps	18-B
Boilers and Steam Generators	1	Boilers and Steam Generators	18
Centrifugal Fans (Floor Mounted) Up to 40 HP	2-A	Centrifugal Fans (Floor Mounted) Up to 40 HP	15-A
Centrifugal Fans (Floor Mounted) 50 HP and over	2-C	Centrifugal Fans (Floor Mounted) Up to 50 HP and over	15-c
Centrifugal Fans (Suspended)	4	Centrifugal Fans (Suspended)	4-17
Chillers (Absorption Centrifugal)	3	Chillers (Absorption Centrifugal)	15
Chillers (Reciprocating)	3	Chillers (Reciprocating)	15
Chillers (Open Centrifugal)	3-C	Chillers (Open Centrifugal)	15-C
Compressors	2-C	Compressors	15-C
Condensate Pumps	1-B	Condensate Pumps	18-B
Cooling Towers	3	Cooling Towers	15
Ductwork	8	Ductwork	8-17
Engine Driven Generators	2	Engine Driven Generators	15
Fan Coil Units	4	Fan Coil Units	4-17
Packaged Air Handling Units (Curb Mounted Rooftop)	D	Packaged Air Handling Units (Curb Mounted Rooftop)	E
Piping	5 or 6	Piping	6-17 or 5-17
Pumps (Close Coupled)	2-C	Pumps (Close Coupled)	15-C
Pumps (End Suction and Split Case)	2-C	Pumps (End Suction and Split Case)	15-C
Pumps (Large Inline Floor Mounted)	2	Pumps (Large Inline Floor Mounted)	15
Pumps (Large Inline Suspended)	4	Pumps (Large Inline Suspended)	4-17
Transformers	1	Transformers	18
Unit Heaters	4	Unit Heaters	4-17
Unit Ventilators	4	Unit Ventilators	4-17
Vav Boxes (Fan Powered)	4	Vav Boxes (Fan Powered)	4-17

This chart has been assembled to assist the engineer in selecting the correct TYPE of mount for various applications. Actual model numbers, deflections, and loads can be selected for specific applications by referring to the appropriate brochure within our full catalog. To use this chart, simply locate the type of equipment you wish to isolate. The corresponding mount types for seismic and non-seismic application are called out in the chart. Once the correct mount TYPE is determined, the engineer can refer to the forward section of this brochure to obtain more information. To learn about specific applications and correct mount selections, refer to the rear section of this brochure.

# MCS Q&A

## The most efficient methods of isolating HVAC equipment

### AIR COOLER CONDENSERS

#### Why do we isolate air cooled condensers?

High volume propeller fans in condensers are noisy and become easily unbalanced. Condensers are generally supported by steel grillage and dunnage located on the roof, a part of the building that is easily excited, and as the equipment ages, its vibration levels often increase.

#### What do we need to know to isolate an air cooled condenser?

**TYPE** - make and model number  
**LOCATION** - on grade, above grade, or critical location  
**SUPPORT STEEL CONFIGURATION** - number of support points and location of mountings  
**CONNECTED PIPING** - same considerations as for the unit

#### How do we isolate an air cooled condenser?

**For Floor Mounted:** Non-Seismic use Mount Type 3-B  
**For Floor Mounted:** Seismic use Mount Type 15-B  
**For Roof Mounted:** Non-Seismic or Seismic, use Mount Type E

#### APPLICATION NOTES

In a seismic area, it is imperative that any housekeeping pads be properly anchored to the building structure. Some roof-mounted condensers may require additional support steel above the isolators. The load from connected piping should not be supported by the equipment flanges. Isolators should be used along the pipe run until piping connects with risers or enters the building.

### BOILERS & STEAM GENERATORS

#### WHY DO WE ISOLATE BOILERS AND STEAM GENERATORS?

On above grade locations low frequency rumble from combustion can excite localized floor areas. Attachments, such as breeching and associated piping, transmit disturbing vibration. Even when units are installed on grade, piping and accessories supported from occupied floor slab must be isolated.

