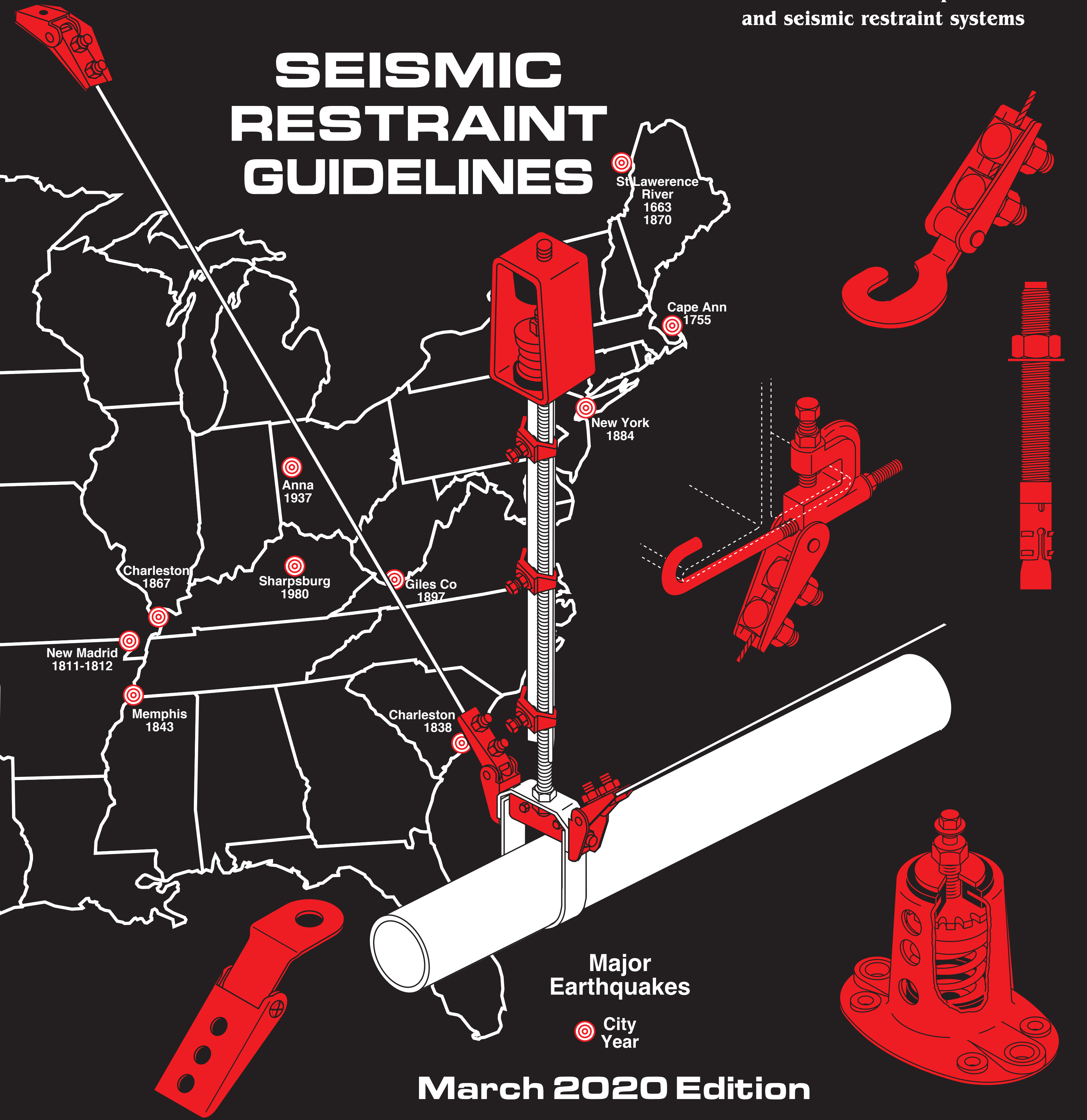
MASON INDUSTRIES, INC

manufacturers of noise and vibration control products
and seismic restraint systems

SEISMIC RESTRAINT GUIDELINES



March 2020 Edition

MASON INDUSTRIES, INC.

SEISMIC MANUAL

SEISMIC RESTRAINT GUIDELINES
For SUSPENDED PIPING,
DUCTWORK, ELECTRICAL SYSTEMS and
FLOOR & ROOF MOUNTED EQUIPMENT

Twelfth Edition, March 2020

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 92801 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

INTRODUCTION TO THE MARCH 2020 EDITION OF THE MASON SEISMIC MANUAL

The March 2020 edition of the Mason Industries Seismic Manual includes our **OSHPD Approved Seismic Restraint Guidelines for Suspended Piping, Ductwork, and Electrical Systems OPA-0349** and also includes our **Seismic Restraint Guidelines for Floor and Roof Mounted Equipment**, which has been updated.

The **Seismic Restraint Guidelines for Suspended Piping, Ductwork, and Electrical Systems** is unchanged from the original OSHPD approval. In California all hardware sizes and installation details are valid without additional review on all OSHPD and DSA projects permitted under CBC 2001, 2007 and 2010. The actual bracing requirements for piping, ductwork and conduit must meet the requirements included in the appropriate code cycle and anchor bolt design and selection must be updated to meet the latest code requirements.

New OPM pre-approvals are required on 2013 CBC or newer OSHPD and DSA projects. Refer to FM55A, B, & C and FM67-72 for current OPM pre-approved products. Products will be added as testing is completed and they are OPM approved

OSHPD pre-approvals are also an excellent source of certification for other projects in California and projects outside of California since they are an independent government agency's certification of a product's seismic capacity, based on test results that have been developed, reviewed and approved by the Office of Statewide Health Planning and Development, the California state agency responsible for hospital construction.

New pre-approvals for 2013 CBC or newer OSHPD projects will be assigned an OPM number. Unlike OPA approvals, OSHPD will not assign OPM approvals to individual products but will instead require those products to be included in a distribution system bracing manual or specific equipment bracing standard. For OPM pre-approval consideration OSHPD is requiring a new series of tests based on the cyclic testing methods in Factory Mutual FM-1950 standard for fire sprinkler bracing.

Mason Industries has completed this testing on seismic bracing products included in our new seismic bracing manual for distribution systems. The Mason Industries Seismic Restraint Guidelines for Suspended Distribution Systems is pre-approved by OSHPD for 2013 CBC and 2016 CBC projects as OPM-0043-13. This manual is very specific and includes products and designs that may far exceed the requirements on typical commercial projects. In addition to the distribution systems included in the manual the approval pages and capacities of our solid braces, cable braces and rod bracing can be used when submitting calculations on suspended equipment bracing on a project by project basis. Several pages that include our seismic bracket approvals have been included in the FM section of this manual for reference.

The testing of isolation hangers, restrained isolators and seismic snubbers is not included in FM-1950 and requires significant modification to provide results that are acceptable to OSHPD. The end result of these tests is a listing of strength and stiffness values for each product. These values will be used to determine the acceptance of product on a particular project and included in a distribution system standard or equipment bracing standard.

On equipment with OSP approvals the isolator and restraint products used on a project must have an equivalent stiffness/weight ratio to those isolation products used in the equipment certification tests, and the strength required to handle the actual project seismic requirements. Mason can provide data to qualify our products on OSP approved equipment, regardless of the particular manufacturer of the isolators or braces used in the OSP testing.

While isolator testing is in progress Mason will provide test results and calculations for submittal and approval on a project by project basis on all isolation and bracing products.

The **Seismic Restraint Guidelines for Floor and Roof Mounted Equipment** includes some original information as well as some valuable new information including:

Z-1011 Seismic Snubber Specification (FM36) includes the revised specification for the new OSHPD Approved Z-1011 Seismic Snubbers.

Z-1011 Seismic Snubbers (FM55A to 55C) includes all information on the Z-1011 Seismic Snubber, wincluding submittals, dimensions, and OSHPD certified Load Rating.

MASON INDUSTRIES, INC.

SEISMIC RESTRAINT GUIDELINES
For SUSPENDED PIPING,
DUCTWORK and ELECTRICAL SYSTEMS

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

Special Note for Engineers Specifying These Guideline:

These guidelines provide general seismic restraint requirements and details for suspended piping, ductwork and electrical systems. Prior to installation, the support and seismic restraint locations shall be verified by the engineer responsible for the design of the structure. Any deviation from the information presented shall be resolved in accordance with standard engineering practice and be approved by the enforcement agency.

These guidelines may be used for any seismic horizontal acceleration input up to 2.0g. However, component sizes are based on Allowable Stress Design (ASD). Building Codes (i.e. 1997 UBC, 2000 IBC, etc.) are changing to Strength Design based acceleration inputs. To use these guidelines for Strength Design acceleration inputs, divide the seismic horizontal acceleration by the appropriate factor stated in the applicable code to reduce it to an ASD based input. For example, if design is based on the 1997 Uniform Building Code, divide the seismic horizontal acceleration input Fp, as determined in Section 1632, by 1.4 and use the resulting acceleration in these guidelines. (e.g. If Fp = 2.1g based on 1997 UBC, use Fp = 2.1g/1.4 = 1.5g in these guidelines.)

Recommended Specification:

All suspended *piping, ductwork, conduit and cable trays** shall be provided with seismic sway braces in accordance with the Mason Industries Seismic Restraint Guidelines for Suspended Piping, Ductwork and Electrical Systems and the *applicable codes***. Seismic sway braces shall consist of galvanized steel aircraft cables or steel angles/channels. Steel aircraft cables shall be prestretched to establish a certified minimum modulus of elasticity. Cables braces shall be designed to resist seismic tension loads and steel braces shall be designed to resist both tension and compression loads with a minimum safety factor of 2. Brace end connections shall be steel assemblies that swivel to the final installation angle. Do not mix cable and steel braces to brace the same system. Steel angles or strut channels, when required, shall be clamped to the threaded hanger rods at the seismic sway brace locations utilizing a minimum of two ductile iron clamps. The bracing system shall have an Anchorage Preapproval “OPA” Number from OSHPD in the State of California verifying its capability to resist seismic forces. Cable brace assemblies shall be Type SCB, steel brace assemblies shall be Type SSB, rod clamps shall be either Type SRC or UCC, pipe clevis braces shall be Type CCB and multiple anchor load distribution brackets shall be Type SLDB all as manufactured by Mason Industries, Inc.

**Modify to meet scope of engineer’s responsibility.*
***Modify to include all applicable codes.*

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide
Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

TABLE OF CONTENTS

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

GENERAL NOTES

1. These guidelines are designed to meet the requirements of the California Code of Regulations (CCR), Chapter 16 for essential facilities, the 1997 Uniform Building Code (Refer to Page 15), the 1996 Building Officials Code Administration, the 1997 Southern Building Code Congress International and any other horizontal acceleration input. They address seismic sway bracing for suspended pipe, duct or electrical systems and vertical risers for up to a five-story building. Riser supports must be engineered individually for six story and higher buildings.

2. For California hospitals submitted prior to November 1, 2002 and designed in accordance with the 1998 CCR, all restraints and their anchorages must be capable of restraining horizontal accelerations as follows. For nonstructural components:

   Fp = Seismic Horizontal Force = Z x 1 x Cp x Wp
   Z = Zone Factor = 0.3 for Zone 3, 0.4 for Zone 4
   I = Importance Factor = 1.5 for Essential Facilities
   Cp = Horizontal Force Factor = 0.75 for Mechanical/Electrical Systems
   Wp = Operating Weight of Pipe, Duct and/or Electrical Systems
   Therefore, Fp = 0.34g for Zone 3, 0.45g for Zone 4

   Note: The Engineer of Record shall determine the horizontal acceleration for non-California hospital projects when using these guidelines.

3. A complete description on how to use these guidelines is provided on pages 17 to 29. It includes specific examples for both using the enclosed details/ charts and layout of bracing for individual and trapeze supported systems.

Notes on Seismic Bracing:

1. These guidelines list installations, which may be exempt from bracing. However, the engineer of record shall be responsible for determining whether to allow the exceptions.

2. Each straight pipe, duct or electrical run with two or more supports requires a minimum of two transverse braces (perpendicular to the run). (Option: A longitudinal brace on the opposite side of an elbow or tee may act as a transverse brace. Refer to the layout examples detailed on pages 26 to 29.)

3. Each straight pipe, duct or electrical run requires a minimum of one longitudinal brace (parallel to the run). (Option: A transverse brace on the opposite side of an elbow or tee can sometimes act as a longitudinal brace. Refer to the layout examples detailed on pages 26 to 29.)

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

GENERAL NOTES (continued)

4. Transverse and longitudinal brace shall be installed up to 45 degrees or 1(Vert.): 1(Horiz.) brace angle ratio from horizontal. Brace spacing or maximum weight per foot (meter) can be reduced to allow up to 1.5:1 or 2:1 brace angle ratios. Consult Mason Industries for braces installed at an angle higher than a 2:1 ratio.

5. Seismic bracing may consist of solid bracing designed to accept loads in tension and compression or cable bracing designed to accept tension loads only. Each brace method requires a vertical hanger at or within 4" (*102 mm*) of their attachment to the mechanical or electrical system. The vertical hanger may or may not require stiffening or additional anchorage to the structure (Refer to Notes on Supports).

6. Do not mix solid bracing with cable bracing in the same direction on any run of a mechanical or electrical system.

7. Do not brace a system to two different parts of a building, which may act differently in response to an earthquake. For example, avoid connecting a transverse brace to a wall and a longitudinal brace to a floor or roof at the same brace location.

8. Systems with significant thermal motion shall be designed on a case by case basis by a professional engineer familiar with both seismic loading and thermal expansion.

9. Seismic brace requirements for individually supported and trapeze supported systems including maximum transverse and longitudinal spacing; aircraft cable and solid brace member size; and attachment to the building structure are tabulated in Section A and D, respectively.

10. Seismic brace requirements for a trapeze supported system in Section D are based on the maximum total weight per foot (meter). In addition, the maximum total weight per foot (meter) in Section D can be used to determine seismic brace requirements for individually supported systems. Note: If the load on the trapeze is not equally distributed to each support rod, the maximum total weight per foot (meter) used to determine longitudinal brace requirements must be equal to 2 times the maximum loaded rod.

11. All components supported by a trapeze member must be clamped or bolted down to the trapeze. Pipes set in rollers or other thermal expansion supports only require clamping at seismic brace locations designed to prevent uplift but allow for thermal motion. Friction connections must have approved or tested values, such as strut nuts and bolts torqued to manufacturer's requirements.

12. Multiple or stacked trapezes that share support rods must be braced independently from one another. Each section of threaded rod between trapezes and/or the building structure is subject to vertical stiffening requirements of pages E1 or E2 (Refer to Notes on Supports).

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

GENERAL NOTES (continued)

13. Vertical drops from suspended systems to equipment (or flexible connectors where applicable) may be braced using the transverse and longitudinal braces in this manual. ***Note:*** Do not exceed 1/2 of the maximum brace spacing as measured from the seismic brace to the equipment of flexible connector when bracing vertical drops. (Refer to Layout of the Seismic Braces, page 29)

14. Any system which crosses a building separation or seismic joint must be designed accommodate 2 times the joint width displacements or as specified by the engineer of record for approval by the enforcement agency.

Notes on Supports:

1. Where the seismic brace system incorporates the use of a threaded vertical hanger and designed to carry gravity loads only, additional anchorage and/or stiffening may be required as detailed. General support of pipe, duct and electrical systems to carry gravity loads shall be determined by the engineer of record and/or mechanical, plumbing or electrical code requirements. The use of “C-Clamps” designed to attach threaded rod to one side of a steel beam flange shall not be used unless they are provided with a restraining strap or hook to the opposite beam flange. Pipe clevis shall be provided with pipe insulation protection shields o protect the insulation as per MSS-SP-69. When insulation is removed to facilitate the installation of pipe clamps or other hardware, the mechanical engineer shall provide details for the re-insulation of the pipe.

2. Support rod capacity and its anchorage to the structure is an important part of a solid bracing system. Solid braces shall not be attached to existing systems or support rods designed for gravity loads unless they are checked for increased tension loads. Section K of these guidelines tabulates the seismic tension load applied to the support rod at solid brace locations.

3. Threaded vertical hanger rods where seismic sway bracing is attached may require stiffening. A vertical rod stiffener can be done two ways. One way is with a steel angle cut to the appropriate length attached to the threaded rod with a minimum of two Seismic Rod Clamps (Mason type SRC). The second way is with strut channel cut to the appropriate length and attached to the threaded rod with a minimum of two Strut Channels (Mason type UCC). Maximum spacing will be as tabulated on pages B1, E1, E2, X5 and X5C. Installation of the threaded vertical hanger rod, with or without a stiffener, must conform to the details on pages G1 and G2 including maximum distance to the clamp from each end. Vibration isolation hangers (neoprene, spring, or combination of the two) must be installed within 3/8" (*10 mm*) of the structure with a vertical limit stop 1/4" (*6 mm*) from the underside of the hanger housing. Page B1 tabulates the maximum unbraced rod length (the maximum length of the rod allowed ***without*** a stiffener) and the maximum braced rod length (the maximum length of the rod allowed ***with*** a stiffener) for up to 24" (*610 mm*) diameter pipe (or the tabulated maximum weight per foot (*meter*) of an individually supported system). Pages E1 and E2 tabulate the same information for trapeze supported systems. Page E1 is based on SCB/SSB size and rod diameter, and page E2 is based on maximum total weight.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002
Bill Staehlin (916) 654-3362

GENERAL NOTES (continued)

4. Vibration isolation hangers at seismic sway brace locations must be installed with the top of the hanger housing flush with the structural support surface. In the case of combination spring and neoprene hangers (Mason type PC30N), a space of up to 3/8" (*10 mm*) between the top of the hanger housing and the structure due to the deflection of the neoprene element is acceptable, as detailed throughout these guidelines.

5. Trapeze supports shall consist of steel angles, back to back channels, or 12 gauge (*2.7 mm*) single or double channel strut. Determine trapeze size based on load and spacing between vertical supports on page E3. Threaded rods shall attach to the trapeze with nuts and washers on both the top and bottom.

Notes on Seismic Cable Bracing:

1. Cables shall be prestretched galvanized 7x19 strand core aircraft cable with no limit to their installed length. ***Note:*** Horizontal accelerations defined in general note 2 or by applicable code must be multiplied by 2 if non-prestretched cable is used.

2. Cables shall be installed such that the only visible slack is that due to cable sag. Cables shall not support gravity loads.

3. Cables shall be attached to both the mechanical/electrical system and the structure using the seismic cable brace components (Mason Type SCB (H,V). Refer to pages X1, X2 and X3).

4. The SCB cable bolts shall be installed per the torque requirements tabulated on pages X1, X2 and X3.

5. The SCBH component can be used for attachment directly to the threaded vertical hanger rod used for supporting system gravity loads as detailed in Sections C and F.

6. The SCBV component can be used for attachment to steel beams in lieu of bolting or welding as detailed on page H12. Note: Installation of the SCBV must be perpendicular to the steel beam.

Notes on Seismic Solid Bracing:

1. Solid bracing members shall be steel angle or 12 gauge (*2.7 mm*) channel strut. The charts in sections A and D tabulate the minimum solid brace size based on a maximum solid brace length of 9'-6" (*2.9 m*). The chart on page X4 allows for a different solid brace member size if the maximum installed length is 5'-0" (*1.5 m*) or 14'-6" (*4.4 m*).

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

GENERAL NOTES (continued)

2. Solid brace members shall be attached to both the mechanical/electrical system and the structure using the seismic solid brace components (Mason Type SSB (U) or SSBS. Refer to pages X4 and X11).

3. As stated in "Notes on Supports", the support rod attachment at seismic solid brace locations must be designed to accept the seismic tension load tabulated in Section K in addition to the gravity load.

Notes on Seismic Attachment to the Building Structure:

1. Attachment to the building structure is the determining factor in the design of seismic sway bracing. Lightweight structures may limit the maximum spacing between seismic braces. The engineer of record shall determine the maximum allowable seismic loads for the building structure.

2. Attachment to four different types of structures is addressed separately. Attachment to a minimum 6" (*152 mm*) thick, 3000 psi (*20680 kPa*) stone aggregate concrete slab using expansion anchors; a minimum 3000 psi (*20680 kPa*) lightweight concrete filled metal deck using expansion anchors; a steel structure using bolts, welds or seismic clamps (Mason Type SCBV only, Refer to page X3.) or a wood structure with Lag Screws. Attachments not addressed or detailed must be engineered on an individual job basis subject to approval by the enforcement agency. ***Note:*** The engineer of record shall determine which attachment details in Section H of this manual are acceptable for steel structures.

3. Expansion anchors shall be ITW Ramset/Trubolt Wedge Anchors for 3000 psi (*20680 kPa*) stone aggregate concrete slabs and 3000 psi (*20680 kPa*) stone aggregate or lightweight concrete filled decks installed in accordance with ICBO Report ER-1372/1997, Tables 7, 8, 9 and 14. When expansion anchors are used, 50 percent of alternate bolts in a group shall be tension tested or torque tested to the test values tabulated on page X8. Testing shall be done in the presence of the project inspector and a report of the test results shall be submitted to the enforcement agency. If any anchors fail, the enforcement agency shall determine the additional testing requirements. ***Note:*** This is not a standard UBC, BOCA or SBCCI requirement and may not be required for commercial buildings.

4. All welded connections shall be minimum 70xx electrode welds. ***Note:*** This is not a standard UBC, BOCA or SBCCI requirement and may not be required for commercial buildings. Charts support the use of 60xx electrode welds on Non-OSHPD/DSA projects.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

GENERAL NOTES (continued)

5. Metal decks shall be minimum 20 gauge (*0.9mm*) with a maximum 3" (*76 mm*) flute and minimum 6" (*152mm*) total thickness from bottom of flute to top of concrete fill. Concrete fill shall be minimum 3000 psi (*20680 kPa*) lightweight concrete. ***Note:*** Metal decks with minimum 3000 psi (*20680 kPa*) stone aggregate concrete fill may use the lightweight concrete deck charts.

6. Concrete attachments are based on specified anchor bolts or inserts. Substitution of alternate anchors must be approved by Mason Industries (and the enforcement agency where applicable) on a job by job basis.

7. For structures with concrete waffle slabs use the stone aggregate concrete slab charts while following the minimum edge distance requirements of the expansion anchors and/or inserts. Seismic Cable Brace, Mason Type SCB, Seismic Solid Brace, Mason Type SSB, and Seismic Solid Brace Strut Anchor Mason Type SSB components may be attached to the side of the vertical potion of the waffle as long as the brace angle ratio of the SCB or SSB relative to the surface of the concrete does not exceed 2:1.

8. When installing drilled-in anchors in existing non-prestressed reinforced concrete, use care and caution to avoid cutting or damaging reinforcing bars. When installing them in existing prestressed concrete, locate the prestressed tendons by using a non-destructive method and avoid cutting or damaging the tendons during installation.

9. Seismic Load Distribution Brackets shall be installed where (2) or (4) bolts are required for attachment to a concrete slab or deck. (Mason Type SLDB. Refer to pages X9 and X10).

10. Lag screws shall be installed into a wood structure with regard to minimum edge and end distances tabulated on Page H13. Wood must have a minimum specific gravity of 0.35, which includes Douglas Fir, Pine and Redwood. The Structural Engineer of Record shall verify wood specific gravity, connection detail and capability of structure to resist seismic loads indicated on page H13.

Notes on Suspended Piping:

1. Seismic restraints are required for the following installations:

   A. All fuel oil, gas, medical gas, compressed air, vacuum and other potentially hazardous piping systems unless specifically excepted by the engineer of record.

   B. All piping 1 1/4" (*32 mm*) nominal diameter and larger located in boiler, mechanical equipment and refrigeration mechanical rooms.

   C. All other piping 2 1/2" (*64 mm*) nominal diameter and larger.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

GENERAL NOTES (continued)

Exception:

All piping suspended by individual hanger rods 12" (*305 mm*) or less as measured from the top of the pipe to the bottom of the support where the hanger is attached. If the 12" (*305mm*) limit is exceeded by any hanger in the run, seismic bracing is required for the run. ***Note:*** **A single support location that meets the requirement of this exception does not constitute a seismic sway brace location.**

The exception also applies for trapeze supported systems if the distance as measured from the point of attachment to the trapeze to the point of attachment to the structure is less than 12" (*305 mm*). ***Note:*** **If directional changes or offsets to equipment connections do not allow for flexibility of the trapezed system (e.g. long offsets or flexible connectors) then the system must be braced regardless of pipe diameter or distance to the structure if the combined weight per foot (*meter*) of all items is greater than 10 lbs/ft (*14.9 kg/m*).**

Page 30 of these guidelines details the “12 inch Rule” for suspended piping.

In addition, to meet the 1997 Uniform Building Code CBC/2001, all of the following conditions must also be satisfied:

1. Lateral motion of piping will not cause damaging impact with surrounding systems (e.g. other pipe, duct, equipment, sprinkler heads etc.) or cause loss of system vertical support.
2. Piping must be made of ductile material with ductile connections (e.g. welded steel pipe, brazed copper pipe, etc.)
3. Vertical support connections cannot develop moments (e.g. swivel joints, eye bolts, vibration isolation hangers, etc.)

2. Steel and copper pipe with welded or brazed connections shall be braced at the spacings shown in these guidelines. Transverse brace spacing shall not exceed 50 feet (*15.2 m*) up to 0.25g, 40 feet (*12.2 m*) up to 1.0g, and 20 feet (*6.1 m*) up to 2.0g. Maximum longitudinal spacing shall not exceed 80 feet (*24.4 m*) up to 1.0g, and 40 feet (*12.2 m*) up to 2.0g. Steel and copper pipe with screwed connections brace spacing shall not exceed 1/2 the spacing listed in these guidelines. All pipe must be considered full of water when determining seismic brace requirements unless specifically engineered otherwise.

3. Cast iron pipe (no hub pipe) brace spacings shall not exceed 1/2 the spacings listed in note 2 above. In addition, braces shall be installed at each side of a change in direction of 90° or more. Cast iron pipe shall be considered full of water when determining weight.

4. Piping with grooved pipe assemblies UL listed for Standard 213 shall be braced at spacings not to exceed those listed in note 2 above. Non-UL listed grooved pipe assemblies brace spacings shall not exceed 1/2 the spacings listed in note 2 above.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002
Bill Staehlin (916) 654-3362

GENERAL NOTES (continued)

5. For PVC, PVDF, FRP and other specialty piping, brace spacings shall not exceed 1/2 the spacings listed in note 2 above. Braces can be selected for the actual pipe weight at these spacings.

6. Gas, fuel oil, vacuum, medical gas and compressed air piping brace spacings shall not exceed the maximum spacings listed in note 2 above. Piping constructed other than those listed in note 2 must follow the requirements of notes 3, 4 and 5.

7. Transverse restraints for insulated pipe shall be installed on clevis, J-Hanger or roller hanger supports sized to fit over insulation inserts and on trapeze supports where the insulation insert is supported by the trapeze and the clamp is sized to fit over the insulation insert.

8. Longitudinal restraints for all pipes shall be attached directly to the pipe using a pipe clamp hanger or a standard pipe clamp within 4" (*102 mm*) of a vertical support. Where required, insulation shall be installed over the pipe clamp so the pipe clamp is in direct contact with the pipe. The Engineer of Record is responsible for determining and detailing if a special clamp is required to prevent breaking the vapor barrier for chilled water systems.

9. The pipe weights tabulated in Section A are based on schedule 40 steel pipe for up to 12" (*305 mm*) diameter, schedule 30 steel pipe for 14" (*356 mm*) to 18" (*457 mm*) diameter and schedule 20 for 20" (*508 mm*) and 24" (*610 mm*) diameters. Weights also include water and insulation. Verify the maximum weight per foot (*meter*) listed in the column next to pipe size when determining seismic brace requirements tabulated in Section A. Section M of these guidelines tabulates the weight per foot (*meter*) for steel, copper, PVC and cast iron pipe.

Notes on Suspended Ductwork:

1. Seismic restraints are required for the following installations:

   A. All ductwork containing hazardous gases or exhaust unless specifically excepted by the engineer of record.

   B. All rectangular and square ducts 6 square feet (*0.56 m2*) and larger in cross sectional area and round ducts 28" (*711 mm*) and larger in diameter.

   Exception:

   All ducts suspended by hanger straps 12" (*305 mm*) or less in length as measured from top of the duct to the point of attachment to the structure. Hangers must be attached within 2" (*51 mm*) of the top of the duct with a minimum of two #10 sheet metal screws. If any hanger in the run exceeds the 12" *(305 mm*) limit, seismic bracing is required for the run. ***Note:* A single support location that meets the requirements of this exception does not constitute a seismic sway brace location.**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com
Dhiru Mali
Structural Engineer
California SE No. 2811

GENERAL NOTES (continued)

The exception also applies for trapeze supported systems if the distance as measured from the point attachment to the trapeze to the point of attachment to the structure is less than 12" (*305 mm*). **Note: If directional changes or offsets to equipment connections do not allow for flexibility of the trapezed system (e.g. long offsets or flexible connectors) then the system must be braced regardless of duct size or distance to the structure if the combined weight per foot (meter) of all items is greater than 10 lbs/ft (*14.9 kg/m*).**

Page 31 of these guidelines details the “12 Inch Rule” for ductwork.

In addition, to meet the 1997 Uniform Building Code CBC/2001, all of the following conditions must be satisfied:

1. Lateral motion of ductwork will not cause damaging impact with surrounding systems (e.g. other ducts, pipes, equipment, sprinkler heads etc.) or cause loss of system vertical support.
2. Ductwork must be made of ductile material with ductile connections.
3. Vertical support connections cannot develop moments (e.g. swivel joints, eye bolts, vibration isolation hangers, etc.)

2. Ductwork conforming to SMACNA standards, including but not limited to duct construction and joint connections, shall be braced at a maximum transverse spacing of 40 feet (*12.2 m*) up to 0.25g, 30 feet (*9.1 m*) up to 1.0g, and 20 feet (*6.1 m*) up to 2.0g. Maximum longitudinal spacing shall be 80 feet (*24.4 m*) at 0.25g, 60 feet (*18.3 m*) up to 1.0g, and 40 feet (*12.2 m*) up to 2.0g.

3. Ductwork constructed of non-ductile materials or non-ductile connections, such as specialty plastic or fiberglass ductwork, shall be braced at 1/2 the spacings listed in note 2 above.

4. Rectangular and oval ductwork shall be stiffened at seismic brace locations with a trapeze support member sized to carry the gravity load of the ductwork; a minimum of (2) threaded vertical hanger rods and an upper support member over top of the duct. The trapeze and upper support members must be fastened to the ductwork with #10 sheet metal screws spaced at maximum 12" (*305mm*) centers. Refer to Pages E3 and E4 for sizing of the trapeze and upper support members.

5. Multiple ducts may be combined in a single framed and braced based on the combined duct weight.

6. Wall penetrations may be considered transverse brace locations where duct is tightly blocked unless smoke dampers are installed in the wall.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide
Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

GENERAL NOTES (continued)

7. Floor penetrations of vertical duct may be considered transverse and longitudinal brace locations where duct is tightly blocked and the distance from the floor penetration to the inside of the 90 degree turn horizontal is less than 2 duct widths. Floor penetrations may be considered transverse brace locations where duct is tightly blocked unless smoke dampers are installed in the floor.

8. Devices mounted in-line and rigidly attached to the ductwork at both ends must be braced independently from the ductwork if the unit weight is 50 lbs (*23 kg*) or greater ***or*** the unit weighs between 20 lbs (*9 kg*) and 49 lbs (*22 kg*) and is separated from the duct with a flexible connector. Flexible connections between the device and associated pipings should be provided ***or*** the unit is attached to braced piping, and flexible piping connectors are not used.

9. Section N of these guidelines tabulates duct weight per foot (*meter*) for rectangular and round ductwork of different sizes and gages.

10. If a 2 piece rod is used to support ductwork, minimum engagement of the rod shall be 1/3 of the coupling nut length. Rods shall be run up tight in the coupling nut.

Notes on Suspended Electrical Systems:

1. Seismic braces are required for the following installations:

   A. All conduit 21/2" (*64 mm*) trade size and larger.

   B. All cable trays with weights greater than 10 lbs/ft (*14.9 kg/m*).

   Exception:

   All conduit or cable trays suspended by individual hanger rods 12" (*305 mm*) or less as measured from the to of the conduit or cable tray to the bottom of the support where the hanger is attached. However, if any hanger in the run exceeds the 12" (*305 mm*) limit, seismic bracing is required for the run. **Note: A single support location that meets the requirements of this exception does not constitute a seismic sway brace location.**

   The exception also applies for trapeze supported systems if the distance as measured from the point of attachment to the trapeze to the point of attachment to the structure is less than 12" (*305 mm*). **Note: If directional changes or offsets to equipment connections do not allow for flexibility of the trapezed system (e.g. long offsets or flexible connectors) then the system must be braced regardless of conduit size or distance to the structure if the combined weight per foot (*meter*) of all items is greater than 10 lbs/ft (*14.9 kg/m*).**

   Page 30 of these guidelines details the "12 Inch Rule" for suspended electrical systems.

A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002
Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

GENERAL NOTES (continued)

In addition, to meet the 1997 Uniform Building Code CBC/2001, all of the following conditions must be satisfied:

1. Lateral motion of electrical system will not cause damaging impact with surrounding systems (e.g. other electrical systems, ducts, pipes, equipment, etc.) or cause loss of system vertical support.
2. Electrical system must be made of ductile material with ductile connections.
3. Vertical support connections cannot develop moments (e.g. swivel joints, eye bolts etc.)

2. Conduits and cable trays shall be braced at the spacings shown in these guidelines. Transverse brace spacing shall not exceed 50 feet (*15.2 m*) up to 0.25g, 40 feet (*12.2 m*) up to 1.0g, and 20 feet (*6.1 m*) up to 2.0g. Maximum longitudinal spacing shall not exceed 80 feet (*24.4 m*) up to 1.0g, and 40 feet (*12.2 m*) up to 2.0g.

3. Transverse restraints for conduit or cable trays shall be installed at general support locations. Connection of the restraint to the support shall be at the support rod connection to the hanger or cable tray.

4. Longitudinal restraints for conduits shall be attached directly to the conduit using a pipe clamp hanger or a standard pipe clamp within 4" (*102 mm*) of a vertical support. Longitudinal restraints for cable trays shall be at the support rod connection to the cable tray.

5. The charts in Section A or D may be used to determine seismic restraint components and their anchorage for conduits or cable trays. Section M of these guidelines tabulates the weight per foot (*meter*) of steel conduit with maximum conductor fill.

Notes on Vertical Risers:

1. Vertical pipe, duct or electrical systems supported at each floor up to a five story building shall be considered seismically braced if the penetration through each floor is tightly packed. Refer to Page R1 for support details.

2. Vertical risers in an open shaft must be attached to the supports with connections sized to accept the horizontal seismic loads. Support spacing shall not exceed 40 feet (*12.2 m*) up to 0.25g, 30 feet (*9.1 m*) up to 1.0g and 20 feet (*6.1 m*) up to 2.0g. Supports and connections must be engineered on a job by job basis subject to approval by the enforcement agency.

3. Vertical cast iron pipe risers attached with shield and clamp assemblies must be stiffened at the connection points of any unsupported section of pipe. Refer to Page R1 for stiffening details.

GENERAL NOTES (continued)

1997 Uniform Building Code

As defined in the 1997 Uniform Building Code 2001 CBC, Chapter 16, Section 1632/1632A, the seismic horizontal force, Fp, may be calculated using the following formula:

$$F_p = \frac{a_p\, C_a\, I_p}{R_p}\left(1 + 3\,\frac{h_x}{h_r}\right) W_p$$

Except that: F_p shall not be less than 0.7 C_a I_p W_p and need not be more than 4 C_a I_p W_p.

Where:

W_p = Operating Weight of Pipe, Duct and/or Electrical System

a_p = Component Amplification Factor
= 1.0 for Suspended Piping, Ductwork or Electrical Systems.

R_p = Component Response Modification Factor
= 3.0 for Suspended Piping, Ductwork or Electrical Systems.
= 1.5 for installations using concrete anchors with an embedment length-to-diameter ratio less 8. (e.g. a 1/2” (*13 mm*) diameter concrete anchor embedded less 4" (*104 mm*))

I_p = Importance Factor
1.5 for Essential Facilities such as Hospitals, Fire or Police Stations, etc., hazardous facilities and life-safety systems.
1.0 for all other Occupancies. Refer to 1997 UBC Table 16-K.

C_a = Seismic Coefficient derived from the Seismic Zone, Soil Properties and Proximity to Known Earthquake Faults summarized in 1997 UBC Tables 16-I, 16-Q and 16-S.

h_x = Element or Component Attachment Elevation with respect to grade. H_x shall not be taken less than 0.0.

h_r = Structure Roof Elevation with respect to grade.

Example:

Piping is suspended on the 1st floor of a 50 foot (*15.2 m*) high, 3-story office building. The piping is actually suspended from the 2nd floor which has an elevation of 15 feet (*4.6 m*) from grade. The building is located in Seismic Zone 3 on Soil Type SD which results in a Seismic Coefficient, C_a = 0.36.

$$F_p = \frac{a_p\, C_a\, I_p}{R_p}\left(1 + 3\,\frac{h_x}{h_r}\right) W_p = \frac{(1.0)(0.36)(1.0)}{3.0}\left(1 + 3\,\frac{15}{50}\right) W_p = 0.23\ W_p = 0.23g$$

A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002
Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive, Hauppauge, NY 11788, 631/348-0282, FAX 631/348-0279
2101 W. Crescent Ave., Suite D, Anaheim, CA 92801, 714/535-2727, FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

GENERAL NOTES (continued)

2000 International Building Code

As defined in the 2000 International Building Code, Chapter 16, Section 1621, the seismic horizontal force, F_p , may be calculated using the following formula:

$$F_p = \frac{0.4\, a_p\, S_{DS}\, I_p}{R_p}\left(1 + 2\,\frac{z}{h}\right) W_p$$

Except that F_p shall not be less than $0.3\ S_{DS}\ I_p\ W_p$ and need not be more than $1.6\ S_{DS}\ I_p\ W_p$
Where:

W_p = Operating Weight of Pipe, Duct and/or Electrical System

a_p = Component Amplification Factor
= 1.0 for Suspended Piping and Ductwork.
= 2.5 for Suspended Bus Ducts, Conduits and Cable Trays.

R_p = Component Response Modification Factor
= 5.0 for Suspended Bus Ducts, Conduits and Cable Trays.
= 3.5 for Suspended High Deformability Piping Systems such as welded steel pipe or brazed/soldered copper pipe.
= 2.5 for Suspended Ductwork and Limited Deformability Piping Systems such as piping with screwed fittings.
= 1.5 for installations using concrete anchors with an embedment length-to-diameter ratio less than 8. (e.g. a 1/2 (*13 mm*) diameter concrete anchor embedded less than 4" (*102 mm*)).
= 1.25 for Suspended Low Deformability Piping Systems such as cast iron pipe.

I_p = Importance Factor
= 1.5 for Essential Facilities such as Hospitals, Fire or Police Stations, etc., hazardous facilities and life-safety systems.
= 1.0 for all other Occupancies. Refer to 2000 IBC Section 1621.1.6.

S_{DS} = The Design Spectral Response Acceleration at short periods.
= $2/3\ S_{MS}$

S_{MS} = The Maximum Considered Earthquake Spectral Accelerations for short periods.
= $F_a \times S_s$

S_s = The Mapped Spectral Response Acceleration at Short Periods.

F_a = The Site Coefficient as a function of Site Class (soil conditions) and Mapped Spectral Accelerations. Refer to 2000 IBC Table 1615.1.2.

z = Element or Component Attachment Elevation with respect to grade. z shall not be taken less than 0.0 or greater than h.

h = Structure Roof Elevation with respect to grade.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

GENERAL NOTES (continued)

F_p shall not be taken less than, $0.7\ C_a\ I_p\ W_p = 0.7(0.36)(1.0)\ W_p = 0.26g$
F_p shall not be greater than, $4.0\ C_a\ I_p\ W_p = 4.0(0.36)(1.0)\ W_p = 1.44g$

Therefore, $F_p = 0.26g$

For use in this manual we can convert the result from Design Strength to Allowable Stress Design by dividing the result by 1.4, **$F_p = 0.26g / 1.4 = 0.19g$**

For installations using concrete anchors installed with an embedment length-to-diameter ratio less than 8, also defined as shallow concrete anchors, the component Response Factor, $R_p = 1.5$, therefore for the same example.

$$F_p = \frac{a_p\ C_a\ I_p}{R_p}\left(1 + 3\frac{h_x}{h_r}\right) W_p = \frac{(1.0)(0.36)(1.0)}{1.5}\left(1 + 3\frac{15}{50}\right) W_p = 0.46\ W_p = 0.46g$$

Comparing this value with the minimum and maximum F_p equations previously calculated gives, $F_p = 0.46g$. Again, converting to Allowable Stress Design fo use in this manual, $F_p = 0.46g / 1.4 = 0.33g$

Consider the same example, if the piping is suspended from the roof,

$$F_p = \frac{a_p\ C_a\ I_p}{R_p}\left(1 + 3\frac{h_x}{h_r}\right) W_p = \frac{(1.0)(0.36)(1.0)}{3.0}\left(1 + 3\frac{50}{50}\right) W_p = 0.48\ W_p = 0.48g$$

Compare this value with the minimum and maximum F_p equations previously calculated gives, $F_p = 0.48 / 1.4 = 0.35g$

For shallow concrete anchor installations,

$$F_p = \frac{a_p\ C_a\ I_p}{R_p}\left(1 + 3\frac{h_x}{h_r}\right) W_p = \frac{(1.0)(0.36)(1.0)}{1.5}\left(1 + 3\frac{50}{50}\right) W_p = 0.96\ W_p = 0.96g$$

Comparing this value with the minimum and maximum F_p equations previously calculated gives, $F_p = 0.96g / 1.4 = 0.69g$

This example can be summarized as follows for use with this manual.

Office Building Level	Horizontal Acceleration Fp	Fp For Shallow Concrete Anchor Installations
1st Floor	0.19g	0.33g
2nd Floor	0.24g	0.48g
3rd Floor	0.35g	0.69g

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

GENERAL NOTES (continued)

Example:

Piping with screwed fittings is suspended on the 1st floor of a 50 foot (*15.2m*) high, 3-story office building. The piping is actually suspended from the 2nd floor, which has an elevation of 15 feet (*4.6m*) from the grade. The building is located where the value of S_s is 1.00 and the site class is D.

$$S_{DS} = 2/3\ S_{MS} = 2/3\ F_a \times S_s = 2/3(1.1)(1.00) = 0.73$$

$$F_p = \frac{0.4\ a_p S_{DS} I_p}{R_p}\left(1 + 2\frac{z}{h}\right) W_p = \frac{(0.4)(1.0)(0.73)}{2.5}\left(1 + 2\frac{15}{50}\right) W_p = 0.19g$$

F_p shall not be taken less than, $0.3\ S_{DS}\ I_p\ W_p = 0.3(0.73(1.0)W_p = 0.22g$

F_p shall not be greater than, $1.6\ S_{DS}\ I_p\ W_p = 1.6(0.73(1.0)W_p = 0.17g$

Therefore, $F_p = 0.22g$

For use in this manual we can convert the result from Design Strength to Allowable Stress Design by dividing the result by 1.4, **F_p = 0.22g / 1.4 = 0.16g.**

For Installation using concrete anchors installed with an embedment length-to-diameter ratio less than 8, also defined as shallow concrete anchors, the Component Response Factor, Rp= 1.5, therefore for the same example

$$F_p = \frac{0.4\ a_p S_{DS} I_p}{R_p}\left(1 + 2\frac{z}{h}\right) W_p = \frac{(0.4)(1.0)(0.73)}{1.5}\left(1 + 2\frac{15}{50}\right) W_p = 0.31g$$

Comparing this value with the minimum and maximum F_p equations previously calculated gives, $F_p = 0.31g$. Again, converting to Allowable Stress Design for use in this manual, **F_p = 0.31g / 1.4 = 0.22g.**

Consider the same example, if the piping is suspended from the roof,

$$F_p = \frac{0.4\ a_p S_{DS} I_p}{R_p}\left(1 + 2\frac{z}{h}\right) W_p = \frac{(0.4)(1.0)(0.73)}{2.5}\left(1 + 2\frac{50}{50}\right) W_p = 0.35g$$

Comparing this value with the minimum and maximum F_p equations previously calculated gives, **F_p = 0.35g / 1.4 = 0.25g.**

This example can be summarized as follows for use with this manual.

Office Building Level	Horizontal Acceleration F_p	F_p For Shallow Concrete Anchor Installations
1st Floor	0.16g	0.22g
2nd Floor	0.19g	0.31g
3rd Floor	0.25g	0.42g

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

DESIGN PROCEDURE
FOR INDIVIDUALLY SUPPORTED SYSTEMS

Selection charts are available for each of the following attachment methods and types of structures:

1. Expansion anchors into a 3000 psi (*20.68 MPa*), stone aggregate concrete slab.
2. Expansion anchors into a 3000 psi (*20.68 MPa*), lightweight concrete filled metal deck.
3. Bolted or welded direct to structural steel.
4. Lag screw into a wood structure.

Design Procedure:

Step 1. Select the Seismic Restraint Guideline for the actual attachment method or type of structure listed above. These charts show anchorage requirements, size of seismic cable brace (SCB) or seismic solid brace (SSB) or seismic strut brace (SSBS), cable or solid brace size and maximum brace spacing for different pipe sizes or maximum weight per foot (*meter*). (Ref. Pages A1 to A4)

Step 2. Select the Rod Stiffener Guidelines for Individually Supported Systems. This chart defines the maximum unbraced rod length, maximum braced rod length and maximum spacing between each seismic rod clamp (SRC) or strut clamp (UCC). (Ref. Page B1)

Step 3. Check the minimum size of SCBH, SCB, SSBS and SSB. An increase in size may be required if a larger clevis is used on insulated pipe, etc. (Ref. Page B2)

Step 4. Select the Supported Rod Attachment Guideline, which coincides with the Seismic Restraint Guideline selected in Step 1 if using seismic solid braces. Each chart defines the seismic tension load applied to the support rod at the seismic solid brace location. (Ref. Pages K1 to K4)

The following summary can be used for easy reference.

SEISMIC RESTRAINT/SUPPORT GUIDELINES

Structure or Attachment Type	Seismic Restraint Guidelines	Rod Stiffener Guidelines	Minimum SCBH, SCB SSB and SSBS Size	Support Rod Attachment Guidelines at SSB and SSBS Locations
1	A1	B1	B2	K1
2	A2	B1	B2	K2
3	A3	B1	B2	K3
4	A4	B1	B2	K4

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

DESIGN PROCEDURE
FOR INDIVIDUALLY SUPPORTED SYSTEMS (continued)

Step 5. Select the appropriate seismic restraint details.

The following summary can be used for easy reference.

SEISMIC RESTRAINT DETAILS

	Support Type	Transverse Brace	Alternate Transverse Brace	Longitudinal Brace	Rod Stiffener
Type SCB Cable Brace System	Spring Isolated	C1	C2	C3	G1, G2
	Rigidly Supported	C4	C5	C6	G1, G2
Type SBB Solid Brace System	Rigidly Supported	C7	C8	C9	G1, G2

Step 6. Select the appropriate attachment details.

The following summary can be used for easy reference.

SEISMIC RESTRAINT/SUPPORT GUIDELINES

Structure or Attachment Type	RESTRAINT DETAILS			Support Rod Attachment Details
	SCB/SSB/SSBS Direct Attachment	SCB/SSB 2 Bolt Attachment	SCB/SSB 4 Bolt Attachment	
1	H1	H2	H3	L1
2	H4	H5	H6	L2, L3
3	H7 to H12			L4 to L6
4	H13			L1 to L6

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

DESIGN PROCEDURE
FOR INDIVIDUALLY SUPPORTED SYSTEMS (example)

The design procedure is used to select the appropriate guidelines and details for a particular type of structure, attachment method and support type as listed below:

Structure: 3000 psi (*20.86 MPa*) concrete filled metal deck.
Restraint Type: Seismic Cable Brace (SCB)
Restraint Attachment: Expansion Anchors
Support Attachment: Refer to project specifications for attachments designed to accept gravity loads.

A. From the design procedure on page 17, the structure/attachment type for seismic attachment is #2.

B. Follow step 1 through 6 as listed in the design procedure.

From the Seismic Restraint/Support Guidelines summary on page 17:

Step 1. Select the Seismic Restraint Guideline for structure/attachment #2, sheet A2.

Step 2. Select the Rod Stiffener Guideline on sheet B1.

Step 3. Select the Minimum SCBH, SCB, SSB and SSBS size on sheet B2.

Step 4. Support Rod Attachment Guideline is not required when using seismic cable bracing.

From the Seismic Restraint Details summary on page 18

Step 5. For the spring isolated/SCB cable brace system select:
a. Sheets C1 and C2 for transverse braces.
b. Sheet C3 for longitudinal braces.
c. Sheet G1 for rod bracing details.

From the Attachment Details summary on page 18

Step 6. For seismic structure/attachment #2 select:
a. Sheet H4 for SCB direct attachment.
b. Sheet H5 for SCB (2) bolt attachment.
c. Sheet H6 for SCB (4) bolt attachment.
d. All applicable L sheets.

A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002
Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

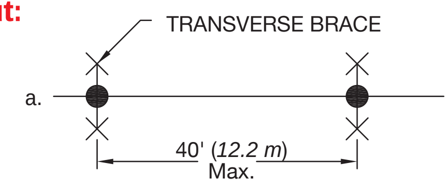
Dhiru Mali
Structural Engineer
California SE No. 2811

DESIGN PROCEDURE
FOR INDIVIDUALLY SUPPORTED SYSTEMS (example continued)

There are a number of choices available to suit a variety of project requirements and field conditions. The selected guidelines and details are used to determine restraint size, anchorage and vertical rod stiffening requirements for the following pipeline with the project requirements and field conditions listed below:

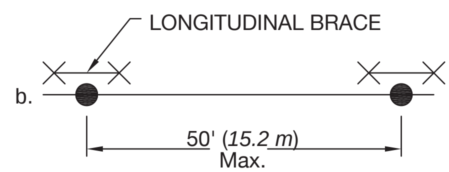
Seismic Acceleration Input: 0.5 g
Pipe Size: 8" (*203 mm*) diameter steel pipe filled with water
Support Rod Diameter: 7/8" (*22 mm*)
Support Rod Length: 72" (*1829 mm*)
Restraint Type: SCBH attached to support rod at clevis, SCB attached to structure.
Maximum Brace Angle Ratio: 1:1
Restraint Spacing: Maximum Allowed

From Sheet A2 (A2m), for 8" (*203mm*) pipe and 0.5g seismic input:



a. Maximum trans. Brace spacing = 40 feet (*12.2 m*).

b. Maximum long. Brace spacing = 50 feet (*15.2 m*).



