

KINETICS NOISE CONTROL

SEISMIC
RESTRAINT
CAPABILITIES

 **KINETICS**
Noise Control

WHY IS SEISMIC RESTRAINT NEEDED?

The damaging effects of earthquakes are of significant concern in many areas of the world. Earthquake damage to inadequately restrained mechanical and electrical systems within buildings can be extensive. Mechanical and electrical equipment knocked off of its supporting structure due to earthquake-related building movement can threaten both life and property. The cost of properly restraining this equipment is insignificant compared to the associated costs of replacing or repairing the equipment and to the cost of system down-time as a result of seismic damage to the building services.

This brochure presents restraint systems which serve to limit the movement of equipment and to keep the equipment captive during a seismic event. Proper utilization of these systems can reduce the threat to life and minimize long-term costs due to equipment damage and associated loss of service.

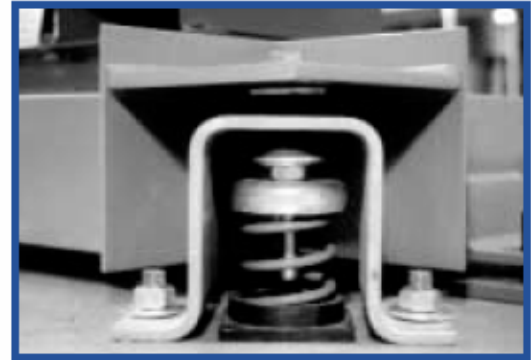
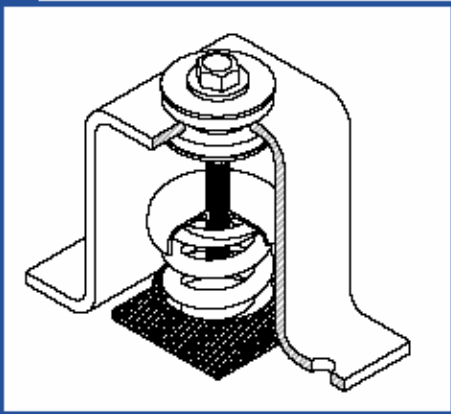
A thorough analysis of seismic restraint hardware and seismic rated vibration isolators requires the consideration of four (4) aspects of the system:

- 1) Attachment of the Equipment to the Restraint.** The equipment must be securely attached to the restraint, and this attachment must demonstrate sufficient strength to withstand the imposed forces and to allow for transfer of seismic forces into the restraint.
- 2) Restraint Design.** The strength of the seismic restraint must be sufficient to withstand the equipment imposed forces. Kinetics offers a wide variety of restraints suitable for many different applications.
- 3) Attachment of Restraint to the Building Structure.** This attachment is typically via bolts, welds, or concrete anchors. In addition, the building attachment interface must be reviewed to ensure that it is capable of withstanding the imposed seismic forces. Typically this attachment is the 'weakest link' of the overall design, especially when embedded concrete anchors are used.
- 4) Equipment Fragility.** The ability of the equipment to continue to operate after being subjected to seismic force. This fragility information must be obtained from the equipment manufacturer and is not covered in this brochure.



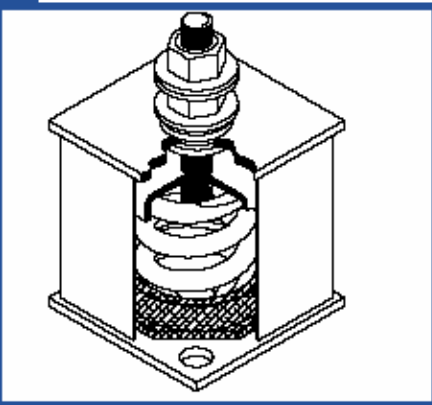
Examples of properly restrained HVAC equipment surviving the 1994 Northridge earthquake unscathed. On the left is a rooftop installation directly next door to the collapsed parking garage in Northridge. On the right is a rooftop installation across from the I-10 collapse.