#### WHAT DO WE NEED TO KNOW TO ISOLATE BOILERS AND STEAM GENERATORS?

**MODEL NUMBER** - Size  
**LOCATION** - On grade, above grade or in a critical location  
**SUPPORT FRAME** - Is it capable of isolator point loading?

### AIR HANDLING UNITS

#### WHY DO WE ISOLATE AIR HANDLING UNITS?

There are two major sources of energy causing air handlers to excite a structure:  
 1. the unbalanced forces of the fan.  
 2. the energy transmitted throughout the frame and sheet metal "skin" as a result of casing rumble, the turbulence within the cabinet. Noise and vibration problems can be caused by unbalanced wheels, especially as equipment ages.

#### What do we need to know to isolate an air handling unit?

**TYPE** - Is the unit floor mounted or ceiling hung? Is it vertical or horizontal?  
**ACCESSORIES** - Does the unit have filters, mixing boxes, coils, damper, etc.? These accessories add weight to the unit.  
**LOCATION** - on grade, above grade, or critical location  
**CONNECTED PIPING** - same considerations as for the air handler  
**FLEXIBLE DUCT CONNECTORS** - before or after accessories?

#### How do we isolate an air handling unit?

**Point Mounted:** For Non-Seismic use Mount Type 2, For Seismic use Mount Type 15  
**Suspended Mounting:** For Non-Seismic use Mount Type 4, For Seismic use Mounts Type 4-17

#### APPLICATION NOTES

Always use the slowest operating speed of the fan for isolator selection. The load from connected piping should not be supported on the air handling unit's flanges. Proper design suggests that, at a minimum, the first five support locations nearest the unit be supported with isolators having the same deflection as the unit's mountings. Some ceiling suspended units may require supplementary support steel. Isolate the entire air handler cabinet if it is rigidly attached to the fan section. Isolate the fan section only, if it is flexibly connected on both ends. Be sure to "tie" fan heads (without accessories) to the structure with thrust restraints when forces exceed 10% of the fan section's weight.

#### HOW DO WE ISOLATE A BOILER OR STEAM GENERATOR?

For Non-Seismic use Mount Type 1-B  
 For Seismic use Mount Type 18-B

#### APPLICATION NOTES

When neoprene pads are used and seismic restraints are required, angle brackets can be fabricated to accept isolated tie down bolts and should be field welded onto the boiler base rails. Housekeeping pads must also be anchored to the structure. Most boilers have base rail members suitable for direct attachment to vibration isolators. Make sure this is the case for your installation. The load from connected piping must never be supported from the equipment flanges. Proper design suggest that, as a minimum, the first five support locations nearest the boiler be supported with isolators having the same deflection as the unit's mountings.

### CHILLERS

Chillers, although high speed and well-balanced can excite localized floor areas depending on construction variables and floor locations. Isolators relieve stresses on equipment thereby reducing maintenance costs.

#### WHAT DO WE NEED TO KNOW TO ISOLATE A CHILLER?

**TYPE** - Absorption, centrifugal, reciprocating, or rotary  
**LOCATION** - on grade, above grade or critical location  
**CONNECTED PIPING** - same isolator deflection as the unit  
**SUPPORT STEEL CONFIGURATION** - number of support points and location of mountings.

#### HOW DO WE ISOLATE A CHILLER?

**Absorption / Centrifugal:** For Non-Seismic use Mount Type 3  
 For Seismic use Mount Type 15  
**Open Centrifugal:** For Non-Seismic use Mount Type 3-C  
 For Seismic use Mount Type 15-C

#### APPLICATION NOTES

In a seismic installation, the housekeeping pad must also be anchored to the structure. Soom roof-mounted chillers may require additional support steel above the isolators. VMC's type 3 and 15 mountings serve as blocking devices for the erection of the equipment. They also limit vertical movement when the system is drained down. The installed and operating heights of these products are the same. The load from connected piping must never be supported from the equipment flanges. Proper design suggests that, at a minimum, the first five support locations nearest the equipment be supported with isolators having the same deflection as the unit's mountings. Flexible connectors should be used in all lines at their connection to the equipment. While most chillers can be supported on four points, some very large chillers may require as many as 14 points of support.