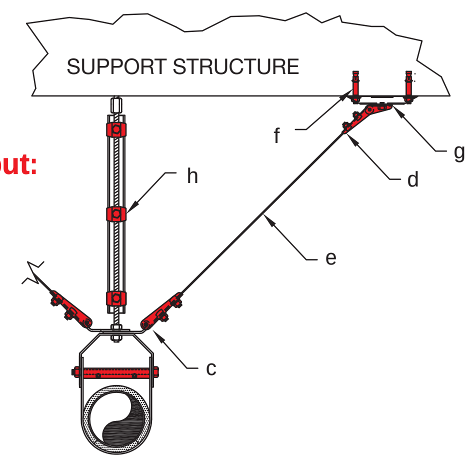
c. Use SCBH-2 attached to support rod at clevis.

d. Use SCB-2 attached to structure

e. Cable Diameter = 3/16" (*5 mm*)

f. Use (2) 5/8" (*16 mm*) dia. With 5" (*127 mm*) embed. ITW Ramset/Red Head Trubolt Wedge exp. anchors for attachment to the structure.

g. Use an SLDB-2000 anchor bracket for the SCB attachment to the structure.



From Sheet B1 (B1m), for 8 in. (*203 mm*) pipe at 0.5g seismic input:

h. The 72" (1829 mm) long rod must be braced with a 1 1/2" x 1 1/2" x 1/4" (38 x 38 x 6 mm) angle and (3) SRC 1-1/2 rod clamps.

From Sheet B2:

i. An SCBH-2 will fit the 7/8" (*22 mm*) rod used to support the 8" (*203 mm*) pipe.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

DESIGN PROCEDURE
FOR TRAPEZE SUPPORTED SYSTEMS

Selection charts are available for each of the following attachment methods and types of structures:

1. Expansion anchors into a 3000 psi (*20.68 MPa*), stone aggregate concrete slab.
2. Expansion anchors into a 3000 psi (*20.68 MPa*), lightweight concrete filled metal deck.
3. Bolted or welded direct to structural steel.
4. Lag screws into a wood structure.

Design Procedure:

Step 1. Select the Seismic Restraint Guideline for the actual attachment method or type of structure listed above. These charts show anchorage requirements, size of SCB, SSB, or SSBS and cable or solid brace size for maximum system weight per foot (*meter*). (Ref. Pages D1 to D4)

Step 2. Select the Rod Stiffener Guidelines for Trapeze Supported Systems. Each chart defines the maximum unbraced rod length, maximum braced rod length and maximum spacing between each seismic rod clamp (SRC) or strut clamp (UCC). (Ref. Pages E1 and E2)

Step 3. Select the Trapeze Support Guidelines. These charts define the maximum allowable uniform load for different trapeze support spans. (Ref. Page E3)

Step 4. Select the Upper Support Member Guideline for Rectangular/Oval Duct (Not required for round duct.) These charts define upper support member sizes for each SCH/SSB size and upper support extension (Ref. Page E4)

Step 5. Select the Support Rod Attachment Guideline which coincides with the Seismic Restraint Guideline selected in Step 1 if using seismic solid braces. Each chart defines the seismic tension load applied to the support rod at the seismic solid brace location. (Ref. Pages K1 to K4)

The following summary can be used for easy reference.

SEISMIC RESTRAINT/SUPPORT GUIDELINES

Structure or Attachment Type	Seismic Restraint Guidelines	Rod Stiffener Guidelines	Trapeze Support Guidelines	Top Brace Member Guidelines for Rect./Oval Ductwork Only	Support Rod Attachment Guidelines at SSB Locations
1	D1	E1 & E2	E3	E4	K1
2	D2	E1 & E2	E3	E4	K2
3	D3	E1 & E2	E3	E4	K3
4	D4	E1 & E2	E3	E4	K4

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

Step 6. Select the appropriate seismic restraint details.

The following summary can be used for easy reference.

SEISMIC RESTRAINT DETAILS

Mechanical or Electrical System	Seismic Brace System	Support Type	All Direction Brace	Transverse Brace	Longitudinal Brace	Rod Stiffener
Piping or Conduit	Type SCB Cable Brace System	Spring Isolated	F1	F2	F3	G1, G2
		Rigidly Supported	F4	F5	F6	G1, G2
	Type SSB/SSBS Solid Brace System	Rigidly Supported	F7	F8	F9	G1, G2
Rectangular or Oval Ductwork	Type SCB Cable Brace System	Spring Isolated	F10	F11	F12	G1, G2
		Rigidly Supported	F13	F14	F15	G1, G2
	Type SSB/SSBS Solid Brace System	Rigidly Supported	F16	F17	F18	G1, G2
Round Ductwork	Type SCB Cable Brace System	Spring Isolated	F19	F20	F21	G1, G2
		Rigidly Supported	F22	F23	F24	G1, G2
	Type SSB/SSBS Solid Brace System	Rigidly Supported	F25	F26	F27	G1, G2
Electrical Cable Tray	Type SCB Cable Brace System	Rigidly Supported	F28	F29	F30	G1, G2
	Type SSB/SSBS Solid Brace System	Rigidly Supported	F31	F32	F33	G1, G2

Step 7. Select the appropriate attachment details.

The following summary can be used for easy reference.

ATTACHMENT DETAILS

Structure or Attachment Type	RESTRAINT DETAILS			Support Rod Attachment Details
	SCB/SSB/SSBS Direct Attachment	SCB/SSB 2 Bolt Attachment	SCB/SSB 4 Bolt Attachment	
1	H1	H2	H3	L1
2	H4	H5	H6	L2, L3
3	H7 to H13			L4 to L6
4	H13			L1 to L6

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

DESIGN PROCEDURE
FOR TRAPEZE SUPPORTED SYSTEMS (example)

The design procedure is used to select the appropriate guidelines and details for a particular type of structure, attachment method and support type as listed below:

Mechanical/Electrical System: Rectangular Ductwork
Structure: Stone aggregate concrete slab
Restraint Type: Seismic Solid Brace (SSB or SSBS)
Restraint Attachment: Expansion Anchors
Support type: Rigid Support Rod
Support Attachment: Steel Beam Clamp

A. From the design procedure on page 21 the structure/attachment type for seismic attachment is #1

B. Follow steps 1 through 7 as listed in the design procedure.

From the Seismic Restraint/Support Guidelines summary on page 22:

Step 1. Select the Seismic Restraint Guideline for structure/attachment #1, sheet D1.

Step 2. Select the Rod Stiffener Guideline sheet E1.

Step 3. Select the Trapeze Support Guideline sheet E3.

Step 4. Select the Top Brace Member Guideline if bracing Rect./Oval Duct, sheet E4.

Step 5. Select the Support Rod Attachment Guideline at SSB/SSBS Locations for structure/attachment #1, sheet K1.

From the Seismic Restraint details summary on page 22:

Step 6. For rectangular duct, rigidly supported SSB/SSBS solid brace system select:
a. Sheet F16 for all directional braces.
b. Sheet F17 for transverse braces.
c. Sheet F18 for longitudinal braces.
d. Sheet G1 or G2 for rod bracing details.

From the Attachment Details summary on page 22:

Step 7. For structure/attachment #1, select:
a. Sheet H1 for SSB/SSBS direct attachment.
b. Sheet H2 for SSB (2) bolt attachment.
c. Sheet H3 for SSB (4) bolt attachment.
d. All applicable L sheets.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive, Hauppauge, NY 11788, 631/348-0282, FAX 631/348-0279
2101 W. Crescent Ave., Suite D, Anaheim, CA 92801, 714/535-2727, FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

DESIGN PROCEDURE
FOR TRAPEZE SUPPORTED SYSTEMS (example continued)

There are a number of choices available to suit a variety of project requirements and field conditions. The selected guidelines and details are used to determine restraint size, anchorage and vertical rod stiffening requirements for the following ductwork with the project requirements and field conditions as listed below:

Seismic Acceleration Input: 1.0g
Duct Size: 70" x 60" x 18 gage (*1778 x 1524 x 1.2 mm*).
Support Rod Diameter: To be determined in Section K at SSB Locations only.
Support Rod Length: 84" (*2134 mm*).
Restraint Type: SSB attached to the upper support member and the structure.
Brace Angle Ratio: 1:1
Restraint Spacing: Maximum allowed, 30 feet (*9.1m*) trans. and 60 feet (*18.3m*) long.
Trapeze Span: 72" (*1829 mm*).
Trapeze Support Spacing: 6 ft. (*1.8m*).
Top Brace Extension: 3" (*76 mm*).

Determine the Maximum Weight of the Duct:

From Sheet N6 (N6m):

a. Weight of the duct is 50 lbs/ft (*74.4 kg/m*).

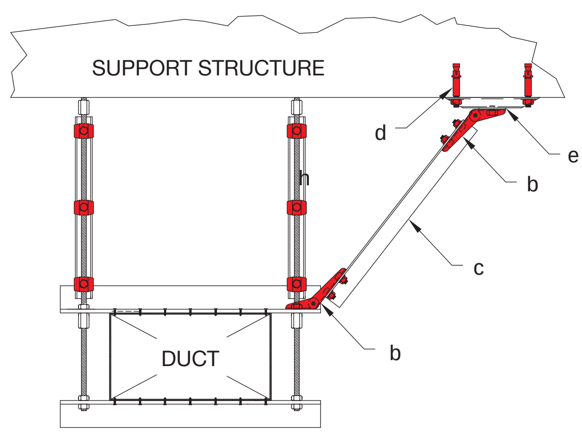
From Sheet D1 (D1m), for a maximum weight of 73 lbs/ft (*109 kg/m*) at 1.0g seismic acceleration input and 30 ft. (*9.1m*) transverse brace spacing:

b. Use SSB-3 for attachment to the top brace member and the structure.

c. Minimum brace size is 4 x 4 x 1/4" (*102 x 102 x 6 mm*) steel angle.

d. Use (4) 5/8" (*16 mm*) dia. with 51/8" (*130mm*) embed. ITW Ramset/Red Head Trubolt wedge expansion anchors for attachment to the structure.

e. Use an SLDB-4000 anchor bracket for the SSB attachment to the structure.



MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

DESIGN PROCEDURE
FOR TRAPEZE SUPPORTED SYSTEMS (example continued)

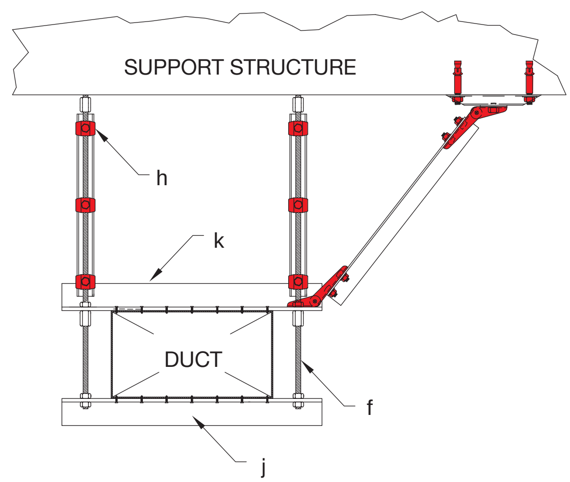
From Sheet K1 (K1m), for SSB-3:

f. Minimum support rod diameter is 3/4". (*19 mm*).

g. The attachment of the support rod to the structure must be capable of accepting the gravity load in addition to the seismic tension load of 2200 lbs. (*998 kg*).

From Sheet E1 (E1m), when using an SSB-3 and a 3/4" (*19 mm*) diameter support rod:

h. The 84" (*2134 mm*) long rod must be braced with a 11/2 x 11/2 x 1/4" (*38 x 38 x 6 mm*) steel angle and (3) SRC-11/2 rod clamps.



From Sheet E3 (E3m):

i. The actual load on the trapeze at 6 ft. (*1829 mm*) support spacing is : 50 lbs/ft x 6 ft. of pipe = 300 lbs. (*74 kg/m x 1.8m of pipe = 133.2 kg*)

j. For a 72" span, use a 15/8 x 15/8 x 12ga (*41 x 41 x 2.7 mm*) strut with an allowable uniform load of 560 lbs. (*254 kg*).

From Sheet E4 (E4m):

k. For a 3" (*76 mm*) top brace extension with an SSB-3, use a 15/8 x 15/8 x 12ga double strut. (*41 x 41 x 2.7 mm* double strut)

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive, Hauppauge, NY 11788, 631/348-0282, FAX 631/348-0279
2101 W. Crescent Ave., Suite D, Anaheim, CA 92801, 714/535-2727, FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

LAYOUT OF SEISMIC BRACES

The next few pages outline a procedure for the seismic brace layout of pipes, ducts and conduits. Transverse and longitudinal braces indicated throughout are detailed in Section C for Individually Supported Systems and Section F for Trapeze Supported Systems. A transverse and longitudinal brace indicated at the same support points are defined as all directional braces for trapeze supported systems.

Step 1. Separate the layout of the system into individual straight runs. A straight run is defined as a section of pipe, duct or conduit between changes in direction. If an offset(s) occurs between changes of direction it may be neglected if the distance perpendicular to the run is less than the maximum offset length tabulated below.

STEEL PIPE OR CONDUIT

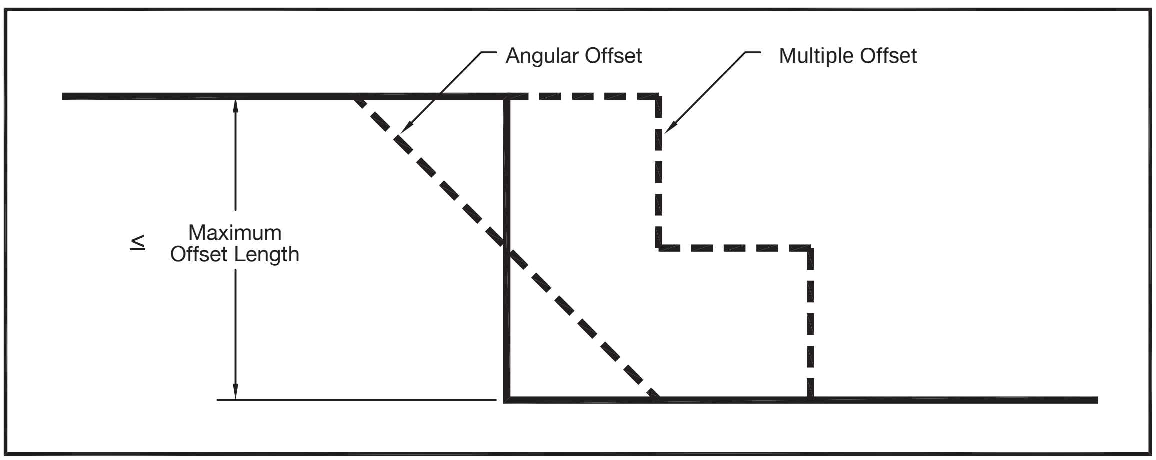
Pipe Diameter in (*mm*)	Max. Offset Length ft (m)		
	0.25g	0.5g	1.0g
1¼ to 2 (*35 to 50*)	4 (*1.2*)	2 (*0.6*)	1 (*0.3*)
2½ to 3 (*65 to 75*)	8 (*2.4*)	4 (*1.2*)	2 (*0.6*)
4 to 5 (*100 to 125*)	10 (*3*)	6 (*1.8*)	3 (*0.9*)
6 (*150*)	10 (*3*)	10 (*3*)	5 (*1.5*)
8 (*200*)	10 (*3*)	10 (*3*)	7 (*2.1*)
10 to 12 (*250 to 300*)	10 (*3*)	10 (*3*)	9 (*2.7*)
14 to 24 (*350 to 600*)	10 (*3*)	10 (*3*)	10 (*3*)

COPPER PIPE

Pipe Diameter in (*mm*)	Max. Offset Length ft (m)		
	0.25g	0.5g	1.0g
2½ to 3 (*65 to 75*)	2 (*0.6*)	1 (*0.3*)	0
4 to 5 (*100 to 125*)	4 (*1.2*)	2 (*0.6*)	1 (*0.3*)
6 (*150*)	8 (*2.4*)	4 (*1.2*)	2 (*0.6*)
8 (*200*)	10 (*3*)	8 (*2.4*)	4 (*1.2*)
10 (*250*)	10 (*3*)	10 (*3*)	5 (*1.5*)
12 (*300*)	10 (*3*)	10 (*3*)	6 (*1.8*)

The above Offset Charts are limited to pipe with welded, soldered, brazed or UL listed grooved joints.

Ductwork maximum offset length is 2 times the duct width. Pipe with screwed joints, cast iron pipe and PVC pipe maximum offset length is 2 feet (*0.6 m*) or as tabulated above.



MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

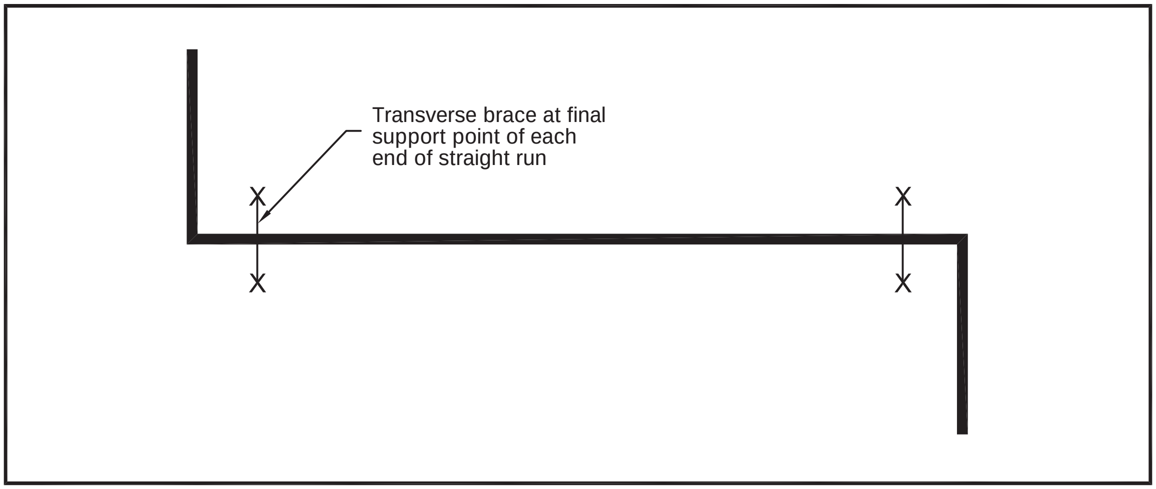
APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

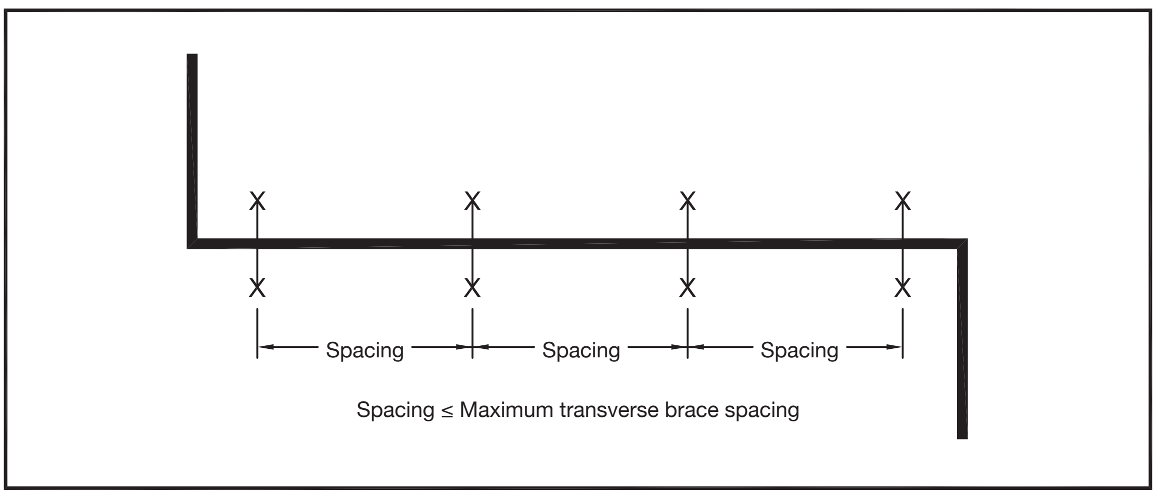
Dhiru Mali
Structural Engineer
California SE No. 2811

LAYOUT OF SEISMIC BRACES (continued)

Step 2. Each straight run must be braced in the transverse direct (perpendicular to the run) at each end.

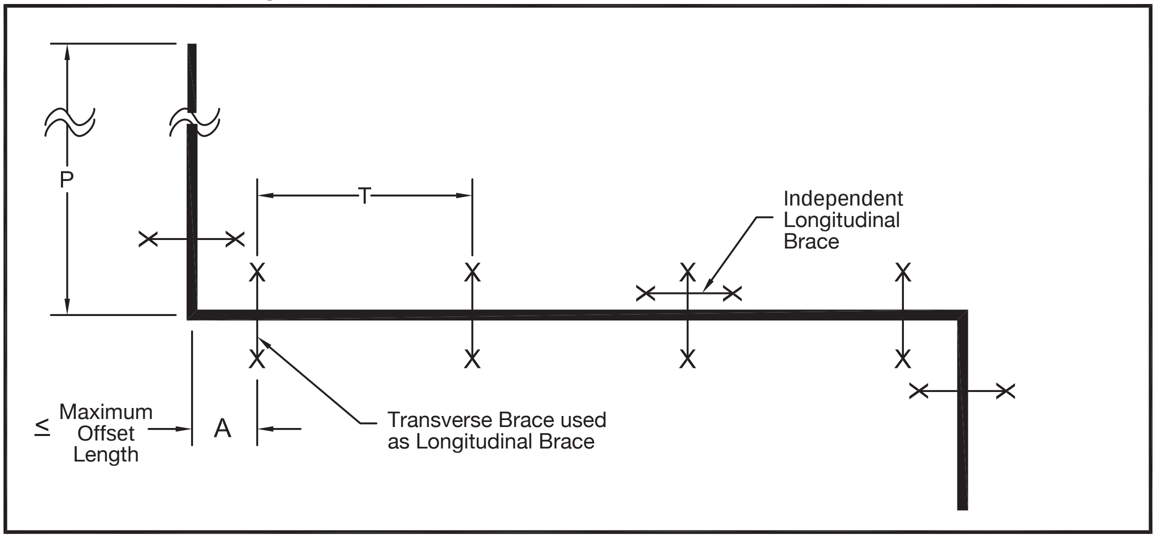


Step 3. Add transverse braces, if required, to limit the spacing(s) to the maximum spacing indicated in sections A and D.

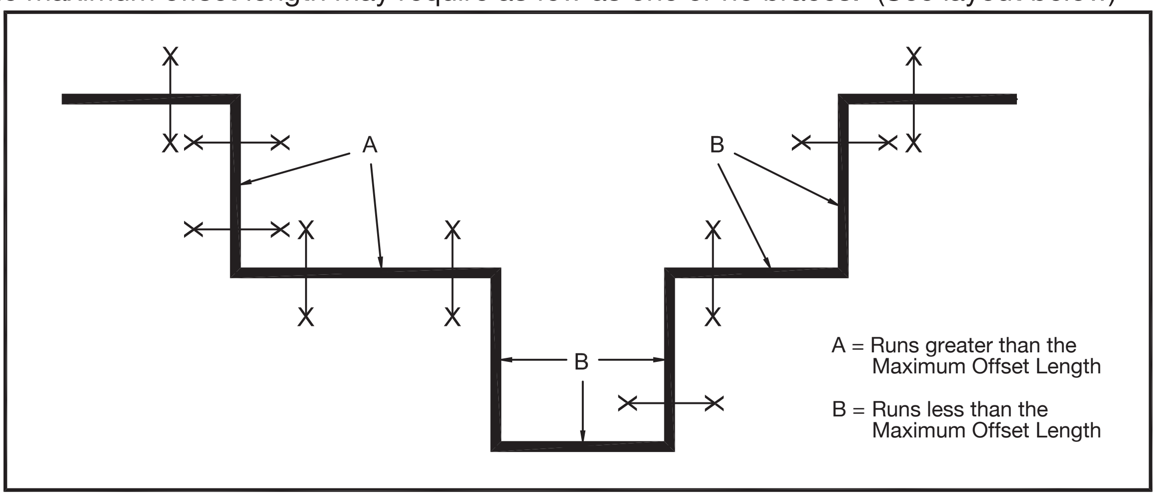


Step 4. Each straight run must be braced in the longitudinal direction (parallel to the run) with at least one brace. Transverse braces within the maximum offset length discussed in Step 1 may be used in additional to or in lieu of independent longitudinal braces. The length of pipe around a 90° turn (indicated as 'P' below) longitudinally braced from a transverse brace = 0.9L-0.5T-A, where:

L = Longitudinal Brace spacing (From Section A or D)
T = The distance between Transverse Braces
A = Offset Length



Step 5. Multiple changes in direction may be treated as one complete system. Straight runs greater than the maximum offset length require 2 transverse braces. Straight runs less than the maximum offset length may require as few as one or no braces. (See layout below)



MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

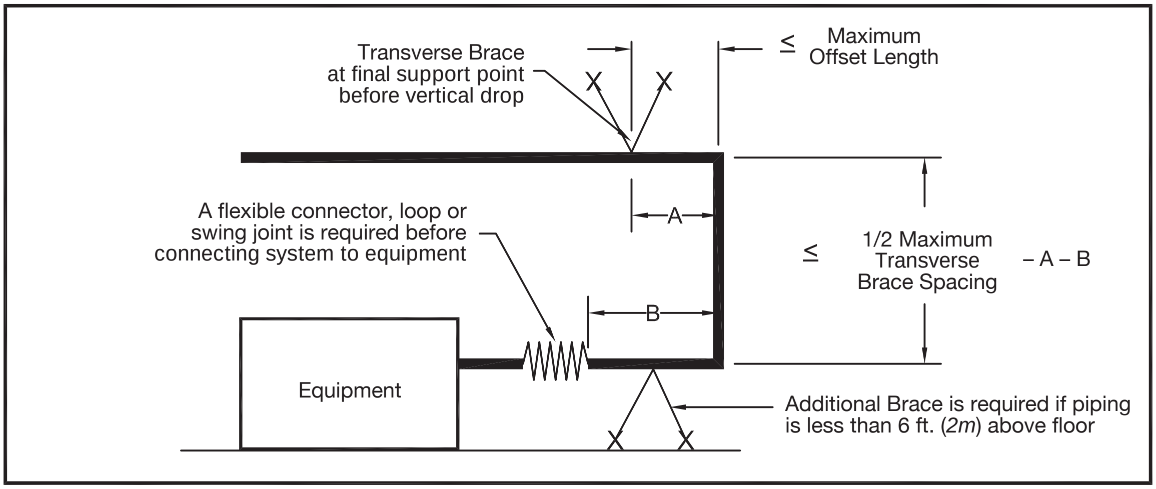
APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

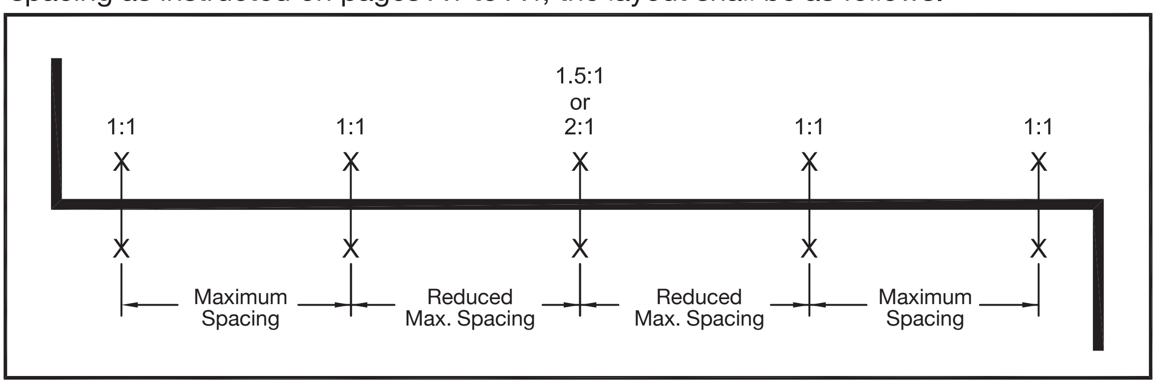
LAYOUT OF SEISMIC BRACES (continued)

Step 6. Vertical drops to equipment must be protected with a transverse brace at the final support point before the vertical drop. The distance from the transverse brace to the drop must be within the maximum offset length of the system. The length of the system braced from the transverse brace to the flexible connector is equal to 1/2 of the maximum transverse brace spacing indicated in sections A and D. If this distance is greater than 1/2 of the maximum transverse brace spacing, an additional brace is required at the end of the vertical drop by attaching to the floor.



Note: Length of system braced = 1/4 max. brace spacing for 2" to 3" (*51 to 76 mm*) dia. copper pipe. Additional brace at floor is required for 1 1/2" (*38 mm*) dia. and smaller copper pipe, and 1" (*25 mm*) dia. and smaller steel pipe, unless specific analysis is approved by the enforcement agency.

Step 7. If seismic braces installed at a 1:1 brace angle ratio from horizontal are intermixed with 1.5:1 or 2:1 brace angle ratios, and the installer opts to reduce the brace spacing as instructed on pages A1 to A4, the layout shall be as follows.



APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

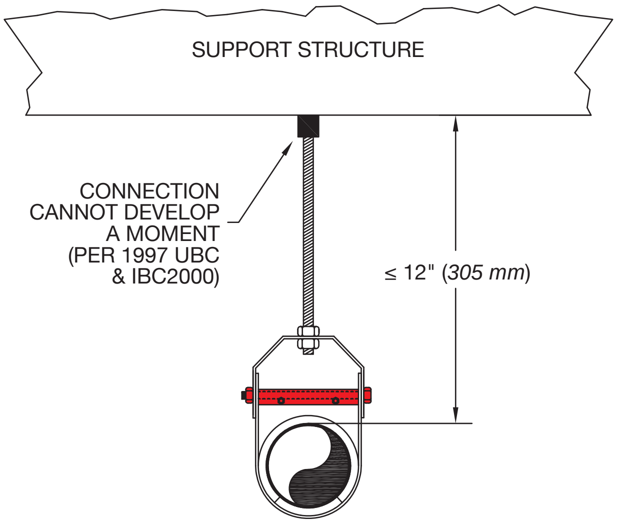
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

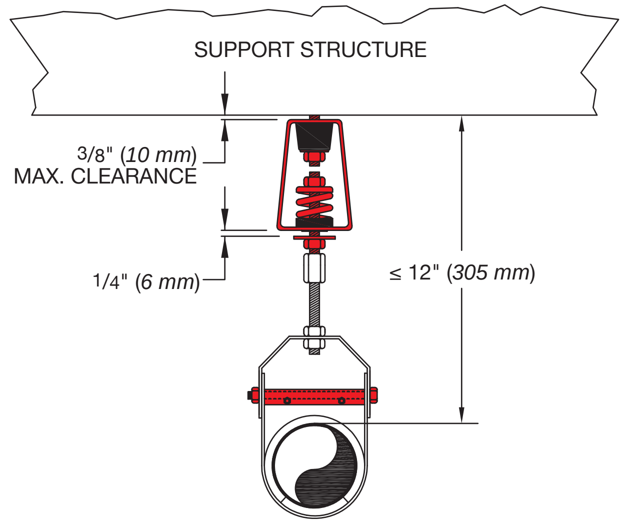
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

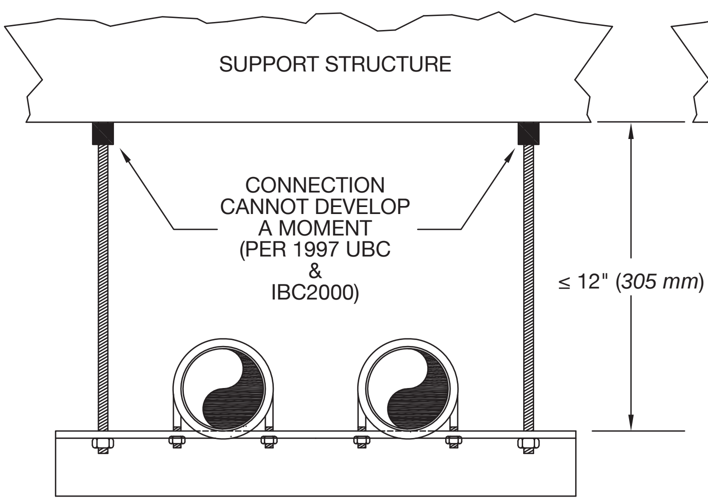
"12 INCH RULE" FOR PIPES, CONDUITS OR CABLE TRAYS



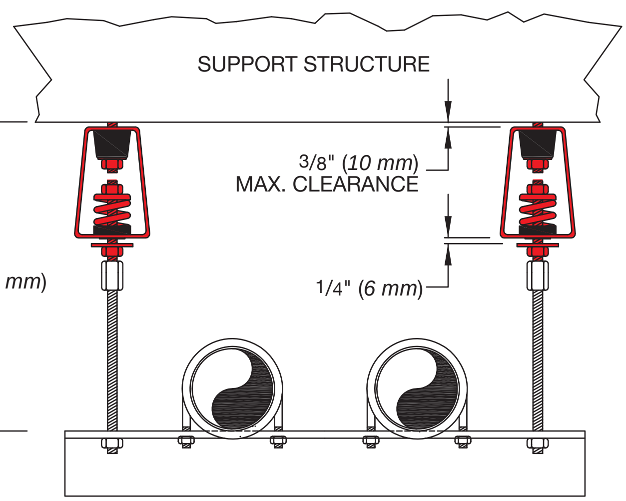
PIPE OR CONDUIT



PIPE OR CONDUIT



PIPE, CONDUIT OR CABLE TRAY



PIPE, CONDUIT OR CABLE TRAY

Note 1: Refer to Page 10, note 1 and page 13, note 1 for additional requirements of the "12 inch Rule".
Note 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

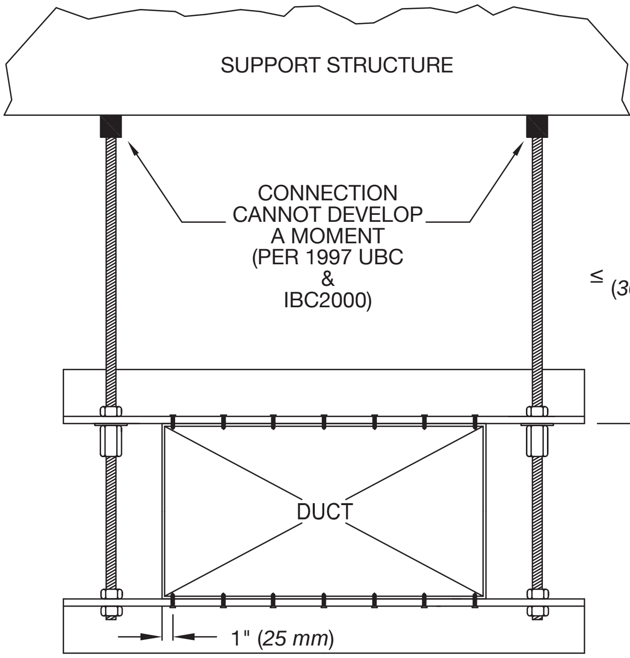
California Office of Statewide Health Planning and Development

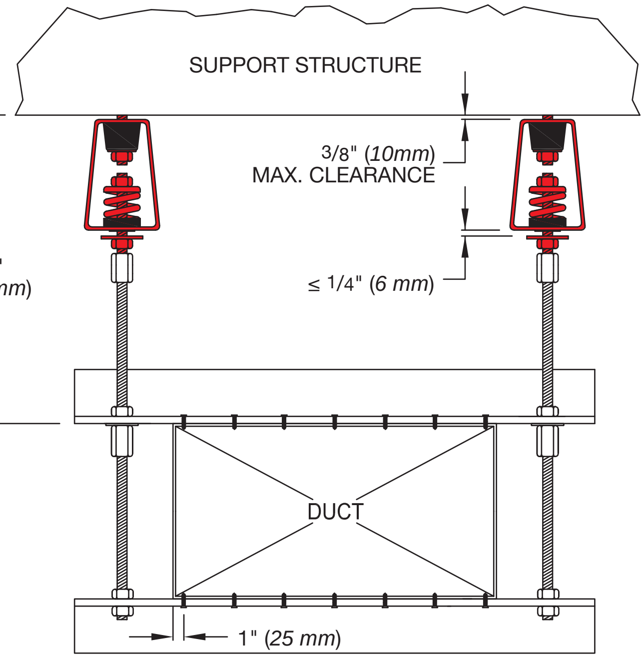
FIXED EQUIPMENT ANCHORAGE

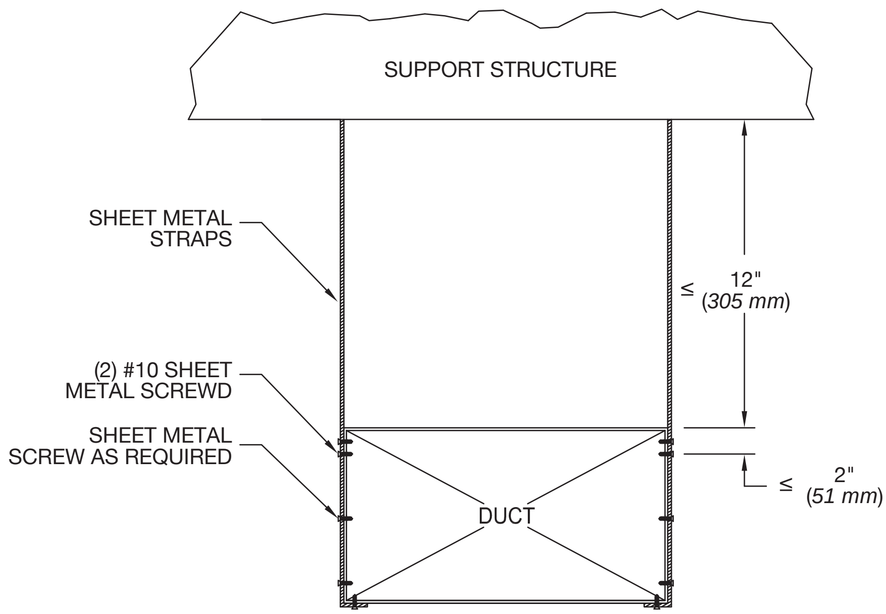
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

"12 INCH RULE" FOR DUCTWORK







Note 1: Refer to Page 12, note 1 for additional requirements of the "12 inch Rule".
Note 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

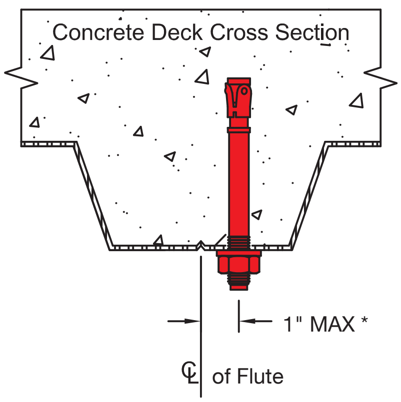
Dhiru Mali
Structural Engineer
California SE No. 2811

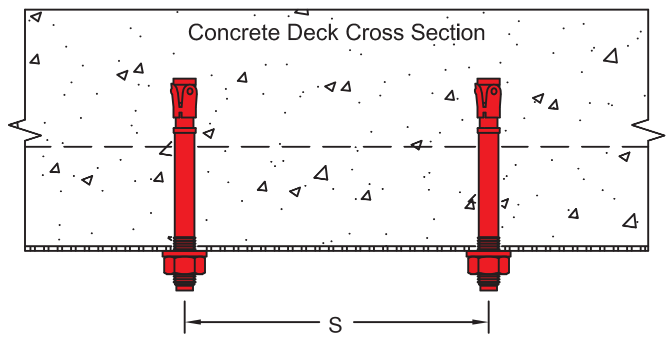
HILTI KWIK BOLT 3 ANCHORS

Allowable brace spacing in charts A2 & D2 are based on Ramset/Redhead Trubolt expansion anchors or approval equal. The following Hilti Kwik Bolt 3 anchors are approved equals.

PREAPPROVED: RAMSET/REDHEAD TRUBOLT		APPROVED EQUAL: HILTI KWIK BOLT 3	
ANCHOR TYPE	ANCHOR Ø X EMBED	ANCHOR TYPE	ANCHOR Ø X EMBED
RAMSET/REDHEAD TRUBOLT	1/2 x 3	HILTI KWIK-BOLT 3	1/2 x 3 1/2
RAMSET/REDHEAD TRUBOLT	5/8 x 5	HILTI KWIK-BOLT 3	5/8 x 4

Note: For use with CBC-2001, Kwik Bolt 3 embedment lengths must be increased to 8x the anchor diameter, or Rp = 1.5 must be used in calculating anchor loads.





Hilti Kwik Bolt 3 Spacing Requirements	
Anchor Diameter (in)	Minimum Allowable Spacing (S) ** (in)
1/2	7 7/8
5/8	9

* Reference ICBO ESR-1385, Figure 3

** Reference ICBO ESR-1385, Table 2

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
January 25, 2008

Anthony R. Pike **(916) 654-3362**

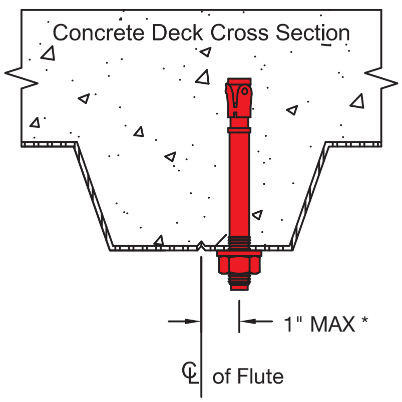
Dhiru Mali
Structural Engineer
California SE No. 2811

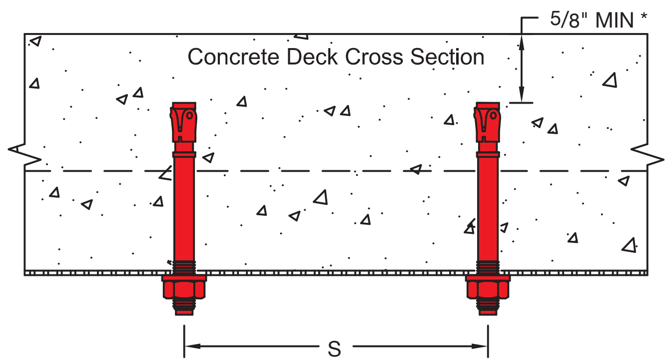
HILTI KWIK BOLT TZ ANCHORS

Allowable brace spacing in charts A2 & D2 are based on Ramset/Redhead Trubolt expansion anchors or approval equal. The following Hilti Kwik Bolt TZ anchors are approved equals.

PREAPPROVED: RAMSET/REDHEAD TRUBOLT		APPROVED EQUAL: HILTI KWIK BOLT TZ	
ANCHOR TYPE	ANCHOR Ø X EMBED	ANCHOR TYPE	ANCHOR Ø X EMBED
RAMSET/REDHEAD TRUBOLT	1/2 x 3	HILTI KWIK-BOLT TZ	1/2 x 3 1/4
RAMSET/REDHEAD TRUBOLT	5/8 x 5	HILTI KWIK-BOLT TZ	5/8 x 4

Note: For use with CBC-2001, Kwik Bolt 3 embedment lengths must be increased to 8x the anchor diameter, or Rp = 1.5 must be used in calculating anchor loads.





Hilti Kwik Bolt TZ Spacing Requirements	
Anchor Diameter (in)	Minimum Allowable Spacing (S) ** (in)
1/2	9 3/4
5/8	12

* Reference ICBO ESR-1917, Figure 5

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
January 25, 2008

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SSRF BRACKET SELECTION

The SSRF bracket as shown on X4A can be used as the lowest bracket attachment of a solid brace to a suspended piping or trapeze system as describe below:

INDIVIDUALLY SUPPORTED SYSTEMS

Max. Pipe Diameter (in)	*(mm)*	Max. Pipe Weight (lbs/ft)	*(kg/m)*	Rod Diameter (in)	Retrofit Bracket Size	Minimum Allowable Brace Angle	Maximum Allowable Brace Angle
5	*51*	6.2	*9.2*	3/8-16 UNC	SSRF-1	0.7:1	2:1
3	*76*	12.1	*18.0*	1/2-13 UNC	SSRF-1	0.5:1	2:1
5	*127*	26.6	*39.5*	5/8-11 UNC	SSRF-2	0.5:1	2:1
10	*254*	80.2	*119.3*	3/4-10 UNC	SSRF-2	0.5:1	2:1

The SSRF brackets indicated above can be used on pipe systems braced at the spacings shown on pages A1-A4.

Support rods must have rod bracing with a rod clamp within 1" *25mm* of each end of the rod.

TRAPEZE SUPPORTED SYSTEMS

Referenced Trapeze Weight (lbs/ft)	*(kg/m)*	Rod Diameter (in)	Retrofit Bracket Size	Minimum Allowable Brace Angle	Maximum Allowable Brace Angle
9	*13*	3/8-16 UNC	SSRF-1	0.5:1	2:1
17	*25*	1/2-13 UNC	SSRF-1	0.5:1	2:1
36	*54*	5/8-11 UNC	SSRF-2	0.5:1	2:1
36	*54*	3/4-10 UNC	SSRF-2	0.5:1	2:1

The SSRF brackets indicated above can be used on any combination of trapeze weight per food, g level and maximum brace spacing as shown in a row of the "Maximum Weight per Foot" charts on pages D1-D4 whose weight at 40 ft brace spacing and 1.0 g is equal to or less than the weight in the chart above.

The trapeze brace selections are valid for support rods carrying 70% or less of the total trapeze load.

General Notes:

Brace angles listed are Rise : Run.

Use of the SSRF bracket on pipe sizes and trapeze weights greater than those listed above must be designed and submitted for approval on a project by project basis.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
January 31, 2008

Anthony R. Pike (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

SSB BRACKET SELECTION

The SSB bracket as shown on X4B can be used as the structure attachment bracket of a solid brace to a suspended piping or trapeze system as described below:

INDIVIDUALLY SUPPORTED SYSTEM

Max. Pipe Diameter (in)	(*mm*)	Max. Pipe Weight (lbs/ft)	(*kg/m*)	Anchor Diameter (in)		SSB Bracket Size
5	*127*	26.6	*39.5*	1/2	*13*	SSB-1
8	*203*	55.1	*82.0*	5/8	*13*	SSB-2

The SSB brackets indicated above can be used on pipe systems braced at the spacings shown on pages A1-A4.

TRAPEZE SUPPORTED SYSTEMS

Referenced Trapeze Weight (lbs/ft)	(*kg/m*)	Anchor Diameter (in)		SSB Bracket Size
17	*25*	1/2	*13*	SSB-1
36	*54*	5/8	*13*	SSB-2

The SSB brackets indicated above can be used on any combination of trapeze weight per food, g level and maximum brace spacing as shown in a row of the "Maximum Weight per Foot" charts on pages D1-D4 whose weight at 40 ft brace spacing and 1.0 g is equal to or less than the weight in the chart above and whose required anchor diameter matches that of the SSB.

General Notes:

Use of the SSB bracket on pipe sizes and trapeze weights greater than those listed above must be designed and submitted for approval on a project by project basis.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

OPA-0349
on
January 16, 2009

Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

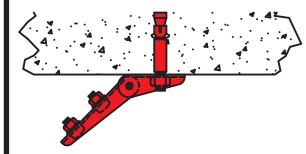
End of
Section

SEISMIC RESTRAINT GUIDELINES

INDIVIDUALLY SUPPORTED SYSTEMS

MINIMUM 3000 PSI STONE AGGREGATE CONCRETE SLAB

EXPANSION ANCHORS



Pipe Dia. (in)	Max Weight per Foot (lbs)	Maximum Brace Spacing (ft) for Specified Seismic 'g' Loads*						Option 1		Option 2		Concrete Anchors		
		0.25g		0.5g		1.0g								
		Trans.	Long.	Trans.	Long.	Trans.	Long.	SCB Size	Cable Dia. (in)	SSB/ SSBS Size	Minimum Brace Size (in)	Qty. Req'd	Dia. (in)	Embed. (in)
1	2.8	50	80	40	80	40	80	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	2 1/4
1 1/4	3.8	50	80	40	80	40	80	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	2 1/4
1 1/2	4.5	50	80	40	80	40	80	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	2 1/4
2	6.2	50	80	40	80	40	68	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4 1/8
2 1/2	9.1	50	80	40	80	40	61	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4 1/8
3	12.1	50	80	40	80	40	46	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4 1/8
4	18.3	50	80	40	60	30	30	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4 1/8
5	26.6	50	80	40	42	21	21	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4 1/8
6	34.8	50	80	40	50	25	25	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	1	5/8	5 1/8
8	55.1	50	80	40	52	26	26	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	2	5/8	5 1/8
10	80.2	50	72	36	36	18	18	SCB-2	3/16	SSB-3	L3 x 3 x 1/4	2	5/8	5 1/8
12	109.0	50	80	40	40	20	20	SCB-3	1/4	SSB-3	L4 x 4 x 1/4	4	5/8	5 1/8
14	122.0	50	72	36	36	18	18	SCB-3	1/4	SSB-4	L4 x 4 x 1/4	4	5/8	5 1/8
16	150.0	50	56	28	28	14	14	SCB-3	1/4	SSB-4	L4 x 4 x 1/4	4	5/8	5 1/8
18	190.0	44	44	22	22	11	11	SCB-3	1/4	SSB-4	L4 x 4 x 1/4	4	5/8	5 1/8
20	214.0	50	72	36	36	18	18	SCB-4	3/8	SSB-4	L4 x 4 x 1/4	4	5/8	5 1/8
24	289.0	50	52	26	26	13	13	SCB-4	3/8	SSB-4	L4 x 4 x 1/4	4	5/8	5 1/8

*Maximum braced spacing for up to 1:1 brace angle from horizontal.