FLOOR MOUNTED EQUIPMENT ISOLATION/RESTRAINT



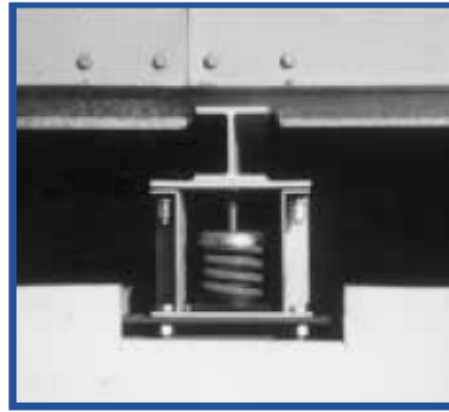
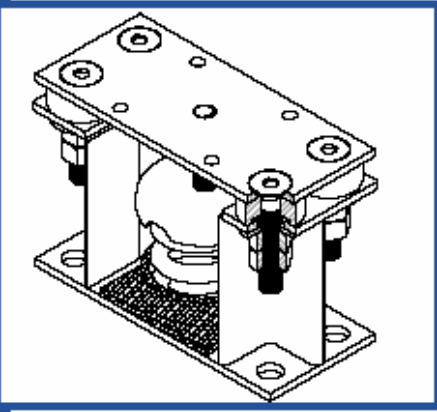
KINETICS MODEL FHS

- Combination coil spring isolator and seismic restraint for indoor and outdoor floor mounted fans, pumps, air compressors and other mechanical equipment
- All-directional restraint with vertical limit stops
- Field interchangeable spring coils
- Galvanized housing and epoxy powder coated coils
- Constant free height and operating height
- Equipment motion limited to 0.2" in all directions, at the isolator
- Provides minimum 1 g restraint
- Available static deflection from 1" to 4"
- OSHPD Preapproval Number R-0433



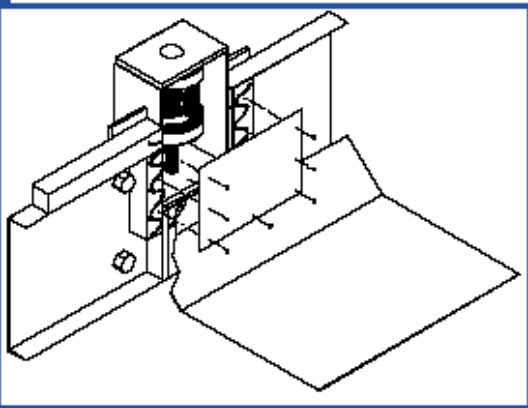
KINETICS MODEL FYS

- Combination coil spring isolator and seismic restraint for indoor floor mounted fans, pumps, air compressors and other mechanical equipment
- All-directional restraint with vertical limit stop
- Painted housing and epoxy powder coated coils
- Equipment motion limited to 0.2" laterally at the isolator
- Compact space-saving construction
- Available static deflection from 1" to 4"



KINETICS MODEL FLSS

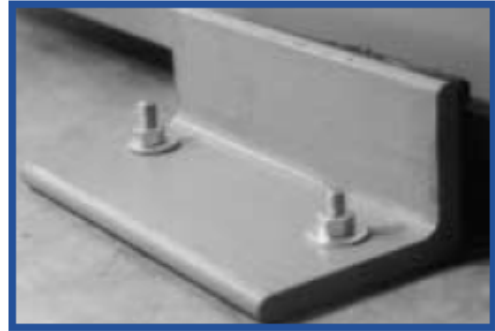
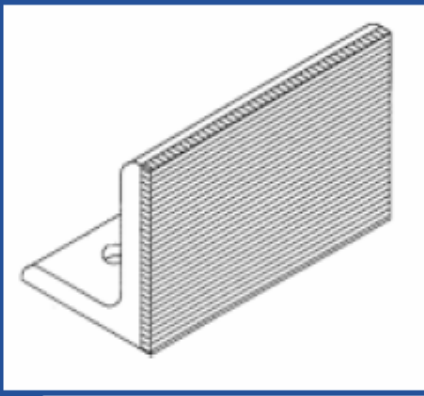
- Combination coil spring isolator and seismic restraint for indoor and outdoor floor mounted cooling towers, chillers and boilers
- All-directional restraint with adjustable vertical limit stops
- Field interchangeable spring coils
- Galvanized housing and epoxy powder coated coils
- Constant free height and operating height
- Equipment motion limited to 0.2" in all directions at the isolator
- Provides minimum 1 g restraint
- Available static deflection from 1" to 4"