### CENTRIFUGAL FANS

#### WHY DO WE ISOLATE CENTRIFUGAL FANS? CENTRIFUGAL FANS

Centrifugal fans have characteristics that can transmit significant disturbing energy to the building structure. Fans can cause noise and vibration problems due to unbalanced wheels, especially as the equipment ages. When operating at variable speeds, some slow speeds may be near resonance with the building structure, creating disturbing vibration. It is also important to maintain motor and drive alignment utilizing either a fan/motor base or concrete inertia base.

#### WHAT DO WE NEED TO KNOW TO ISOLATE A CENTRIFUGAL FAN?

**TYPE** - Arrangement, class, H.P., single or double width  
**RPM** - slowest operating speed of the fan  
**LOCATION** - on grade, above grade, floor or ceiling mounted or critical location

#### HOW DO WE ISOLATE A CENTRIFUGAL FAN?

**Up to 40HP:** For Non-Seismic use Mount Type 2-A  
 For Seismic use Mount Type 15-A  
**50 HP and Over:** For Non-Seismic use Mount Type 2-C  
 For Seismic use Mount Type 15-C  
**Suspended Fans:** For Non-Seismic use Mount Type 4  
 For Seismic use Mount Type 4-17

#### APPLICATION NOTES

Most fans can be directly mounted on isolators. However, when necessary, VMC fan/motor bases can be used to maintain motor-drive alignment on a single platform, which is in turn mounted on isolators. All bases should be blocked up and installed without springs. When the system is at operating load, the springs can then be inserted and adjusted only so far as is required to remove the blocking. Floor mounted fans operating at a static pressure over 5" or any Class 2 or 3 fans require the use of the VMC "MPF" concrete inertia base. Ceiling hung fans require thrust restraints if the total thrust exceeds 10% of the unit weight. Take into consideration options such as inlet vanes, weather covers and inlet or outlet cones that add weight to fans. These items must be included when calculating weight distribution. Fans with outlet cones or large motors mounted at the 3 o'clock or 9 o'clock positions must be carefully reviewed since the overhanging weight of these items may shift the center of gravity enough to require supplemental steel or additional isolators.

### COMPRESSORS

#### WHY DO WE ISOLATE COMPRESSORS?

The reciprocating action of compressors transmits significant disturbing forces into the structure. Their characteristic intermittent operation tends to draw attention to their presence. Isolators relieve stresses on equipment thereby reducing maintenance costs.

#### WHAT DO WE NEED TO KNOW TO ISOLATE A COMPRESSOR?

**TYPE** - Tank mounted or not, single stroke, multiple compressors on one base, horizontal or vertical orientation  
**RPM** - note any speed below 900 rpm  
**LOCATION** - on grade, above grade or critical location  
**CONNECTED PIPING** - same considerations as for the compressor

#### HOW DO WE ISOLATE A COMPRESSOR?

For Non-Seismic use Mount Type 2-C  
 For Seismic use Mount Type 15-C

#### APPLICATION NOTES

In seismic areas, the housekeeping pad must be anchored to the structure. The load from connected piping should not be supported on the compressor connections. Proper design suggests that, as a minimum, the first five support locations nearest the compressor inlet and outlet be supported with isolators having the same deflection as the unit's mounts. Flexible connectors should be used in critical locations. Large H.P. (over 20) single stroke and/or slow speed compressors with high unbalanced forces typically require substantial concrete bases (mass) weighing 6 to 7 times the compressor weight in order to reduce the amplitude of inertial forces. Full compressor and installation details should be forwarded to the VMC engineering department for an in depth analysis and recommendation.