For up to 1.5:1 brace angle from horizontal, divide braced rod length by 1.67; for 2:1 brace angle, divide by 2.33.
Example: For 3" diameter pipe at 0.5 g input and 1.5:1 brace angle ratio, the maximum transverse spacing = 40/1.67 = 23 ft.

For maximum brace spacing at 'g' forces other than those listed, divide the 1g spacing by the desired 'g' force.
Example: For a 0.74g input for 12" diameter pipe, transverse brace spacing = 20/0.74 = 27 ft. (Note: Transverse and longitudinal brace spacing shall not exceed those stated in the general notes.)

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H1, H2 and H3 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with an ITW Ramset/Red Head Trubolt Wedge Anchor, ICBO Report ER-1372/2000, Table 3, 4 and 5, embedded headed stud or J-bolt of equal embedment or approved equal.

Where (2) anchors are specified, the SCB, SSB or SSBS w/SLDB-2000 is required for attachment to structure. (Ref. Page H2 and X9)

Where (4) anchors are specified, the SCB or SSB w/SLDB-4000 is required for attachment to structure. (Ref. Page H3 and X10)

An increase in SCB or SSB size may be required to accommodate the cross bolt or support rod. (Ref. Page B2)

All SSB brace members tabulated are steel angle. Factory 12ga formed channel strut may be in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channel.

(Ref. page X4)

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

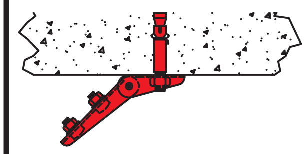
Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIVIDUALLY SUPPORTED SYSTEMS

MINIMUM 20,680 kPa STONE AGGREGATE CONCRETE SLAB

EXPANSION ANCHORS



Pipe Dia. *(mm)*	Max Weight per meter *(kg)*	Maximum Brace Spacing (*m*) for Specified Seismic 'g' Loads*						Option 1		Option 2		Concrete Anchors		
		0.25g		0.5g		1.0g								
		Trans.	Long.	Trans.	Long.	Trans.	Long.	SCB Size	Cable Dia. *(mm)*	SSB/ SSBS Size	Minimum Brace Size *(mm)*	Qty. Req'd	Dia. *(mm)*	Embed. *(mm)*
25	4.1	15.2	24.4	12.2	24.4	12.2	24.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	57
32	5.6	15.2	24.4	12.2	24.4	12.2	24.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	57
38	6.6	15.2	24.4	12.2	24.4	12.2	24.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	57
51	9.2	15.2	24.4	12.2	24.4	12.2	20.7	SCB-1	3	SSBS	41 x 41 Strut	1	13	105
64	13.5	15.2	24.4	12.2	24.4	12.2	18.6	SCB-1	3	SSBS	41 x 41 Strut	1	13	105
76	18.0	15.2	24.4	12.2	24.4	12.2	14.0	SCB-1	3	SSBS	41 x 41 Strut	1	13	105
102	27.3	15.2	24.4	12.2	18.3	9.1	9.1	SCB-1	3	SSBS	41 x 41 Strut	1	13	105
127	39.5	15.2	24.4	12.2	12.8	6.4	6.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	105
152	51.8	15.2	24.4	12.2	15.2	7.6	6.4	SCB-2	5	SSBS	41 x 41 Strut	1	16	130
203	82.0	15.2	24.4	12.2	15.8	7.9	7.9	SCB-2	5	SSBS	41 x 41 Strut	2	16	130
254	119.3	15.2	21.9	11.0	11.0	5.5	5.5	SCB-2	5	SSB-3	L76 x 76 x 6	2	16	130
305	162.2	15.2	24.4	12.2	12.0	6.1	6.1	SCB-3	6	SSB-3	L102 x 102 x 6	4	16	130
356	181.5	15.2	21.9	11.0	11.0	5.5	5.5	SCB-3	6	SSB-4	L102 x 102 x 6	4	16	130
406	222.6	15.2	17.1	8.5	8.5	4.3	4.3	SCB-3	6	SSB-4	L102 x 102 x 6	4	16	130
457	282.7	13.4	13.4	6.7	6.7	3.4	3.4	SCB-3	6	SSB-4	L102 x 102 x 6	4	16	130
508	317.7	15.2	21.9	11.0	11.0	5.5	5.5	SCB-4	10	SSB-4	L102 x 102 x 6	4	16	130
610	430.1	15.2	15.8	7.9	7.9	4.0	4.0	SCB-4	10	SSB-4	L102 x 102 x 6	4	16	130

*Maximum braced spacing for up to 1:1 brace angle from horizontal.

For up to 1.5:1 brace angle from horizontal, divide braced rod length by 1.67; for 2:1 brace angle, divide by 2.33. Example: For 76 mm diameter pipe at 0.5 g input and 1.5:1 brace angle ratio, the maximum transverse spacing = 12.2/1.67 = 7.3 m.

For maximum brace spacing at 'g' forces other than those listed, divide the 1g spacing by the desired 'g' force. Example: For a 0.74g input for 305mm diameter pipe, transverse brace spacing = 6.1/0.74 = 8.2m. (Note: Transverse and longitudinal brace spacing shall not exceed those stated in the general notes.)

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H1, H2 and H3 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with an ITW Ramset/Red Head Trubolt Wedge Anchor, ICBO Report ER-1372/2000, Table 3, 4 and 5, embedded headed stud or J-bolt of equal embedment or approved equal.

Where (2) anchors are specified, the SCB, SSB or SSBS w/SLDB-2000 is required for attachment to structure. (Ref. Page H2 and X9)

Where (4) anchors are specified, the SCB or SSB w/SLDB-4000 is required for attachment to structure. (Ref. Page H3 and X10)

An increase in SCB, SSB or SSBS size may be required to accommodate the cross bolt or support rod. (Ref. Page B2)

All SSB brace members tabulated are steel angle. Factory 2.7mm formed channel strut may be in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channel. (Ref. page X4)

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

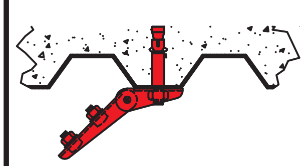
Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIVIDUALLY SUPPORTED SYSTEMS

MINIMUM 3000 PSI LIGHTWEIGHT CONCRETE DECK

EXPANSION ANCHORS



Pipe Dia. (in)	Max Weight per Foot (lbs)	Maximum Brace Spacing (ft) for Specified Seismic 'g' Loads*						Option 1		Option 2		Concrete Anchors		
		0.25g		0.5g		1.0g								
		Trans.	Long.	Trans.	Long.	Trans.	Long.	SCB Size	Cable Dia. (in)	SSB/ SSBS Size	Minimum Brace Size (in)	Qty. Req'd	Dia. (in)	Embed. (in)
1	2.8	50	80	40	80	40	80	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	3
1 1/4	3.8	50	80	40	80	40	80	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	3
1 1/2	4.5	50	80	40	80	40	80	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	3
2	6.2	50	80	40	80	40	60	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	3
2 1/2	9.1	50	80	40	80	40	41	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	3
3	12.1	50	80	40	62	31	31	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	3
4	18.3	50	80	40	40	20	20	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	3
5	26.6	50	56	28	28	14	14	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	3
6	34.8	50	64	32	32	16	16	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	1	5/8	5
8	55.1	50	80	40	50	25	25	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	2	5/8	5
10	80.2	50	68	34	34	17	17	SCB-2	3/16	SSB-3	L3 x 3 x 1/4	2	5/8	5
12	109.0	50	80	40	40	20	20	SCB-3	1/4	SSB-3	L4 x 4 x 1/4	4	5/8	5
14	122.0	50	72	36	36	18	18	SCB-3	1/4	SSB-4	L4 x 4 x 1/4	4	5/8	5
16	150.0	50	56	28	28	14	14	SCB-3	1/4	SSB-4	L4 x 4 x 1/4	4	5/8	5
18	190.0	44	44	22	22	11	11	SCB-3	1/4	SSB-4	L4 x 4 x 1/4	4	5/8	5
20	214.0	50	52	26	26	13	13	SCB-4	3/8	SSB-4	L4 x 4 x 1/4	4	5/8	5
24	289.0	36	36	18	18	9	9	SCB-4	3/8	SSB-4	L4 x 4 x 1/4	4	5/8	5

*Maximum braced spacing for up to 1:1 brace angle from horizontal.

For up to 1.5:1 brace angle from horizontal, divide braced rod length by 1.68; for 2:1 brace angle, divide by 2.38. Example: For 3" diameter pipe at 0.5 g input and 1.5:1 brace angle ratio, the maximum transverse spacing = 40/1.68 = 23 ft.

For maximum brace spacing at 'g' forces other than those listed, divide the 1g spacing by the desired 'g' force. Example: For a 0.74g Input for 12" diameter pipe, transverse brace spacing = 20/0.74 = 27 ft. (Note: Transverse and longitudinal brace spacing shall not exceed those stated in the general notes.)

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H4, H5 and H6 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with an ITW Ramset/Red Head Trubolt Wedge Anchor, ICBO Report ER-1372/2000, Table 4, 5 and 10, embedded headed stud or J-bolt of equal embedment or approved equal.

Where (2) anchors are specified, the SCB, SSB or SSBS w/SLDB-2000 is required for attachment to structure. (Ref. Page H5 and X9)

Where (4) anchors are specified, the SCB or SSB w/SLDB-4000 is required for attachment to structure. (Ref. Page H6 and X10)

An increase in SCB, SSB or SSBS size may be required to accommodate the cross bolt or support rod. (Ref. Page B2)

All SSB brace members tabulated are steel angle. Factory 12ga formed channel strut may be in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channel.

(Ref. page X4)

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

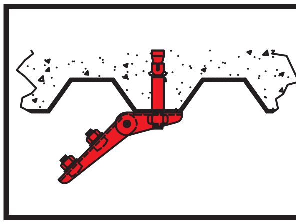
Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIVIDUALLY SUPPORTED SYSTEMS

MINIMUM 20,680 kPa LIGHTWEIGHT CONCRETE DECK

EXPANSION ANCHORS



Pipe Dia. *(mm)*	Max Weight per meter *(kg)*	Maximum Brace Spacing (*m*) for Specified Seismic 'g' Loads* 0.25g Trans.	0.25g Long.	0.5g Trans.	0.5g Long.	1.0g Trans.	1.0g Long.	Option 1 SCB Size	Option 1 Cable Dia. *(mm)*	Option 2 SSB/ SSBS Size	Option 2 Minimum Brace Size *(mm)*	Concrete Anchors Qty. Req'd	Concrete Anchors Dia. *(mm)*	Concrete Anchors Embed. *(mm)*
25	4.1	15.2	24.4	12.2	24.4	12.2	24.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	76
32	5.6	15.2	24.4	12.2	24.4	12.2	24.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	76
38	6.6	15.2	24.4	12.2	24.4	12.2	24.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	76
51	9.2	15.2	24.4	12.2	24.4	12.2	18.3	SCB-1	3	SSBS	41 x 41 Strut	1	13	76
64	13.5	15.2	24.4	12.2	24.4	12.2	12.5	SCB-1	3	SSBS	41 x 41 Strut	1	13	76
76	18.0	15.2	24.4	12.2	18.9	9.4	9.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	76
102	27.3	15.2	24.4	12.2	12.2	6.1	6.1	SCB-1	3	SSBS	41 x 41 Strut	1	13	76
127	39.5	15.2	17.1	8.5	8.5	4.3	4.3	SCB-1	3	SSBS	41 x 41 Strut	1	13	76
152	51.8	15.2	19.5	9.8	9.8	4.9	4.9	SCB-2	5	SSBS	41 x 41 Strut	1	16	127
203	82.0	15.2	24.4	12.2	15.2	7.6	7.6	SCB-2	5	SSBS	41 x 41 Strut	2	16	127
254	119.3	15.2	20.7	10.4	10.4	5.2	5.2	SCB-2	5	SSB-3	L76 x 76 x 6	2	16	127
305	162.2	15.2	24.4	12.2	12.2	6.1	6.1	SCB-3	6	SSB-3	L102 x 102 x 6	4	16	127
356	181.5	15.2	21.9	11.0	11.0	5.5	5.5	SCB-3	6	SSB-4	L102 x 102 x 6	4	16	127
406	222.6	15.2	17.1	8.5	8.5	4.3	4.3	SCB-3	6	SSB-4	L102 x 102 x 6	4	16	127
457	282.7	13.4	13.4	6.7	6.7	3.4	3.4	SCB-3	6	SSB-4	L102 x 102 x 6	4	16	127
508	317.7	15.2	15.8	7.9	7.9	4.0	4.0	SCB-4	10	SSB-4	L102 x 102 x 6	4	16	127
610	430.1	11.0	11.0	5.5	5.5	2.7	2.7	SCB-4	10	SSB-4	L102 x 102 x 6	4	16	127

*Maximum braced spacing for up to 1:1 brace angle from horizontal.

For up to 1.5:1 brace angle from horizontal, divide braced spacing by 1.68; for 2:1 brace angle, divide by 2.38. Example: For 76mm diameter pipe at 0.5 g input and 1.5:1 brace angle ratio, the maximum transverse spacing = 12.2/1.68 = 7.3m.

For maximum brace spacing at 'g' forces other than those listed, divide the 1g spacing by the desired 'g' force. Example: For a 0.74g input for 305mm diameter pipe, transverse brace spacing = 6.1/0.74 = 8.2m. (Note: Transverse and longitudinal brace spacing shall not exceed those stated in the general notes.)

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H4, H5 and H6 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with an ITW Ramset/Red Head Trubolt Wedge Anchor, ICBO Report ER-1372/2000, Table 4, 5 and 10, embedded headed stud or J-bolt of equal embedment or approved equal.

Where (2) anchors are specified, the SCB, SSB or SSBS w/SLDB-2000 is required for attachment to structure. (Ref. Page H5 and X9)

Where (4) anchors are specified, the SCB or SSB w/SLDB-4000 is required for attachment to structure. (Ref. Page H6 and X10)

An increase in SCB or SSB size may be required to accommodate the cross bolt or support rod. (Ref. Page B2)

All SSB brace members tabulated are steel angle. Factory 2.7mm formed channel strut may be in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channel. (Ref. page X4)

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

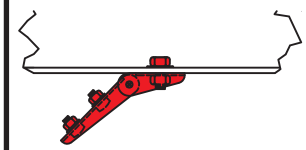
Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIVIDUALLY SUPPORTED SYSTEMS

STRUCTURAL STEEL BEAM OR MEMBER
A307 BOLT OR 70XX WELD



Pipe Dia. (in)	Max Weight per Foot (lbs)	Maximum Brace Spacing (ft) for Specified Seismic 'g' Loads* 0.25g Trans.	0.25g Long.	0.5g Trans.	0.5g Long.	1.0g Trans.	1.0g Long.	Option 1 SCB Size	Option 1 Cable Dia. (in)	Option 2 SSB/SSBS Size	Option 2 Minimum Brace Size (in)	Steel Bolt Qty. Req'd	Steel Bolt Dia. (in)	Weld Size (in)
1	2.8	50	80	40	80	40	80	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	1/8
1 1/4	3.8	50	80	40	80	40	80	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	1/8
1 1/2	4.5	50	80	40	80	40	80	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	1/8
2	6.2	50	80	40	80	40	68	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	1/8
2 1/2	9.1	50	80	40	80	40	75	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	1/8
3	12.1	50	80	40	80	40	56	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	1/8
4	18.3	50	80	40	74	37	37	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	1/8
5	26.6	50	80	40	50	25	25	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	1/8
6	34.8	50	80	40	80	40	41	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	1	5/8	1/8
8	55.1	50	80	40	52	26	26	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	1	5/8	1/8
10	80.2	50	72	36	36	18	18	SCB-2	3/16	SSB-3	L3 x 3 x 1/4	1	5/8	3/16
12	109.0	50	80	40	40	20	20	SCB-3	1/4	SSB-3	L4 x 4 x 1/4	1	3/4	3/16
14	122.0	50	72	36	36	18	18	SCB-3	1/4	SSB-4	L4 x 4 x 1/4	1	3/4	3/16
16	150.0	50	56	28	28	14	14	SCB-3	1/4	SSB-4	L4 x 4 x 1/4	1	3/4	3/16
18	190.0	44	44	22	22	11	11	SCB-3	1/4	SSB-4	L4 x 4 x 1/4	1	3/4	3/16
20	214.0	50	80	40	44	22	22	SCB-4	3/8	SSB-4	L4 x 4 x 1/4	1	1 1/4	3/16
24	289.0	50	64	32	32	16	16	SCB-4	3/8	SSB-4	L4 x 4 x 1/4	1	1 1/4	3/16

*Maximum braced spacing for up to 1:1 brace angle from horizontal.

For up to 1.5:1 brace angle from horizontal, divide braced spacing by 1.5; for 2:1 brace angle, divide by 2.
Example: For 3" diameter pipe at 0.5 g input and 1.5:1 brace angle ratio, the maximum transverse spacing = 40/1.5 = 26 ft.

For maximum brace spacing at 'g' forces other than those listed, divide the 1g spacing by the desired 'g' force.
Example: For a 0.74g input for 12" diameter pipe, transverse brace spacing = 20/0.74 = 27 ft. (Note: Transverse and longitudinal brace spacing shall not exceed those stated in the general notes.)

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H7 to H12 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with a Standard ASTM A307 Quality Bolts or E70xx electrode welds.

An increase in SCB, SSB or SSBS size may be required to accommodate the cross bolt or support rod. (Ref. Page B2)

All SSB brace members tabulated are steel angle. Factory 12ga formed channel strut may be in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channels.

(Ref. page X4)

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

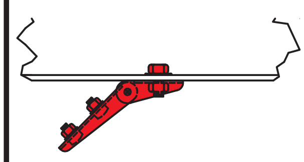
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIVIDUALLY SUPPORTED SYSTEMS

STRUCTURAL STEEL BEAM OR MEMBER
A307 BOLT OR 70XX WELD



Pipe Dia. *(mm)*	Max Weight per meter *(kg)*	Maximum Brace Spacing (*m*) for Specified Seismic 'g' Loads*						Option 1		Option 2		Steel Bolt		Weld Size *(mm)*
		0.25g		0.5g		1.0g								
		Trans.	Long.	Trans.	Long.	Trans.	Long.	SCB Size	Cable Dia. *(mm)*	SSB/ SSBS Size	Minimum Brace Size *(mm)*	Qty. Req'd	Dia. *(mm)*	
25	4.1	15.2	24.4	12.2	24.4	12.2	24.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	3
32	5.6	15.2	24.4	12.2	24.4	12.2	24.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	3
38	6.6	15.2	24.4	12.2	24.4	12.2	24.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	3
51	9.2	15.2	24.4	12.2	24.4	12.2	20.7	SCB-1	3	SSBS	41 x 41 Strut	1	13	3
64	13.5	15.2	24.4	12.2	24.4	12.2	22.9	SCB-1	3	SSBS	41 x 41 Strut	1	13	3
76	18.0	15.2	24.4	12.2	24.4	12.2	17.1	SCB-1	3	SSBS	41 x 41 Strut	1	13	3
102	27.3	15.2	24.4	12.2	12.6	11.3	11.3	SCB-1	3	SSBS	41 x 41 Strut	1	13	3
127	39.5	15.2	24.4	12.2	15.2	7.6	7.6	SCB-1	3	SSBS	41 x 41 Strut	1	13	3
152	51.8	15.2	24.4	12.2	24.4	12.2	12.5	SCB-2	5	SSBS	41 x 41 Strut	1	16	3
203	82.0	15.2	24.4	12.2	15.8	7.6	7.9	SCB-2	5	SSBS	41 x 41 Strut	1	16	3
254	119.3	15.2	21.9	11.0	11.0	5.5	5.5	SCB-2	5	SSB-3	L76 x 76 x 6	1	16	5
305	162.2	15.2	24.4	12.2	12.2	6.1	6.1	SCB-3	6	SSB-3	L102 x 102 x 6	1	19	5
356	181.5	15.2	21.9	11.0	11.0	5.5	5.5	SCB-3	6	SSB-4	L102 x 102 x 6	1	19	5
406	222.6	15.2	17.1	8.5	8.5	4.3	4.3	SCB-3	6	SSB-4	L102 x 102 x 6	1	19	5
457	282.7	13.4	13.4	6.7	6.7	3.4	3.4	SCB-3	6	SSB-4	L102 x 102 x 6	1	19	5
508	317.7	15.2	24.4	12.2	12.2	6.7	6.7	SCB-4	10	SSB-4	L102 x 102 x 6	1	32	5
610	430.1	15.2	19.5	9.8	9.8	4.9	4.9	SCB-4	10	SSB-4	L102 x 102 x 6	1	32	5

*Maximum braced spacing for up to 1:1 brace angle from horizontal.

For up to 1.5:1 brace angle from horizontal, divide braced spacing by 1.5; for 2:1 brace angle, divide by 2. Example: For 76mm diameter pipe at 0.5 g input and 1.5:1 brace angle ratio, the maximum transverse spacing = 12.2/1.5 = 8.1m.

For maximum brace spacing at 'g' forces other than those listed, divide the 1g spacing by the desired 'g' force. Example: For a 0.74g input for 305mm diameter pipe, transverse brace spacing = 6.1/0.74 = 8.2m. (Note: Transverse and longitudinal brace spacing shall not exceed those stated in the general notes.)

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H7 to H12 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with a Standard ASTM A307 Quality Bolts or E70xx electrode welds.

An increase in SCB, SSB or SSBS size may be required to accommodate the cross bolt or support rod. (Ref. Page B2)

All SSB brace members tabulated are steel angle. Factory 2.7mm formed channel strut may be in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channel.

(Ref. page X4)

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

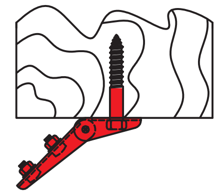
Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIVIDUALLY SUPPORTED SYSTEMS

STRUCTURAL WOOD BEAM OR MEMBER LAG BOLT



Pipe Dia. (in)	Max Weight per Foot (lbs)	Maximum Brace Spacing (ft) for Specified Seismic 'g' Loads* 0.25g Trans.	0.25g Long.	0.5g Trans.	0.5g Long.	1.0g Trans.	1.0g Long.	Option 1 SCB Size	Option 1 Cable Dia. (in)	Option 2 SSB Size	Option 2 Minimum Brace Size (in)	Lag Screws Qty. Req'd	Lag Screws Dia. (in)	Lag Screws Embed. (in)
1	2.8	50	80	40	80	40	80	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4
1 1/4	3.8	50	80	40	80	40	65	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4
1 1/2	4.5	50	80	40	80	40	55	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4
2	6.2	50	80	40	80	40	40	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4
2 1/2	9.1	50	80	40	54	27	27	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4
3	12.1	50	80	40	40	20	20	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4
4	18.3	50	52	26	26	13	13	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4
5	26.6	36	36	18	18	9	9	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4
6	34.8	40	40	20	20	10	10	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	1	5/8	5
8	55.1	24	24	12	12	6	6	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	1	5/8	5
10	80.2	16	16	8	8	4	4	SCB-2	3/16	SSB-3	L2 x 2 x 1/4	1	5/8	5
12	109.0	12	12	6	6	3	3	SCB-2	3/16	SSB-3	L2 x 2 x 1/4	1	5/8	5

*Maximum braced spacing for up to 1:1 brace angle from horizontal.

For up to 1.5:1 brace angle from horizontal, divide braced spacing by 1.5; for 2:1 brace angle, divide by 2.

For maximum brace spacing at 'g' forces other than those listed, divide the 1g spacing by the desired 'g' force. Example: For a 0.74g input for 6" diameter pipe, transverse brace spacing = 10/0.74 = 13 ft. (Note: Transverse and longitudinal brace spacing shall not exceed those stated in the general notes.)

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H13 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with Lag Screws, 1997 National Design Specification Tables 9.2A & 9.3B.

An increase in SCB, SSB or SSBS size may be required to accommodate the cross bolt or support rod. (Ref. Page B2)

All SSB brace members tabulated are steel angle. Factory 12ga formed channel strut may be in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channel.

(Ref. page X4)

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

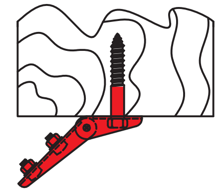
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIVIDUALLY SUPPORTED SYSTEMS

STRUCTURAL WOOD BEAM OR MEMBER LAG BOLT



Pipe Dia. (mm)	Max Weight per Foot (kg)	Maximum Brace Spacing (ft) for Specified Seismic 'g' Loads*						Option 1		Option 2		Lag Screws		
		0.25g		0.5g		1.0g								
		Trans.	Long.	Trans.	Long.	Trans.	Long.	SCB Size	Cable Dia. (mm)	SSB Size	Minimum Brace Size (mm)	Qty. Req'd	Dia. (mm)	Embed. (mm)
25	4.1	15.2	24.4	12.2	24.4	12.2	24.4	SCB-1	3	SSBS	41 x 41 Strut	1	13	102
32	5.6	15.2	24.4	12.2	24.4	12.2	19.8	SCB-1	3	SSBS	41 x 41 Strut	1	13	102
38	6.6	15.2	24.4	12.2	24.4	12.2	16.8	SCB-1	3	SSBS	41 x 41 Strut	1	13	102
51	9.2	15.2	24.4	12.2	24.4	12.2	12.2	SCB-1	3	SSBS	41 x 41 Strut	1	13	102
64	13.5	15.2	24.4	12.2	16.5	8.2	8.2	SCB-1	3	SSBS	41 x 41 Strut	1	13	102
76	18.0	15.2	24.4	12.2	12.2	6.1	6.1	SCB-1	3	SSBS	41 x 41 Strut	1	13	102
102	27.3	15.2	18.3	7.9	7.9	4.0	4.0	SCB-1	3	SSBS	41 x 41 Strut	1	13	102
127	39.5	11.0	11.0	5.5	5.5	2.7	2.7	SCB-1	3	SSBS	41 x 41 Strut	1	13	102
152	51.8	12.2	12.2	6.1	6.1	3.0	3.0	SCB-2	5	SSBS	41 x 41 Strut	1	16	127
203	82.0	7.3	7.3	3.7	3.7	1.8	1.8	SCB-2	5	SSBS	41 x 41 Strut	1	16	127
254	119.3	4.9	4.9	2.4	2.4	1.2	1.2	SCB-2	5	SSB-3	L51 x 51 x 6	1	16	127
305	162.2	3.7	3.7	1.8	1.8	0.9	0.9	SCB-2	5	SSB-3	L51 x 51 x 6	1	16	127

*Maximum braced spacing for up to 1:1 brace angle from horizontal.

For up to 1.5:1 brace angle from horizontal, divide braced spacing by 1.5; for 2:1 brace angle, divide by 2.

For maximum brace spacing at 'g' forces other than those listed, divide the 1g spacing by the desired 'g' force. Example: For a 0.74g input for 152mm diameter pipe, transverse brace spacing = 3.0/0.74 = 4.1m (Note: Transverse and longitudinal brace spacing shall not exceed those stated in the general notes.)

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H13 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with Lag Screws, 1997 National Design Specification Tables 9.2A & 9.3B.

An increase in SCB, SSB or SSBS size may be required to accommodate the cross bolt or support rod. (Ref. Page B2)

All SSB brace members tabulated are steel angle. Factory 2.7 mm formed channel strut may be in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channel.

(Ref. page X4)

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

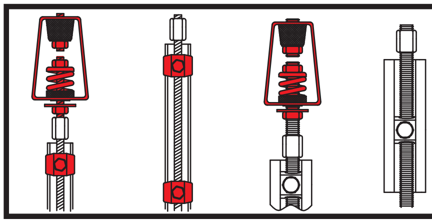
Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL ROD STIFFENER GUIDELINES

INDIVIDUALLY SUPPORTED SYSTEMS

SEISMIC ROD CLAMPS
ROD DIAMETERS: 3/8 to 1 1/4 IN.



Pipe Dia. (in)	Max Weight per Foot (lbs)	Support Rod Dia. (in)	for Specified Seismic 'g' Loads* Maximum Unbraced Rod Length (in) 0.25g Trans.	0.25g Long.	0.5g Trans.	0.5g Long.	1.0g Trans.	1.0g Long.	Max Braced Rod Length (in)	SRC Size	UCC Size	Max. Spacing (in)	Angle Brace Size (in)	Strut Channel Size
1	2.8	3/8	22	22	22	22	22	18	96	1	1	22	1 x 1 x 1/8	
1 1/4	3.8	3/8	22	22	22	22	22	15	96	1	1	22	1 x 1 x 1/8	
1 1/2	4.5	3/8	22	22	22	20	20	14	96	1	1	22	1 x 1 x 1/8	
2	6.2	3/8	22	22	22	17	17	13	96	1	1	22	1 x 1 x 1/8	
2 1/2	9.1	1/2	30	30	30	26	26	19	96	1	1	31	1 x 1 x 1/8	
3	12.1	1/2	30	30	30	23	23	19	96	1	1	31	1 x 1 x 1/8	1 5/8 x 1 5/8
4	18.3	5/8	38	38	38	31	31	31	96	1	2	39	1 x 1 x 1/8	x 12
5	26.6	5/8	38	35	35	31	31	31	96	1	2	39	1 x 1 x 1/8	GAUGE
2 1/2	9.1	1/2	30	30	30	26	26	19	120	1 1/2	1	31	1 1/2 x 1 1/2 x 1/4	
3	12.1	1/2	30	30	30	23	23	19	120	1 1/2	1	31	1 1/2 x 1 1/2 x 1/4	
4	18.3	5/8	38	38	38	31	31	31	120	1 1/2	2	39	1 1/2 x 1 1/2 x 1/4	
5	26.6	5/8	38	35	35	31	31	31	120	1 1/2	2	39	1 1/2 x 1 1/2 x 1/4	
6	34.8	3/4	47	46	46	32	32	32	144	1 1/2	2	48	1 1/2 x 1 1/2 x 1/4	
8	55.1	7/8	55	51	51	45	45	45	132	1 1/2		56	1 1/2 x 1 1/2 x 1/4	
10	80.2	7/8	55	44	44	44	44	44	132	1 1/2		56	1 1/2 x 1 1/2 x 1/4	
12	109.0	7/8	51	36	36	36	36	36	132	1 1/2		65	1 1/2 x 1 1/2 x 1/4	
14	122.0	1	63	47	47	47	47	47	132	1 1/2		65	1 1/2 x 1 1/2 x 1/4	
16	150.0	1	57	48	48	48	48	48	132	1 1/2		65	1 1/2 x 1 1/2 x 1/4	
18	190.0	1	51	48	48	48	48	48	132	1 1/2		65	1 1/2 x 1 1/2 x 1/4	
8	55.1	7/8	55	51	51	45	45	45	144	2		56	2 x 2 x 1/4	
10	80.2	7/8	55	44	44	44	44	44	144	2		56	2 x 2 x 1/4	
12	109.0	7/8	51	36	36	36	36	36	144	2		56	2 x 2 x 1/4	
14	122.0	1	63	47	47	47	47	47	144	2		65	2 x 2 x 1/4	
16	150.0	1	57	48	48	48	48	48	144	2		65	2 x 2 x 1/4	
18	190.0	1	51	48	48	48	48	48	144	2		65	2 x 2 x 1/4	
20	214.0	1 1/4	78	55	55	52	52	52	144	2		82	2 x 2 x 1/4	
24	289.0	1 1/4	67	53	53	53	53	53	144	2		82	2 x 2 x 1/4	

*Maximum unbraced rod length for up to 1:1 brace angle from horizontal.
For up to 1.5:1 brace angle from horizontal, divide unbraced rod length by 1.25; for 2:1 brace angle, divide by 1.5.

NOTES:
Rod stiffeners are only required at the seismic restraint locations.
Rod stiffeners are required when the length of the rod exceeds the maximum unbraced length.
A minimum of (2) rod clamps are required per support rod to attach the "Angle or Strut Channel Brace" to the support rod.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

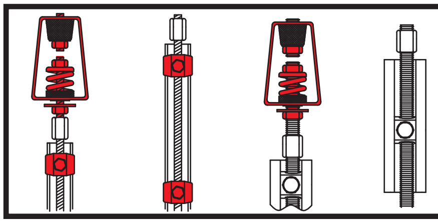
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL ROD STIFFENER GUIDELINES

INDIVIDUALLY SUPPORTED SYSTEMS

SEISMIC ROD CLAMPS
ROD DIAMETERS: 10 mm to 32 mm



Pipe Dia. *(mm)*	Max Weight per meter *(kg)*	Support Rod Dia. *(mm)*	Maximum Unbraced Rod Length *(mm)* for Specified Seismic 'g' Loads* 0.25g Trans.	0.25g Long.	0.5g Trans.	0.5g Long.	1.0g Trans.	1.0g Long.	Max Braced Rod Length *(mm)*	SRC Size	UCC Size	Max. Spacing *(mm)*	Angle Brace Size *(mm)*	Strut Channel Size *(mm)*
25	4.1	10	559	559	559	559	559	457	2438	1	1	559	25 x 25 x 3	
32	5.6	10	559	559	559	559	559	381	2438	1	1	559	25 x 25 x 3	
38	6.6	10	559	559	559	508	508	356	2438	1	1	559	25 x 25 x 3	
51	9.2	10	559	559	559	432	432	330	2438	1	1	559	25 x 25 x 3	
64	13.5	13	762	762	762	660	660	483	2438	1	1	787	25 x 25 x 3	
76	18.0	13	762	762	762	584	584	483	2438	1	1	787	25 x 25 x 3	41 x 41
102	27.3	16	965	965	965	787	787	787	2438	1	2	991	25 x 25 x 3	x 2.5
127	39.5	16	965	889	889	787	787	787	2438	1	2	991	25 x 25 x 3	
64	13.5	16	762	762	762	660	660	483	3048	1 1/2	1	787	38 x 38 x 6	
76	18.0	13	762	762	762	584	584	483	3048	1 1/2	1	787	38 x 38 x 6	
102	27.3	16	965	965	965	584	787	787	3048	1 1/2	2	991	38 x 38 x 6	
127	39.5	16	965	889	889	584	787	787	3048	1 1/2	2	991	38 x 38 x 6	
152	51.8	19	1194	1168	1168	813	813	813	3658	1 1/2	2	1219	38 x 38 x 6	
203	82.0	22	1397	1295	1295	1143	1143	1143	3353	1 1/2		1422	38 x 38 x 6	
254	119.3	22	1397	1118	1118	1118	1118	1118	3353	1 1/2		1422	38 x 38 x 6	
305	162.2	22	1295	914	914	914	914	914	3353	1 1/2		1422	38 x 38 x 6	
356	181.5	25	1600	1194	1194	1194	1194	1194	3353	1 1/2		1651	38 x 38 x 6	
406	222.6	25	1448	1219	1219	1219	1219	1219	3353	1 1/2		1651	38 x 38 x 6	
457	282.7	25	1295	1219	1219	1219	1219	1219	3353	1 1/2		1651	38 x 38 x 6	
203	82.0	22	1397	1295	1295	1143	1143	1143	3658	2		1422	51 x 51 x 6	
254	119.3	22	1397	1118	1118	1118	1118	1118	3658	2		1422	51 x 51 x 6	
305	162.2	22	1295	914	914	914	914	914	3658	2		1422	51 x 51 x 6	
356	181.5	25	1600	1194	1194	1194	1194	1194	3658	2		1651	51 x 51 x 6	
406	222.6	25	1448	1219	1219	1219	1219	1219	3658	2		1651	51 x 51 x 6	
457	282.7	25	1295	1219	1219	1219	1219	1219	3658	2		1651	51 x 51 x 6	
508	317.7	32	1981	1397	1397	1321	1321	1321	3658	2		2083	51 x 51 x 6	
610	430.1	32	1702	1346	1346	1346	1346	1346	3658	2		2083	51 x 51 x 6	

*Maximum unbraced rod length for up to 1:1 brace angle from horizontal.
For up to 1.5:1 brace angle from horizontal, divide unbraced rod length by 1.25; for 2:1 brace angle, divide by 1.5.

NOTES:

Rod stiffeners are only required at the seismic restraint locations.
Rod stiffeners are required when the length of the rod exceeds the maximum unbraced length.
A minimum of (2) rod clamps are required per support to attach the "Angle or Strut Channel Brace" to the support rod.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

MINIMUM SIZE OF SCBH, SCB, SSB AND SSBS

SCB selections are based on an SCBH attached to a standard support rod. An increase in SCBH may be required to accommodate a large support rod.

Minimum SCBH size for support rods are shown in the following table:

AT SCBH LOCATIONS:

Pipe Diameter (in) (*mm*)	Maximum Support Rod Diameter (in) (*mm*)	Minimum SCBH Size for Support Rods
1-5 *25-127*	5/8 *16*	SCBH-1
6-12 *152-305*	7/8 *22*	SCBH-1
14-18 *356-457*	1 1/8 *29*	SCBH-1

An SCB may be attached to the clevis cross bolt, however, an increase in SCB size may be required.

SSB and SSBS selections are based on an SSB and SSBS attached to a standard clevis cross bolt. An increase in SSB or SSBS size may be required to accommodate a large clevis cross bolt.

Minimum SCB, SSB and SSBS sizes for clevis cross bolts are shown in the following table:

AT SCB/SSB/SSBS LOCATIONS:

Pipe Diameter (in) (*mm*)	Maximum Cross Bolt (in) (*mm*)	Minimum SSB/SSB/SSBS Size for Clevis Cross Bolts
1-6 *25-152*	1/2 *13*	SCB/SSB/SSBS-12
8 *203*	5/8 *16*	SCB/SSB-2/SSBS-20, 25
10-12 *254-305*	3/4 *19*	SCB/SSB-3
14-24 *356-610*	1 1/4 *32*	

An SSB or SSBS may be attached to the support rod, however, an increase in SSB or SSBS size may be required.

Minimum SSB or SSBS size for support rods are shown in the following table:

AT SSB/SSBS LOCATIONS:

Pipe Diameter (in) (*mm*)	Maximum Support Rod Diameter (in) (*mm*)	Minimum SSB/SSBS Size for Support Rods
1-3 *25-76*	1/2 *13*	SSBS-12
4-5 *102-127*	5/8 *16*	SSBS-20, 25
6 *152*	3/4 *19*	SSB-3
8-24 *203-610*	1 1/4 *32*	SSB-4

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

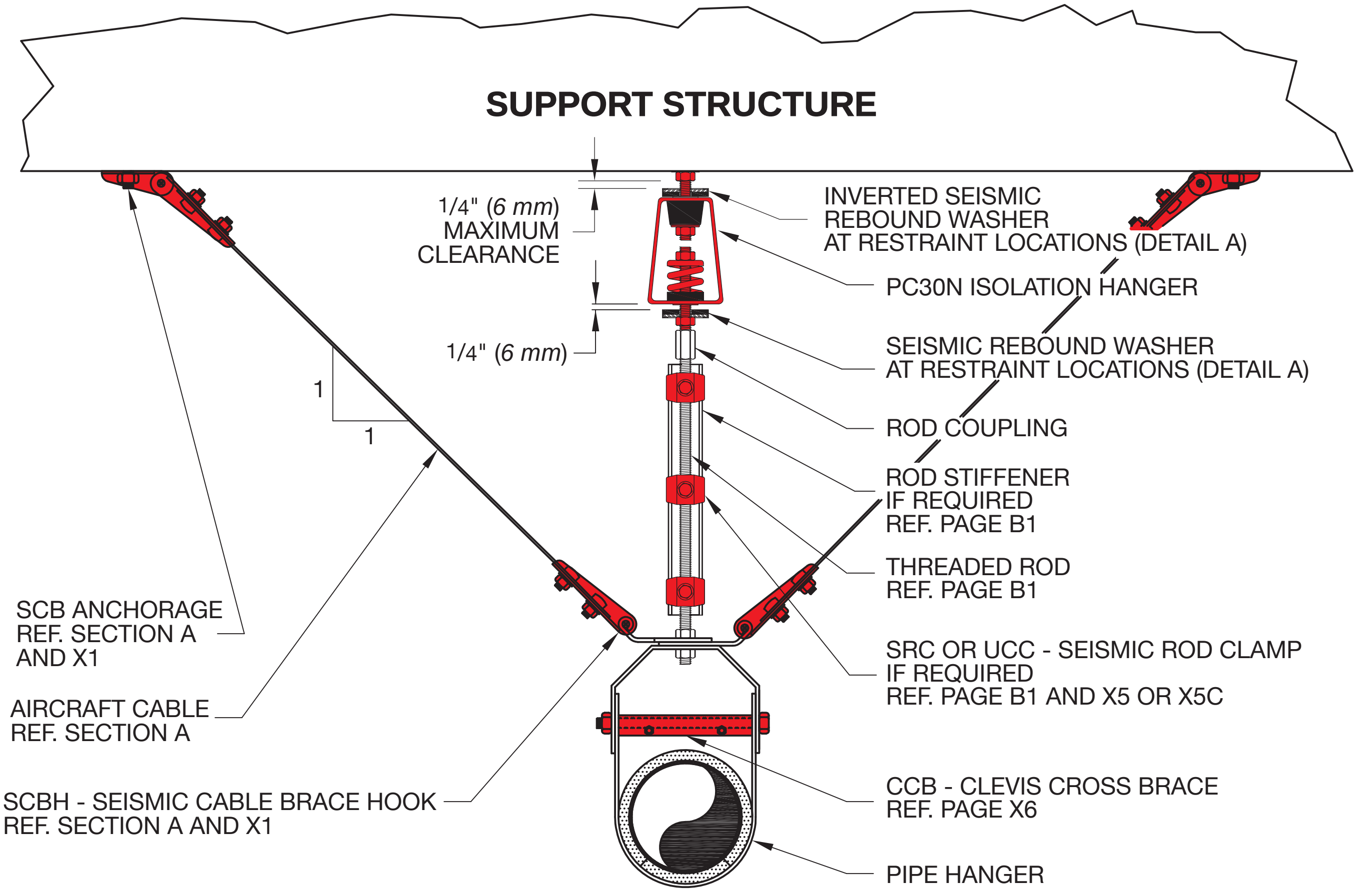
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

End of
Section

TRANSVERSE SEISMIC CABLE BRACE HOOK GUIDELINES FOR SPRING-ISOLATED CLEVIS SUPPORTED SYSTEMS



DETAIL A

NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBH.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

A P P R O V E D

Fixed Equipment Anchorage

Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

OPA-0349

on

December 22, 2006

Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

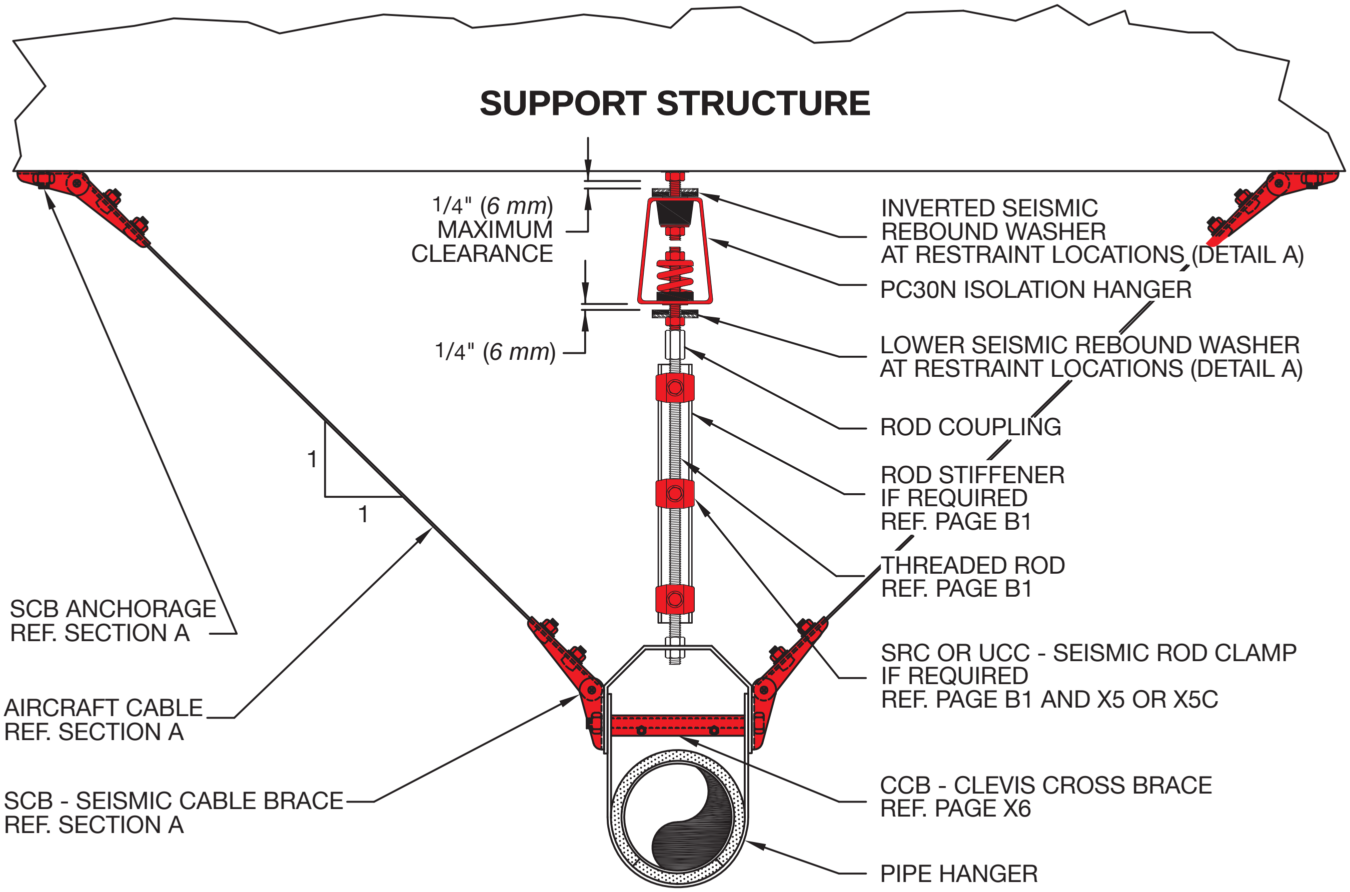
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

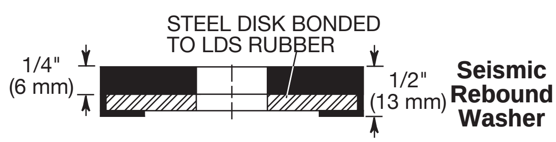
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC CABLE BRACE HOOK GUIDELINES FOR SPRING-ISOLATED CLEVIS SUPPORTED SYSTEMS





DETAIL A

NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBH.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA

OPA-0349
on
December 22, 2006

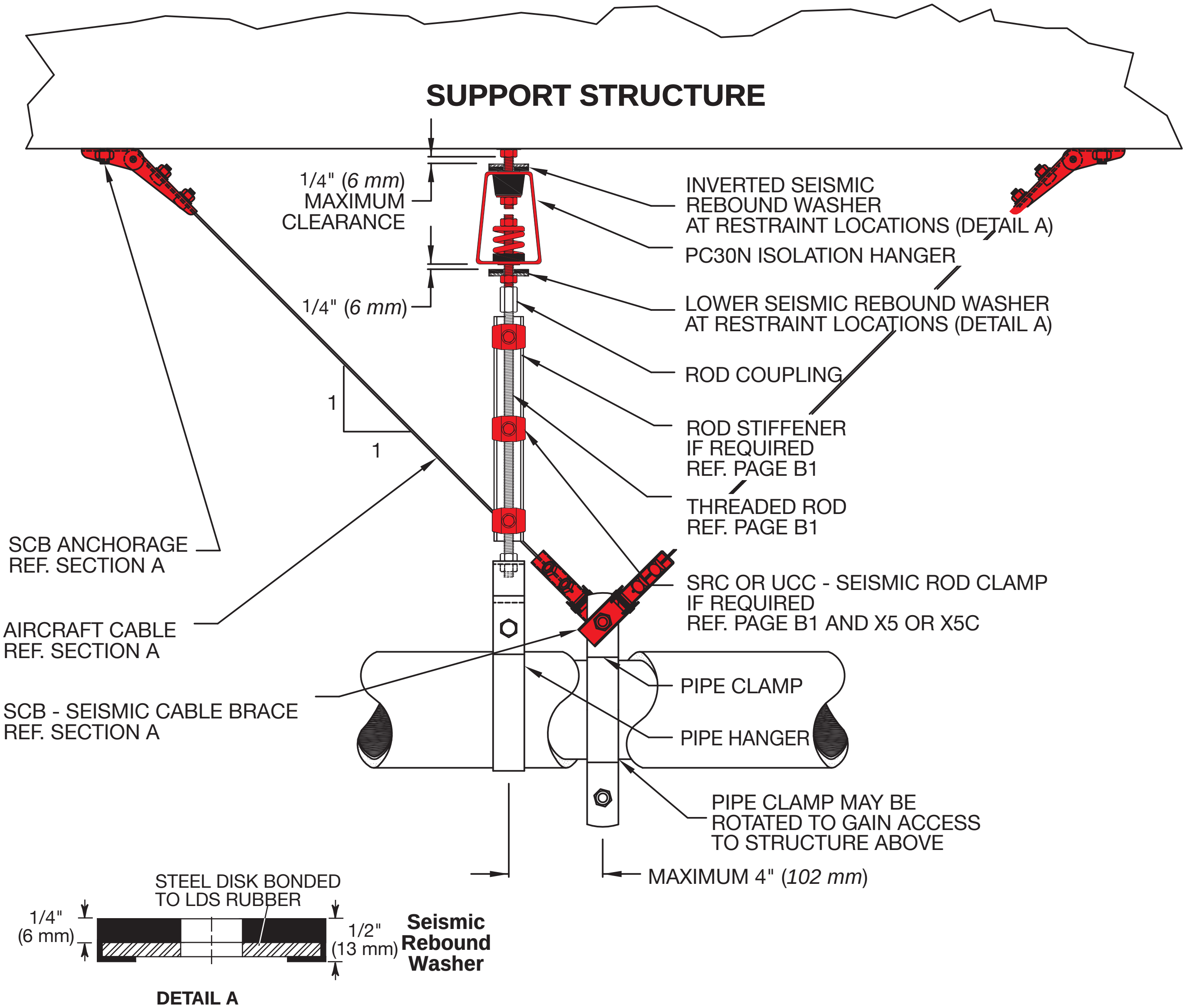
Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC CABLE BRACE GUIDELINES FOR SPRING-ISOLATED CLEVIS SUPPORTED SYSTEMS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBH.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
December 22, 2006

Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

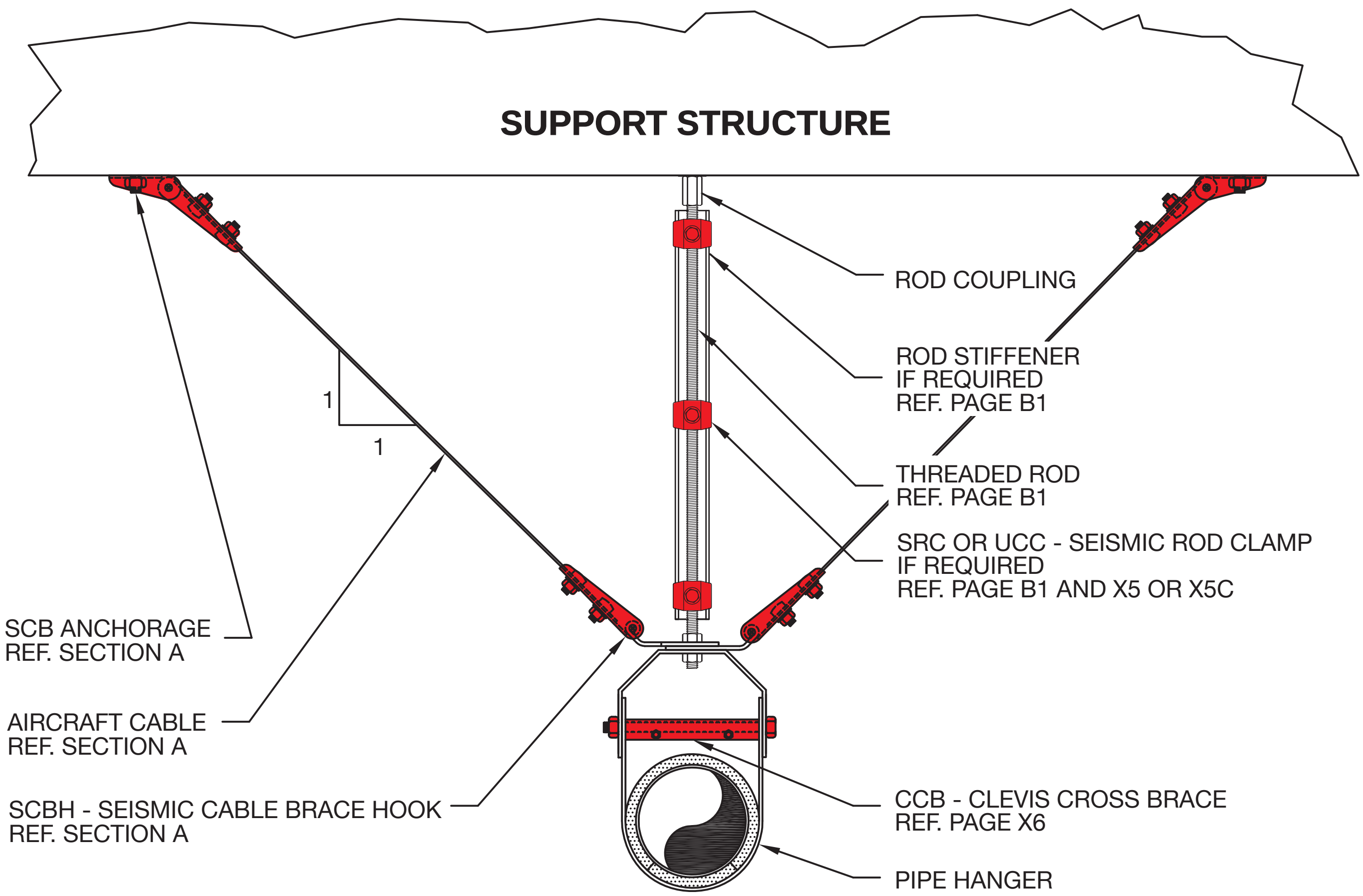
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC CABLE BRACE HOOK GUIDELINES FOR CLEVIS SUPPORTED SYSTEMS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1.
Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section A for limitations.
Refer to page X2 for proper installation of the SCBH.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

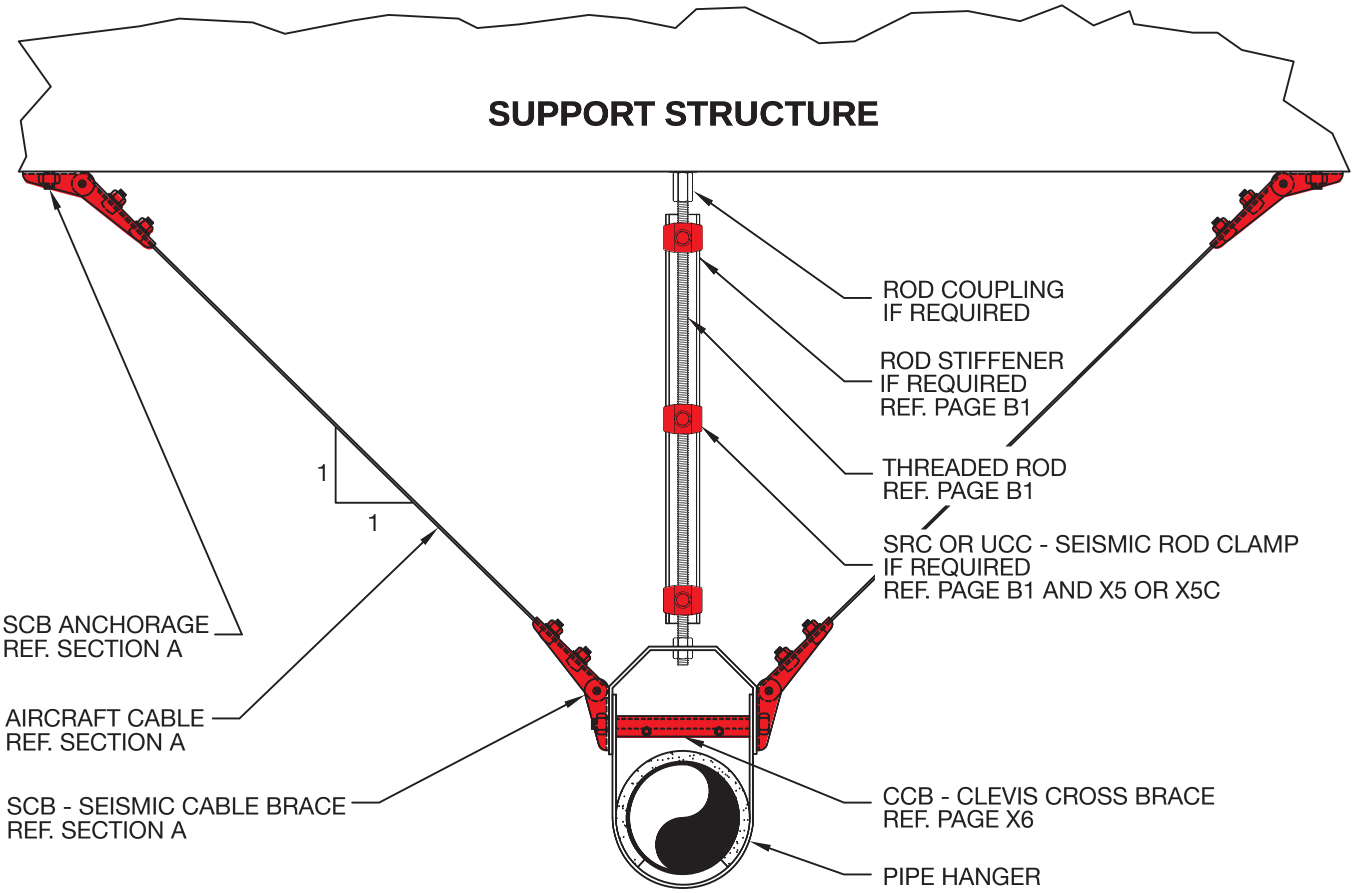
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

TRANSVERSE SEISMIC CABLE BRACE GUIDELINES FOR CLEVIS SUPPORTED SYSTEMS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section A for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

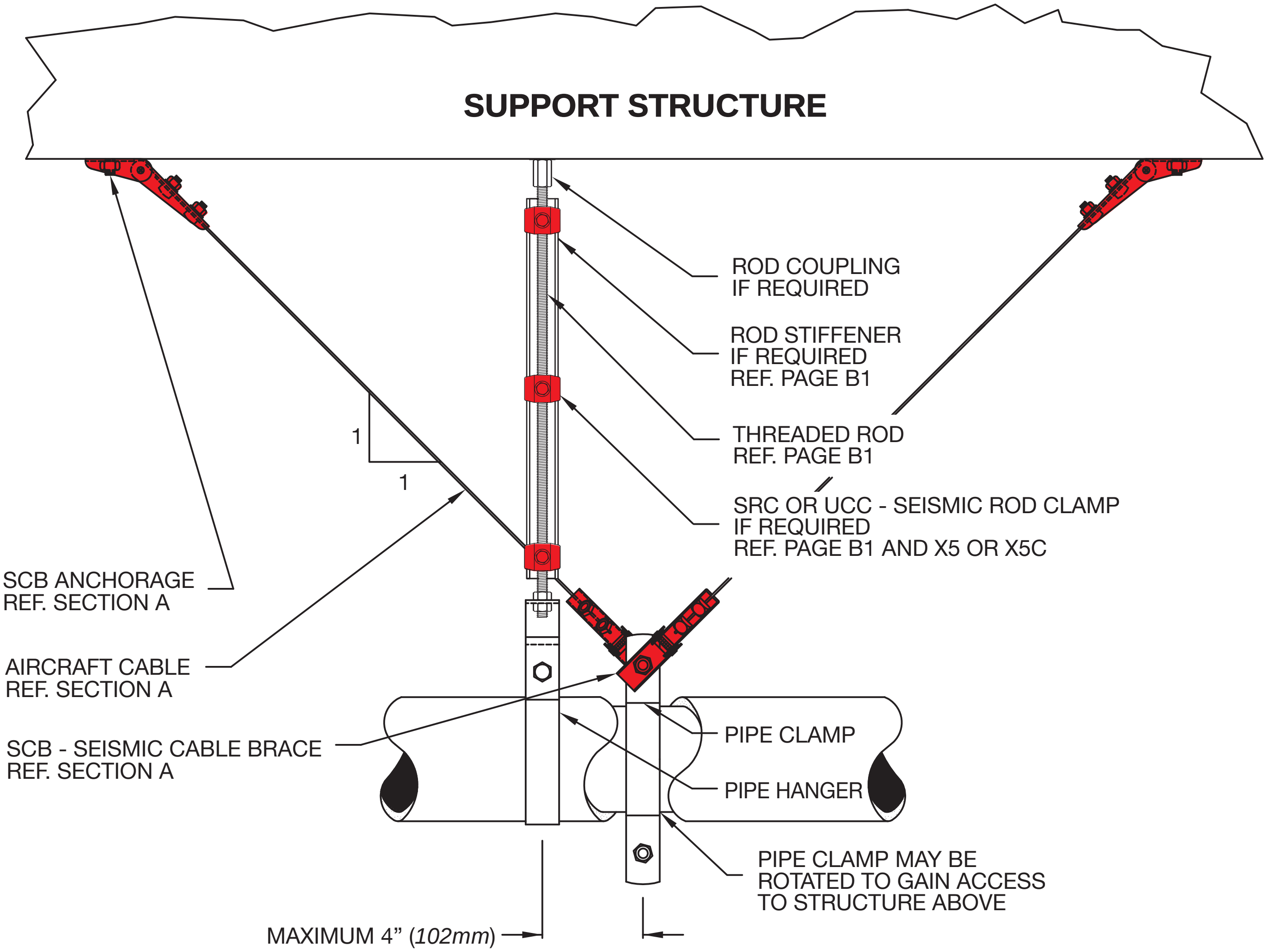
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC CABLE BRACE GUIDELINES FOR CLEVIS SUPPORTED SYSTEMS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section A for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

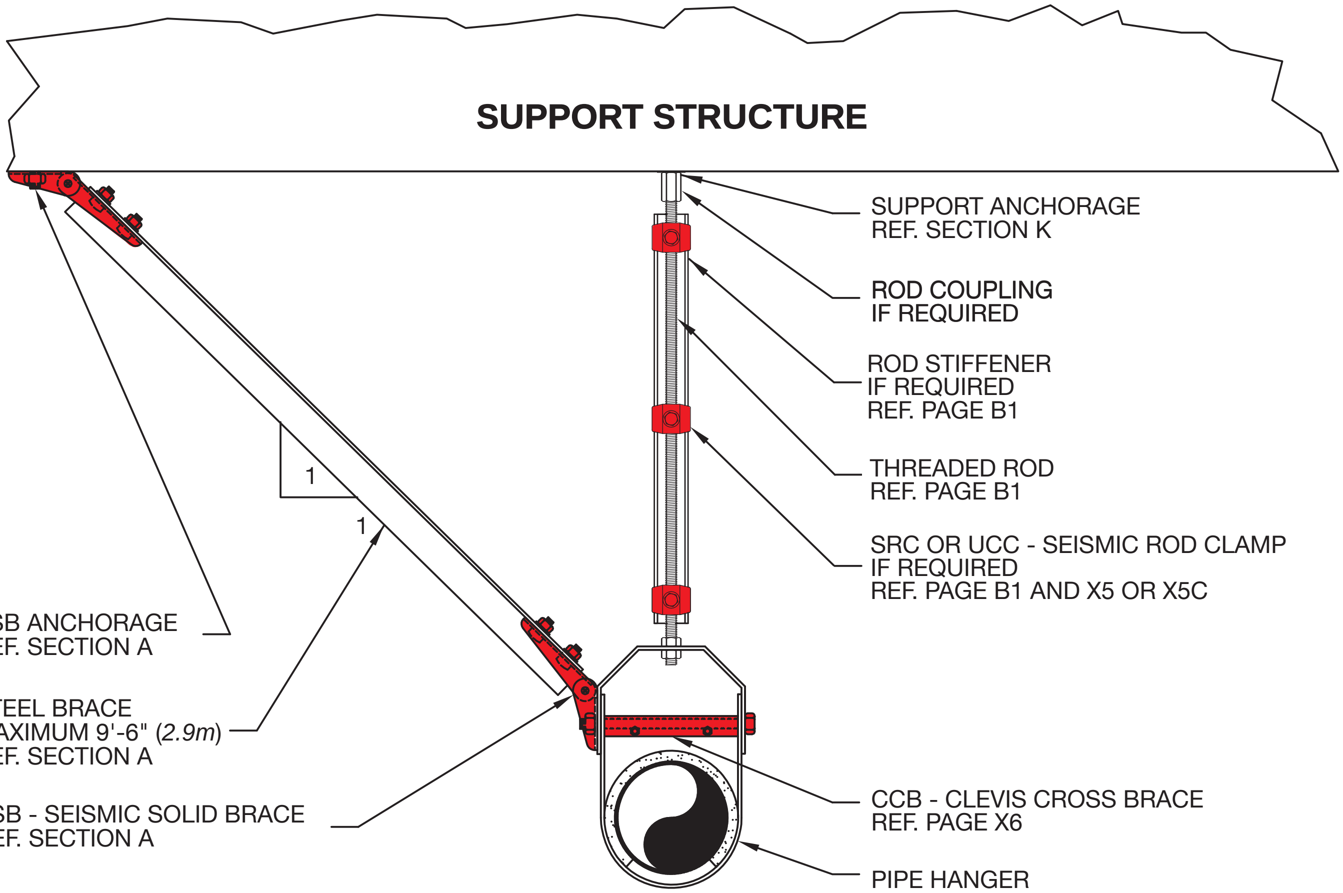
FIXED EQUIPMENT ANCHORAGE

OPA-0349 **August 5, 2002**

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC SOLID BRACE GUIDELINES FOR CLEVIS SUPPORTED SYSTEMS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section A for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

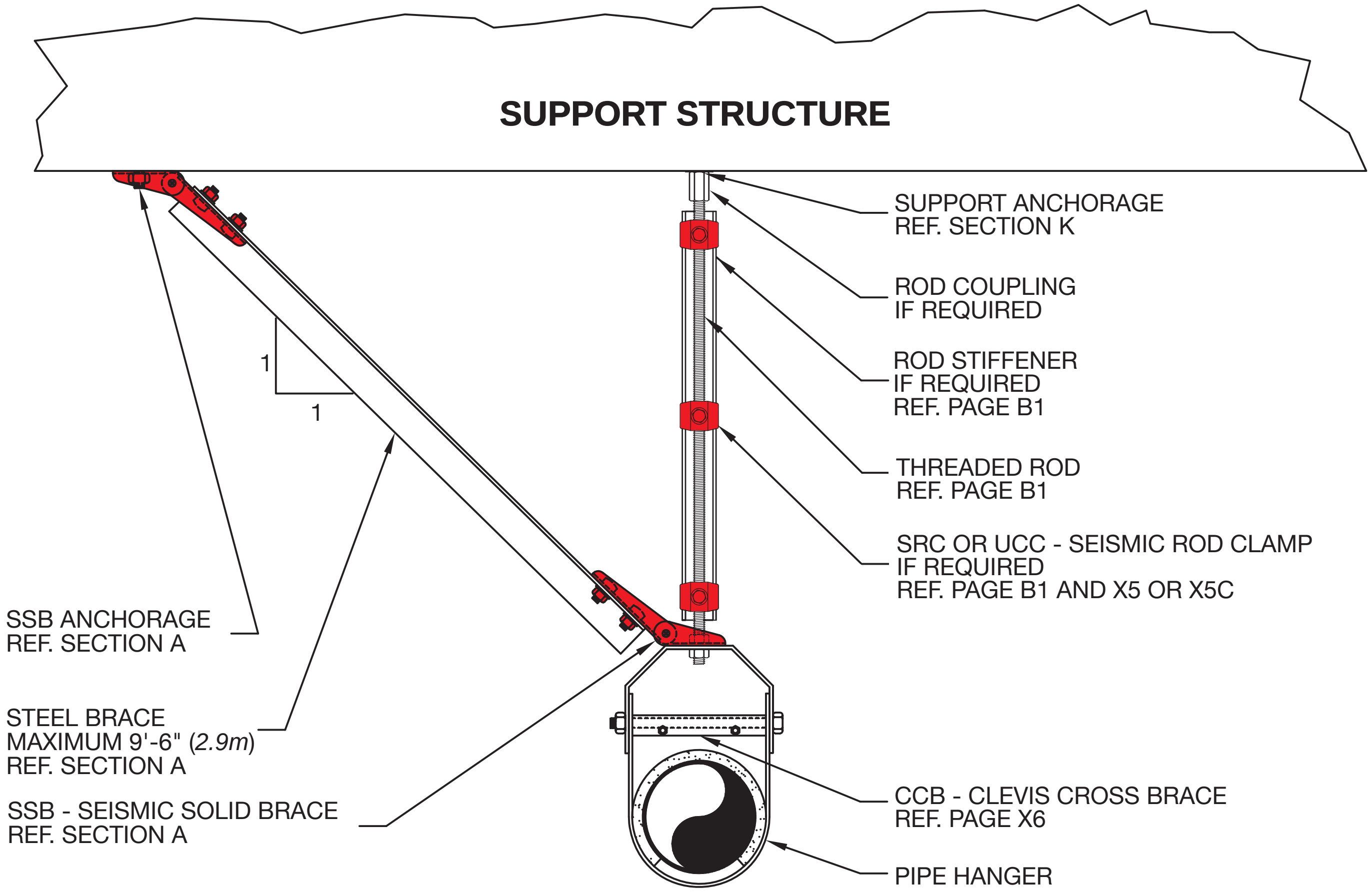
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC SOLID BRACE GUIDELINES FOR CLEVIS SUPPORTED SYSTEMS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1.
Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section A for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

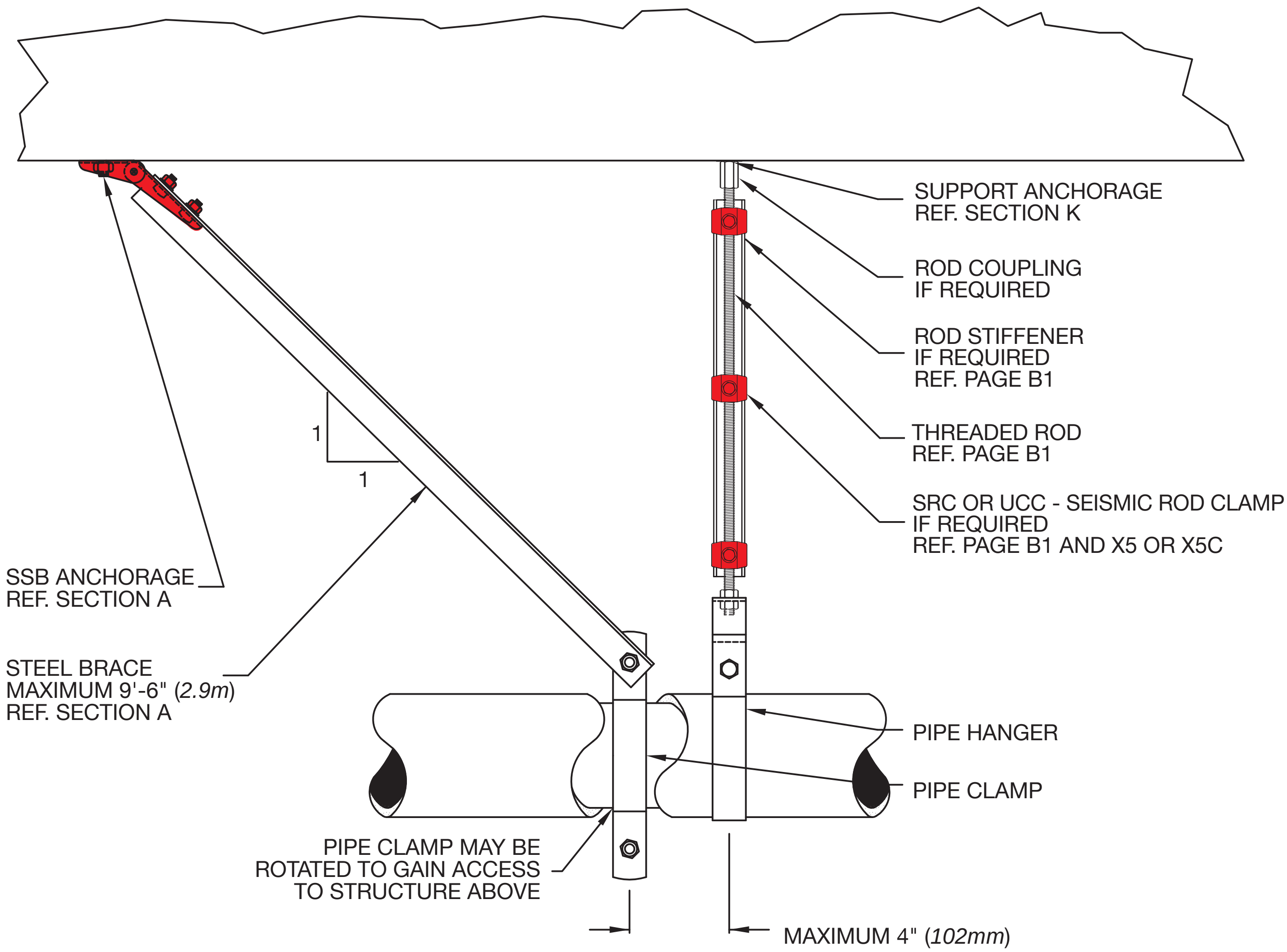
California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

LONGITUDINAL SEISMIC SOLID BRACE GUIDELINES
FOR CLEVIS SUPPORTED SYSTEMS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section A for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

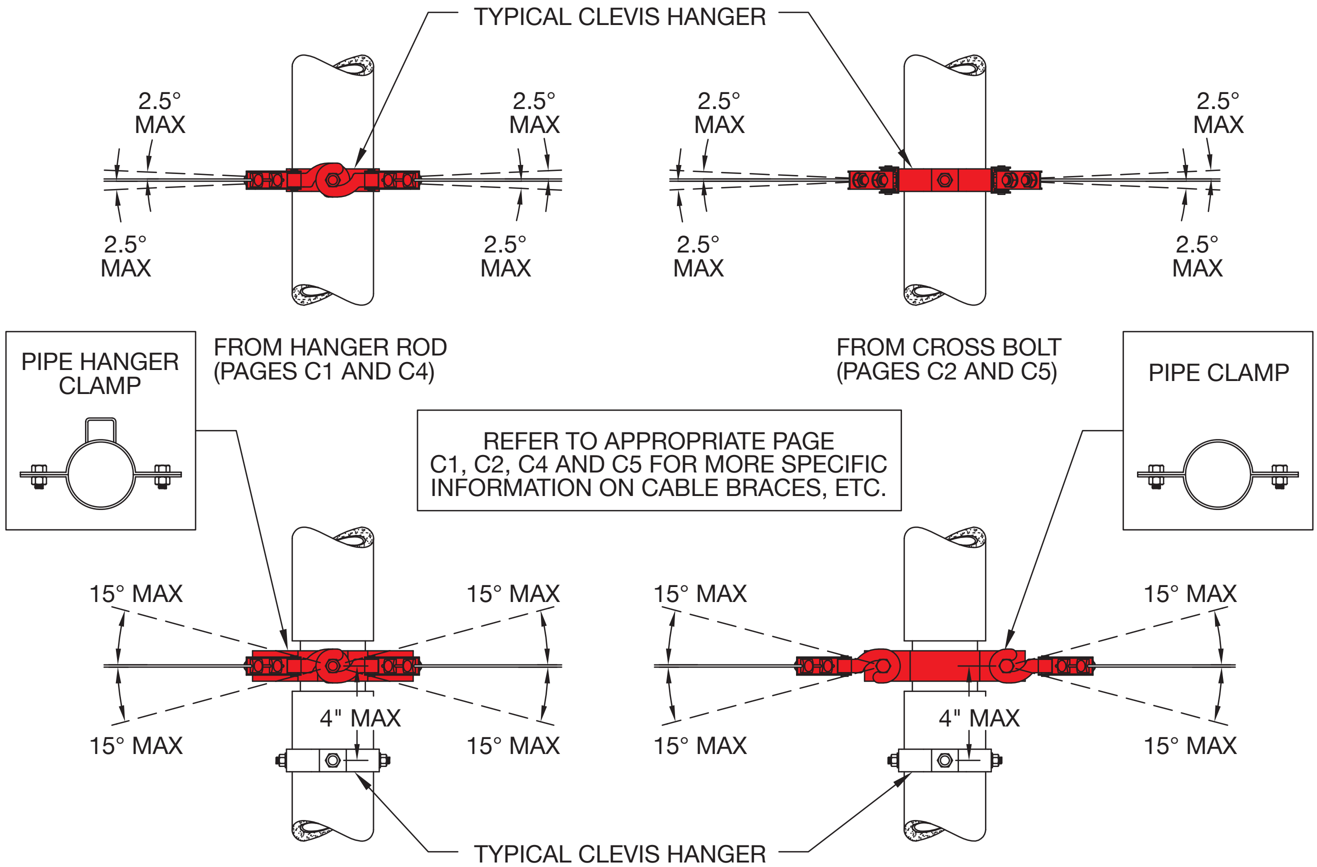
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

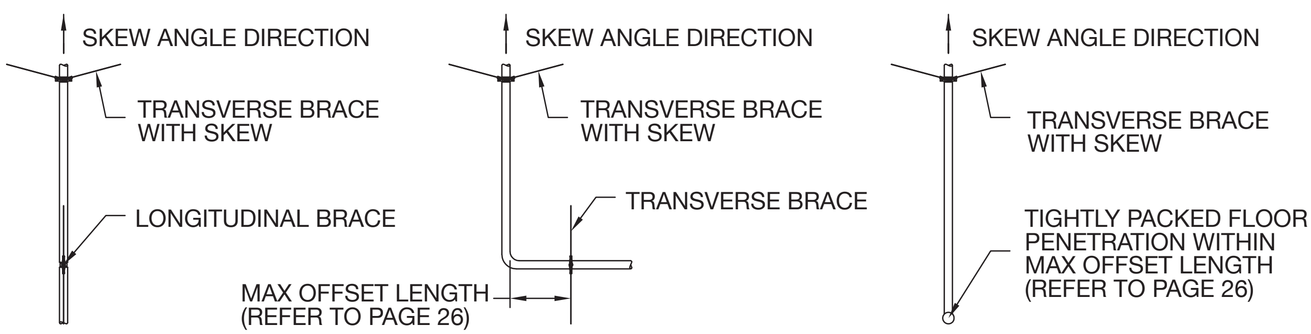
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC CABLE BRACE GUIDELINES
ALLOWABLE BRACE ANGLE VARIATIONS IN PLAN
FOR DETAIL PAGES C1, C2, C4 AND C5



The Angle variation may increase beyond 2.5° up to 15° provided both braces are attached to a pipe clamp, skewed in the same direction and a longitudinal brace occurs opposite the skewed angle direction as shown below.



NOTE: Any or all brace locations are permitted to use the angle variation to meet field conditions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

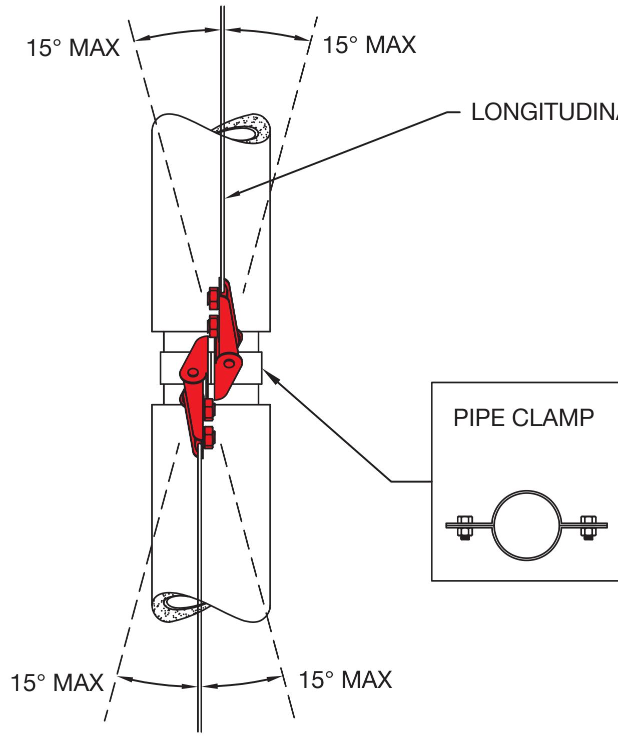
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
April 6, 2009

Anthony R. Pike
Anthony R. Pike **(916) 654-3362**

Dhiru Mali
Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC CABLE BRACE GUIDELINES
ALLOWABLE BRACE ANGLE VARIATIONS IN PLAN
FOR DETAIL PAGES C3 AND C6



REFER TO APPROPRIATE PAGE
C3 AND C6 FOR MORE SPECIFIC
INFORMATION ON CABLE BRACES, ETC.

NOTE: Any or all brace locations are permitted to use the angle variation to meet field conditions.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
March 19, 2009

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

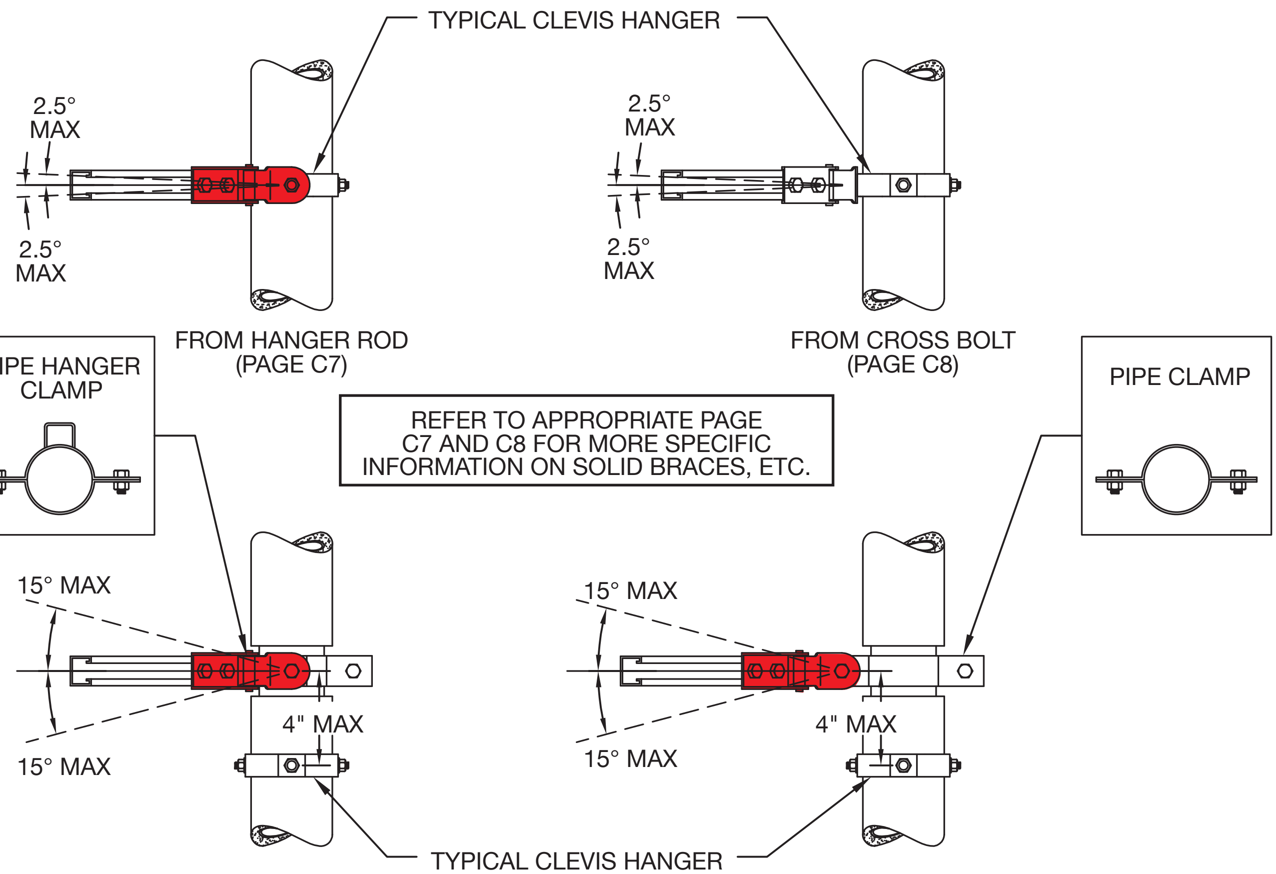
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

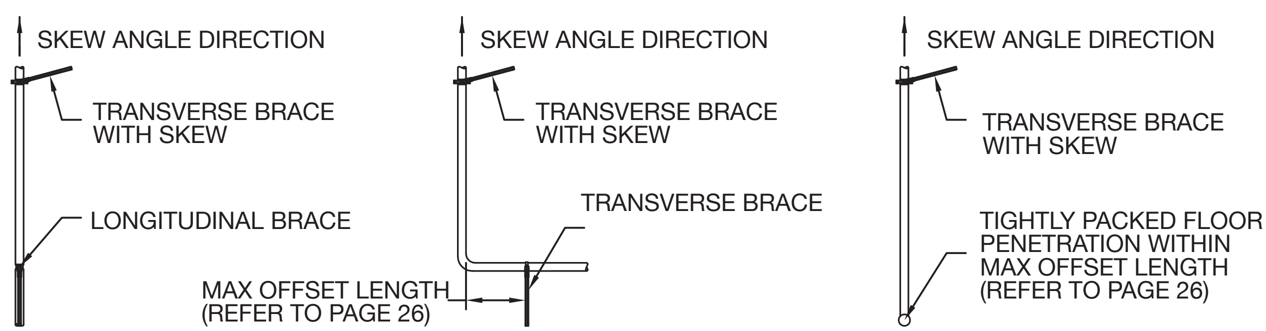
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC SOLID BRACE GUIDELINES
ALLOWABLE BRACE ANGLE VARIATIONS IN PLAN
FOR DETAIL PAGES C7 AND C8



The Angle variation may increase beyond 2.5° up to 15° provided the brace is attached to a pipe clamp and a longitudinal brace occurs opposite the skewed angle direction as shown below.



NOTE: Any or all brace locations are permitted to use the angle variation to meet field conditions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

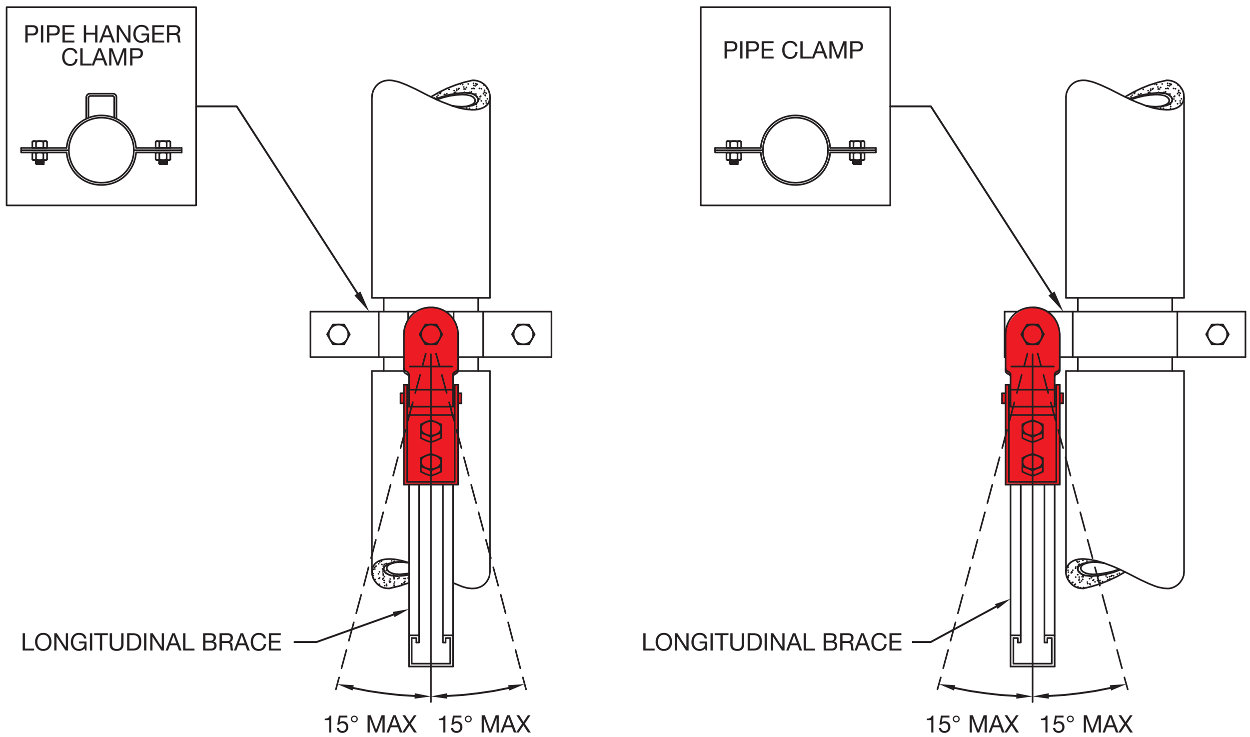
OPA-0349
on
December 22, 2006

Anthony R. Pike **(916) 654-3362**

Page
C12

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC SOLID BRACE GUIDELINES
ALLOWABLE BRACE ANGLE VARIATIONS IN PLAN
FOR DETAIL PAGE C9



REFER TO APPROPRIATE PAGE C9
FOR MORE SPECIFIC INFORMATION ON
CABLE BRACES, ETC.

NOTE: Any or all brace locations are permitted to use the angle variation to meet field conditions.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
March 19, 2009

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

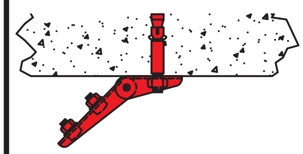
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

End of
Section

SEISMIC RESTRAINT GUIDELINES	**INDIV./TRAPEZE SUPPORTED SYSTEMS** **MINIMUM 3000 PSI STONE AGGREGATE CONCRETE SLAB EXPANSION ANCHORS**



Maximum Weight per Foot (lbs.) for Specified 'g' Loads * at Maximum Transverse Brace Spacings (ft.) **									Option 1		Option 2		Concrete Anchors		
0.25g			0.5g			1.0g			SCB Size	Cable Dia. (in)	SSB/ SSBS Size	Minimum Brace Size (in)	Qty Req'd	Dia. (in)	Embed. (in)
20 ft.	30 ft.	40 ft.	20 ft.	30 ft.	40 ft.	20 ft.	30 ft.	40 ft.							
72	48	36	36	24	18	18	12	9	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	2 1/4
112	75	56	56	37	28	28	19	14	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	4 1/8
176	117	88	88	59	44	44	29	22	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	1	5/8	5 1/8
248	165	124	124	83	62	62	41	31	SCB-3	1/4	SSB-3	L3 x 3 x 1/4	1	3/4	6 5/8
288	192	144	144	96	72	72	48	36	SCB-2	3/16	SSB-2	L3 x 3 x 1/4	2	5/8	5 1/8
440	293	220	220	147	110	110	73	55	SCB-3	1/4	SSB-3	L4 x 4 x 1/4	4	5/8	5 1/8
800	533	400	400	267	200	200	133	100	SCB-4	3/8	SSB-4	L4 x 4 x 1/4	4	5/8	5 1/8

* Maximum weight per foot for up to 1:1 brace angle from horizontal.
For up to 1.5:1 brace angle from horizontal, divide weight per foot by 1.75; for 2:1 brace angle, divide by 2.44.
Example: Reduce the maximum weight of 36 kg/m at 0.5 input for a 1.5:1 brace angle ratio as follows,
24/1.75 = 13 lbs/ft.

For maximum weight per foot at 'g' forces other than those listed, divide the 1.0g weight per foot by the desired 'g' force.
Example: Consider a 0.74g input, for a maximum weight of 12 lbs/ft from the 1.0g chart above, the adjusted weight per foot = 12/0.74 = 16 lbs/ft.

** For trapeze supported systems requiring SCB/SSBS to SCB/SSB-3 and SSB-4, the maximum longitudinal brace spacing = 2 times the maximum transverse spacing, not to exceed 80 feet. For trapeze supported systems requiring an SCB-4, install SCB-4s transversely and SCBH-3s longitudinally every 40 feet. For individually supported systems, the maximum longitudinal brace spacing = the maximum transverse brace spacing.

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H1, H2 and H3 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with an ITW Ramset/Red Head Trubolt Wedge Anchor, ICBO Report ER-1372/2000, Table 3, 4 and 5, embedded headed stud or J-bolt of equal embedment or approved equal.

Where (2) anchors are specified, the SCB, SSB or SSBS w/SLDB-2000 is required for attachment to structure. (Ref. Page H2 and X9)

Where (4) anchors are specified, the SCB or SSB w/SLDB-4000 is required for attachment to structure. (Ref. Page H3 and X10)

All SSB brace members tabulated are steel angle. Factory 12ga formed channel strut may be used in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channel.

(Ref. page X4)

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

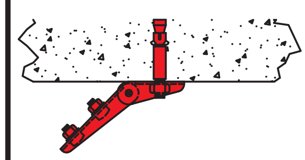
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIV./TRAPEZE SUPPORTED SYSTEMS

MINIMUM 20,680 kPa STONE AGGREGATE CONCRETE SLAB EXPANSION ANCHORS



Maximum Weight per Meter (*kg*) for Specified 'g' Loads * at Maximum Transverse Brace Spacings (*m*) **									Option 1		Option 2		Concrete Anchors		
0.25g			0.5g			1.0g			SCB Size	Cable Dia. (*mm*)	SSB/ SSBS Size	Minimum Brace Size (*mm*)	Qty Req'd	Dia. (*mm*)	Embed. (*mm*)
6m	9.1m	12.2m	6m	9.1m	12.2m	9.1m	9.1m	12.2m							
107	71	54	54	36	27	27	18	13	SCB-1	3	SSBS	41 x 41 Strut	1	13	57
167	111	83	83	56	42	42	28	21	SCB-1	3	SSBS	41 x 41 Strut	1	13	105
262	175	131	131	87	65	65	44	33	SCB-2	5	SSBS	41 x 41 Strut	1	16	130
369	246	185	185	123	92	92	62	46	SCB-3	6	SSB-3	L76 x 76 x 6	1	19	168
429	286	214	214	143	107	107	71	54	SCB-2	5	SSB-2	L76 x 76 x 6	2	16	130
655	437	327	327	218	164	164	109	82	SCB-3	6	SSB-3	L102 x 102 x 6	4	16	130
1191	794	595	595	397	298	298	198	149	SCB-4	10	SSB-4	L102 x 102 x 6	4	16	130

* Maximum weight per meter for up to 1:1 brace angle from horizontal.
For up to 1.5:1 brace angle from horizontal, divide weight per meter by 1.75; for 2:1 brace angle, divide by 2.44.
Example: Reduce the maximum weight of 36 kg/m at 0.5 input for a 1.5:1 brace angle ratio as follows,
36/1.75 = 20 kg/m.

For maximum weight per meter at 'g' forces other than those listed, divide the 1.0g weight per meter by the desired 'g' force.
Example: Consider a 0.74g input, for a maximum weight of 18 kg/m from the 1.0g chart above, the adjusted weight per meter = 18/0.74 = 24 kg/m.

** For trapeze supported systems requiring SCB/SSBS to SCB/SSB-3 and SSB-4, the maximum longitudinal brace spacing = 2 times the maximum transverse spacing, not to exceed 24.4 m. For trapeze supported systems requiring an SCB-4, install SCB-4s transversely and SCBH-3s longitudinally every 12.2 m. For individually supported systems, the maximum longitudinal brace spacing = the maximum transverse brace spacing.

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSBS to the structure are acceptable. Refer to Pages H1, H2 and H3 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with an ITW Ramset/Red Head Trubolt Wedge Anchor, ICBO Report ER-1372/2000, Table 3, 4 and 5, embedded headed stud or J-bolt of equal embedment or approved equal.

Where (2) anchors are specified, the SCB, SSB or SSBS w/SLDB-2000 is required for attachment to structure. (Ref. Page H2 and X9)

Where (4) anchors are specified, the SCB or SSB w/SLDB-4000 is required for attachment to structure. (Ref. Page H3 and X10)

All SSB brace members tabulated are steel angle. Factory 2.7 mm formed channel strut may be used in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channels.

(Ref. page X4)

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

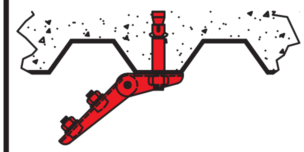
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

SEISMIC RESTRAINT GUIDELINES

INDIV./TRAPEZE SUPPORTED SYSTEMS

MINIMUM 3000 PSI LIGHTWEIGHT CONCRETE DECK EXPANSION ANCHORS



Maximum Weight per Foot (lbs.) for Specified 'g' Loads * at Maximum Transverse Brace Spacings (ft.) **									Option 1		Option 2		Concrete Anchors		
0.25g			0.5g			1.0g			SCB Size	Cable Dia. (in)	SSB/ SSBS Size	Minimum Brace Size (in)	Qty Req'd	Dia. (in)	Embed. (in)
20 ft.	30 ft.	40 ft.	20 ft.	30 ft.	40 ft.	20 ft.	30 ft.	40 ft.							
72	48	36	36	24	18	18	12	9	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	3
112	75	56	56	37	28	28	19	14	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	1	5/8	5
96	64	48	48	32	24	24	16	12	SCB-3	1/4	SSB-3	L2 x 2 x 1/4	1	3/4	3 1/4
136	91	68	68	45	34	34	23	17	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	2	1/2	3
280	187	140	140	93	70	70	47	35	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	2	5/8	5
440	293	220	220	147	110	110	73	55	SCB-3	1/4	SSB-3	L4 x 4 x 1/4	4	5/8	5
568	379	284	284	189	142	142	95	71	SCB-4	3/8	SSB-4	L4 x 4 x 1/4	4	5/8	5

* Maximum weight per foot for up to 1:1 brace angle from horizontal.
For up to 1.5:1 brace angle from horizontal, divide weight per foot by 1.8; for 2:1 brace angle, divide by 2.4.
Example: Reduce the maximum weight of 24 lbs/ft at 0.5g input for a 1.5:1 brace angle ratio as follows, 24/1.8 = 13 lbs/ft.

For maximum weight per foot at 'g' forces other than those listed, divide the 1.0g weight per foot by the desired 'g' force.
Example: Consider a 0.74g input, for a maximum weight of 12 lbs/ft from the 1.0g chart above, the adjusted weight per foot = 12/0.74 = 16 lbs/ft.

** For trapeze supported systems requiring SCB/SSBS to SCB/SSB-3 and SSB-4, the maximum longitudinal brace spacing = 2 times the maximum transverse spacing, not to exceed 80 feet. For trapeze supported systems requiring an SCB-4, install SCB-4s transversely and SCBH-3s longitudinally every 40 feet. For individually supported systems, the maximum longitudinal brace spacing = the maximum transverse brace spacing.