KINETICS MODEL ESR VIBRATION ISOLATION CURB FOR ROOF-MOUNTED AHU EQUIPMENT

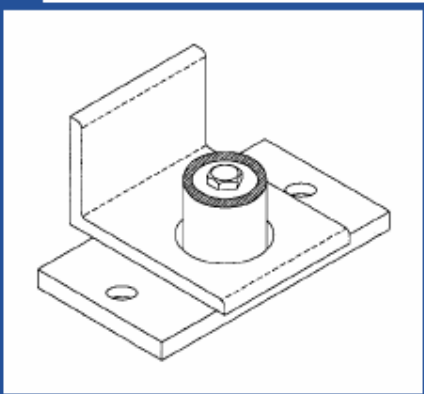
- Structural steel isolated curb with wood nailer
- Capable of 1 g seismic restraint and 150 mph wind restraint
- Access ports for each coil spring isolator
- Available static deflection from 1" to 4"
- Options:
 - Sloped Roof
 - Acoustical Insulation
 - External Thermal Insulation

FLOOR MOUNTED EQUIPMENT RESTRAINT



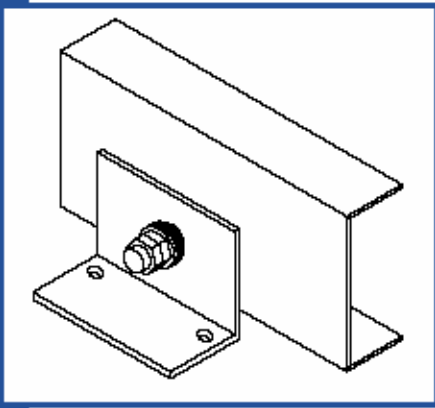
KINETICS HS-1 SEISMIC SNUBBER

- Single axis horizontal seismic restraint
- Standard capacities of up to 5,000 pounds force
- May be bolted or welded in place
- Replaceable neoprene elements
- Easily Inspected for short circuits



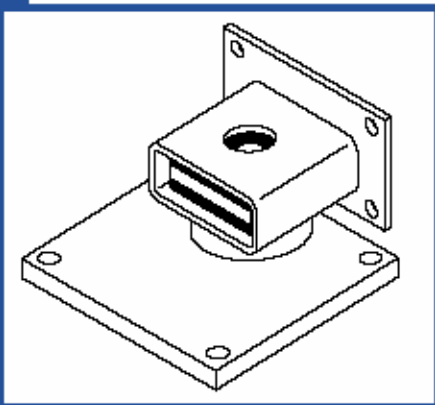
KINETICS HS-2 SEISMIC SNUBBER

- Double axis horizontal seismic restraint
- Standard capacities up to 6,500 pounds force
- May be bolted or welded in place
- Replaceable neoprene elements
- Easily Inspected for short circuits