### COOLING TOWERS

#### WHY DO WE ISOLATE COOLING TOWERS?

Cooling towers usually incorporate low rpm fans and are general supported on steel grillage and dunnage located on roofs, the part of the building easily excited by disturbing vibration. Splashing and spraying of water in the tower often contributes to the disturbing energy entering the building. Cooling towers can cause noise and vibration due to unbalanced wheels, especially as the equipment ages.

#### WHAT DO WE NEED TO KNOW TO ISOLATE A COOLING TOWER?

**TYPE OF TOWER** - single or multiple cells?  
**SUPPORT STEEL CONFIGURATION** - number of support points and location of mountings  
**SIZE OF TOWER** - expressed as tons of cooling capacity  
**LOCATION** - on grade, above grade or in critical area  
**CONNECTED PIPING** - same considerations as for the tower.

#### HOW DO WE ISOLATE A COOLING TOWER?

For Non-Seismic use Mount Type 3  
 For Seismic use Mount Type 15

#### APPLICATION NOTES

Care must be taken to ensure that the tower support steel is adequate to span the distance between isolators (usually twelve feet maximum). In addition, multiple cell towers require common support steel. The tower flanges must not support the load from connected piping. The load should be supported from the tower steel using hangers or floor spring isolators until the piping connects with risers or enters the building. Flexible connectors should be used in the supply and return headers.

## DUCTWORK

### WHY DO WE ISOLATE DUCTWORK?

Air traveling through duct can be a source of disturbing vibration especially in high velocity systems or where duct configuration creates turbulence. Equipment that is hard mounted to ductwork can transmit vibration to the duct and throughout the building.

### WHAT DO WE NEED TO KNOW TO ISOLATE DUCTWORK?

**DUCT SIZE**  
**WEIGHT**  
**SPACING OF SUPPORTS**

### HOW DO WE ISOLATE DUCTWORK?

For Non-Seismic use Mount Type 8 | For Seismic use Mount Type 8-17

#### APPLICATION NOTES

All ductwork in the mechanical equipment rooms larger than four square feet face area should be isolated with 1" nominal deflection spring hangers. In seismic areas, ductwork must be appropriately restrained.

## ENGINE DRIVE GENERATORS

### WHY DO WE ISOLATE GENERATORS?

Generators are generally very large pieces of reciprocating equipment that generate considerable disturbing vibration. Attachments such as exhaust and associated piping transmit disturbing vibration. Even when units are installed on grade, supports from occupied floor slabs must be isolated. Mostly used as standby or emergency power, their periodic testing necessitates a good isolation system. Isolation relieves stresses on the equipment, thereby reducing maintenance costs.

### WHAT DO WE NEED TO KNOW TO ISOLATE GENERATORS?

**SIZE** - kVA and overall dimensions  
**LOCATION** - on grade, above grade or critical location  
**CONNECTED PIPING** - same considerations as for the generator  
**SUPPORT FRAME** - is it capable of isolator point loading?  
**EXHAUST LINES** - size and silencer requirements

### HOW DO WE ISOLATE A GENERATOR?

For Non-Seismic use Mount Type 2 | For Seismic use Mount Type 15

#### APPLICATION NOTES

In seismic areas, the housekeeping pad must be anchored to the building structure. Most generators have base rail members suitable for direct attachment of vibration isolators. Be sure this is the case for your installation. The load from connected piping must never be supported from the equipment flanges. Proper design suggests that, at a minimum, the first five support locations nearest the generator be supported with isolators having the same deflection as the generators mounts. Radiated noise levels from generators can be quite high. If a system operates in a critical area an acoustical consultant should be contacted for direction.

## Unit Heaters

### WHY DO WE ISOLATE UNIT HEATERS?

Unit heaters can cause noise and vibration problems due to unbalanced wheels, especially as the equipment ages. Unit heaters that are gas or oil fired emit a low frequency rumble that is generated by combustion.