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSBS to the structure are acceptable. Refer to Pages H4, H5 and H6 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with an ITW Ramset/Red Head Trubolt Wedge Anchor, ICBO Report ER-1372/2000, Table 4, 5 and 10, embedded headed stud or J-bolt of equal embedment or approved equal.

Where (2) anchors are specified, the SCB, SSB or SSBS w/SLDB-2000 is required for attachment to structure. (Ref. Page H5 and X9)

Where (4) anchors are specified, the SCB or SSB w/SLDB-4000 is required for attachment to structure. (Ref. Page H6 and X10)

All SSB brace members tabulated are steel angle. Factory 12ga formed channel strut may be used in lieu of steel angle.

All SSB brace members tabulated are 12ga strut channels.

(Ref. page X4)

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

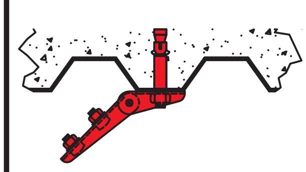
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIV./TRAPEZE SUPPORTED SYSTEMS

MINIMUM 20,680 kPa LIGHTWEIGHT CONCRETE DECK EXPANSION ANCHORS



Maximum Weight per Meter (*kg*) for Specified 'g' Loads * at Maximum Transverse Brace Spacings (*m*) **									Option 1		Option 2		Concrete Anchors		
0.25g			0.5g			1.0g			SCB Size	Cable Dia. (*mm*)	SSB Size	Minimum Brace Size (*mm*)	Qty Req'd	Dia. (*mm*)	Embed. (*mm*)
6.1m	9.1m	12.2m	6.1m	9.1m	12.2m	6.1m	9.1m	12.2m							
107	71	54	54	36	27	27	18	13	SCB-1	3	SSBS	41 x 41 Strut	1	13	76
167	111	83	83	56	42	42	28	21	SCB-2	5	SSBS	41 x 41 Strut	1	16	127
143	95	71	71	48	36	36	24	18	SCB-3	6	SSB-3	L51 x 51 x 6	1	19	83
202	135	101	101	67	51	51	34	25	SCB-1	3	SSBS	41 x 41 Strut	2	13	76
417	278	208	208	139	104	104	69	52	SCB-2	5	SSBS	41 x 41 Strut	2	16	127
655	437	327	327	218	164	164	109	82	SCB-3	6	SSB-3	L102 x 102 x 6	4	16	127
845	564	423	423	282	211	211	141	106	SCB-4	10	SSB-4	L102 x 102 x 6	4	16	127

* Maximum weight per meter for up to 1:1 brace angle from horizontal.
For up to 1.5:1 brace angle from horizontal, divide weight per meter by 1.8; for 2:1 brace angle, divide by 2.4.
Example: Reduce the maximum weight of 36 kg/m at 0.5 input for a 1.5:1 brace angle ratio as follows,
36/1.8 = 20 kg/m

For maximum weight per meter at 'g' forces other than those listed, divide the 1.0g weight per meter by the desired 'g' force.
Example: Consider a 0.74g input, for a maximum weight of 21 kg/m from the 1.0g chart above, the adjusted weight per meter = 21/0.74 = 28 kg/m.

** For trapeze supported systems requiring SCB/SSB/SSBS to SCB/SSB-3 and SSB-4, the maximum longitudinal brace spacing = 2 times the maximum transverse spacing, not to exceed 24.4 m. For trapeze supported systems requiring an SCB-4, install SCB-4s transversely and SCBH-3s longitudinally every 12.2 m. For individually supported systems, the maximum longitudinal brace spacing = the maximum transverse brace spacing.

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H4, H5 and H6 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with an ITW Ramset/Red Head Trubolt Wedge Anchor, ICBO Report ER-1372/2000, Table 4, 5 and 10, embedded headed stud or J-bolt of equal embedment or approved equal.

Where (2) anchors are specified, the SCB, SSB or SSBS w/SLDB-2000 is required for attachment to structure. (Ref. Page H5 and X9)

Where (4) anchors are specified, the SCB or SSB w/SLDB-4000 is required for attachment to structure. (Ref. Page H6 and X10)

All SSB brace members tabulated are steel angle. Factory 2.7 mm formed channel strut may be used in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channels.

(Ref. page X4)

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

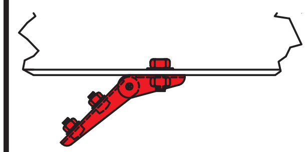
APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

SEISMIC RESTRAINT GUIDELINES

INDIV./TRAPEZE SUPPORTED SYSTEMS

STRUCTURAL STEEL BEAM OR MEMBER A307 BOLT OR 70XX WELD



Maximum Weight per Foot (lbs.) for Specified 'g' Loads * at Maximum Transverse Brace Spacings (ft.) **									Option 1		Option 2		Steel Bolt		
0.25g			0.5g			1.0g			SCB Size	Cable Dia. (in)	SSB/ SSBS Size	Minimum Brace Size (in)	Qty Req'd	Dia. (*mm*)	Weld Size (*mm*)
20 ft.	30 ft.	40 ft.	20 ft.	30 ft.	40 ft.	20 ft.	30 ft.	40 ft.							
136	91	68	68	45	34	34	23	17	SCB-1	1/8	SSBS	1 5/8 x 1 5/8 Strut	1	1/2	1/8
288	192	144	144	96	72	72	48	36	SCB-2	3/16	SSBS	1 5/8 x 1 5/8 Strut	1	5/8	1/8
440	293	220	220	147	110	110	73	55	SCB-3	1/4	SSB-3	L4 x 4 x 1/4	1	3/4	3/16
888	592	444	444	296	222	222	148	111	SCB-4	3/8	SSB-4	L4 x 4 x 1/4	1	1 1/4	3/16

* Maximum weight per foot for up to 1:1 brace angle from horizontal.
For up to 1.5:1 brace angle from horizontal, divide weight per foot by 1.5; for 2:1 brace angle, divide by 2.
Example: Reduce the maximum weight of 45 lbs/ft at 0.5g input for a 1.5:1 brace angle ratio as follows, 45/1.5 = 30 lbs/ft.

For maximum weight per foot at 'g' forces other than those listed, divide the 1.0g weight per foot by the desired 'g' force.
Example: Consider a 0.74g input, for a maximum weight of 17 lbs/ft from the 1.0g chart above, the adjusted weight per foot = 17/0.74 = 22 lbs/ft.

** For trapeze supported systems requiring SCB/SSBS to SCB/SSB-3 and SSB-4, the maximum longitudinal brace spacing = 2 times the maximum transverse spacing, not to exceed 80 feet. For trapeze supported systems requiring an SCB-4, install SCB-4s transversely and SCBH-3s longitudinally every 40 feet. For individually supported systems, the maximum longitudinal brace spacing = the maximum transverse brace spacing.

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H7 to H12 for the maximum seismic loads.

NOTES:
Anchorage is based on attachment with a Standard ASTM A307 Quality Bolts or E70xx Electrode Welds.
All SSB brace members tabulated are steel angle. Factory 12ga formed channel strut may be used in lieu of steel angle.
All SSBS brace members tabulated are 12ga strut channels.

(Ref. page X4)

A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

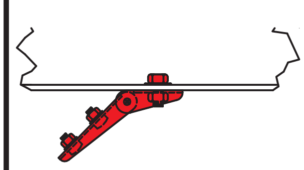
MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive, Hauppauge, NY 11788, 631/348-0282, FAX 631/348-0279
2101 W. Crescent Ave., Suite D, Anaheim, CA 92801, 714/535-2727, FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIV./TRAPEZE SUPPORTED SYSTEMS

STRUCTURAL STEEL BEAM OR MEMBER
A307 BOLT OR 70XX WELD



Maximum Weight per Meter (*kg*) for Specified 'g' Loads * at Maximum Transverse Brace Spacings (*m*) **									Option 1		Option 2		Steel Bolt		Weld Size (*mm*)
0.25g			0.5g			1.0g									
6.1m	9.1m	12.2m	6.1m	9.1m	12.2m	6.1m	9.1m	12.2m	SCB Size	Cable Dia. (*mm*)	SSB/ SSBS Size	Minimum Brace Size (*mm*)	Qty Req'd	Dia. (*mm*)	
202	135	101	101	67	51	51	34	25	SCB-1	3	SSBS	41 x 41 Strut	1	13	3
429	286	214	214	143	107	107	71	54	SCB-2	5	SSBS	41 x 41 Strut	1	16	3
655	437	327	327	218	164	164	109	82	SCB-3	6	SSB-3	L102 x 102 x 6	1	19	5
1321	881	661	661	440	330	330	220	165	SCB-4	10	SSB-4	L102 x 102 x 6	1	32	5

* Maximum weight per meter for up to 1:1 brace angle from horizontal.
For up to 1.5:1 brace angle from horizontal, divide weight per meter by 1.5; for 2:1 brace angle, divide by 2.
Example: Reduce the maximum weight of 67 kg/m at 0.5g input for a 1.5:1 brace angle ratio as follows, 67/1.5 = 44 kg/m.

For maximum weight per meter at 'g' forces other than those listed, divide the 1.0g weight per meter by the desired 'g' force.
Example: Consider a 0.74g input, for a maximum weight of 54 kg/m from the 1.0g chart above, the adjusted weight per meter = 54/0.74 = 72 kg/m.

** For trapeze supported systems requiring SCB/SSBS to SCB/SSB-3 and SSB-4, the maximum longitudinal brace spacing = 2 times the maximum transverse spacing, not to exceed 24.4 m. For trapeze supported systems requiring an SCB-4, install SCB-4s transversely and SCBH-3s longitudinally every 12.2 m. For individually supported systems, the maximum longitudinal brace spacing = the maximum transverse brace spacing.

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Pages H7 to H12 for the maximum seismic loads.

NOTES:
Anchorage is based on attachment with a Standard ASTM A307 Quality Bolts or E70xx Electrode Welds.
All SSB brace members tabulated are steel angle. Factory 2.7 mm formed channel strut may be used in lieu of steel angle.
All SSB brace members tabulated are 12ga strut channel.

(Ref. page X4)

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

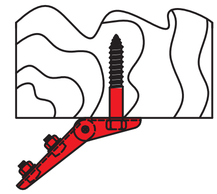
THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA

Bill Staehlin (916) 654-3362

SEISMIC RESTRAINT GUIDELINES

INDIV./TRAPEZE SUPPORTED SYSTEMS

STRUCTURAL WOOD BEAM OR MEMBER LAG BOLT



Maximum Weight per Foot (lbs.) for Specified ‘g’ Loads * at Maximum Transverse Brace Spacings (ft.) **									Option 1		Option 2		Lag Screw		
0.25g			0.5g			1.0g			SCB Size	Cable Dia. (in)	SSB/ SSBS Size	Minimum Brace Size (in)	Qty Req’d	Dia. (in)	Embed. (in)
20 ft.	30 ft.	40 ft.	20 ft.	30 ft.	40 ft.	20 ft.	30 ft.	40 ft.							
48	32	24	24	16	12	12	8	6	SCB-1	1/8	SSBS	15/8 x 15/8 Strut	1	1/2	4
72	48	36	36	24	18	18	12	9	SCB-2	3/16	SSBS	15/8 x 15/8 Strut	1	5/8	5
96	64	48	48	32	24	24	16	12	SCB-3	1/4	SSB-3	L4 x 4 x 1/4	1	3/4	6

* Maximum weight per foot for up to 1:1 brace angle from horizontal.
For up to 1.5:1 brace angle from horizontal, divide weight per foot by 1.5; for 2:1 brace angle, divide by 2.
Example: Reduce the maximum weight of 16 lbs/ft at 0.5g input for a 1.5:1 brace angle ratio as follows, 16/1.5 = 10 lbs/ft.

For maximum weight per foot at ‘g’ forces other than those listed, divide the 1.0g weight per foot by the desired ‘g’ force.
Example: Consider a 0.74g input, for a maximum weight of 12 lbs/ft from the 1.0g chart above, the adjusted weight per foot = 12/0.74 = 16 lbs/ft.

** For trapeze supported systems, the maximum longitudinal brace spacing is 2 times the transverse brace spacing not to exceed 80 feet. For individually supported systems, the maximum longitudinal brace spacing = the maximum transverse brace spacing.

Special Note: **The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Page H13 for the maximum seismic loads.**

NOTES:

Anchorage is based on attachment with Lag Screws, 1991 National Design Specification Tables 9.2A & 9.3B.

All SSB brace members tabulated are steel angle. Factory 12ga formed channel strut may be used in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channel.

(Ref. page X4)

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

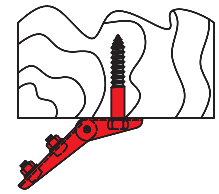
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES

INDIV./TRAPEZE SUPPORTED SYSTEMS

STRUCTURAL WOOD BEAM OR MEMBER LAG BOLT



Maximum Weight per Meter (kg) for Specified 'g' Loads * at Maximum Transverse Brace Spacings (m) **									Option 1		Option 2		Lag Screw		
0.25g			0.5g			1.0g			SCB Size	Cable Dia. (mm)	SSB/ SSBS Size	Minimum Brace Size (mm)	Qty Req'd	Dia. (mm)	Embed. (mm)
6.1m	9.1m	12.2m	6.1m	9.1m	12.2m	6.1m	9.1m	12.2m							
71	48	36	36	24	18	18	12	9	SCB-1	3	SSBS	41 x 41 Strut	1	13	102
107	71	54	54	36	27	27	18	13	SCB-2	5	SSBS	41 x 41 Strut	1	16	127
143	95	71	71	48	36	36	24	18	SCB-3	6	SSB-3	L102 x 102 x 6	1	19	152

* Maximum weight per meter for up to 1:1 brace angle from horizontal.
For up to 1.5:1 brace angle from horizontal, divide weight per meter by 1.5; for 2:1 brace angle, divide by 2
Example: Reduce the maximum weight of 24 kg/m at 0.5g input for a 1.5:1 brace angle ratio as follows, 24/1.5 = 16 kg/m.
For maximum weight per meter at 'g' forces other than those listed, divide the 1.0g weight per meter by the desired 'g' force.
Example: Consider a 0.74g input, for a maximum weight of 18 kg/m from the 1.0g chart above, the adjusted weight per meter = 18/0.74 = 24 kg/m.

** For trapeze supported systems, the maximum longitudinal brace spacing is 2 times the transverse spacing not to exceed 24.4 m. For individually supported systems, the maximum longitudinal brace spacing = the maximum transverse brace spacing.

Special Note: The Structural Engineer of Record shall verify the seismic loads applied by the SCB/SSB/SSBS to the structure are acceptable. Refer to Page H13 for the maximum seismic loads.

NOTES:

Anchorage is based on attachment with Lag Screws, 1991 National Design Specification Tables 9.2A & 9.3B.

All SSB brace members tabulated are steel angle. Factory 2.7 mm formed channel strut may be used in lieu of steel angle.

All SSBS brace members tabulated are 12ga strut channel.

(Ref. page X4)

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

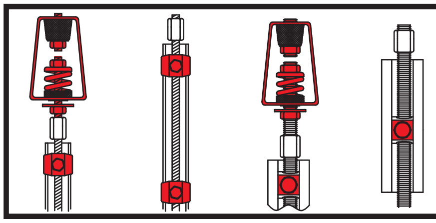
Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL ROD STIFFENER GUIDELINES

INDIV./TRAPEZE SUPPORTED SYSTEMS

SEISMIC ROD CLAMPS
ROD DIAMETERS: 1/2 to 1 1/4"



SCB or SSB Size	Support Rod Dia. (in)	Maximum Unbraced Rod Length (in)	Maximum Braced Rod Length (in)	SRC Size	UCC Size	Max. Spacing (in)	Angle Brace Size (in)	Strut Channel Size
0	3/8	13	96	1	1	22	1 x 1 x 1/8	1 5/8 x 1 5/8 x 12 GAUGE
1	1/2	19	96	1	1	31	1 x 1 x 1/8	
	1/2	19	120	1 1/2	1	31	1 1/2 x 1 1/2 x 1/4	
	5/8	31	96	1	2	39	1 x 1 x 1/8	
	5/8	31	120	1 1/2	2	39	1 1/2 x 1 1/2 x 1/4	
2	5/8	21	96	1	2	39	1 x 1 x 1/8	
	3/4	32	144	1 1/2	2	48	1 1/2 x 1 1/2 x 1/4	
	7/8	44	132	1 1/2		56	1 1/2 x 1 1/2 x 1/4	
	7/8	44	144	2		56	2 x 2 x 1/4	
3	3/4	26	144	1 1/2	2	48	1 1/2 x 1 1/2 x 1/4	1 5/8 x 1 5/8 x 12 GAUGE
	7/8	36	132	1 1/2		56	1 1/2 x 1 1/2 x 1/4	
	7/8	36	144	2		56	2 x 2 x 1/4	
	1	47	144	2		65	2 x 2 x 1/4	
	1 1/8	59	144	2		73	2 x 2 x 1/4	
4	1	33	144	2		65	2 x 2 x 1/4	
	1 1/8	42	144	2		73	2 x 2 x 1/4	
	1 1/4	54	144	2		82	2 x 2 x 1/4	

NOTES:

Rod stiffeners are only required at the seismic restraint locations.
Rod stiffeners are required when the length of the rod exceeds the maximum unbraced length.
A minimum of (2) rod clamps are required per support rod to attach the "Angle or Strut Channel Brace" to the support rod.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

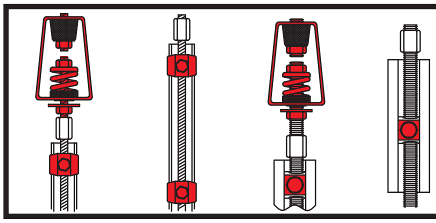
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL ROD STIFFENER GUIDELINES

INDIV./TRAPEZE SUPPORTED SYSTEMS

SEISMIC ROD CLAMPS
ROD DIAMETERS: 13 to 32 mm



SCB or SSB Size	Support Rod Dia. (*mm*)	Maximum Unbraced Rod Length (*mm*)	Maximum Braced Rod Length (*mm*)	SRC Size	UCC Size	Max. Spacing (*mm*)	Angle Brace Size (*mm*)	Strut Channel Size (*mm*)
0	10	330	2438	1	1	558	25 x 25 x 3	41 x 41 x 2.5
1	13	483	2438	1	1	787	25 x 25 x 3	41 x 41 x 2.5
	13	483	3048	1 1/2	1	787	38 x 38 x 6	41 x 41 x 2.5
	16	787	2438	1	2	991	25 x 25 x 3	41 x 41 x 2.5
	16	787	3048	1 1/2	2	991	38 x 38 x 6	41 x 41 x 2.5
2	16	533	2438	1	2	991	25 x 25 x 3	41 x 41 x 2.5
	19	813	3658	1 1/2	2	1219	38 x 38 x 6	41 x 41 x 2.5
	22	1118	3353	1 1/2		1422	38 x 38 x 6	
	22	1118	3658	2		1422	51 x 51 x 6	
3	19	660	3658	1 1/2	2	1219	38 x 38 x 6	41 x 41 x 2.5
	22	914	3353	1 1/2		1422	38 x 38 x 6	
	22	914	3658	2		1422	51 x 51 x 6	
	25	1194	3658	2		1651	51 x 51 x 6	
	29	1499	3658	2		1854	51 x 51 x 6	
4	25	838	3658	2		1651	51 x 51 x 6	
	29	1067	3658	2		1854	51 x 51 x 6	
	32	1372	3658	2		2083	51 x 51 x 6	

NOTES:
Rod stiffeners are only required at the seismic restraint locations.
Rod stiffeners are required when the length of the rod exceeds the maximum unbraced length.
A minimum of (2) rod clamps are required per support rod to attach the "Angle or Strut Channel Brace" to the support rod.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

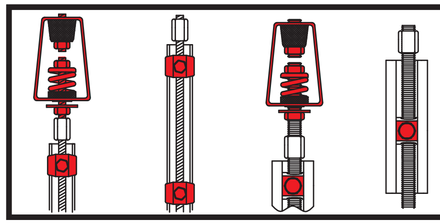
Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL ROD STIFFENER GUIDELINES

INDIV./TRAPEZE SUPPORTED SYSTEMS

SEISMIC ROD CLAMPS ROD DIAMETERS: 3/8 to 1 1/4"



Support Rod Dia. (in)	Maximum Weight per Foot(lbs.) for Specified 'g' Loads * 0.25g	0.5g	1.0g	Maximum Unbraced Rod Length** (in)	Maximum Braced Rod Length (in)	SRC Size	UCC Size	Max. Spacing (in)	Angle Brace Size (in)	Strut Channel Size
3/8	20	10	5	19	96	1	1	22	1 x 1 x 1/8	
3/8	40	20	10	13	96	1	1	22	1 x 1 x 1/8	
1/2	40	20	10	25	96	1	1	31	1 x 1 x 1/8	
1/2	124	62	31	14	96	1	1	31	1 x 1 x 1/8	
5/8	60	30	15	33	96	1	2	39	1 x 1 x 1/8	
5/8	144	72	36	21	96	1	2	39	1 x 1 x 1/8	1 5/8 x 1 5/8 x 12 GAUGE
1/2	80	40	20	18	120	1 1/2	1	31	1 1/2 x 1 1/2 x 1/4	
1/2	120	60	30	14	120	1 1/2	1	31	1 1/2 x 1 1/2 x 1/4	
5/8	80	40	20	29	120	1 1/2	2	39	1 1/2 x 1 1/2 x 1/4	
5/8	132	66	33	22	120	1 1/2	2	39	1 1/2 x 1 1/2 x 1/4	
3/4	100	50	25	38	144	1 1/2	2	48	1 1/2 x 1 1/2 x 1/4	
3/4	248	124	62	24	144	1 1/2	2	48	1 1/2 x 1 1/2 x 1/4	
7/8	160	80	40	42	132	1 1/2		56	1 1/2 x 1 1/2 x 1/4	
7/8	460	230	115	25	132	1 1/2		56	1 1/2 x 1 1/2 x 1/4	
1	200	100	50	50	132	1 1/2		65	1 1/2 x 1 1/2 x 1/4	
1	500	250	125	31	132	1 1/2		65	1 1/2 x 1 1/2 x 1/4	
7/8	160	80	40	42	144	2		56	2 x 2 x 1/4	
7/8	440	220	110	25	144	2		56	2 x 2 x 1/4	
1	200	100	50	50	144	2		65	2 x 2 x 1/4	
1	500	250	125	31	144	2		65	2 x 2 x 1/4	
1 1/8	240	120	60	57	144	2		73	2 x 2 x 1/4	
1 1/8	500	250	125	39	144	2		73	2 x 2 x 1/4	
1 1/4	300	150	75	65	144	2		82	2 x 2 x 1/4	
1 1/4	500	250	125	51	144	2		82	2 x 2 x 1/4	

* Based on 40 foot brace spacing. For 20 and 30 foot brace spacing, multiply the weight per foot by 2 and 1.33, respectively. For maximum weight per foot at 'g' forces other than those listed, divide the 1.0g weight per foot by the desired 'g' force. Example: Consider a 0.74g input, for a maximum weight of 10 lbs/ft from the 1.0g chart above, the adjusted weight per foot = 10/0.74 = 13 lbs/ft.

** For maximum unbraced rod length at a maximum weight per foot other than those listed, interpolate between maximum unbraced rod lengths of equal diameter. Example: Consider maximum weights per foot of 75 and 125 with respective maximum unbraced rod lengths of 65 and 51. For 100 lbs/ft., the maximum unbraced rod length = 58".

NOTES:

Rod stiffeners are only required at the seismic restraint locations.
Rod stiffeners are required when the length of the rod exceeds the maximum unbraced length.
A minimum of (2) rod clamps are required per support rod to attach the "Angle or Strut Channel Brace" to the support rod.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

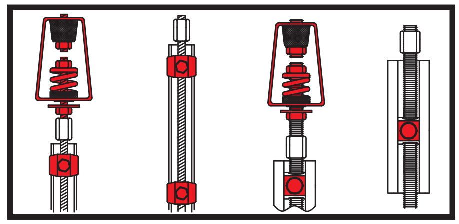
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL ROD STIFFENER GUIDELINES	INDIVIDUALLY SUPPORTED SYSTEMS SEISMIC ROD CLAMPS ROD DIAMETERS: 10 to 32 mm



Support Rod Dia. (*mm*)	Maximum Weight per Meter (*kg*) for Specified 'g' Loads *			Maximum Unbraced Rod Length** (*mm*)	Maximum Braced Rod Length (*mm*)	SRC Size	UCC Size	Max. Spacing (*mm*)	Angle Brace Size (*mm*)	Strut Channel Size (*mm*)
	0.25g	0.5g	1.0g							
10	29	14	7	483	2438	1	1	559	25 x 25 x 3	41 x 41 x 2.5
10	59	29	14	330	2438	1	1	559	25 x 25 x 3	
13	59	29	14	635	2438	1	1	787	25 x 25 x 3	
13	184	92	46	356	2439	1	1	787	25 x 25 x 3	
16	89	44	22	838	2438	1	2	991	25 x 25 x 3	
16	214	107	53	533	2438	1	2	991	25 x 25 x 3	
13	119	59	29	457	3048	1 1/2	1	787	38 x 38 x 6	
13	178	89	44	356	3048	1 1/2	1	787	38 x 38 x 6	
16	119	59	29	737	3048	1 1/2	2	991	38 x 38 x 6	
16	196	98	49	559	3048	1 1/2	2	991	38 x 38 x 6	
19	148	74	37	965	3658	1 1/2	2	1219	38 x 38 x 6	
19	369	184	92	610	3658	1 1/2	2	1219	38 x 38 x 6	
22	238	119	59	1067	3353	1 1/2		1422	38 x 38 x 6	
22	684	342	171	635	3353	1 1/2		1422	38 x 38 x 6	
25	297	148	74	1270	3353	1 1/2		1651	38 x 38 x 6	
25	744	372	186	787	3353	1 1/2		1651	38 x 38 x 6	
22	238	119	59	1067	3658	2		1422	51 x 51 x 6	
22	654	327	163	635	3658	2		1422	51 x 51 x 6	
25	297	148	74	1270	3658	2		1651	51 x 51 x 6	
25	744	372	186	787	3658	2		1651	51 x 51 x 6	
29	357	178	89	1448	3658	2		1854	51 x 51 x 6	
29	744	372	186	991	3658	2		1854	51 x 51 x 6	
32	446	223	111	1651	3658	2		2083	51 x 51 x 6	
32	744	372	186	1295	3658	2		2083	51 x 51 x 6	

* Based on 12.2 meter brace spacing. For 6.1 and 9.1 meter brace spacing, multiply the weight per meter by 2 and 1.33, respectively. For maximum weight per meter at 'g' forces other than those listed, divide the 1.0g weight per meter by the desired 'g' force. Example: Consider a 0.74g input, for a maximum weight of 14 kg/m from the 1.0g chart above, the adjusted weight per meter = 14/0.74 = 18 kg/m.

** For maximum unbraced rod length at a maximum weight per meter other than those listed, interpolate between maximum unbraced rod lengths of equal diameter. Example: Consider maximum weights per meter of 111 and 186 with respective maximum unbraced rod lengths of 1651 and 1295. For 148.5 kg/m, the maximum unbraced rod length = 1473 mm.

NOTES:

Rod stiffeners are only required at the seismic restraint locations.
Rod stiffeners are required when the length of the rod exceeds the maximum unbraced length.
A minimum of (2) rod clamps are required per support rod to attach the "Angle or Strut Channel Brace" to the support rod.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Page

E2m

Dhiru Mali
Structural Engineer
California SE No. 2811

TRAPEZE SUPPORT GUIDELINES

Trapeze Span (in)	Trapeze Steel	Maximum Uniform Load (lbs)	Vertical Deflection at Load (in)
12	A	3380	0.01
	Double A	9530	0.01
	B	10415	0.01
	C	1700	0.01
	D	3250	0.01
24	A	1690	0.06
	Double A	4765	0.03
	B	5205	0.03
	D	1600	0.03
	E	3800	0.02
36	A	1120	0.13
	Double A	3175	0.07
	B	3470	0.07
	Double B	10620	0.04
	E	2550	0.04
48	A	845	0.23
	Double A	2380	0.13
	B	2600	0.12
	Double B	7965	0.06
	E	1900	0.08
60	A	675	0.35
	Double A	1905	0.20
	B	2080	0.19
	Double B	6370	0.10
	F	2800	0.09

Trapeze Span (in)	Trapeze Steel	Maximum Uniform Load (lbs)	Vertical Deflection at Load (in)
72	A	560	0.50
	Double A	1585	0.29
	B	1735	0.27
	Double B	5310	0.14
	F	2300	0.13
84	A	480	0.69
	Double A	1360	0.39
	B	1485	0.36
	Double B	4550	0.20
	G	2700	0.22
96	A	420	0.90
	Double A	1190	0.51
	B	1300	0.47
	Double B	3980	0.26
	H	5000	0.26
108	A	375	1.14
	Double A	1055	0.64
	B	1155	0.60
	Double B	3540	0.32
	J	7500	0.28
120	A	335	1.40
	Double A	950	0.80
	B	1040	0.74
	Double B	3185	0.40
	K	10000	0.30

NOTES:
1. When loads are concentrated near midspan, allowable loads shall be multiplied by 0.5 and deflections by 0.8.
2. Calculations based on section properties tabulated below.

TRAPEZE STEEL DESCRIPTION

Trapeze Steel	Steel Description	Weight (lbs/ft)	Area (in^2)	Ixx (in^4)	Sxx (in^3)	rx (in)	Iyy (in^4)	Syy (in^3)	ry (in)
A	1 5/8 x 1 5/8 Strut	1.90	0.555	0.186	0.203	0.579	0.239	0.294	0.655
Double A	1 5/8 x 1 5/8 Strut	3.80	1.110	0.930	0.572	0.915	0.478	0.588	0.656
B	1 5/8 x 3 1/4 Strut	3.05	0.896	1.094	0.625	1.105	0.436	0.537	0.697
Double B	1 5/8 x 3 1/4 Strut	6.10	1.792	6.215	1.912	1.862	0.872	1.074	0.697
C	2 x 2 x 1/8 Angle	1.65	0.484	0.190	0.131	0.626	0.190	0.131	0.626
D	2 x 2 x 1/4 Angle	3.19	0.938	0.348	0.247	0.609	0.348	0.247	0.609
E	3 x 3 x 1/4 Angle	4.90	1.440	1.240	0.577	0.930	1.240	0.577	0.930
F	4 x 4 x 1/4 Angle	6.60	1.940	3.040	1.050	1.250	3.040	1.050	1.250
G	Double C3 x 4.1	8.20	2.420	3.320	2.200	1.170	0.394	0.404	
H	Double C4 x 5.4	10.80	3.180	7.700	3.860	1.560	0.638	0.566	
J	Double C5 x 6.7	13.40	3.940	14.980	6.000	1.950	0.958	0.756	
K	Double C6 x 8.2	16.40	4.800	26.200	8.760	2.340	1.389	0.984	

NOTES:
1. Strut elements have 12 gage thickness.
2. Structural steel angles and channels are A36 steel.
3. "Double A" or "Double B" refers to a factory supplied back to back strut "A"or "B"
4. Trapeze styles "G" to "K" are back to back steel channels welded together top and bottom with plates at the support rods.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

TRAPEZE SUPPORT GUIDELINES

Trapeze Span *(mm)*	Trapeze Steel	Maximum Uniform Load *(lbs)*	Vertical Deflection at Load *(mm)*
305	A	1533.1	0.25
	Double A	4322.7	0.25
	B	4724.2	0.25
	C	771.1	0.25
	D	1474.2	0.25
610	A	766.6	1.52
	Double A	2161.4	0.76
	B	2360.9	0.76
	D	725.7	0.76
	E	1723.6	0.51
914	A	508.0	3.30
	Double A	1440.2	1.78
	B	1574.0	1.78
	Double B	4817.1	1.02
	E	1156.7	1.02
1219	A	383.3	5.84
	Double A	1079.5	3.30
	B	1179.3	3.05
	Double B	3612.9	1.52
	E	861.8	2.03
1524	A	306.2	8.89
	Double A	864.1	5.08
	B	943.5	4.83
	Double B	2889.4	2.54
	F	1270.1	2.29

Trapeze Span *(mm)*	Trapeze Steel	Maximum Uniform Load *(lbs)*	Vertical Deflection at Load *(mm)*
1829	A	254.0	12.70
	Double A	718.9	7.37
	B	787.0	6.86
	Double B	2408.6	3.56
	F	1043.3	3.30
2134	A	217.7	17.53
	Double A	616.9	9.91
	B	673.6	9.14
	Double B	2063.8	5.08
	G	1224.7	5.59
2438	A	190.5	22.86
	Double A	539.8	12.95
	B	589.7	11.94
	Double B	1805.3	6.60
	H	2268.0	6.60
2743	A	170.1	28.96
	Double A	478.5	16.26
	B	523.9	15.24
	Double B	1605.7	8.13
	J	3401.9	7.11
3048	A	152.0	35.56
	Double A	430.9	20.32
	B	471.7	18.80
	Double B	1444.7	10.16
	K	4535.9	7.62

NOTES:
1. When loads are concentrated near midspan, allowable loads shall be multiplied by 0.5 and deflections by 0.8.
2. Calculations based on section properties tabulated below.

TRAPEZE STEEL DESCRIPTION

Trapeze Steel	Steel Description *(mm)*	Weight *(kg/m)*	Area *(cm^2)*	Ixx *(cm^4)*	Sxx *(cm^3)*	rx *(cm)*	Iyy *(cm^4)*	Syy *(cm^3)*	ry *(cm)*
A	41 x 41 x 2.7 Strut	2.8	3.6	7.7	3.3	1.5	9.9	4.8	1.7
Double A	41 x 41 x 2.7 Strut	5.7	7.2	38.7	9.4	2.3	19.9	9.6	1.7
B	41 x 83 x 2.7 Strut	4.5	5.8	45.5	10.2	2.8	18.1	8.8	1.8
Double B	41 x 83 x 2.7 Strut	9.1	11.6	258.7	31.3	4.7	36.3	17.6	1.8
C	51 x 51 x 3 Angle	2.5	3.1	7.9	2.1	1.6	7.9	2.1	1.6
D	51 x 51 x 6 Angle	4.7	6.1	14.5	4.0	1.5	14.5	4.0	1.5
E	75 x 75 x 6 Angle	7.3	9.3	51.6	9.5	2.4	51.6	9.5	2.4
F	102 x 102 x 6 Angle	9.8	12.5	–	17.2	3.2	126.5	17.2	3.2
G	Double C76 x 6.1	12.2	15.6	138.2	36.1	3.0	16.4	6.6	
H	Double C102 x 8.0	16.1	20.5	320.5	63.3	4.0	26.6	9.3	
J	Double C127 x 10.0	19.9	25.4	623.5	98.3	5.0	39.9	12.4	
K	Double C152 x 12.2	24.4	31.0	1090.5	143.6	5.9	57.7	16.1	

NOTES:
1. Strut elements have 2.7 mm thickness
2. Structural steel angles and channels are A36 steel.
3. "Double A" or "Double B" refers to a factory supplied back to back strut "A"or "B"
4. Trapeze styles "G" to "K" are back to back steel channels welded together top and bottom with plates at the support rods.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

UPPER SUPPORT MEMBER GUIDELINES FOR RECTANGULAR/OVAL DUCT

Upper support member selection at all directional and longitudinal brace locations is based on top brace extension E as shown on page H14.
Upper support member extension at transverse brace locations is not restricted.

The following table defines upper support member sizes for maximum extension E of 6" or 12".

Size	E = 6" Maximum Member Size (in) Steel Angle	E = 6" Maximum Member Size (in) 12 GA Strut
SCBH/SSBS	2 1/2 x 2 1/2 x 12ga	1 5/8 x 1 5/8
SCBH/SSBS	3 x 3 x 12ga	1 5/8 x 1 5/8
SCBH/SSB-3	4 x 4 x 12ga	Double 1 5/8 x 1 5/8

Size	E = 12" Maximum Member Size (in) Steel Angle	E = 12" Maximum Member Size (in) 12 GA Strut
SCBH/SSBS	2 1/2 x 2 1/2 x 3/16	1 5/8 x 1 5/8
SCBH/SSBS	3 x 3 x 3/16	Double 1 5/8 x 1 5/8
SCBH/SSB-3	4 x 4 x 1/4	

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002
Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

UPPER SUPPORT MEMBER GUIDELINES
FOR RECTANGULAR/OVAL DUCT

Upper support member selection at all directional and longitudinal brace locations is based on top brace extension E as shown on page H14.
Upper support member extension at transverse brace locations is not restricted.

The following table defines upper support member sizes for maximum extension E of 152 or 305 *mm*.

Size	E = 152 *mm* Maximum Member Size (*mm*) Steel Angle	 Strut
SCBH/SSBS	64 x 64 x 2.7	41 x 41 x 2.7
SCBH/SSBS	76 x 76 x 2.7	41 x 41 x 2.7
SCBH/SSB-3	102 x 102 x 2.7	Double 41 x 41 x 2.7

Size	E = 305 *mm* Maximum Member Size (*mm*) Steel Angle	 Strut
SCBH/SSBS	64 x 64 x 5	41 x 41 x 2.7
SCBH/SSBS	76 x 76 x 5	Double 41 x 41 x 2.7
SCBH/SSB-3	102 x 102 x 6	

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

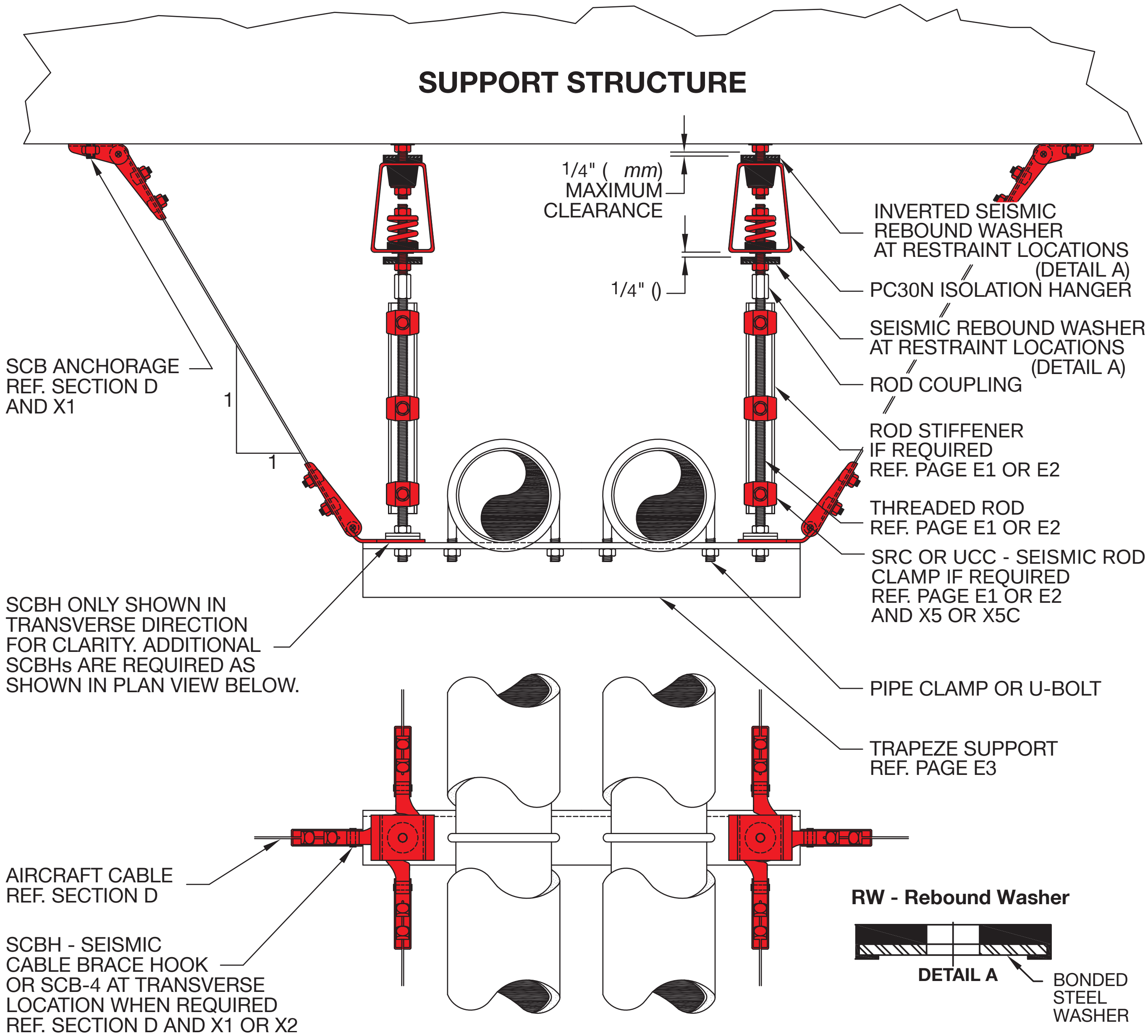
Page
E4m

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

ALL-DIRECTIONAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR SPRING-ISOLATED TRAPEZE SUPPORTED PIPE/CONDUIT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

OPA-0349
on
December 22, 2006

Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

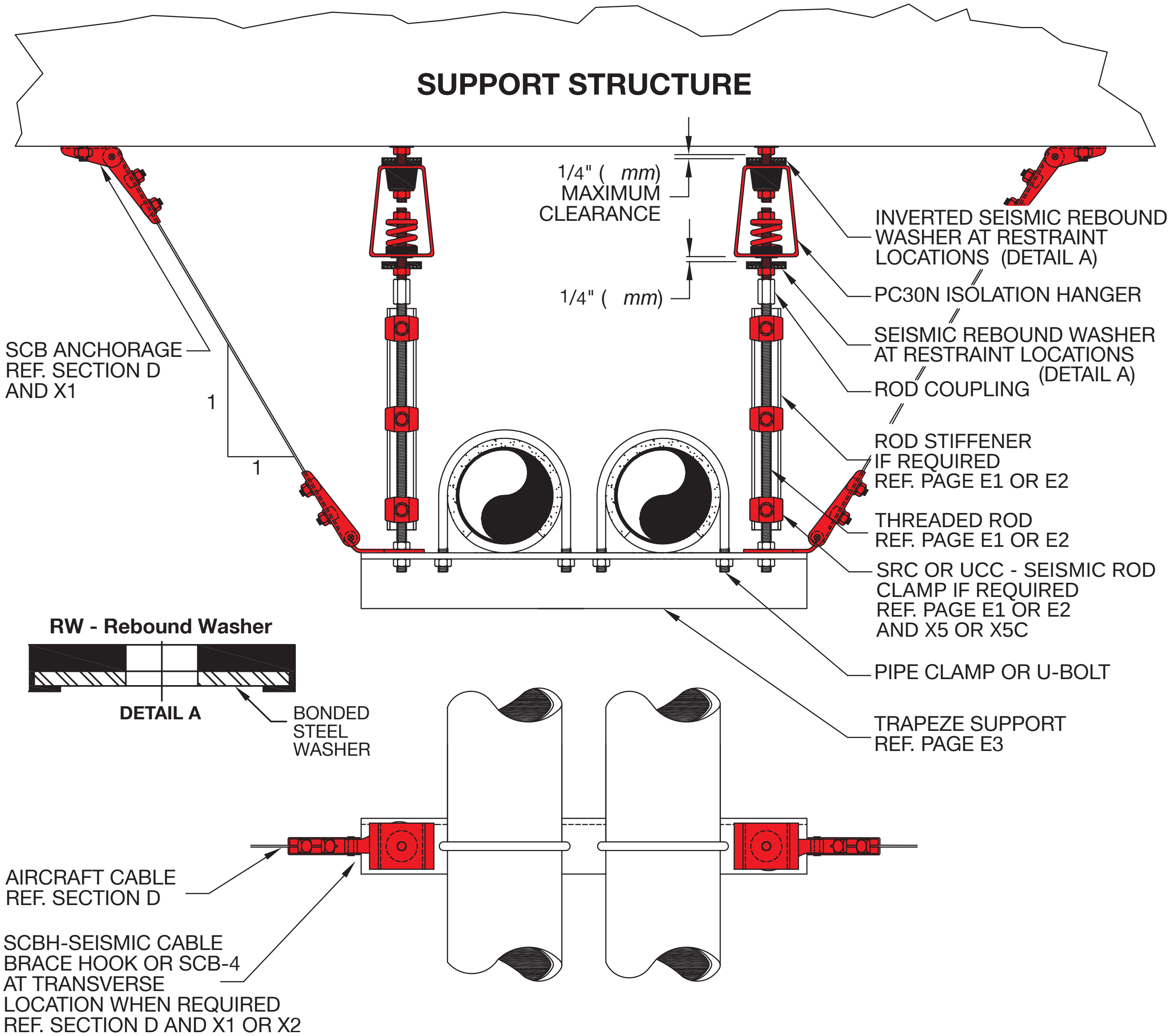
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC CABLE BRACE HOOK GUIDELINES
FOR SPRING-ISOLATED TRAPEZE SUPPORTED PIPE/CONDUIT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

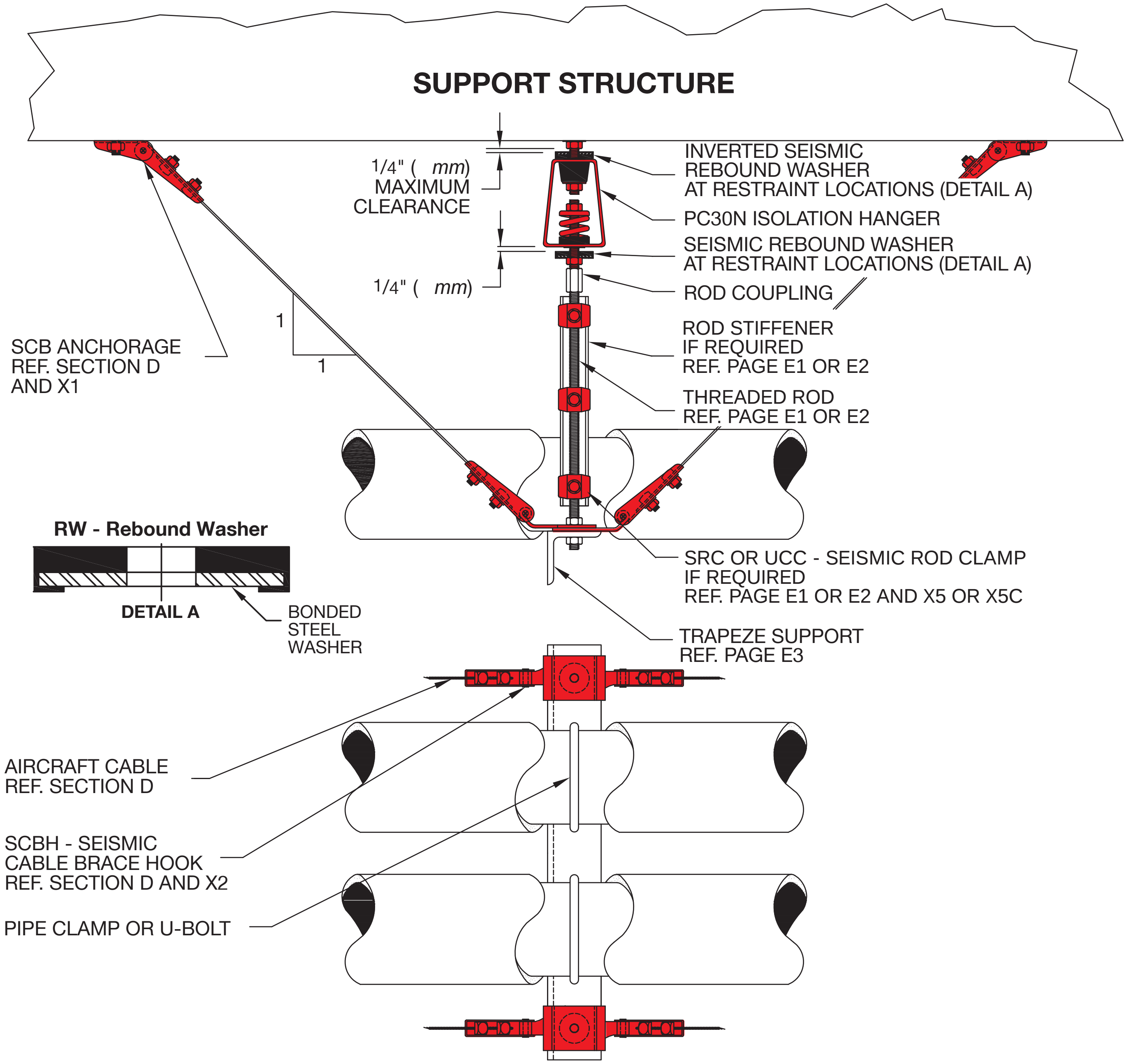
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
December 22, 2006

Anthony R. Pike (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR SPRING-ISOLATED TRAPEZE SUPPORTED PIPE/CONDUIT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBHs.
NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.
NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
December 22, 2006