KINETICS HS-5 SEISMIC SNUBBER

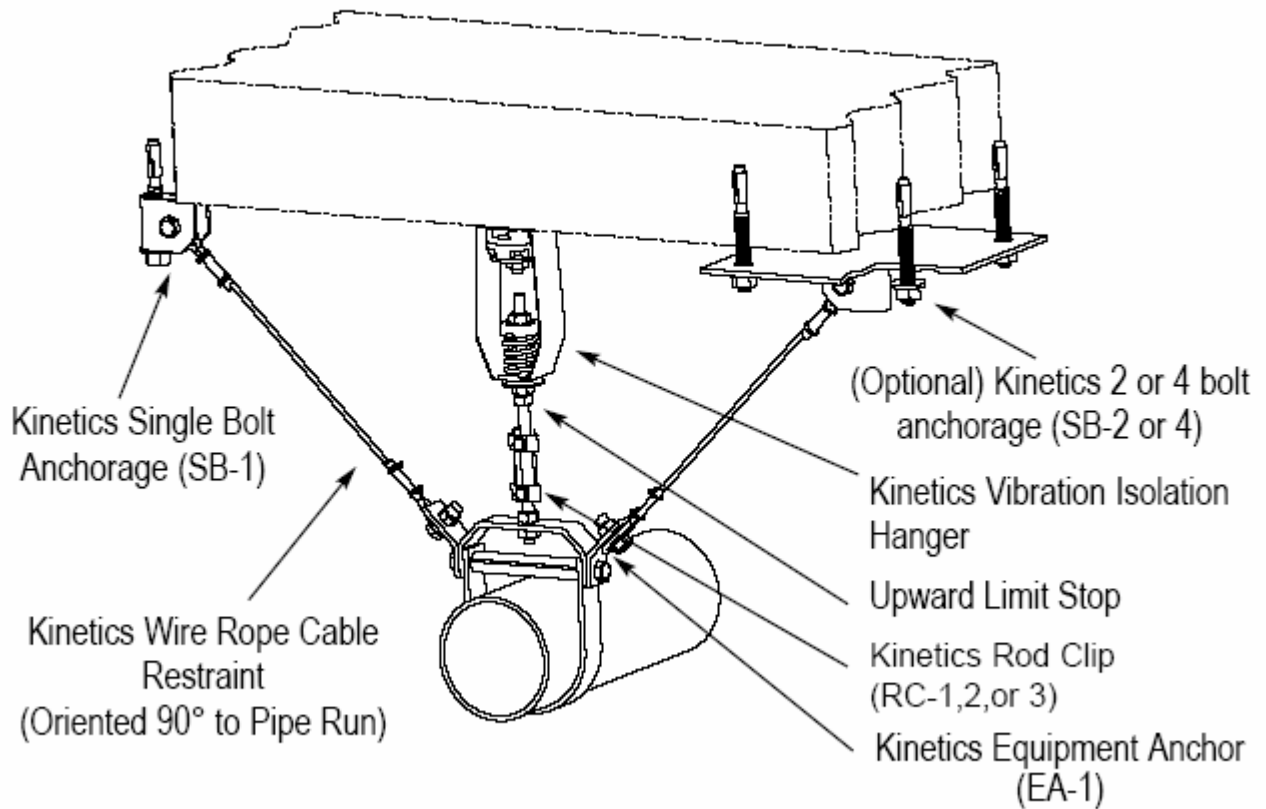
- Double axis horizontal and vertical seismic restraint
- Standard capacities from 250 to 3,275 pounds force
- Restraint capacities to meet all building code requirements
- May be bolted or welded in place
- Replaceable neoprene elements
- Easily inspected for short circuits



KINETICS HS-7 SEISMIC SNUBBER

- Double axis horizontal and vertical seismic restraint
- Standard capacities from 5,000 to 25,000 pounds force
- Restraint capacities to meet all building code requirements
- May be bolted or welded in place
- Replaceable neoprene elements
- Easily inspected for short circuits