### WHAT DO WE NEED TO KNOW TO ISOLATE A UNIT HEATER?

## FAN COIL UNITS / UNIT VENTILATORS / VAV BOXES

### WHY DO WE ISOLATE THESE UNITS?

Fans are centrifugal devices that often transmit significant energy to the structure. These units can cause noise and vibration problems due to unbalanced wheels, especially as the equipment ages.

### WHAT DO WE NEED TO KNOW TO ISOLATE THESE UNITS?

**SIZE** - cfm and HP  
**LOCATION** - only ceiling mounted units need consideration

### HOW DO WE ISOLATE THESE UNITS?

For Non-Seismic use Mount Type 4 | For Seismic use Mount Type 4-17

#### APPLICATION NOTES

Units that are flexibly connected to the ductwork must be seismically braced independent of the duct. Options, such as filter sections add weight to fans and must be included when calculating weight distribution.

## PIPING

### WHY DO WE ISOLATE PIPING?

Piping isolation is almost as critical as equipment isolation since disturbing energy from the equipment connections can flank equipment isolation and be transmitted to the structure above.

### WHAT DO WE NEED TO KNOW TO ISOLATE PIPING?

**PIPE DIAMETER**  
**SUPPORT ROD SPACING AND DIAMETER**  
**TYPE OF PIPE** - PVC, SCHEDULE 40, CAST IRON, ETC.  
**ACCESSORIES** - VALVES, STRAINERS, FITTINGS, ETC.  
**EQUIPMENT ISOLATION** - DEFLECTION

### HOW DO WE ISOLATE PIPING?

For Non-Seismic use Mount Type 5 or 6 | For Seismic use Mount Type 6-17 or 5-17

#### APPLICATION NOTES

Designers must decide to what extent piping should be isolated. We recommend that, at a minimum, the first five support locations for both the supply and return lines be isolated. Piping which runs through critical or acoustically sensitive spaces should be reviewed by an acoustical consultant. Hanger selection requires considering not only the weight of the pipe and accessories at the hanger location but also the required rod diameter. All hangers have a maximum rod diameter limitation, so be careful to coordinate this properly with your hanger selection. Hangers should be hung as close to the structure as possible. In seismic areas, piping must be appropriately restrained using series SCR seismic cable restraints.

**LOCATION** - Only ceiling mounted units need to be isolated.  
**ARRANGEMENT** - Horizontal or vertical throw

### HOW DO WE ISOLATE A UNIT HEATER?

For Non-Seismic use Mount Type 4 | For Seismic use Mount Type 4-17

#### APPLICATION NOTES

Small wall mounted electric unit heaters do not require vibration isolation. Vibration isolation is not required for unit heaters with less than 1 H.P. Vertical units usually have two points of support while horizontal units have four.

## PUMPS

### WHY DO WE ISOLATE PUMPS?

Pumps are centrifugal devices that often transmit significant disturbing energy to the structure, especially as horsepower increases. Bases prevent flexure of the pump frame, maintaining motor-pump alignment, and minimize start up forces (surge and/or torque) transmitted to the pump connections or piping.

### WHAT DO WE NEED TO KNOW TO ISOLATE PUMPS?

**TYPE OF PUMP** - base mounted, close coupled or inline? Single pump or multiple pumps on one base?  
**HORSEPOWER**  
**LOCATION** - on grade, above grade, or critical location  
**CONNECTED PIPING** - same considerations as for the pump