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

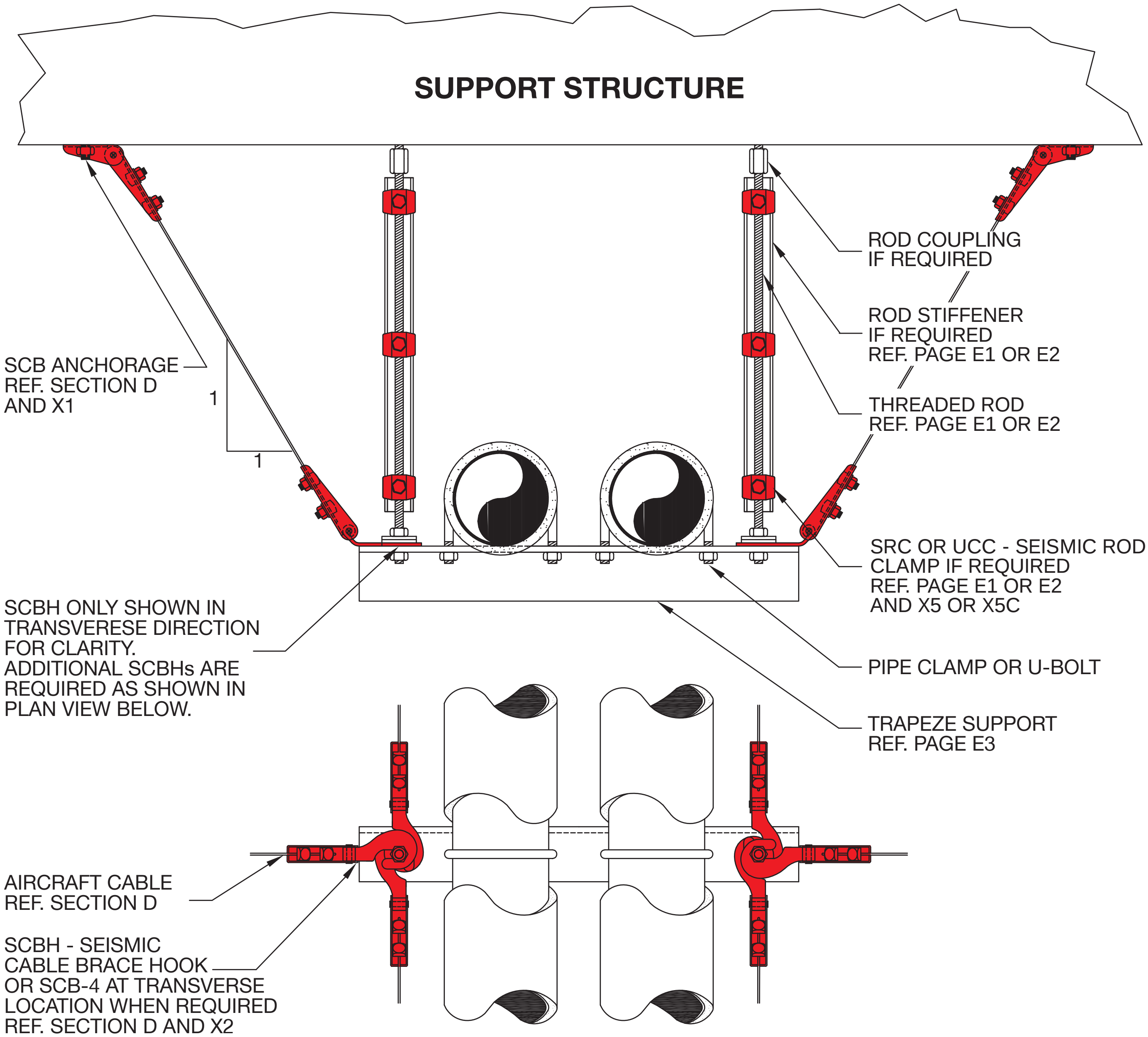
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR TRAPEZE SUPPORTED PIPE/CONDUIT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section D for limitations. Refer to page X2 for proper installation of the SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

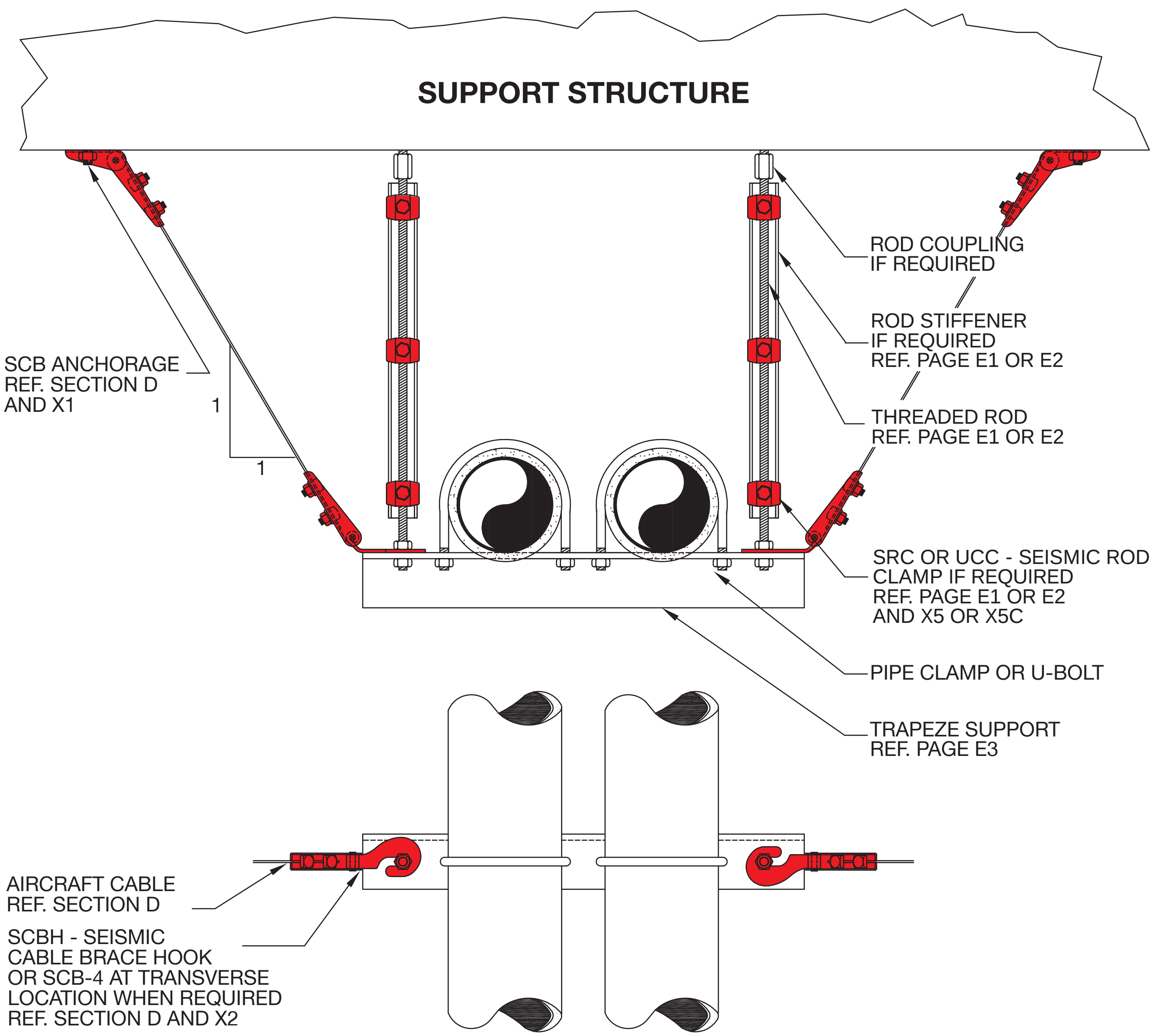
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC CABLE BRACE HOOK GUIDELINES FOR TRAPEZE SUPPORTED PIPE/CONDUIT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section D for limitations. Refer to page X2 for proper installation of SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

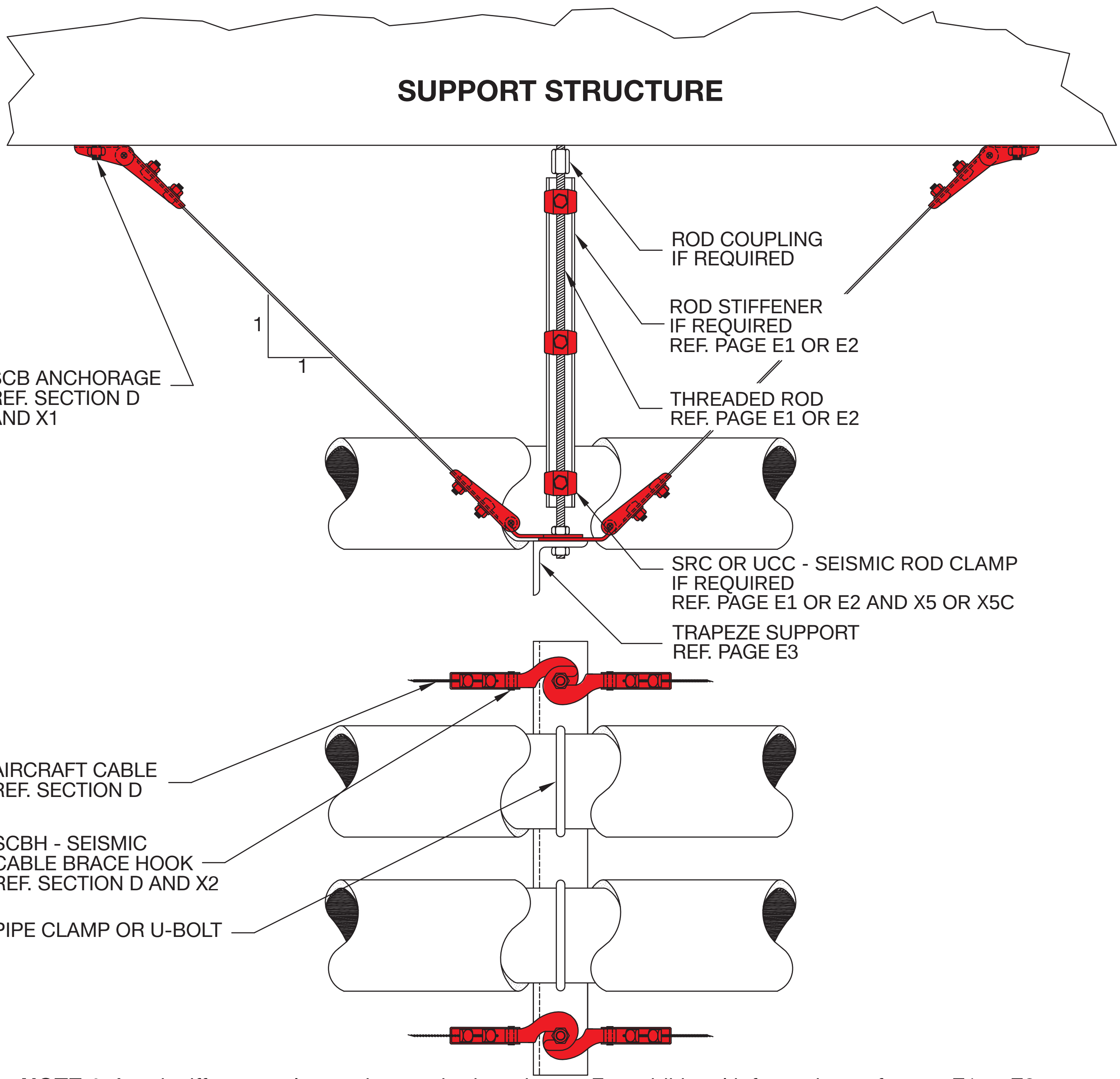
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR TRAPEZE SUPPORTED PIPE/CONDUIT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section D for limitations. Refer to page X2 for proper installation of SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

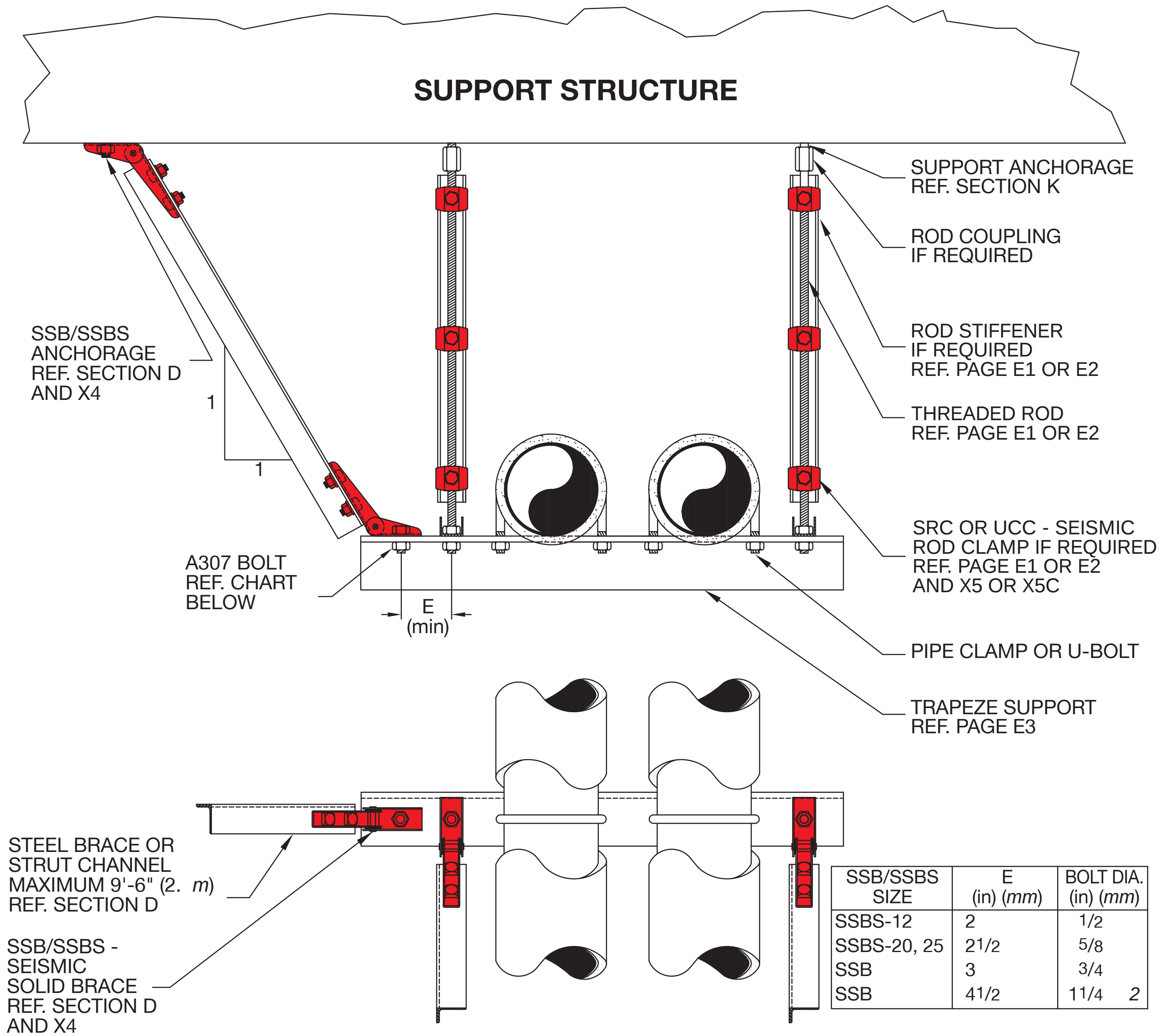
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC SOLID BRACE GUIDELINES FOR TRAPEZE SUPPORTED PIPE/CONDUIT



SSB/SSBS SIZE	E (in) *(mm)*	BOLT DIA. (in) *(mm)*
SSBS-12	2	1/2
SSBS-20, 25	2 1/2	5/8
SSB	3	3/4
SSB	4 1/2	1 1/4 2

NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section A for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

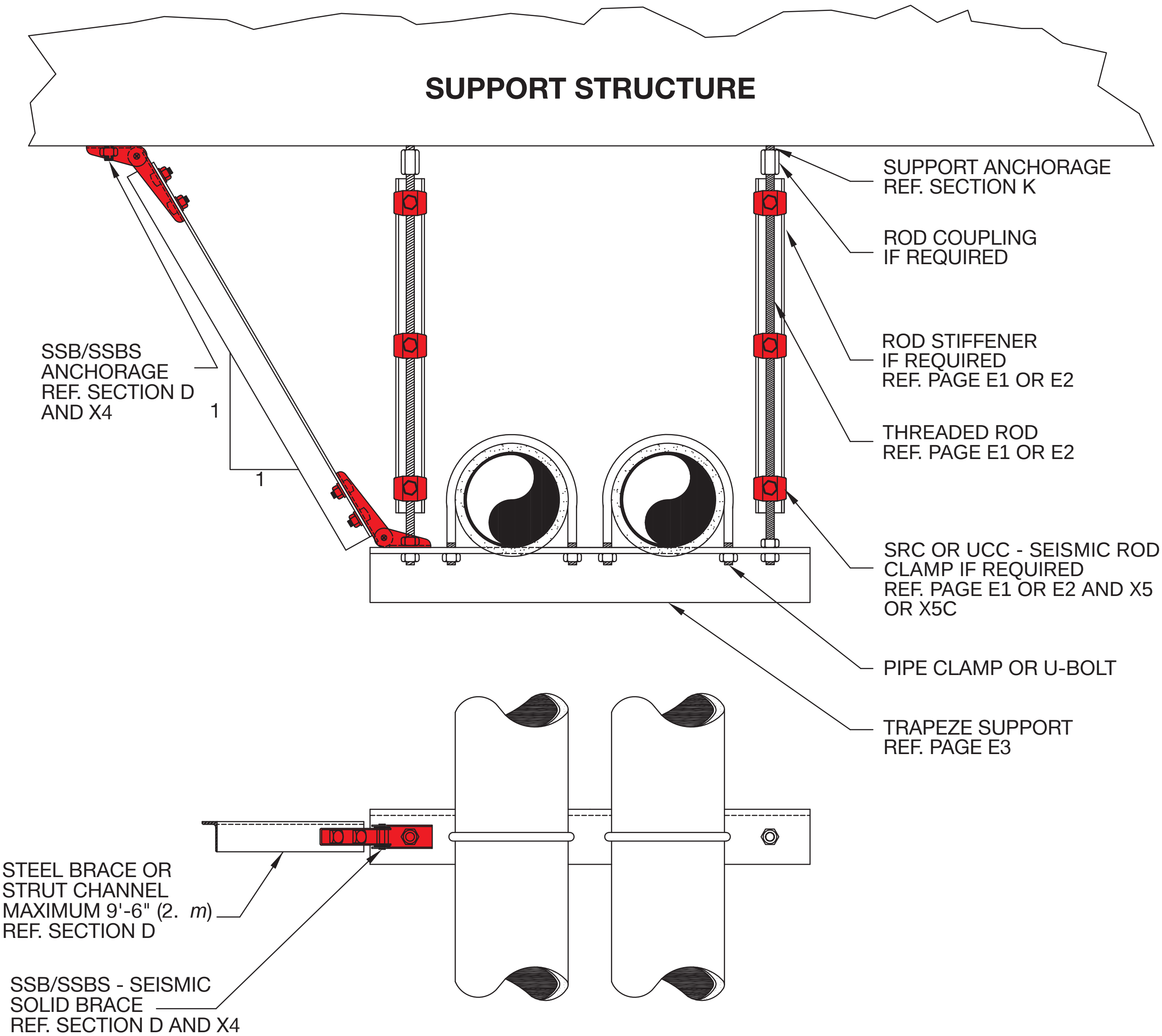
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC SOLID BRACE GUIDELINES FOR TRAPEZE SUPPORTED PIPE/CONDUIT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

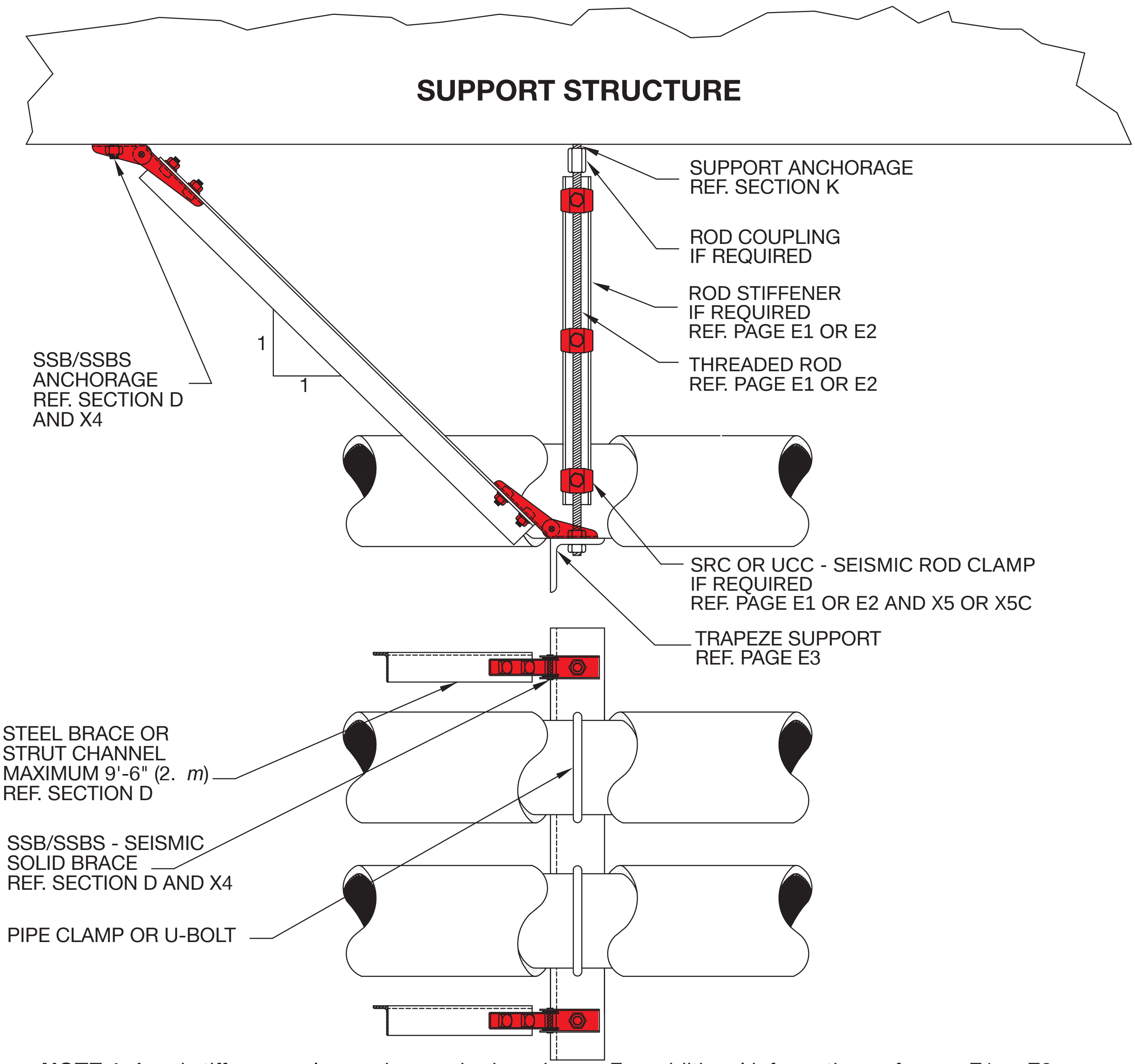
OPA-0349 August 5, 2002

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC SOLID BRACE GUIDELINES FOR TRAPEZE SUPPORTED PIPE/CONDUIT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

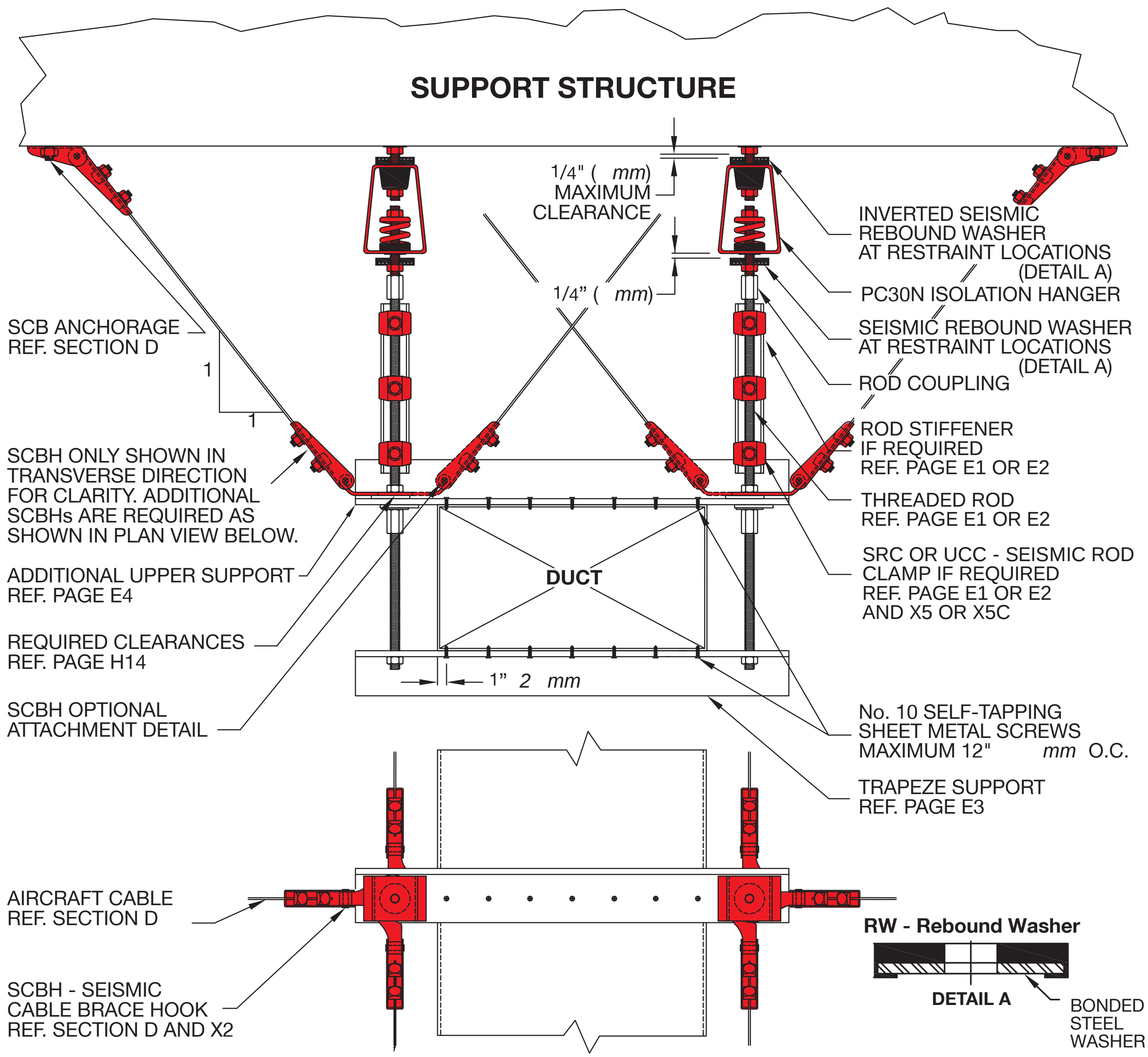
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR SPRING-ISOLATED RECTANGULAR/OVAL DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBHs.
NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.
NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA

OPA-0349
on
December 22, 2006

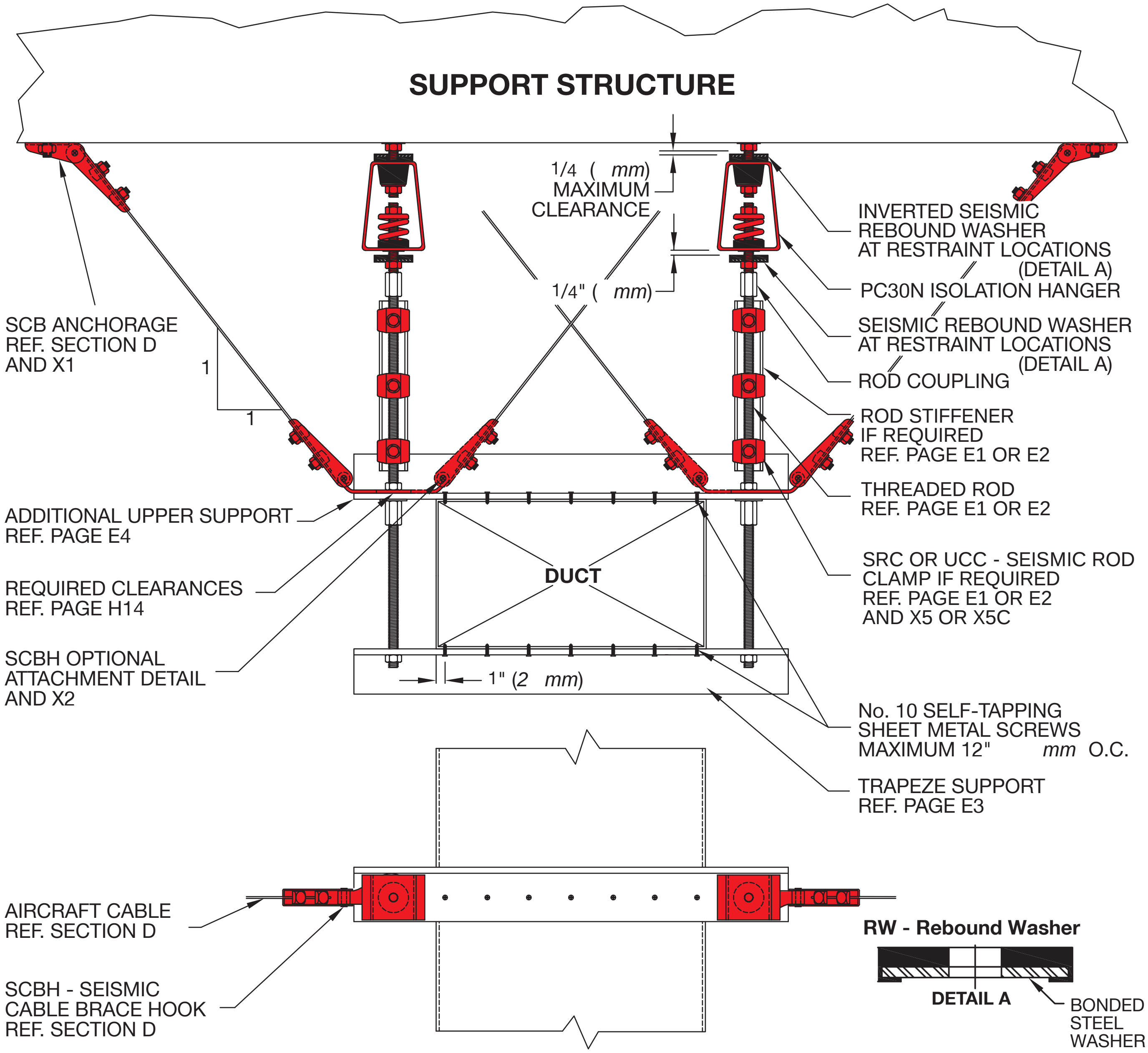
Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC CABLE BRACE HOOK GUIDELINES FOR SPRING-ISOLATED RECTANGULAR/OVAL DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBHs.
NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.
NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA

OPA-0349
on
December 22, 2006

Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

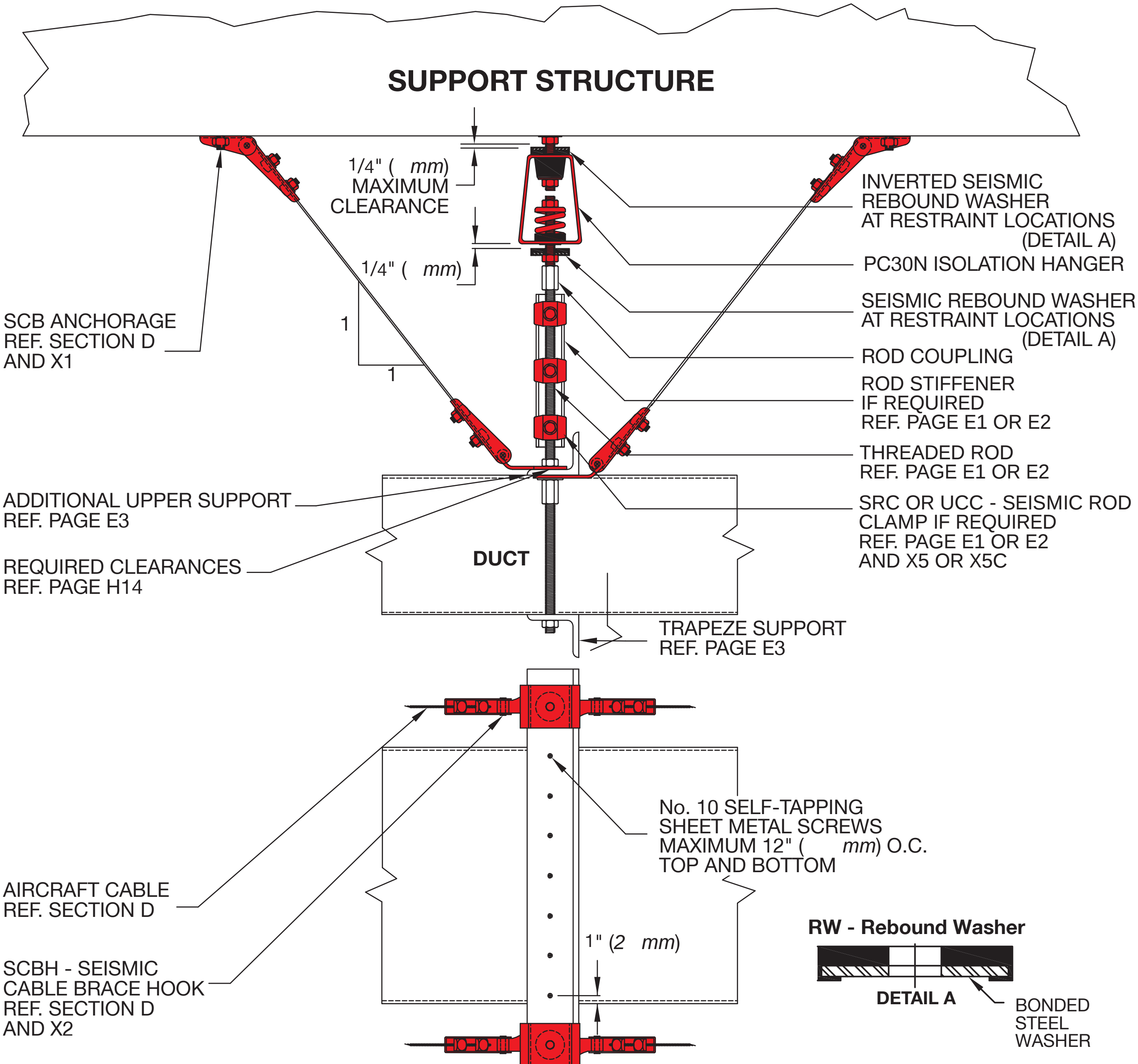
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR SPRING-ISOLATED RECTANGULAR/OVAL DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

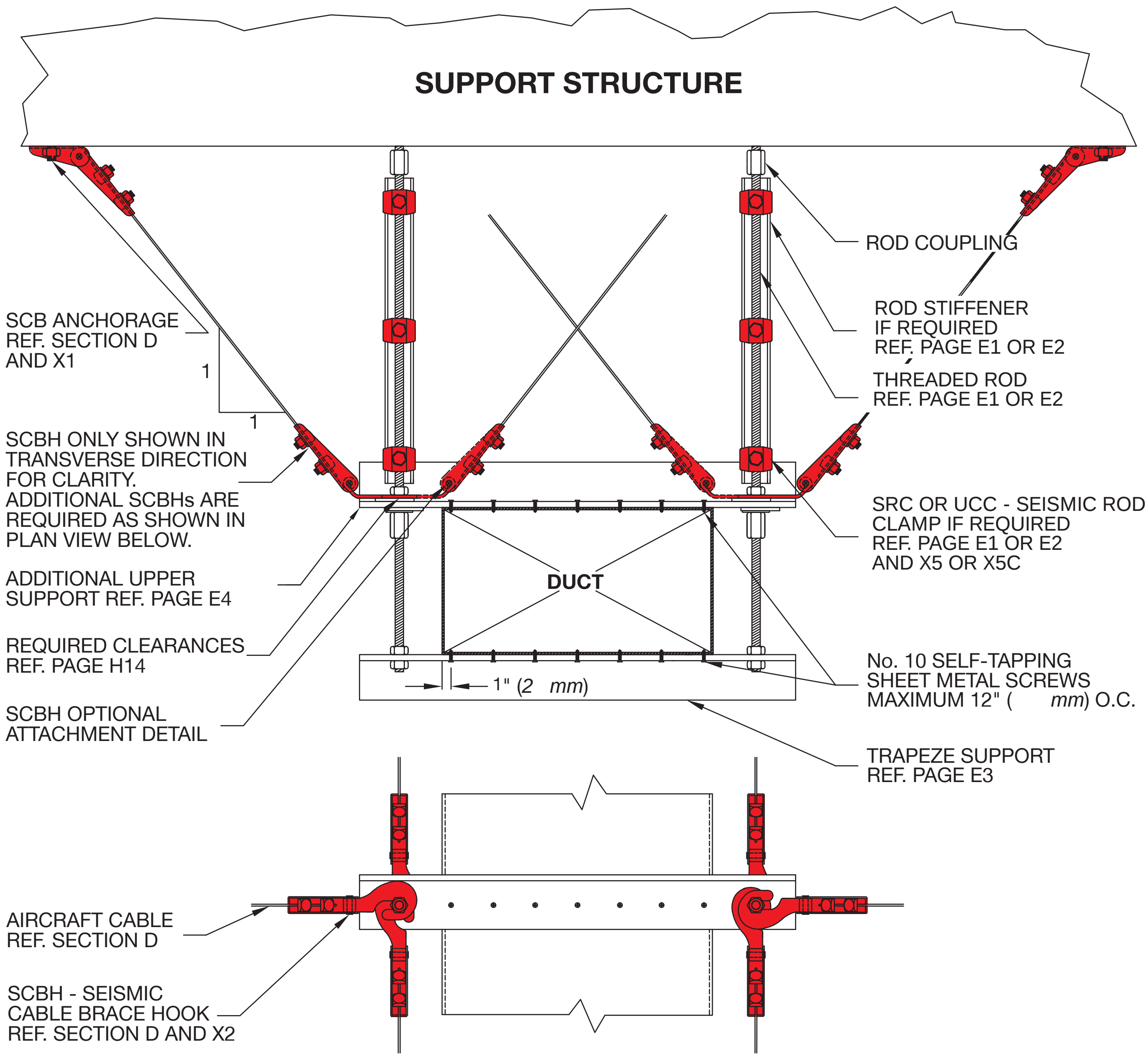
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
December 22, 2006

Anthony R. Pike (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR RECTANGULAR/OVAL DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations. Refer to page X2 for proper installation of the SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

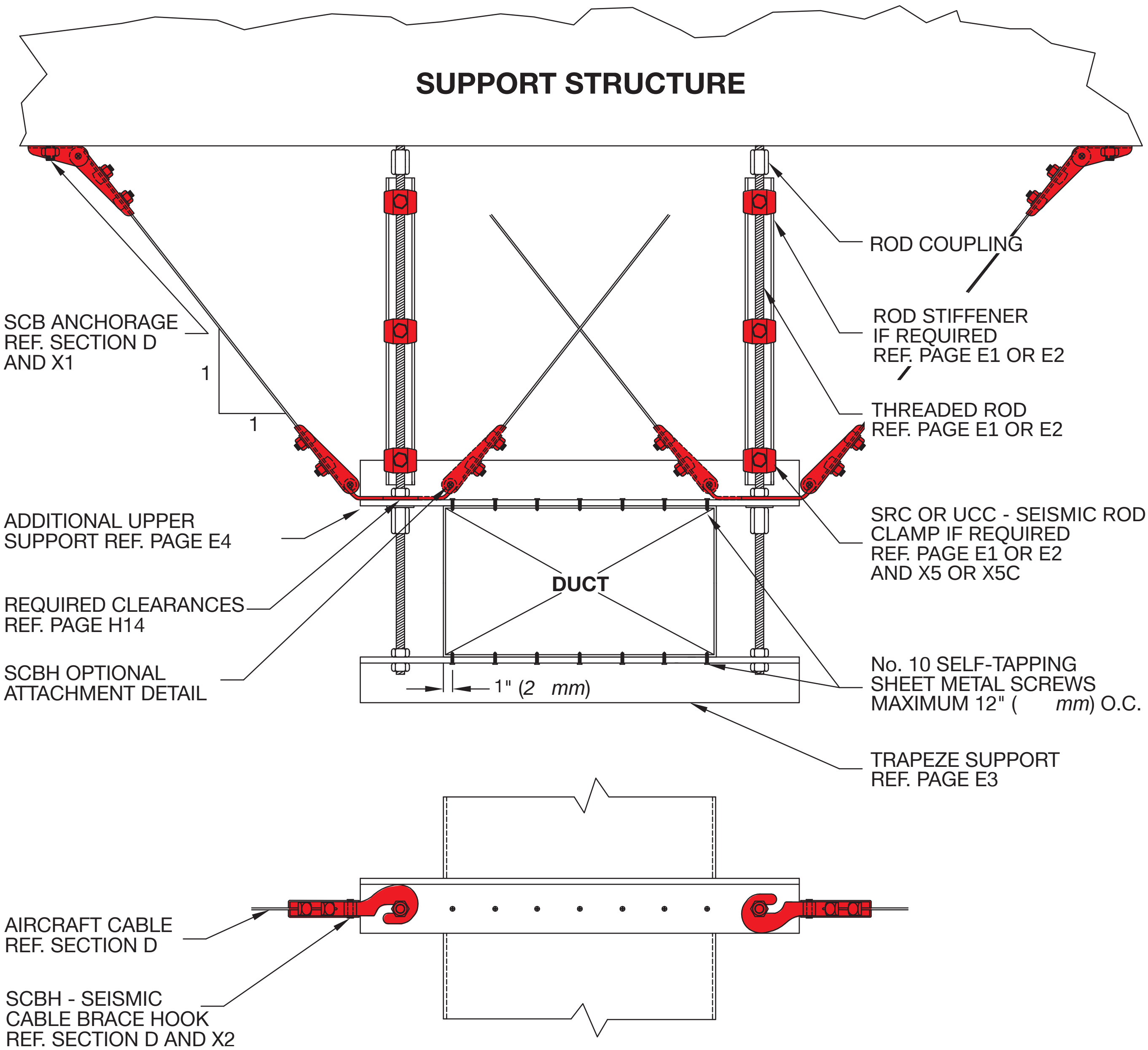
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC CABLE BRACE HOOK GUIDELINES
FOR RECTANGULAR/OVAL DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations. Refer to page X2 for proper installation of the SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

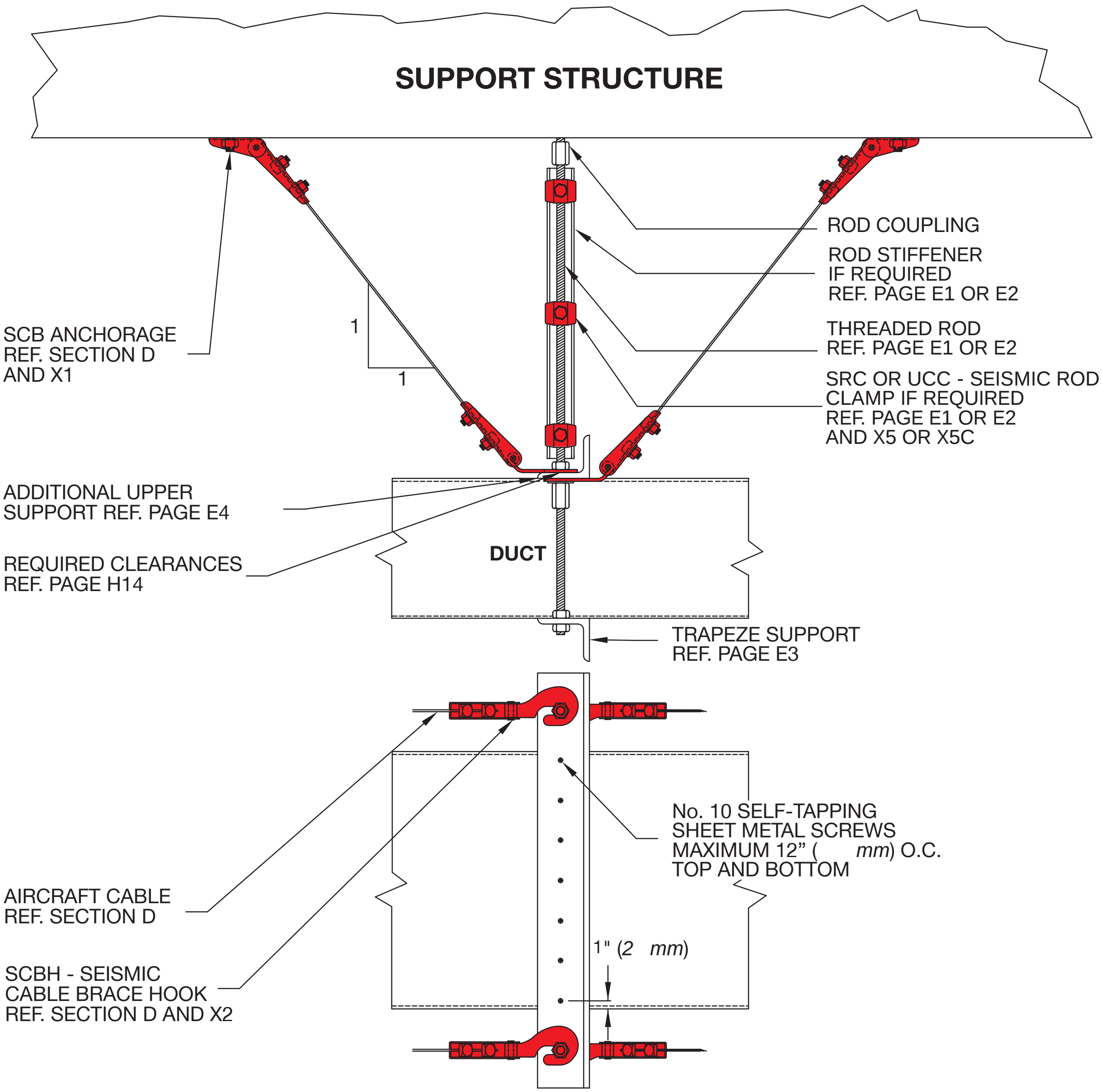
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

LOGITUDINAL SEISMIC CABLE BRACE HOOK GUIDELINES
FOR RECTANGULAR/OVAL DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations. Refer to page X2 for proper installation of the SCBHS.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

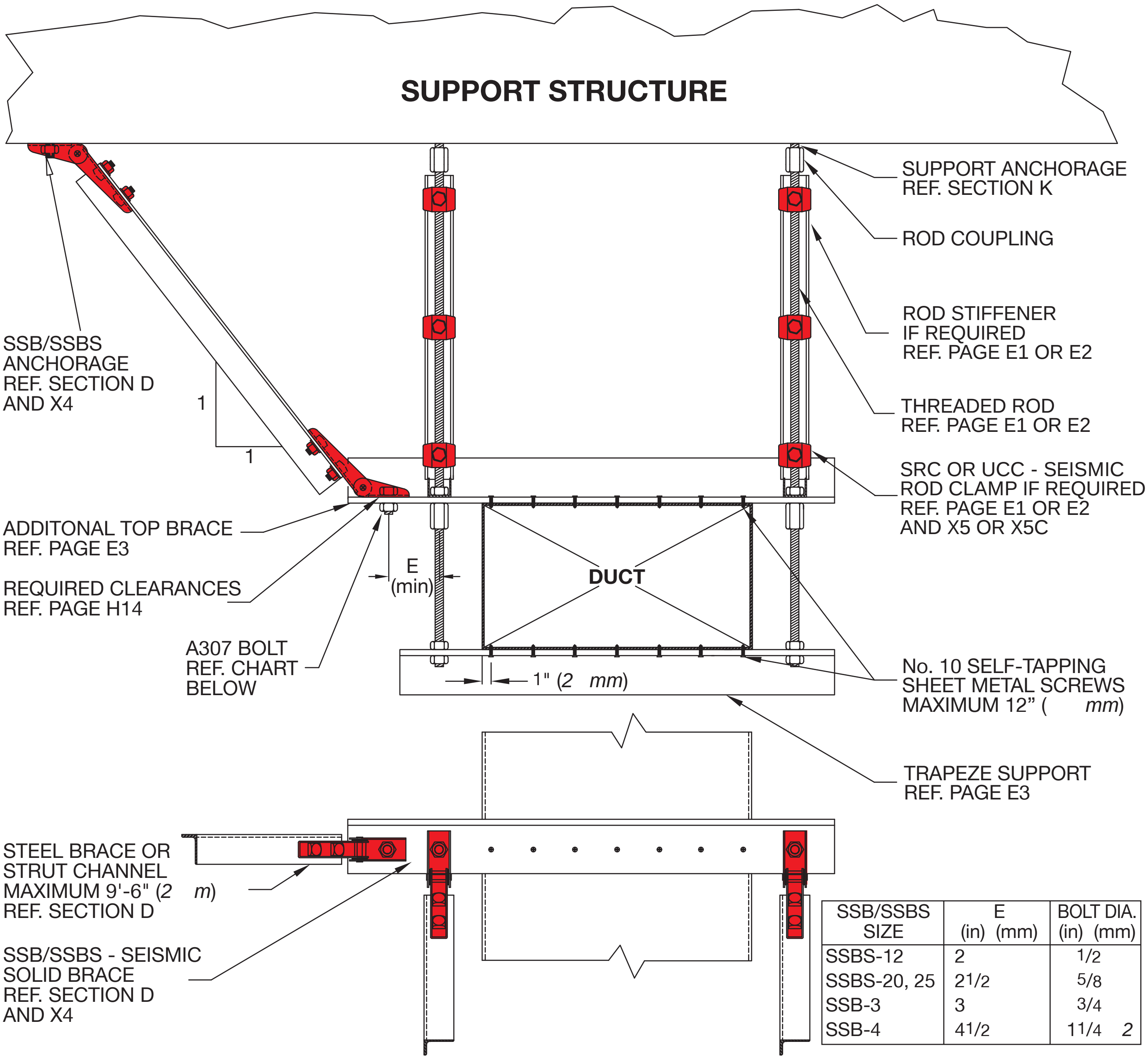
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC SOLID BRACE GUIDELINES FOR RECTANGULAR/OVAL DUCT