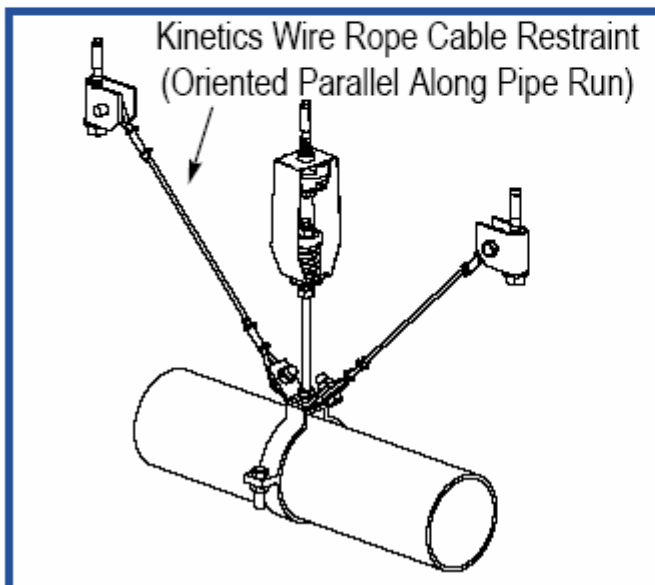
SUSPENDED EQUIPMENT EXAMPLES



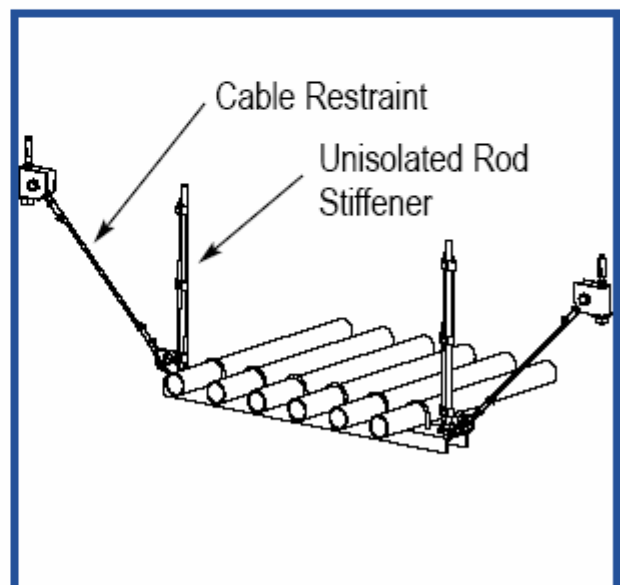
ISOLATED SUSPENDED PIPING LATERAL BRACING

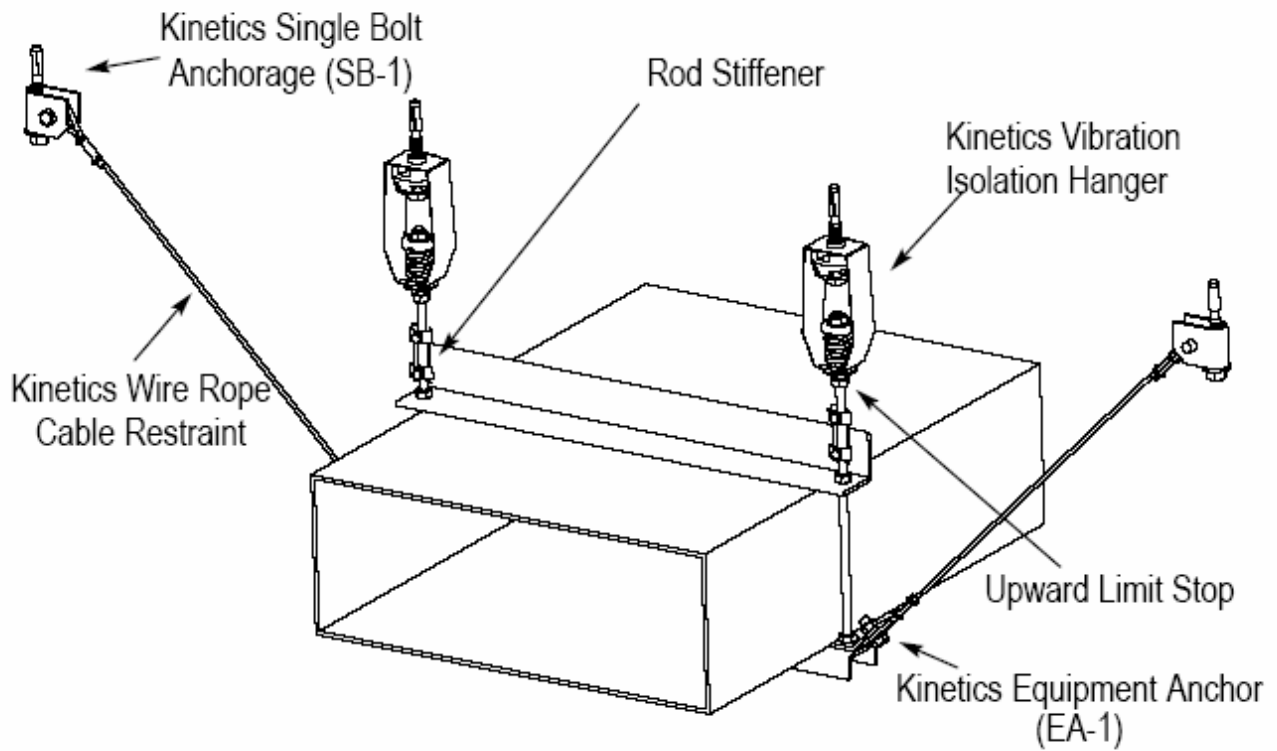
Kinetics Wire Rope Cable Restraints are to be installed slightly loose so as not to short-circuit the Isolation Hanger (when used).