### HOW DO WE ISOLATE A PUMP?

#### Close Coupled / End Suction / Split Case:

For Non-Seismic use Mount Type 2C, For Seismic use Mount type 15-C

#### Large Inline Suspended:

For Non Seismic use Mount Type 4

For Seismic use Mount Type 4-17

#### Large Inline Floor Mounted:

For Non-Seismic use Mount Type 2, For Seismic use Mount Type 15

#### APPLICATION NOTES

In seismic areas the housekeeping pad must be anchored to the building structure. Base elbows should always be supported off of the pump isolation base. If the elbows cannot be supported in this manner use a restrained mount to support the elbows from the floor. Isolated bases should be blocked up and installed without springs. When the system is loading to operating weight, the springs should then be inserted and adjusted only so far as is required to remove the blocking. The load from connected piping must never be supported from the pump flanges. Proper design suggests that, at a minimum, the first five support locations nearest the pump, for both the suction and discharge, be supported with isolators having the same deflection as the unit's mountings. Flexible connectors should be installed at the suction and discharge sides of the pump to reduce the vibration traveling in the pipe as well as the water column itself.

## Transformers

### WHY DO WE ISOLATE TRANSFORMERS?

Transformers emit pure tones that are often annoying.

### WHAT DO WE NEED TO KNOW TO ISOLATE A TRANSFORMER?

**SIZE** - kVA  
**LOCATION** - on grade, above grade, or critical area  
**SUPPORT** - floor or ceiling mount

### HOW DO WE ISOLATE A TRANSFORMER?

For Non-Seismic use Mount Type 1, For Seismic use Mount Type 18

#### APPLICATION NOTES

In seismic areas, the housekeeping pad must be anchored to the structure of the building. Most transformers have base rail members suitable for direct attachment to vibration isolators.



## PACKAGED ROOF-TOP AIR HANDLING UNITS

### WHY DO WE ISOLATE PACKAGED ROOF TOP AIR HANDLING UNITS?

Roof top air handlers have unique noise and vibration control requirements because these units are often integrated into a lightweight roof construction. Rooftop units create vibration through the unbalanced forces of the fan and from casing rumble - the energy transmitted through the unit generated by turbulence within the cabinet. Large roof openings are often required for supply and return air duct connections. These ducts run directly from noise-generating rooftop air handlers to the building interior. Generally, there is insufficient space or distance between the roof mounted equipment and the closest occupied spaces below the rooftop to apply adequate sound control treatments. Rooftop units should be located above spaces that are not acoustically sensitive and should be placed as far as possible from the nearest occupied space.

When a rooftop unit is placed over openings through which the supply and return air ducts pass, the openings should be limited to two openings sized to accommodate only the supply and return air ducts. These openings should be properly sealed after installation of the ducts. If a large single opening exists under the rooftop unit, it should be structurally sealed with one or more layers of gypsum board around the supply and return air ducts. This can be accomplished by ordering an acoustical package incorporated into the vibration curb.

### WHAT DO WE NEED TO KNOW TO ISOLATE A ROOFTOP AIR HANDLER?

**SIZE** - length, width, tons of cooling and model number  
**CONDENSING SECTION** - is there a separate support rail needed for the condensing section?  
**LOCATION** - general, or over critical area?  
**SUPPORT** - Is unit curb mounted or on support steel for point mounting?

### HOW DO WE ISOLATE A PACKAGED ROOFTOP AIR HANDLING UNIT?

#### APPLICATION NOTES

##### Curb Mounted Rooftop:

For Non-Seismic use Mount Type D, For Seismic use Mount Type E

VMC's seismic isolation curbs are designed to comply with seismic specifications. Equipment manufacturer's standard curbs or field fabricated curbs are generally unsuitable without special construction. Be sure the supplier of the curb certifies seismic construction along with solid connection to the structure.

Point supported units may require structural steel on top of the isolators. Check with the unit's manufacturer for requirements. Internal isolators that may be provided with rooftop units must be omitted or "locked out" to prevent the possibility of resonance with the curb springs.

Many rooftop units have condensing sections that are not supported by the roof curb. Here an additional isolated rail is supplied for support. The VMC acoustical package is available as an integral part of our roof curb and provides a means of introducing a floating barrier between the rooftop unit and the roof, greatly reducing radiated noise. This package should be used on all units over 40 tons cooling and over any critical areas.



## Mechanical Control Systems

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