SSB/SSBS SIZE	E (in) (mm)	BOLT DIA. (in) (mm)
SSBS-12	2	1/2
SSBS-20, 25	2 1/2	5/8
SSB-3	3	3/4
SSB-4	4 1/2	1 1/4 2

NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

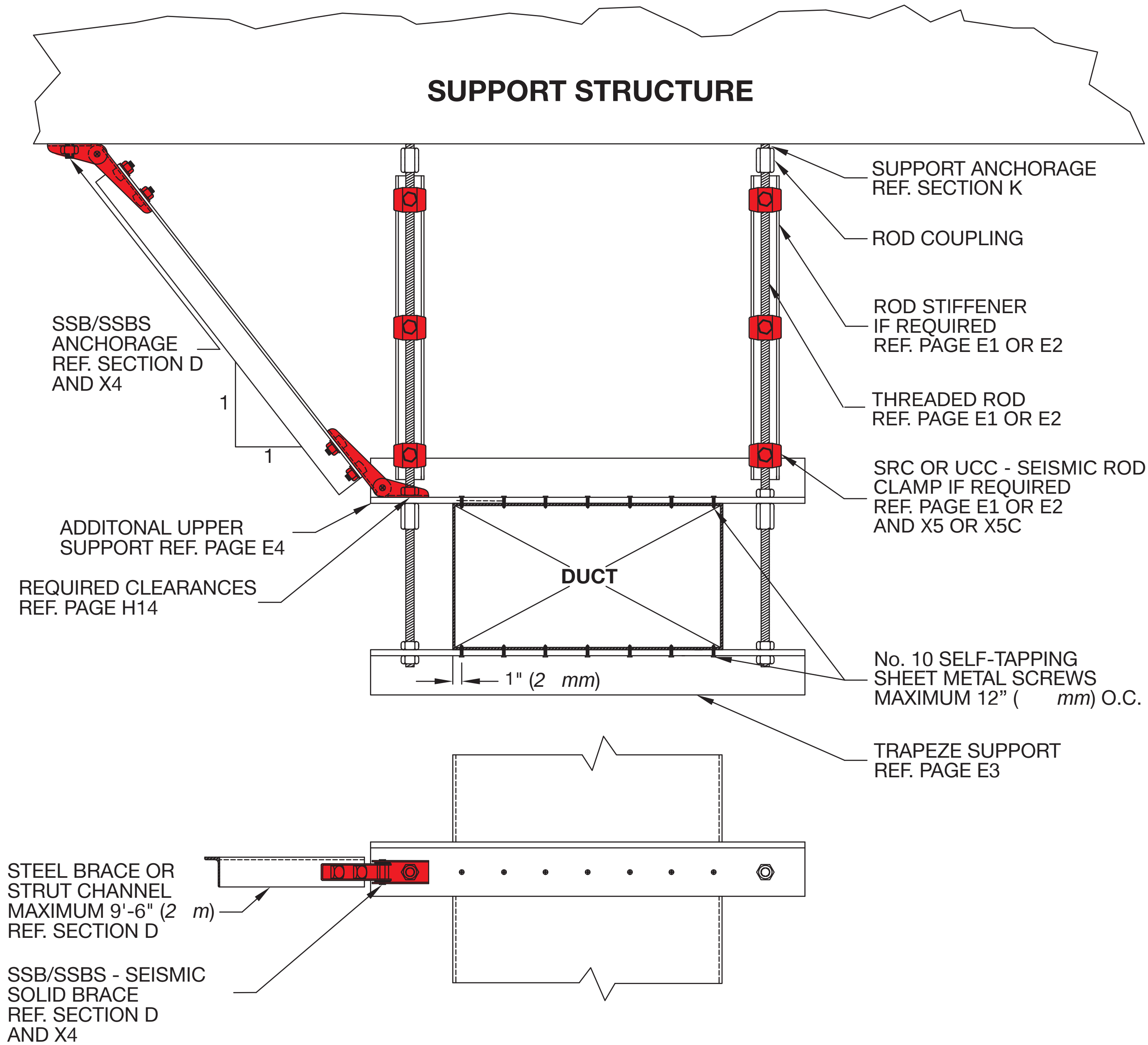
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC SOLID BRACE GUIDELINES FOR RECTANGULAR/OVAL DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

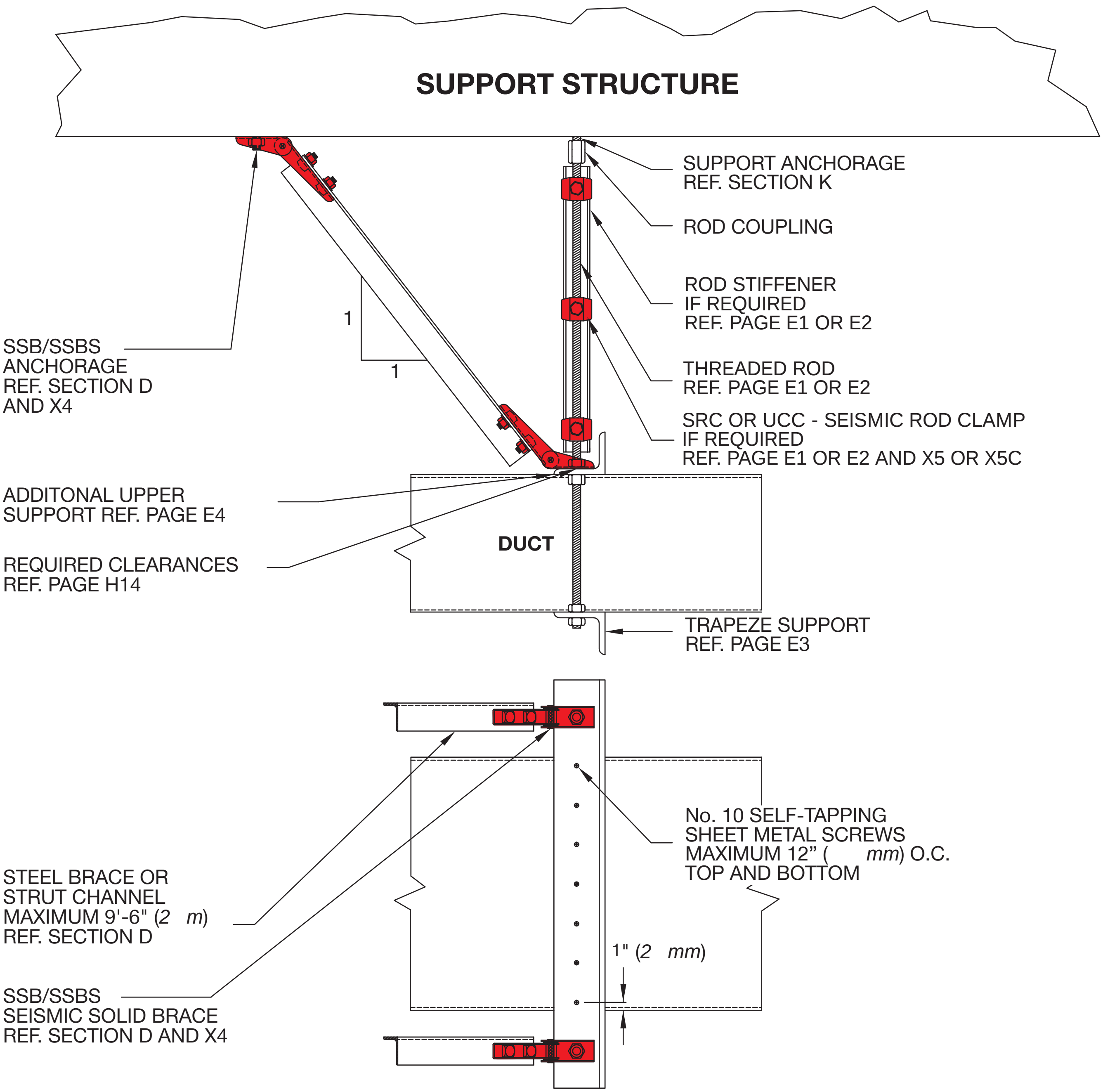
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC SOLID BRACE GUIDELINES FOR RECTANGULAR/OVAL DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

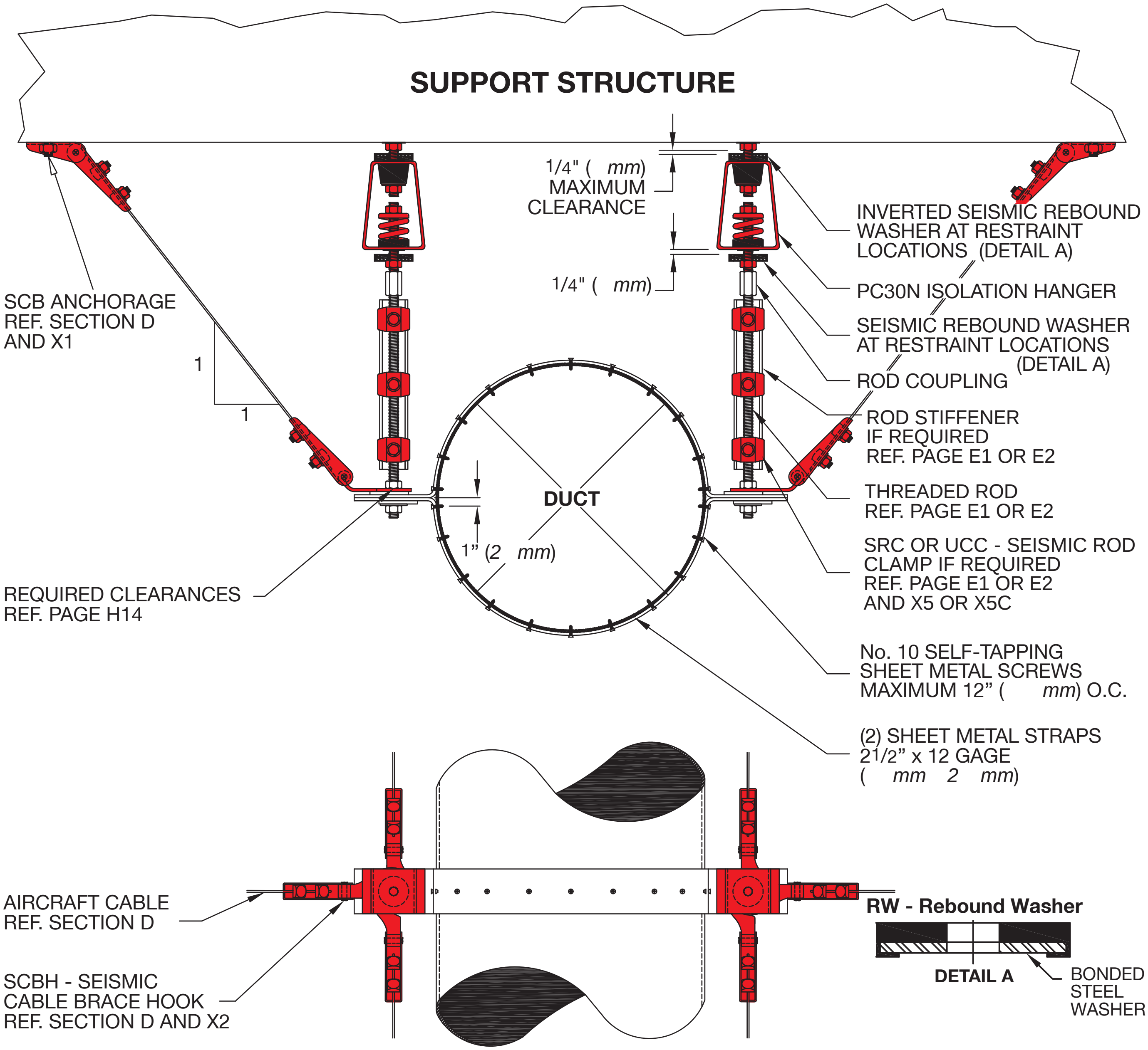
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR SPRING-ISOLATED ROUND DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
December 22, 2006

Anthony R. Pike (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

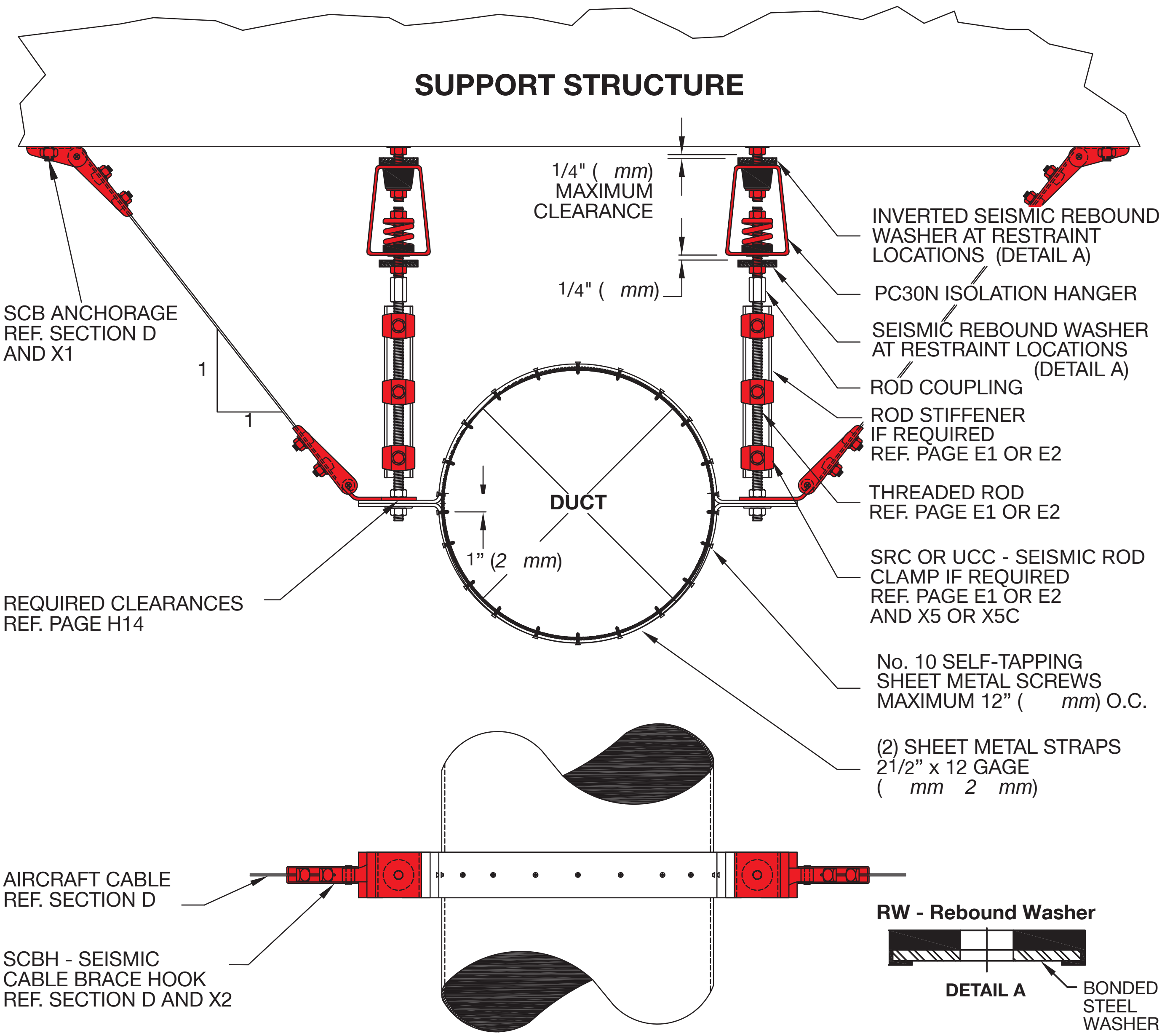
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC CABLE BRACE HOOK GUIDELINES
FOR SPRING-ISOLATED ROUND DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

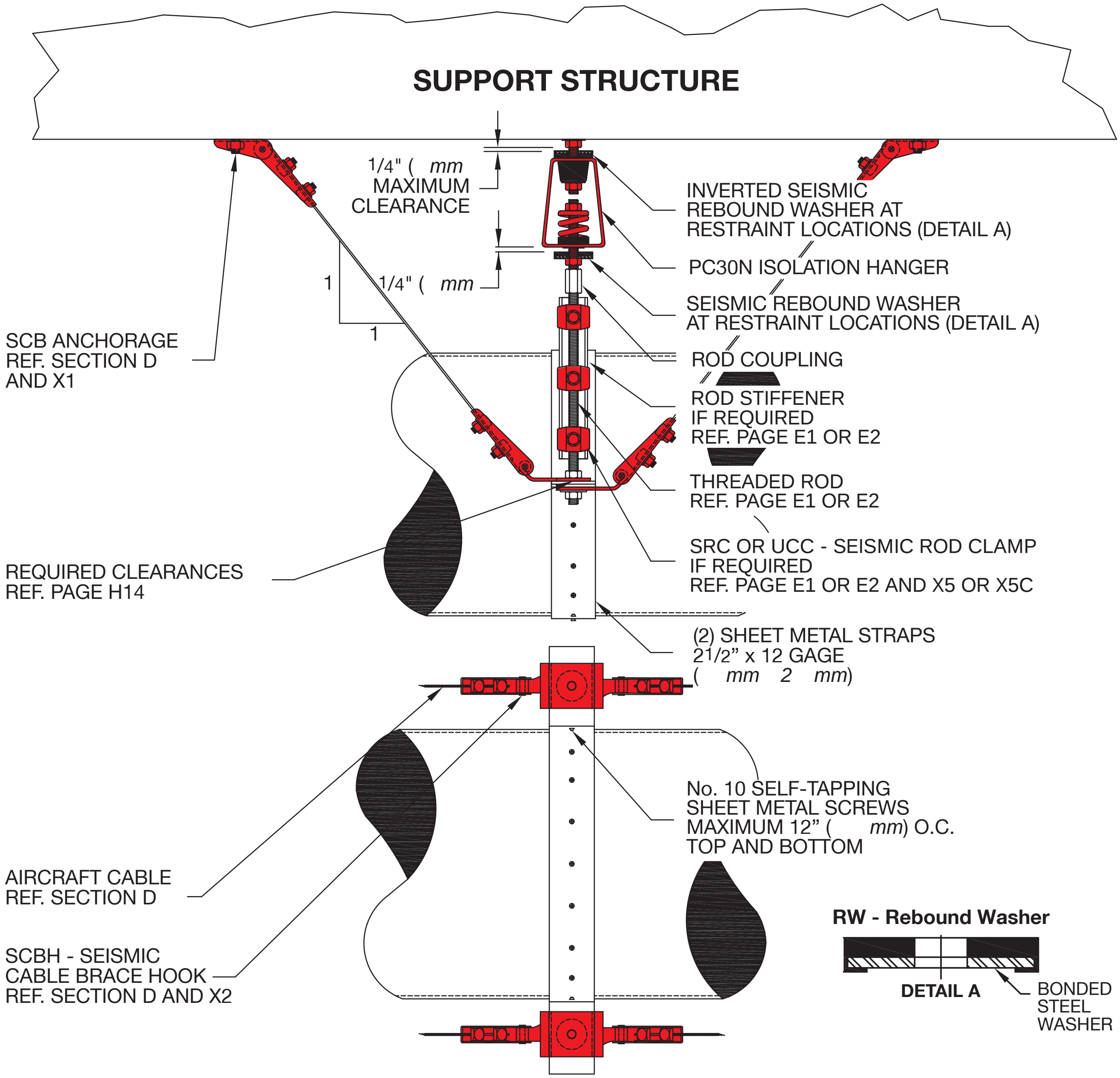
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
December 22, 2006

Anthony R. Pike (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR SPRING-ISOLATED ROUND DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page B1. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section A for limitations. Refer to page X2 for proper installation of the SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 3: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA

OPA-0349
on
December 22, 2006

Anthony R. Pike
Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

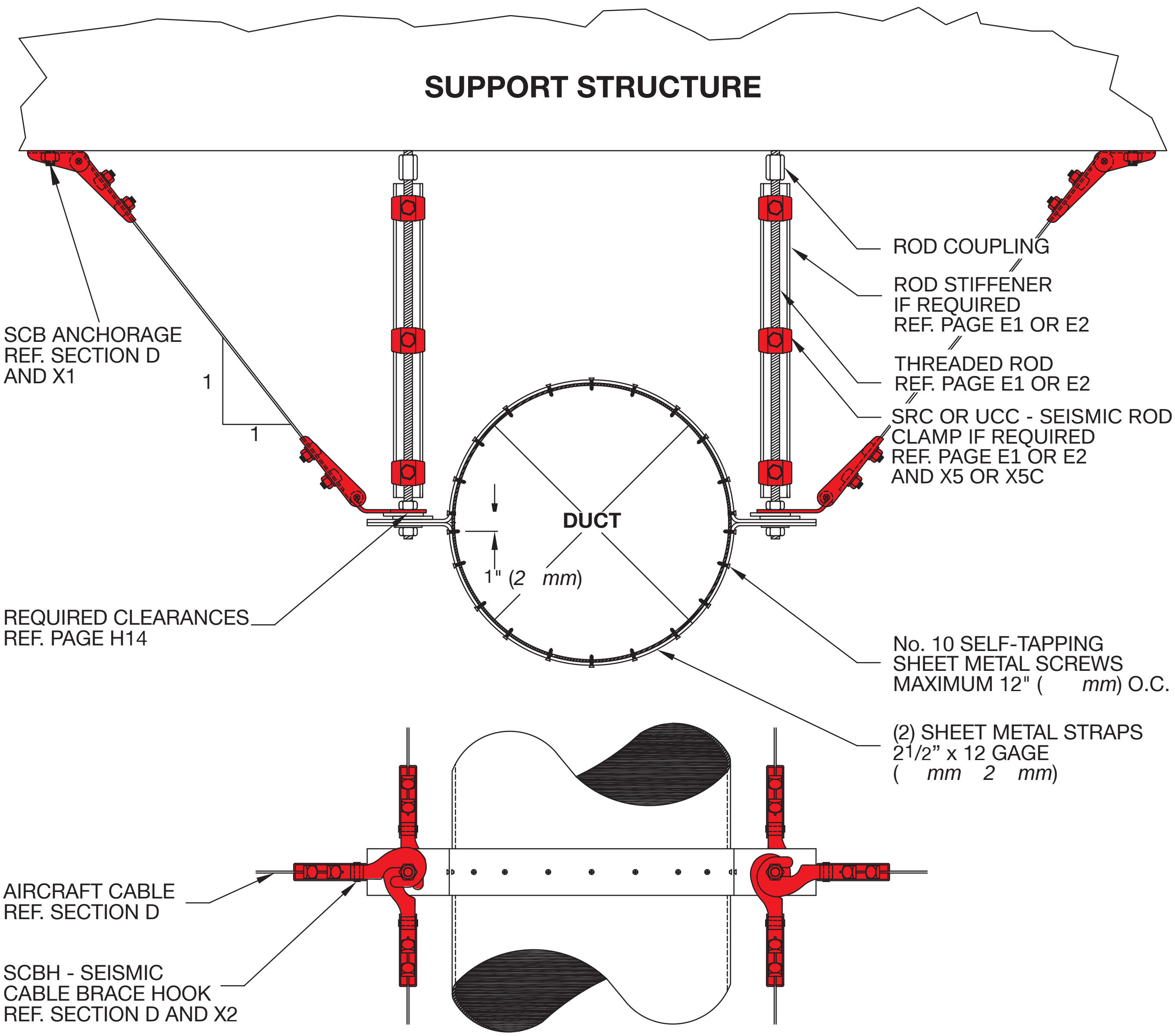
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR ROUND DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations. Refer to page X2 for proper installation of SCBHS.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

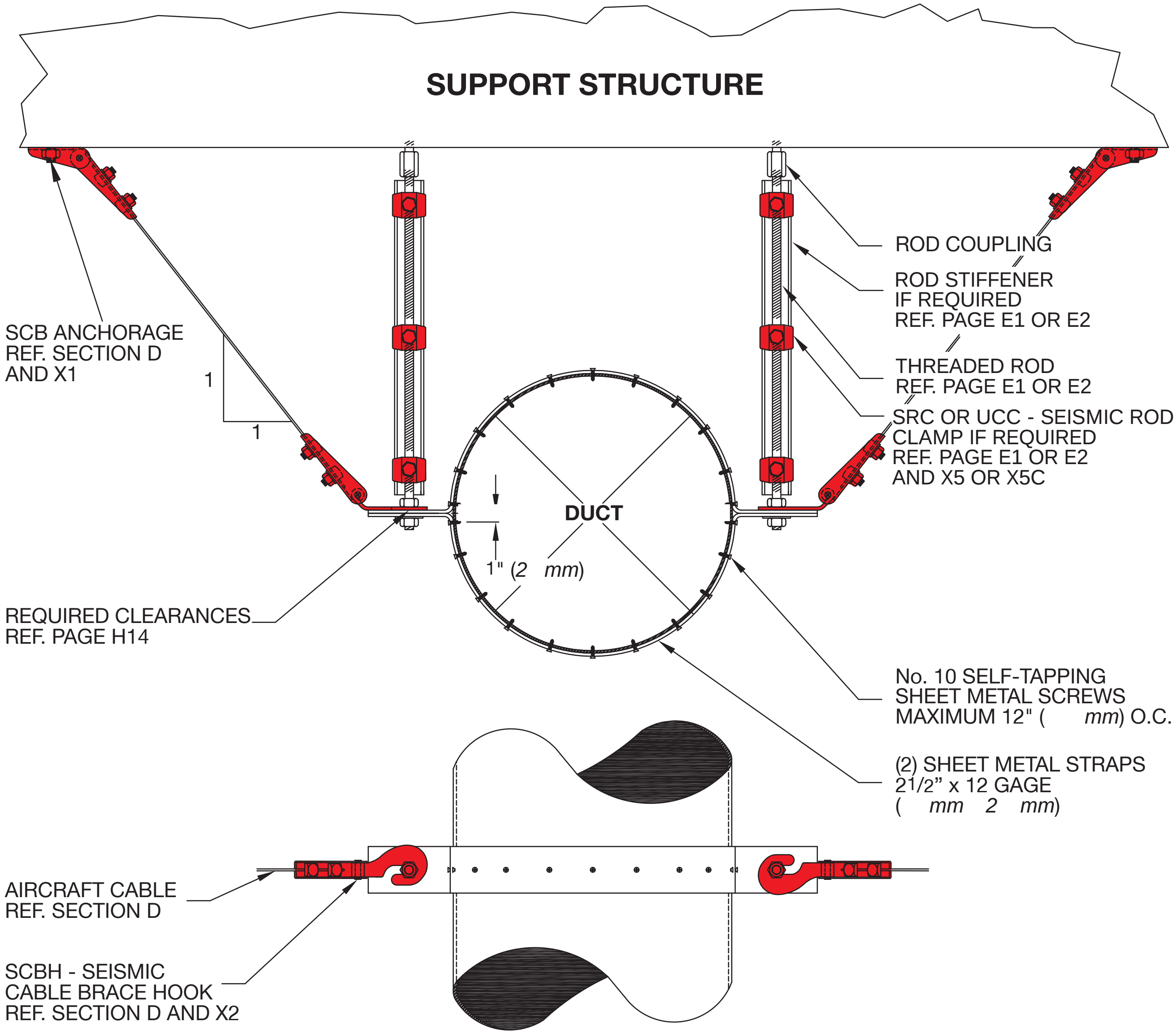
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC CABLE BRACE HOOK GUIDELINES FOR ROUND DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2.
Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations.
Refer to page X2 for proper installation of SCBHS.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

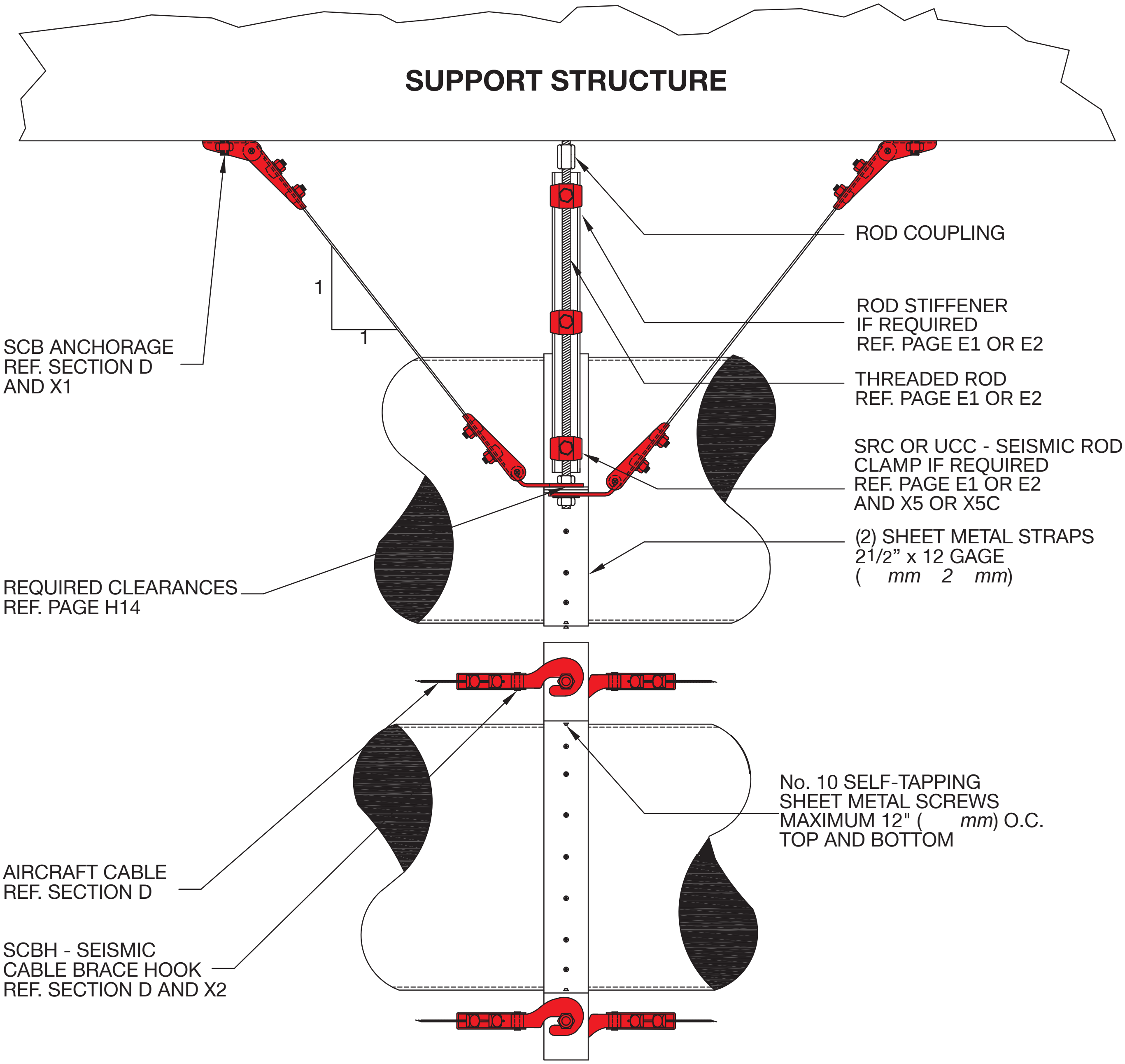
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR ROUND DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations. Refer to page X2 for proper installation of SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

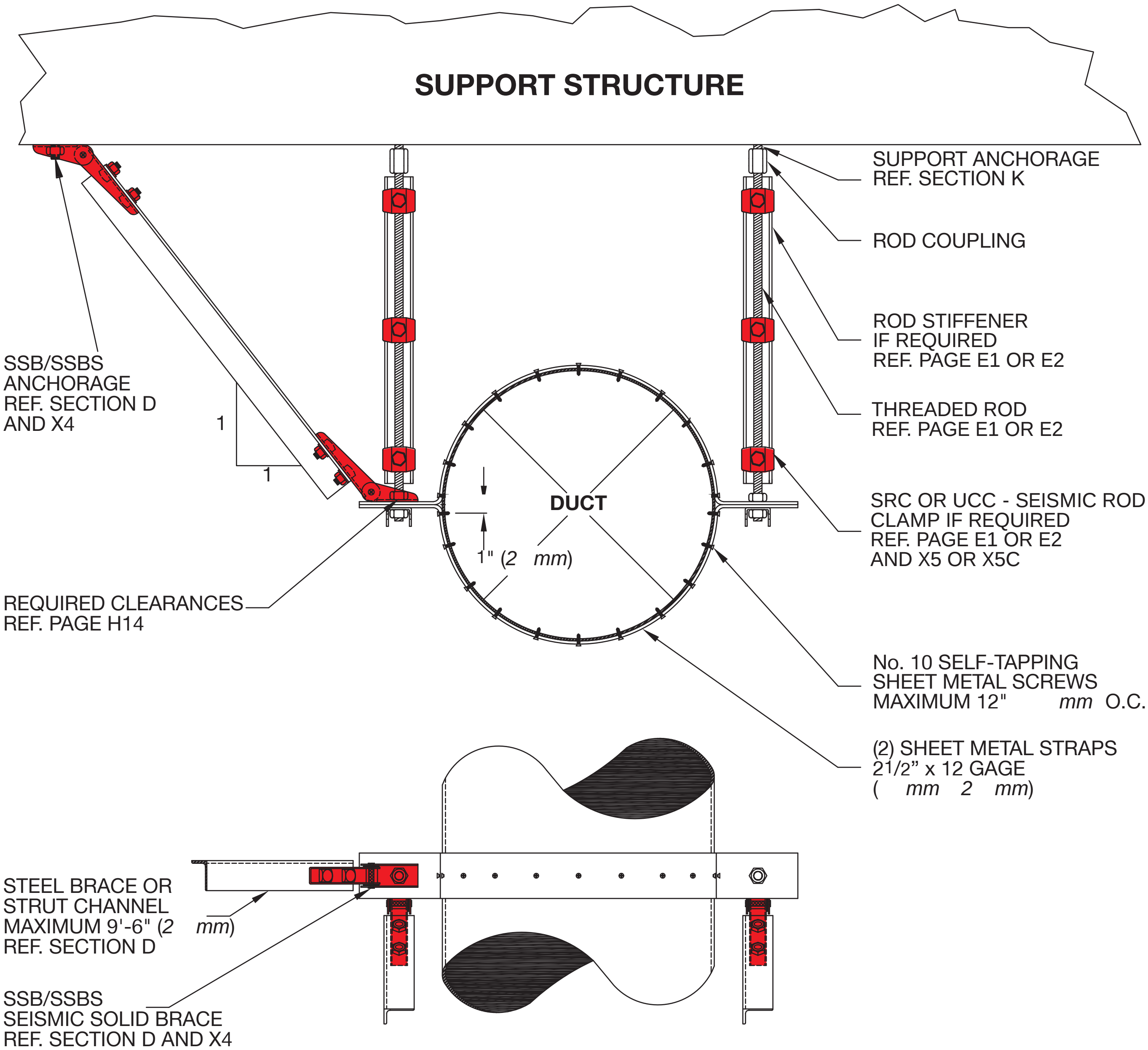
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC SOLID BRACE GUIDELINES FOR ROUND DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

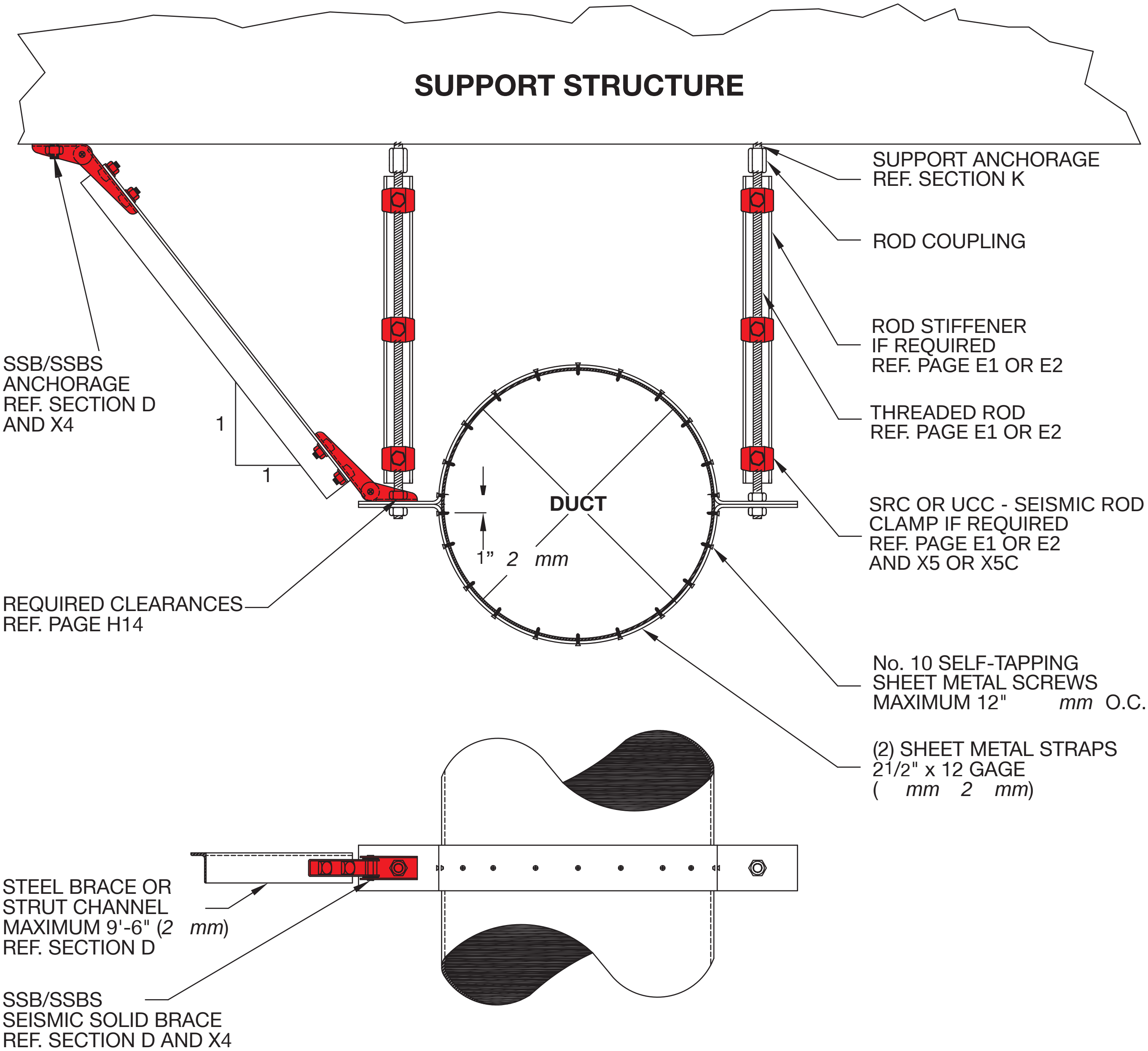
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC SOLID BRACE GUIDELINES
FOR ROUND DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Page

F26

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

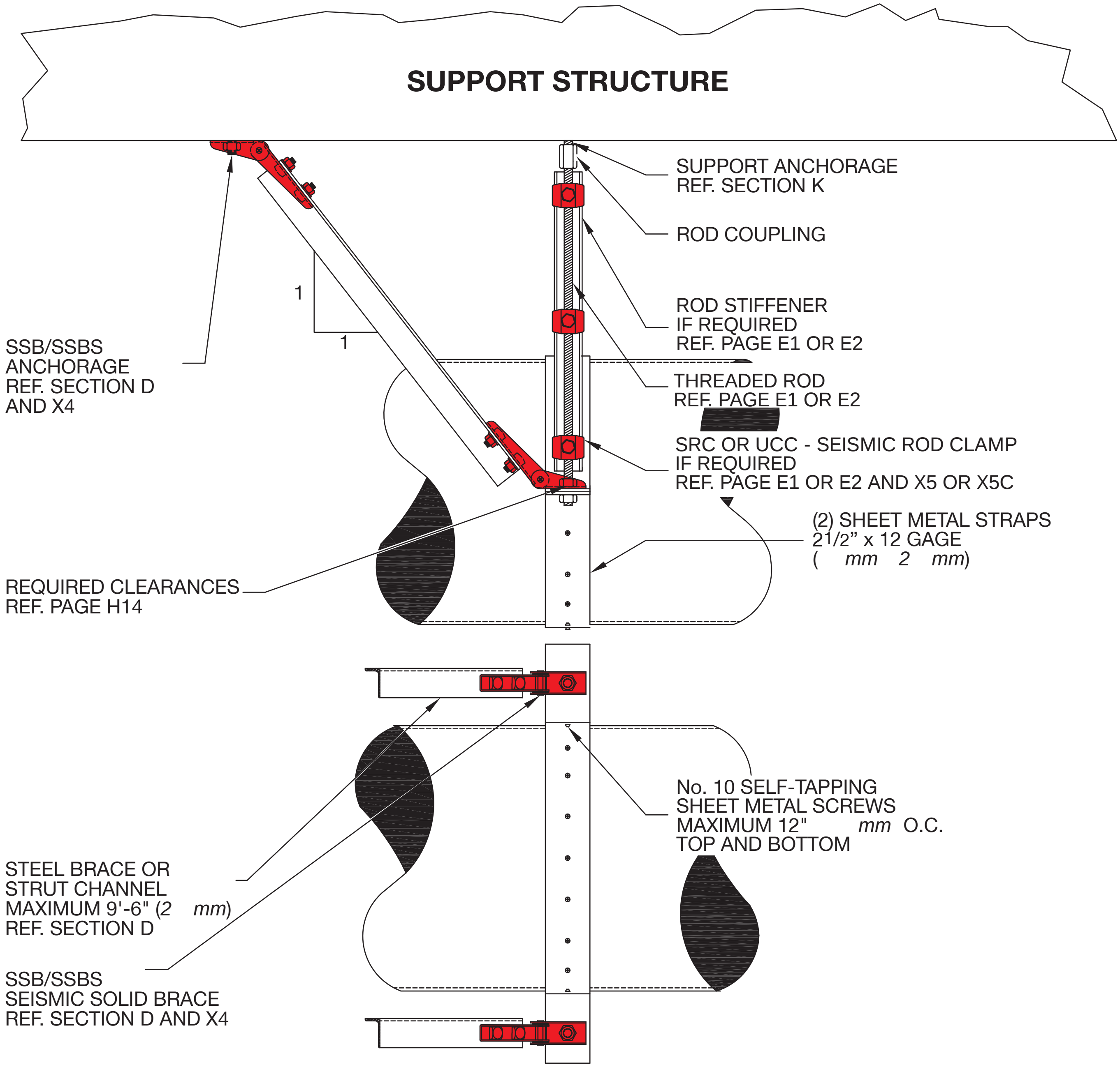
**California Office of Statewide
Health Planning and Development**

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

LONGITUDINAL SEISMIC SOLID BRACE GUIDELINES FOR ROUND DUCT



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

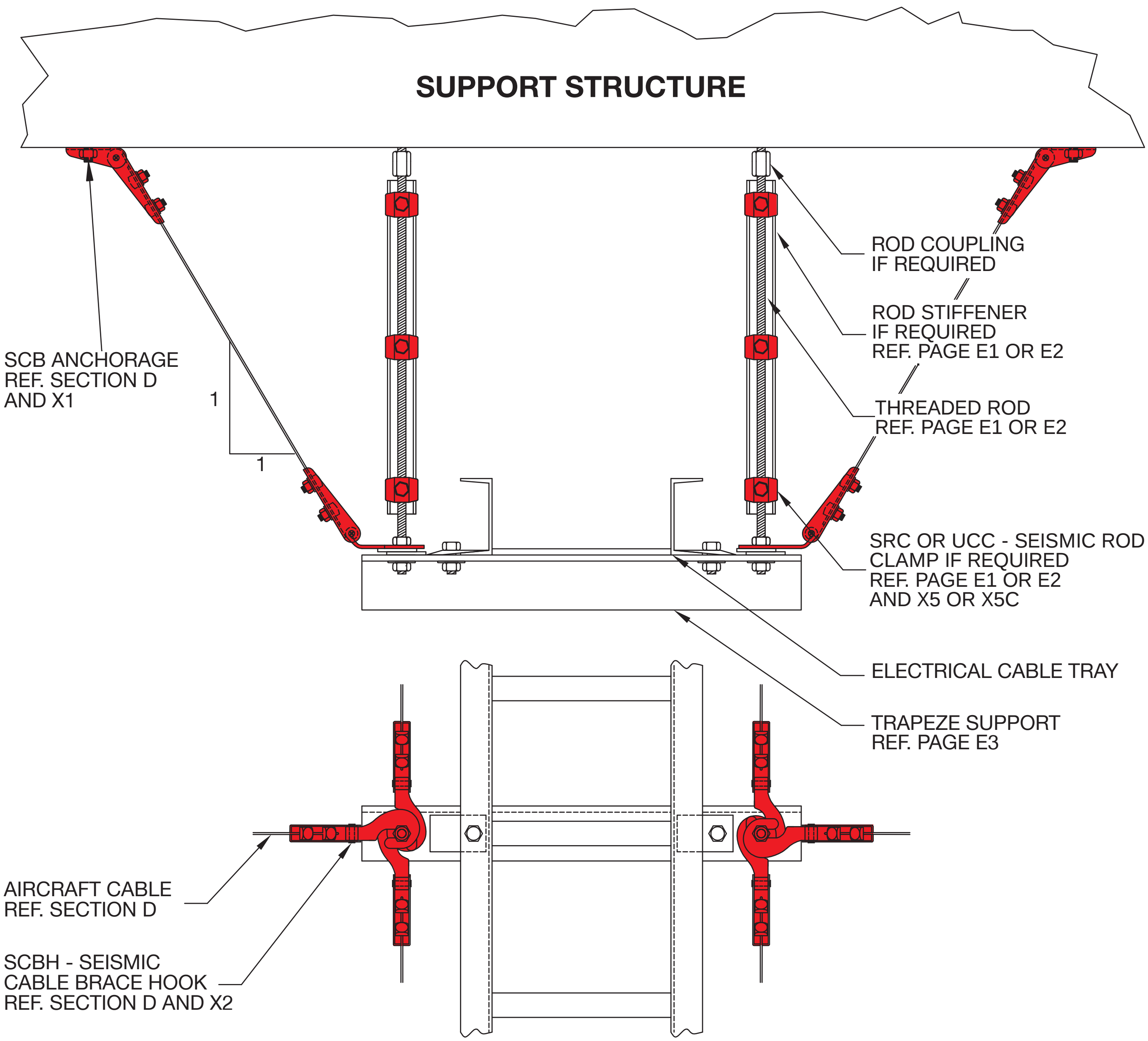
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR TRAPEZE SUPPORTED ELECTRICAL CABLE TRAYS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations. Refer to page X2 for proper installation of SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

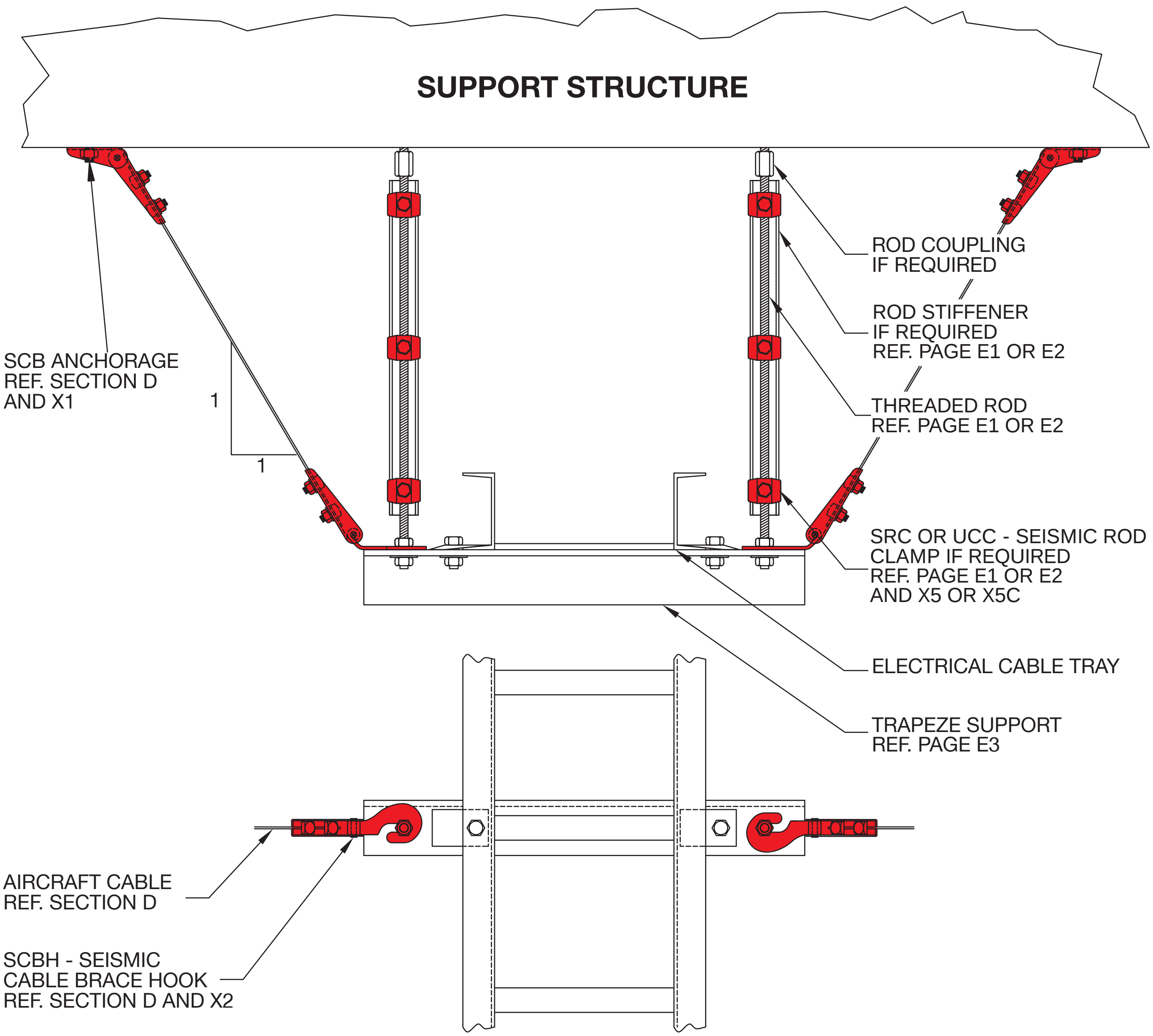
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC CABLE BRACE HOOK GUIDELINES FOR TRAPEZE SUPPORTED ELECTRICAL CABLE TRAYS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2.
Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations.
Refer to page X2 for proper installation of SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