ISOLATED SUSPENDED PIPING LONGITUDINAL BRACING



RIGIDLY SUSPENDED PIPE TRAPEZE

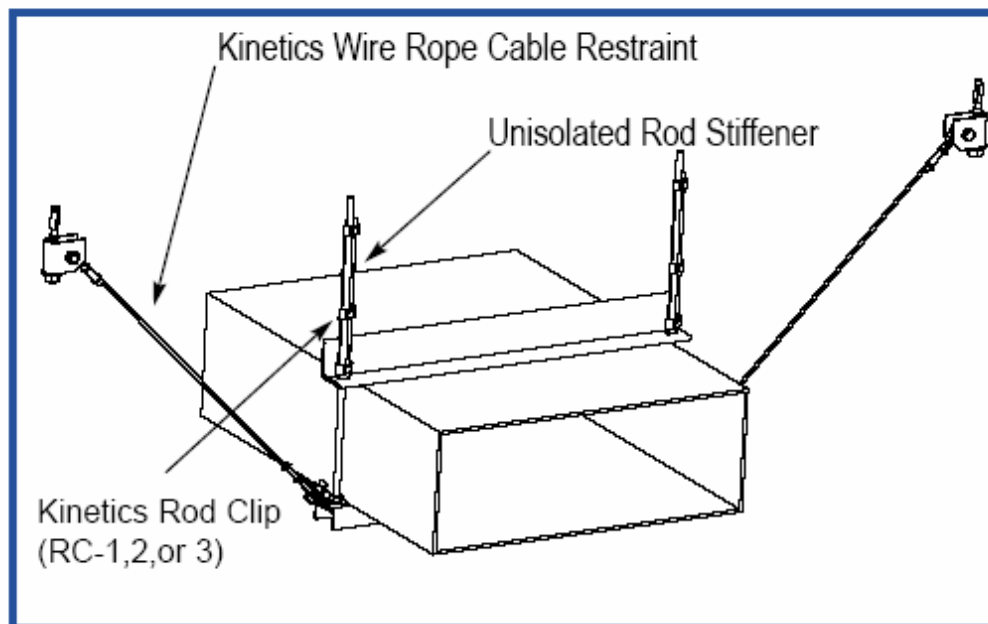


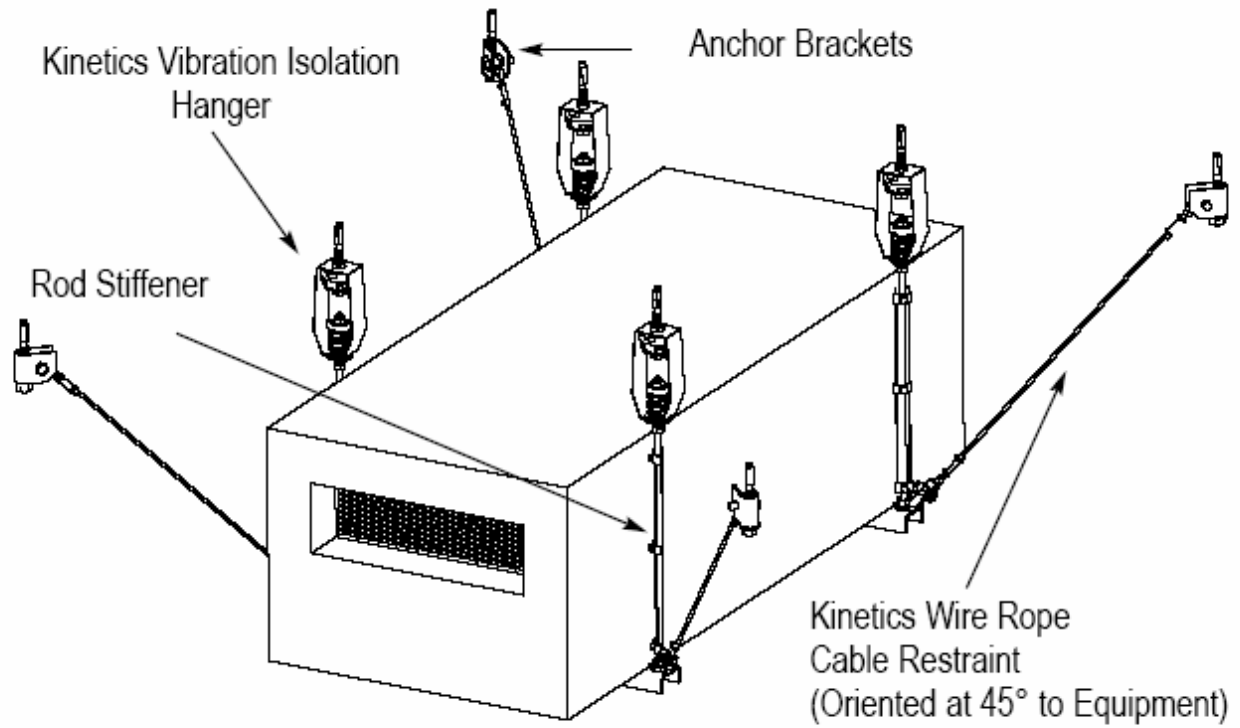


ISOLATED SUSPENDED DUCT

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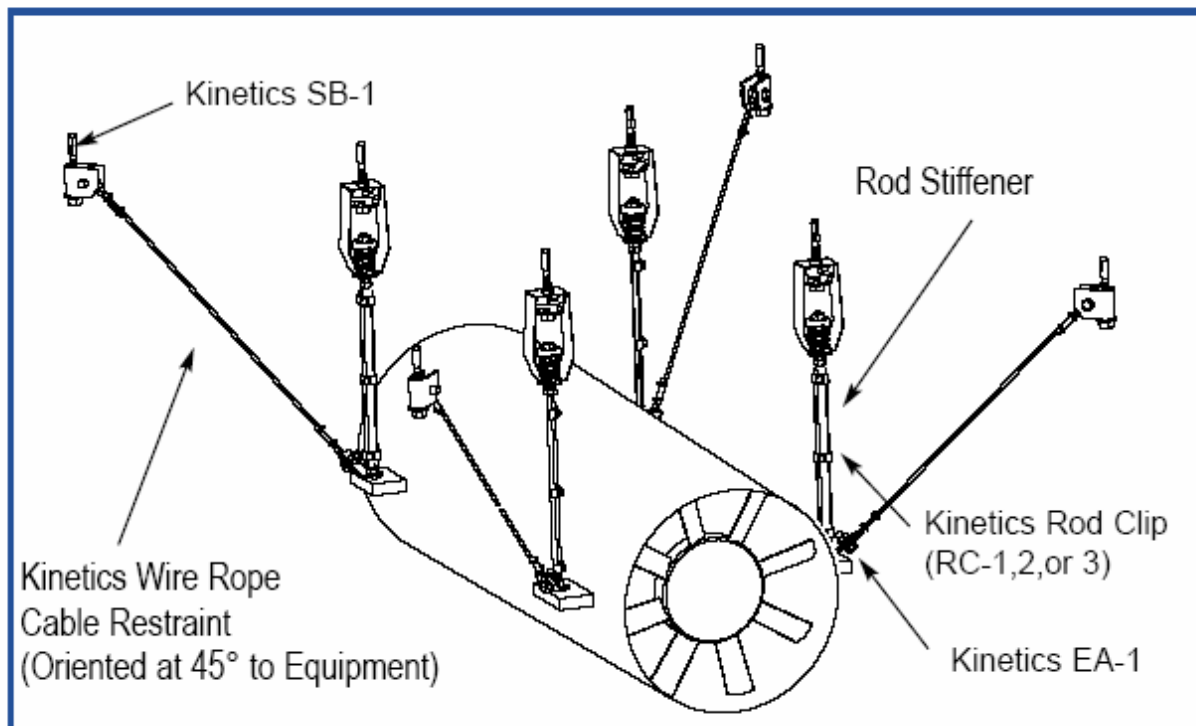
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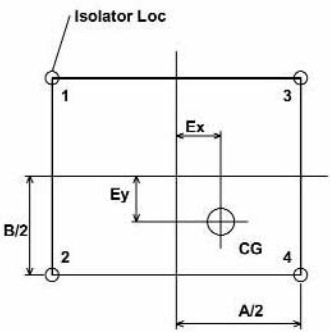




ISOLATED SUSPENDED EQUIPMENT

Kinetics Wire Rope Cable Restraints are to be installed slightly loose so as not to short-circuit the Isolation Hanger (when used).



TYP PUMP																										
KNC PO: KNC01 KINETICS SEISMIC CERTIFICATION (A)																										
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PROJECT DATA	<table border="0" style="width: 100%;"> <tr> <td>Project: Sample Project</td> <td>Representative: KNC Representative</td> <td>P.O. Number: 12345</td> </tr> <tr> <td>Date: 02-11-2004</td> <td>Code Used: 2000IBC</td> <td>Min Horiz G: .00</td> </tr> <tr> <td>Equip Type: SAMPLE PUMP</td> <td>Tag: TYP PUMP</td> <td>Min Vert G: .00</td> </tr> <tr> <td>Installation Type: Base Mounted, Common Support/Restraint Loc</td> <td>Code G (ASD): .47/.06 (H/V)</td> <td>Conc Ancs(ASD): .61/.06 (H/V)</td> </tr> <tr> <td>Soil Type: Sd (1.4)</td> <td>Fault Type: n/a</td> <td>Fault Proximity: n/a</td> </tr> </table> <p style="font-size: small;">Data used is derived from Customer input, others are responsible for the accuracy of this data. Wgt(lb): 2500 Elev-Roof/Equip: 30/15 ft</p> <p style="font-size: small;">Geometry (in): Ap: 2.50 Ss: .44 L: 1.00 Rp s/c: 2.50/2.50 A: 84.00 B: 44.00 ex: 8.00 ey: 1.50 Hgt (CG to Restraint): 6.25</p> <p style="font-size: small;">Restraint Data Total # of Restraints: 4 Restraints/Side on Lg Axis: 2 Restraints/Side on Sht Axis: 2</p> <p style="font-size: small;">Restraint Type: FHS(Isolated) > 8 Dias. Loc 1: 1-250/2200 Loc 2: 1-250/2200 Loc 3: 1-250/2200 Loc 4: 1-250/2200</p>	Project: Sample Project	Representative: KNC Representative	P.O. Number: 12345	Date: 02-11-2004	Code Used: 2000IBC	Min Horiz G: .00	Equip Type: SAMPLE PUMP	Tag: TYP PUMP	Min Vert G: .00	Installation Type: Base Mounted, Common Support/Restraint Loc	Code G (ASD): .47/.06 (H/V)	Conc Ancs(ASD): .61/.06 (H/V)	Soil Type: Sd (1.4)	Fault Type: n/a	Fault Proximity: n/a										
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WELD ATTACHMENT	If welded, each bracket corner requires 4.50 linear inches of .25 weld.																									
GENERAL NOTES	<p>Note: Bolt Safety Factors based on the capacity of Type A-307 hardware to handle uplift after all horizontal loads are accounted for. Min Edge Distance - See Anchor Data Sheet Safety Factors listed as 100 indicate 100 or greater</p> <p>For a detailed summary of how these loadings were derived, contact KINETICS NOISE CONTROL, Inc.</p> <p>KNC certifies that the seismic/wind isolation and or restraint system described on this sheet is adequate to resist the certification loads specified herein. The use of hardware other than that provided by KNC voids this certification.</p> <p style="font-size: x-small;">This certification addresses the load path from the equipment point connection to the connection point of the structure. Others must verify the ability of the equipment or structure to resist these loads. See also the included disclaimer. Certification void if disclaimer and Certification Cover Sheet not included. In connection with this certification and the application of the certification design loads to the project, KINETICS NOISE CONTROL, Inc. guarantees that we will use that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession to determine restraint loadings and Safety Factors based on customer supplied input data. No other warranty, expressed or implied, is made or intended. 02/04/2004</p>																									
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