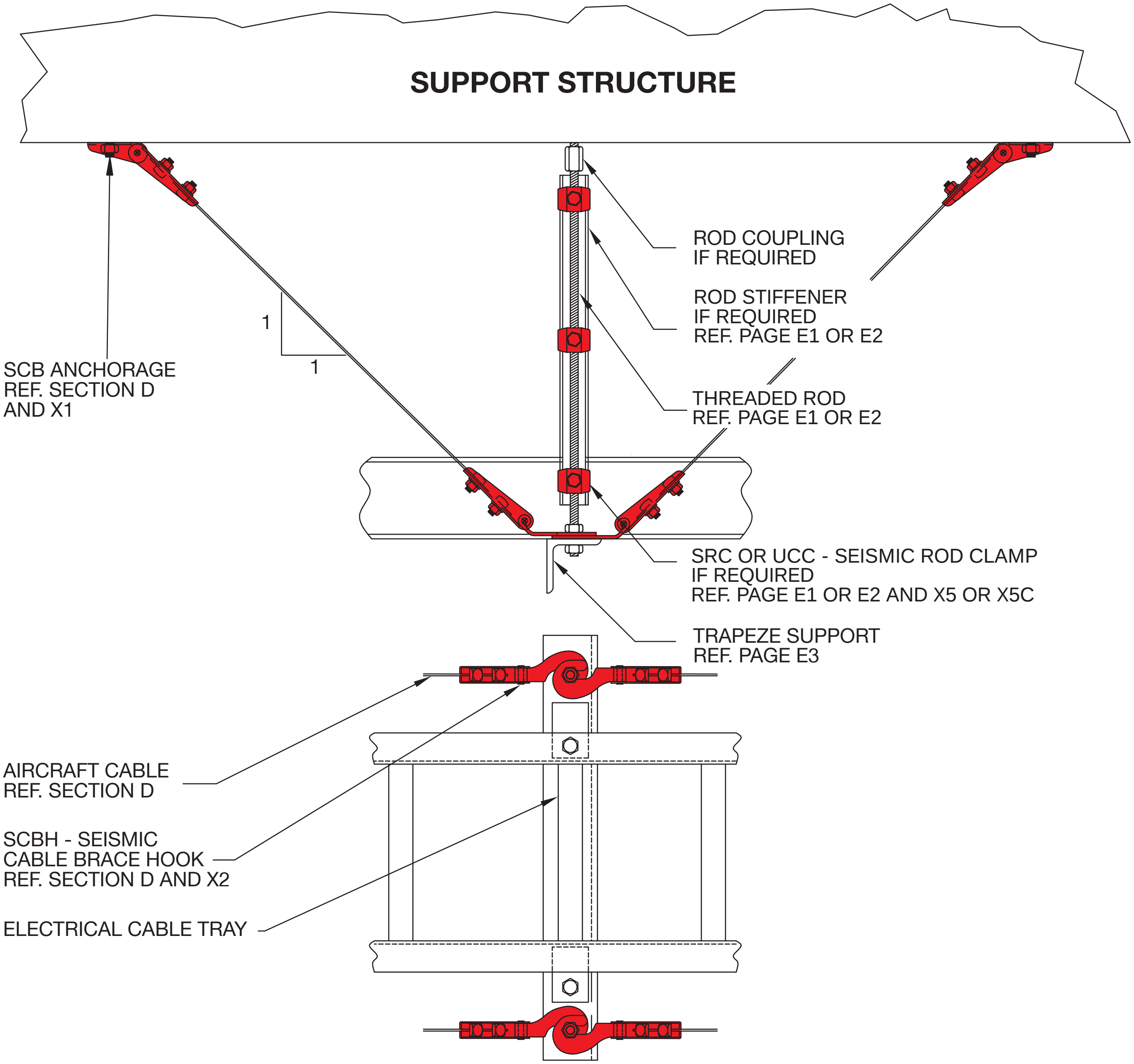
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC CABLE BRACE HOOK GUIDELINES FOR TRAPEZE SUPPORTED ELECTRICAL CABLE TRAYS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations. Refer to page X2 for proper installation of SCBHs.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

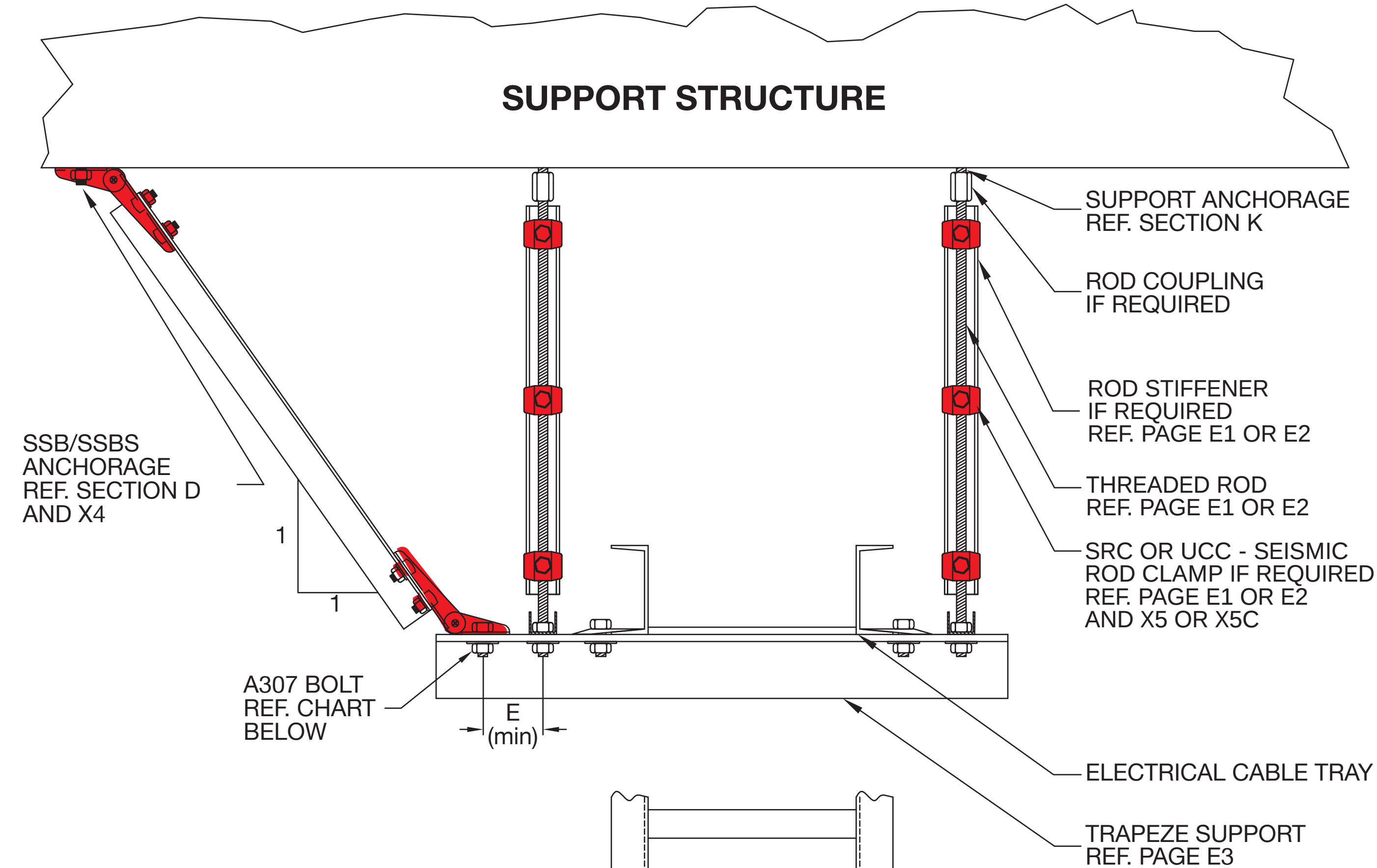
FIXED EQUIPMENT ANCHORAGE

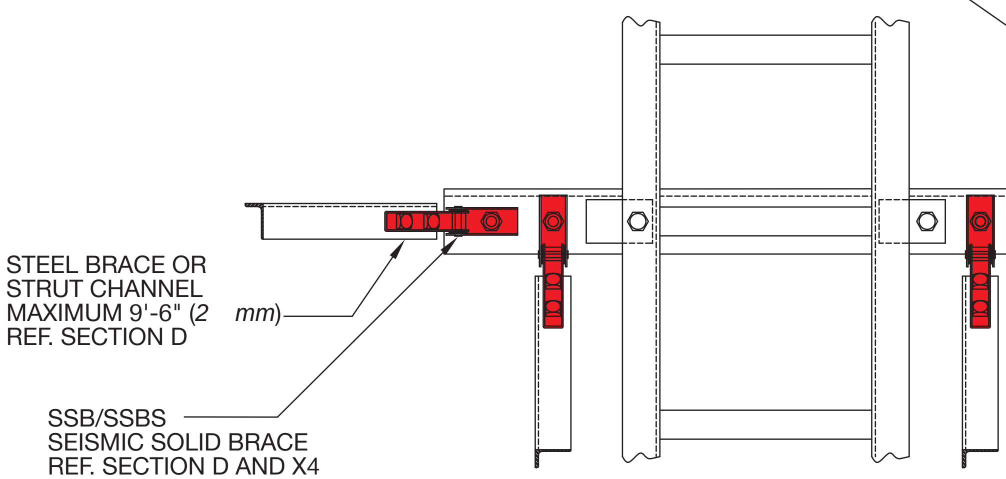
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC SOLID BRACE GUIDELINES FOR TRAPEZE SUPPORTED ELECTRICAL CABLE TRAYS





SSB/SSBS SIZE	E (in) (mm)	BOLT DIA. (in) (mm)
SSBS-12	2	1/2
SSBS-20, 25	2 1/2	5/8
SSB-3	3	3/4
SSB-4	4 1/2	1 1/4 2

NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

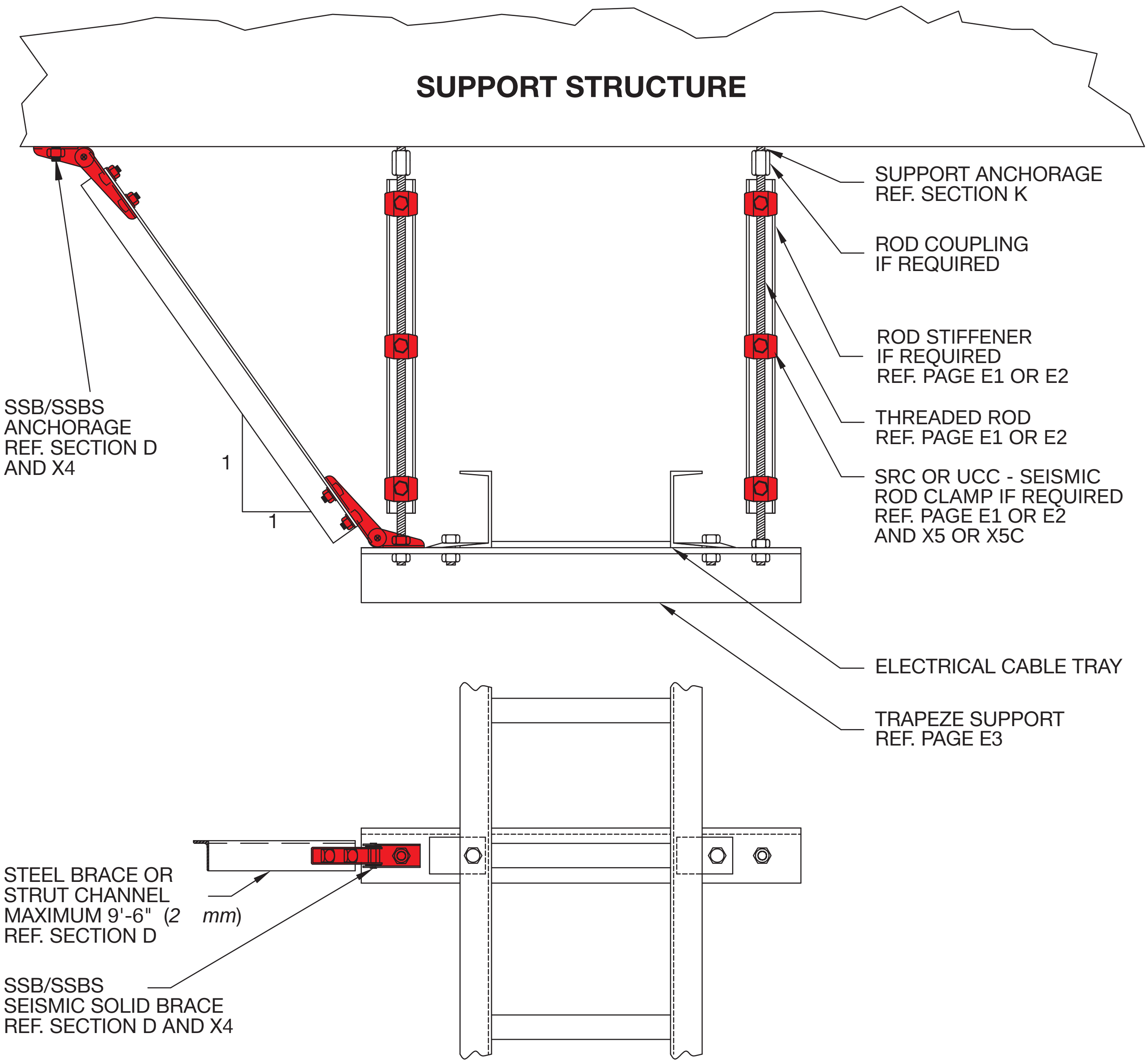
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

TRANSVERSE SEISMIC SOLID BRACE GUIDELINES FOR TRAPEZE SUPPORTED ELECTRICAL CABLE TRAYS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

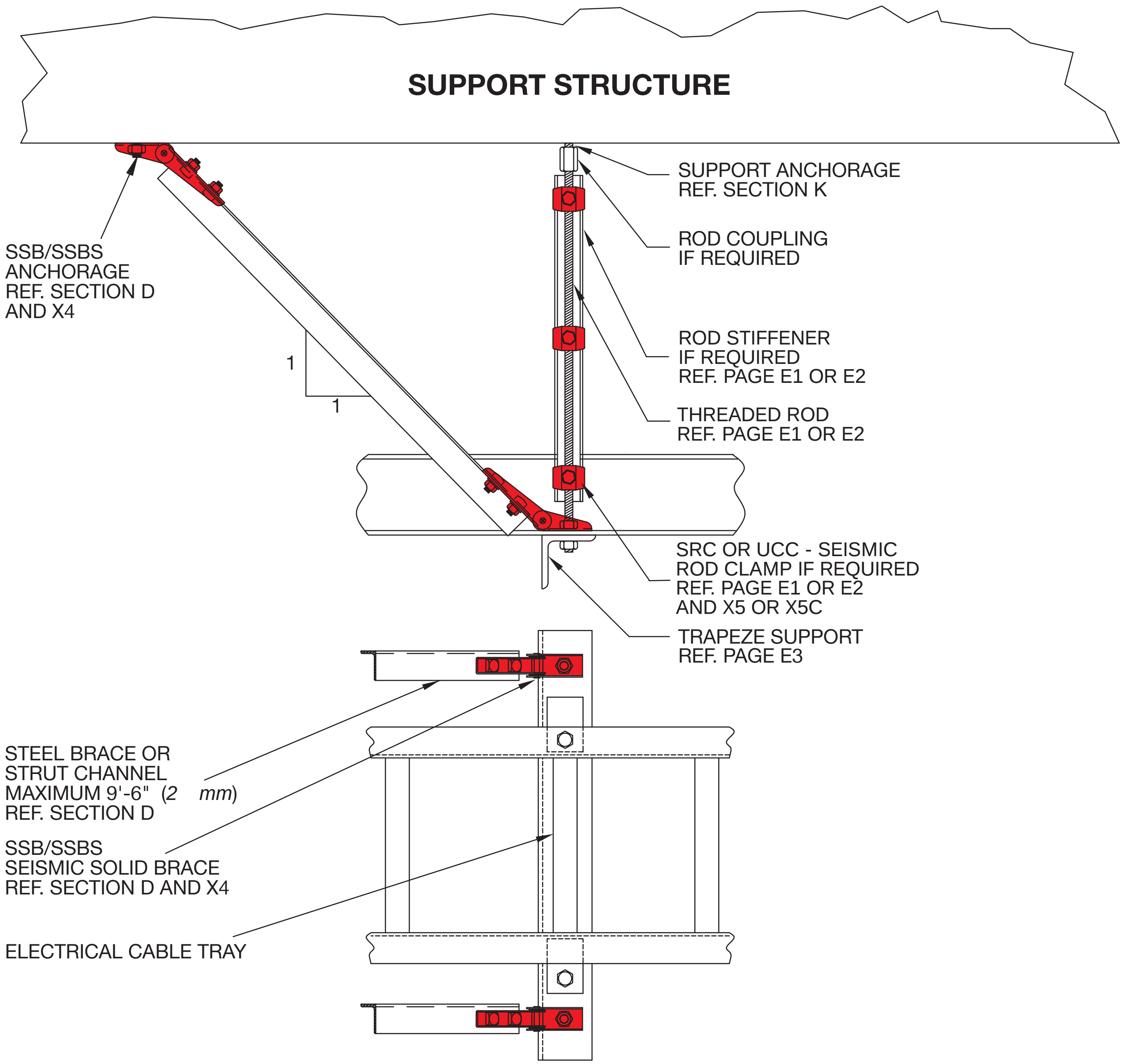
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC SOLID BRACE GUIDELINES
FOR TRAPEZE SUPPORTED ELECTRICAL CABLE TRAYS



NOTE 1: A rod stiffener angle may be required as shown. For additional information, ref. page E1 or E2. Brace angle ratio may be increased to 2 (vert.): 1 (horiz.). Refer to section D for limitations.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

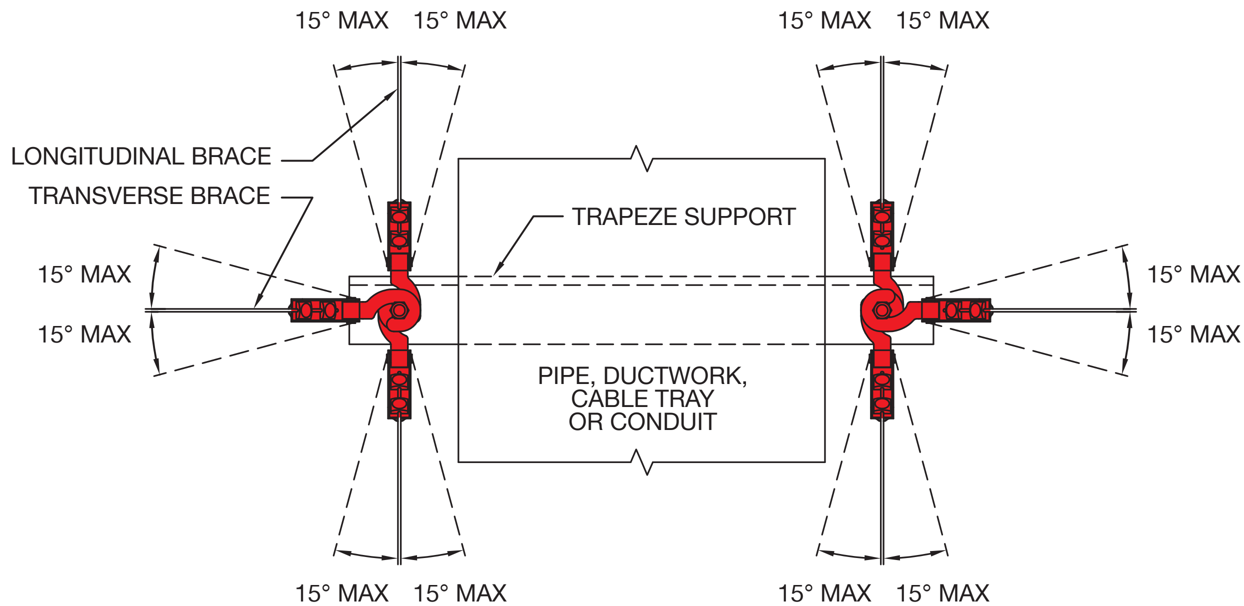
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC CABLE BRACE GUIDELINES
ALLOWABLE BRACE ANGLE VARIATIONS IN PLAN
FOR DETAIL PAGES F1, F4, F10, F13, F19, F22 AND F28



REFER TO APPROPRIATE PAGE
F1, F4, F10, F13, F19, F22 AND F28
FOR MORE SPECIFIC INFORMATION
ON CABLE BRACES, TRAPEZE SUPPORTS, ETC.

NOTE: Any or all brace locations are permitted to use the angle variation to meet field conditions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

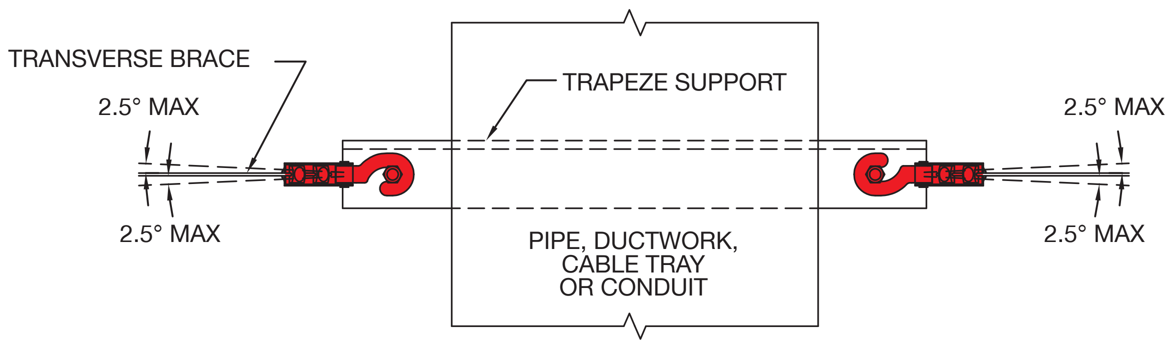
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
March 19, 2009

Anthony R. Pike (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

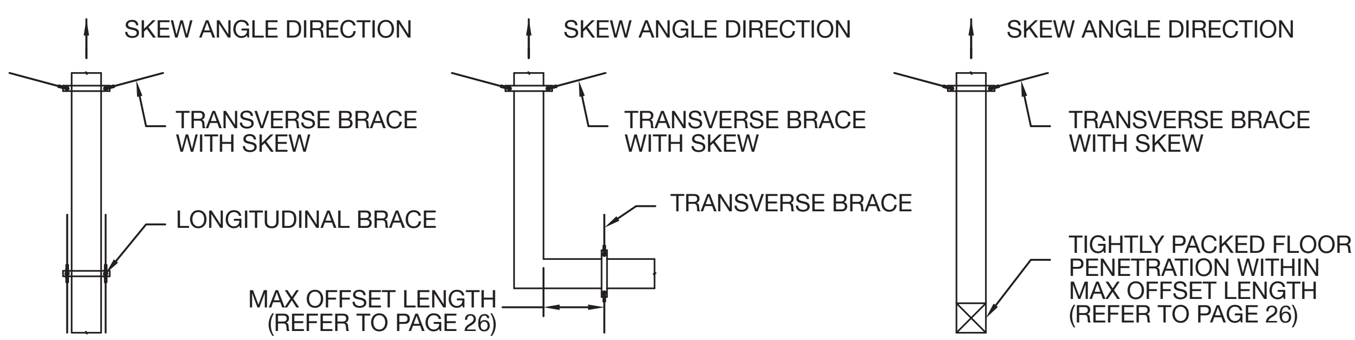
TRANSVERSE SEISMIC CABLE BRACE GUIDELINES
ALLOWABLE BRACE ANGLE VARIATIONS IN PLAN
FOR DETAIL PAGES F2, F5, F11, F14, F20, F23 AND F29



REFER TO APPROPRIATE PAGE
F2, F5, F11, F14, F20, F23 AND F29
FOR MORE SPECIFIC INFORMATION
ON CABLE BRACES, TRAPEZE SUPPORTS, ETC.

The angle variation may increase beyond 2.5° up to 15° provided both braces are skewed in the same direction and a longitudinal brace occurs opposite the skewed angle direction as shown below.

Additionally, for trapeze piping there must be at least (2) pipes on the trapeze that vary by no more than 1 pipe diameter.



NOTE: Any or all brace locations are permitted to use the angle variation to meet field conditions.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
April 6, 2009

Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

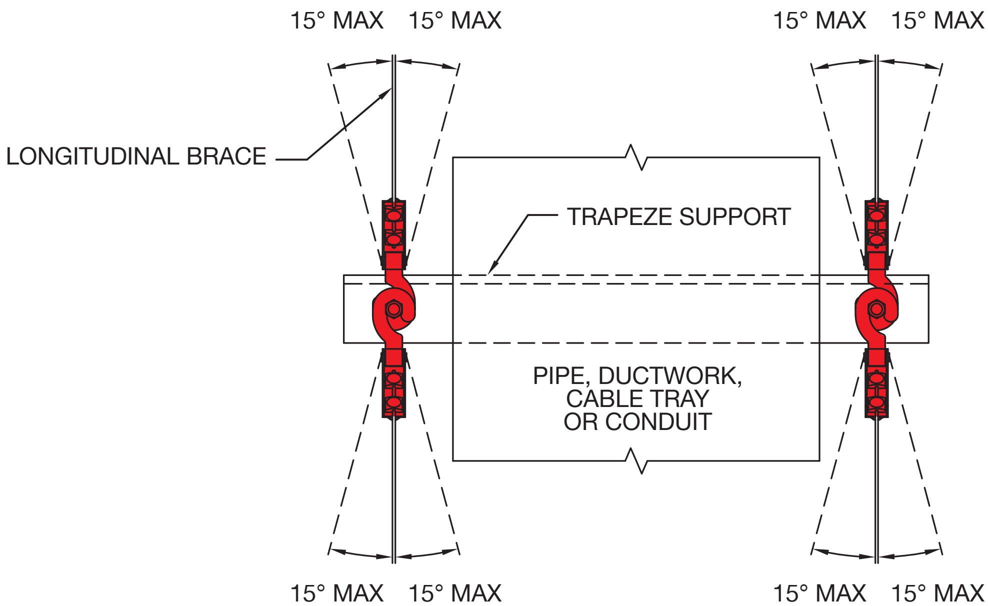
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

LONGITUDINAL SEISMIC CABLE BRACE GUIDELINES
ALLOWABLE BRACE ANGLE VARIATIONS IN PLAN
FOR DETAIL PAGES F3, F6, F12, F15, F21, F24 AND F30



REFER TO APPROPRIATE PAGE
F3, F6, F12, F15, F21, F24 AND F30
FOR MORE SPECIFIC INFORMATION
ON CABLE BRACES, TRAPEZE SUPPORTS, ETC.

NOTE: Any or all brace locations are permitted to use the angle variation to meet field conditions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
March 19, 2009

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

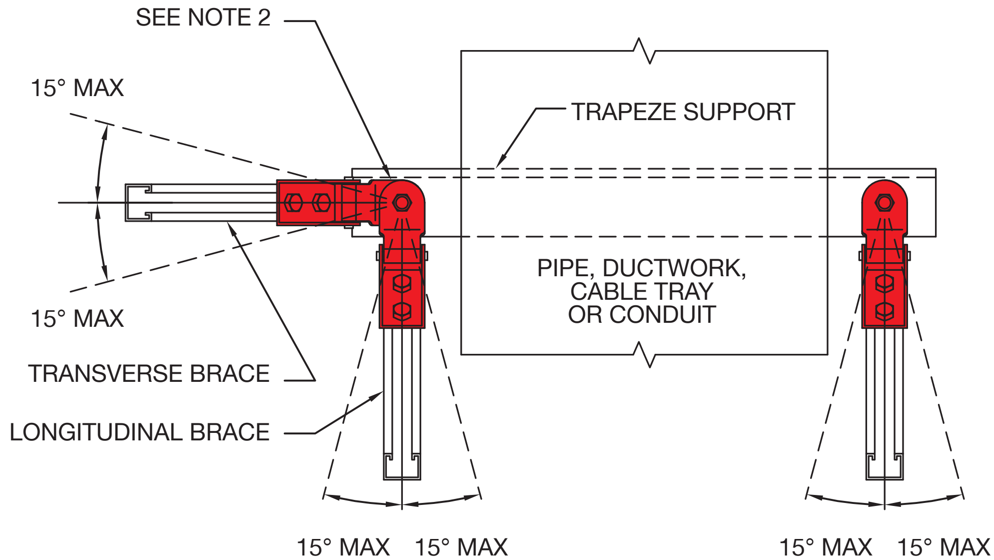
Anthony R. Pike

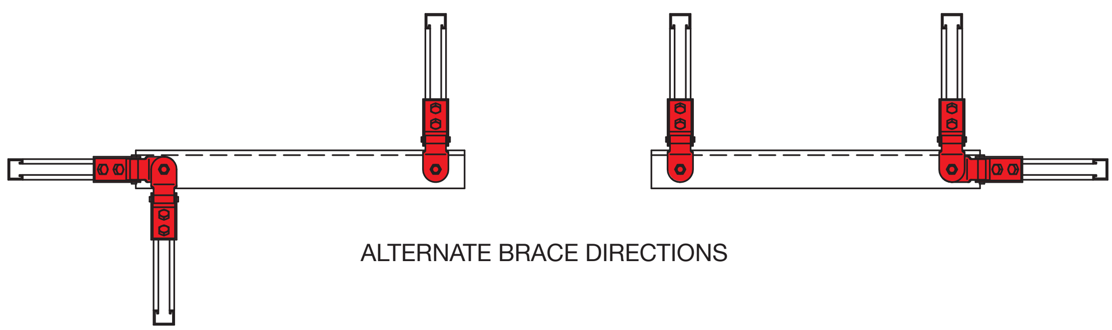
Anthony R. Pike **(916) 654-3362**

Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC SOLID BRACE GUIDELINES
ALLOWABLE BRACE ANGLE VARIATIONS IN PLAN
FOR DETAIL PAGES F7, F16, F25 AND F31





ALTERNATE BRACE DIRECTIONS

REFER TO APPROPRIATE PAGE
F7, F16, F25 AND F31
FOR MORE SPECIFIC INFORMATION
ON CABLE BRACES, TRAPEZE SUPPORTS, ETC.

NOTE 1: Any or all brace locations are permitted to use the angle variation to meet field conditions.

NOTE 2: Mason type SSBS components may be stacked at the hanger rod location as detailed. Mason type SSB components cannot be stacked and must be installed as shown on pages F7, F16, F25 and F31.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
March 19, 2009

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

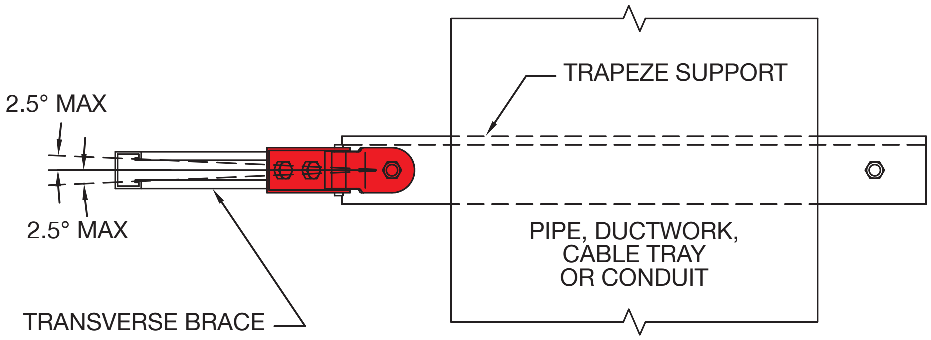
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

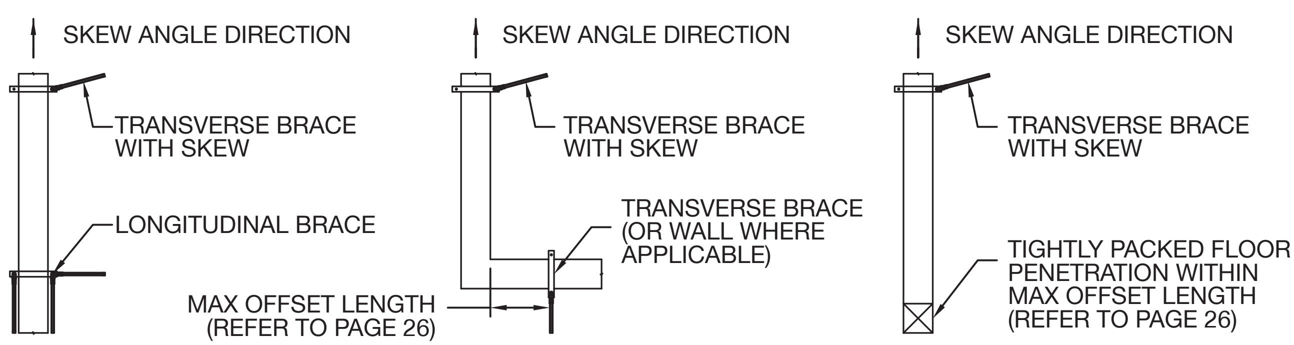
TRANSVERSE SEISMIC SOLID BRACE GUIDELINES
ALLOWABLE BRACE ANGLE VARIATIONS IN PLAN
FOR DETAIL PAGES F8, F17, F26 AND F32



REFER TO APPROPRIATE PAGE
F8, F17, F26 AND F32
FOR MORE SPECIFIC INFORMATION
ON CABLE BRACES, TRAPEZE SUPPORTS, ETC.

The angle variation may increase beyond 2.5° up to 15° provided a longitudinal brace occurs opposite the skewed angle direction as shown below.

Additionally, for trapeze piping there must be at least (2) pipes on the trapeze that vary by no more than 1 pipe diameter.



NOTE: Any or all brace locations are permitted to use the angle variation to meet field conditions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

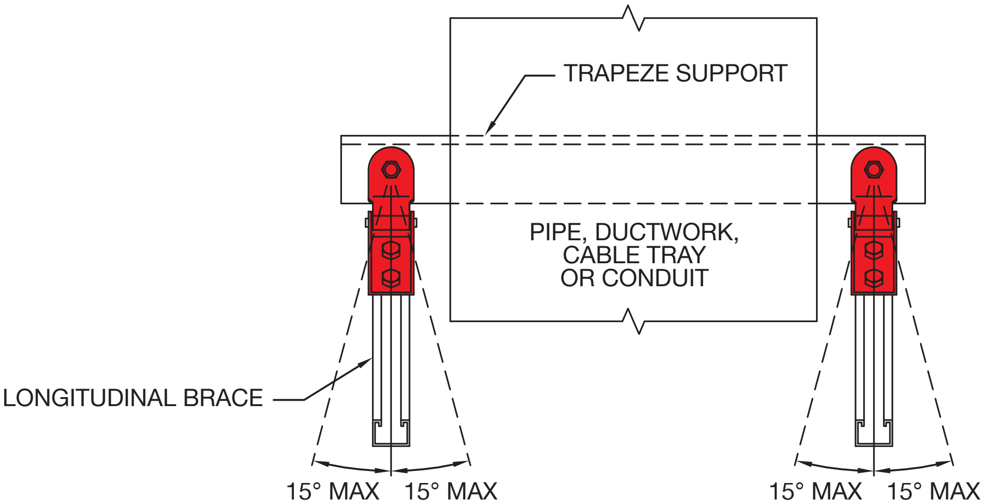
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

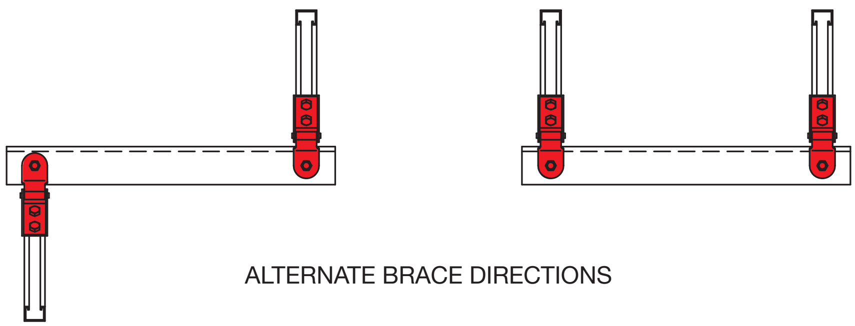
OPA-0349
on
December 22, 2006

Anthony R. Pike
Anthony R. Pike **(916) 654-3362**

Dhiru Mali
Dhiru Mali
Structural Engineer
California SE No. 2811

ALL-DIRECTIONAL SEISMIC SOLID BRACE GUIDELINES
ALLOWABLE BRACE ANGLE VARIATIONS IN PLAN
FOR DETAIL PAGES F9, F18, F27 AND F33





ALTERNATE BRACE DIRECTIONS

REFER TO APPROPRIATE PAGE F9, F18, F27 AND F33 FOR MORE SPECIFIC INFORMATION ON CABLE BRACES, TRAPEZE SUPPORTS, ETC.

NOTE: Any or all brace locations are permitted to use the angle variation to meet field conditions.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
March 19, 2009

Anthony R. Pike
Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

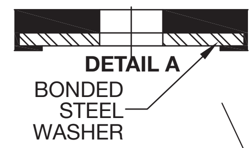
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Dhiru Mali
Structural Engineer
California SE No. 2811

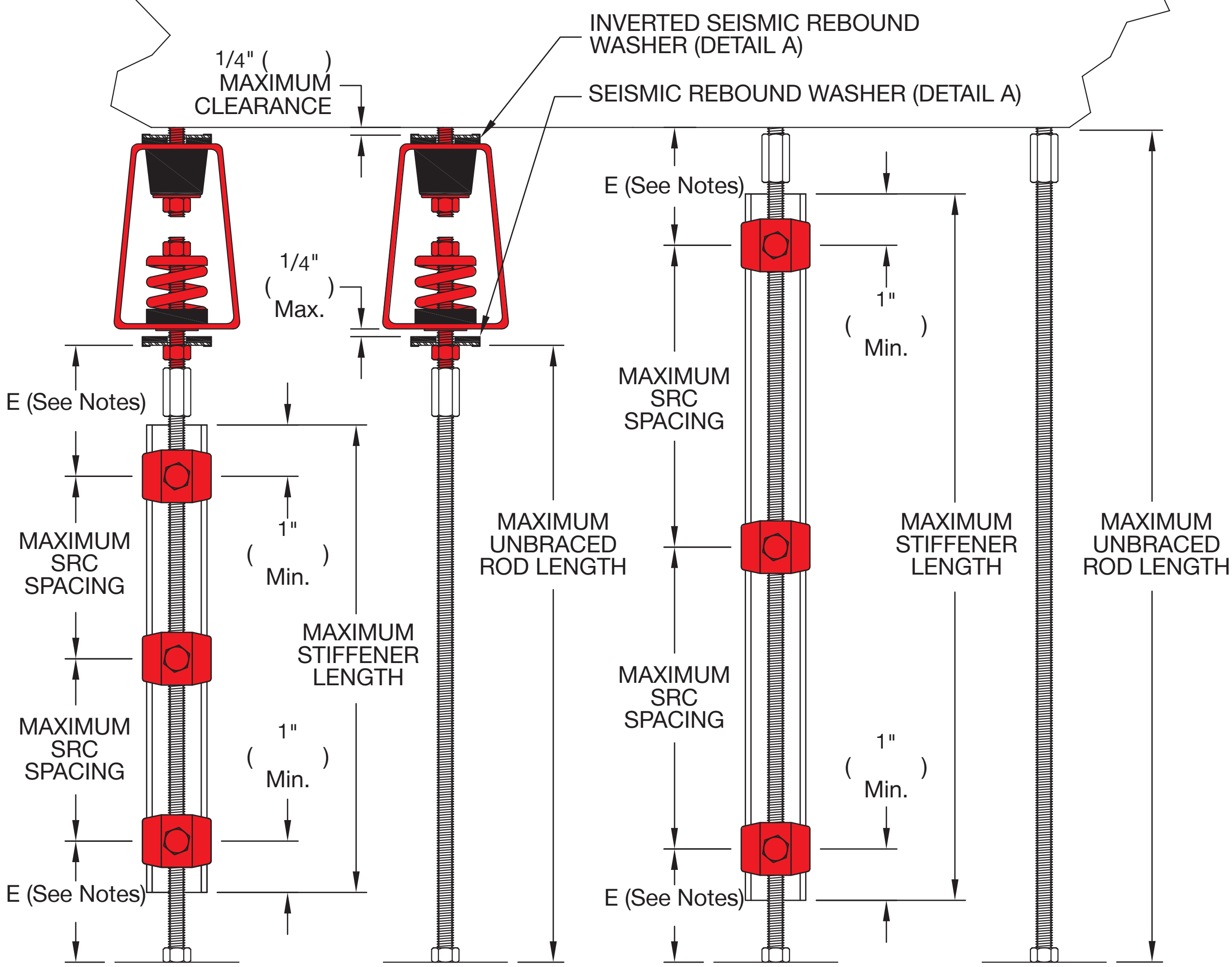
End of
Section

ROD STIFFENER GUIDELINES FOR THE SRC - SEISMIC ROD CLAMP

RW - Rebound Washer



SRC INSTALLATION



RODS WITH SPRING HANGERS **RODS SOLID TO STRUCTURE**

NOTE 1: E = 3" ( ) maximum for 1/4" ( ) to 1/2" ( ) rods, and E = 6" ( ) maximum for 5/8" ( ) to 1 1/4" ( ) diameter rods. A minimum of (2) SRC Seismic Rod Clamps per stiffener angle are required. Ref. Pages B1, E1 or E2 for Maximum Unbraced Rod Length, Maximum SRC Spacing and Maximum Stiffener Length.

NOTE 2: Install hanger boxes snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving clearance on top.

NOTE 3: For Seismic Rebound Washer requirements, Ref. Section L and Page X11.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
December 22, 2006

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

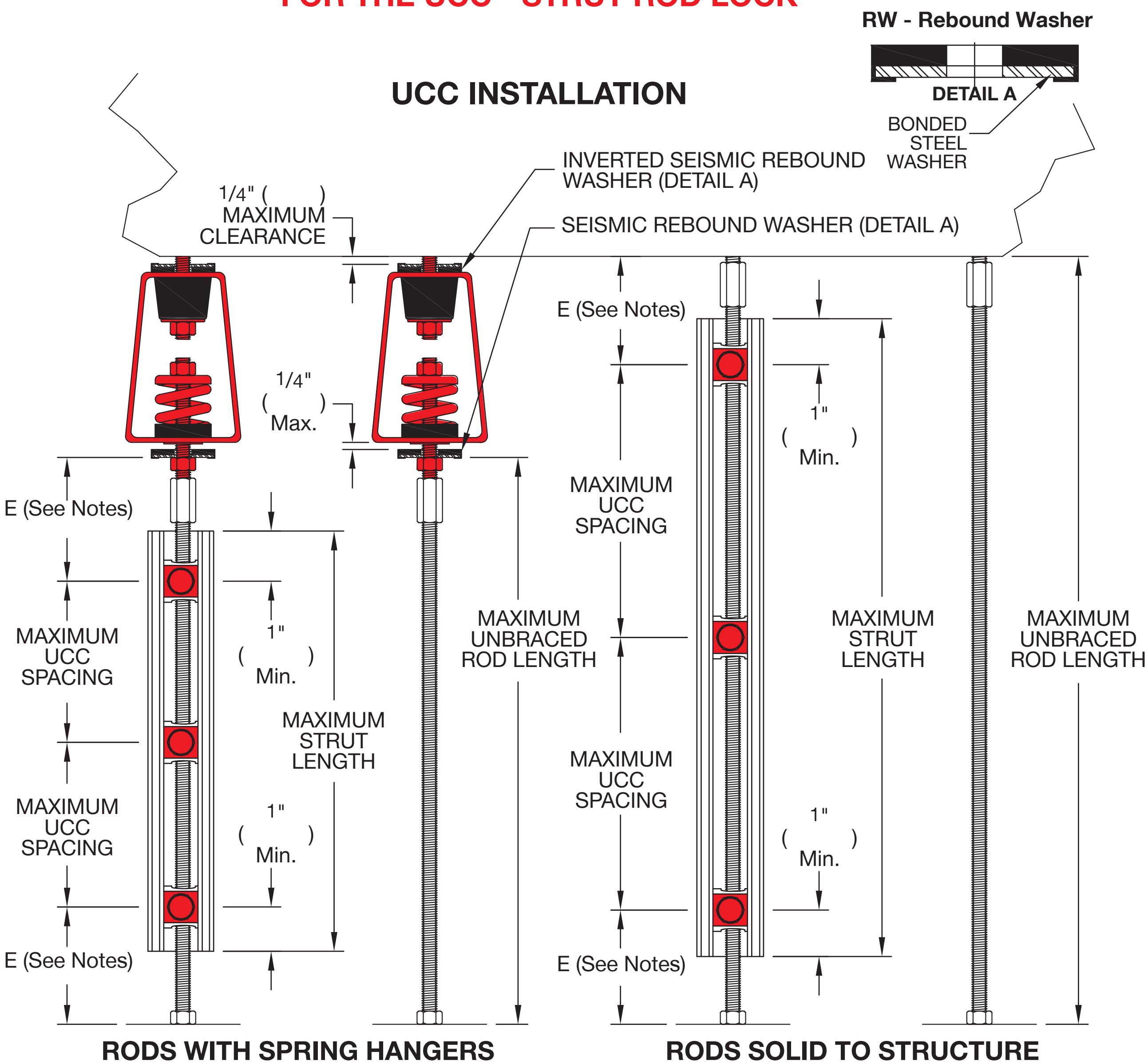
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

ROD STIFFENER GUIDELINES
FOR THE UCC - STRUT ROD LOCK



NOTE 1: E = 3" ( ) maximum for 1/4" ( ) to 1/2" ( ) rods, and E = 6" ( ) maximum for 5/8" ( ) to 1 1/4" ( ) diameter rods. A minimum of (2) UCC Seismic Rod Clamps per stiffener angle are required. Ref. Pages B1, E1 or E2 for Maximum Unbraced Rod Length, Maximum UCC Spacing and Maximum Stiffener Length.

NOTE 2: Install hanger boxes snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving clearance on top.

NOTE 3: For Seismic Rebound Washer requirements, Ref. Section L and Page X11.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

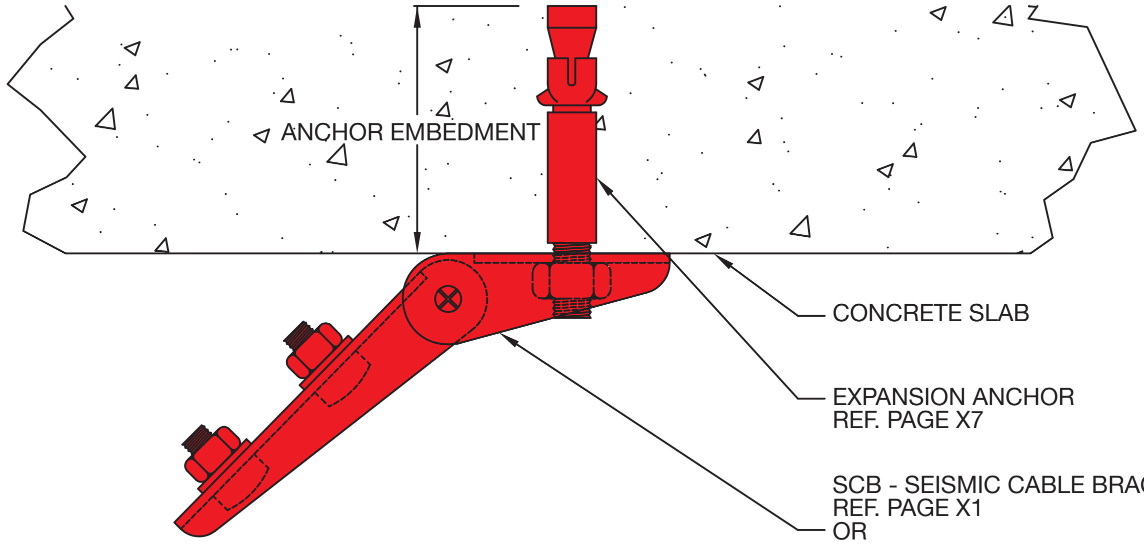
THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA

OPA-0349
on
December 22, 2006

Anthony R. Pike **(916) 654-3362**

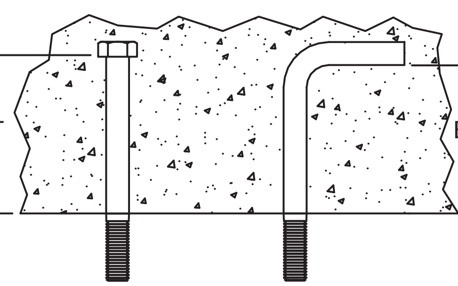
Dhiru Mali
Structural Engineer
California SE No. 2811

SCB, SSB OR SSBS ATTACHMENT
TO A CONCRETE SLAB WITH (1) EXPANSION ANCHOR



MAXIMUM EXPANSION ANCHOR LOADS
TO STRUCTURE UP TO 2:1 BRACE ANGLE

SCB SIZE	SSB/SSBS SIZE	TENSION (lbs) ( )	SHEAR (lbs) ( )
1	SSBS-12	810	560
2	SSBS-20, 25	1185	880
3	SSB-3	1730	1240



A P P R O V E D

California Office of Statewide
Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

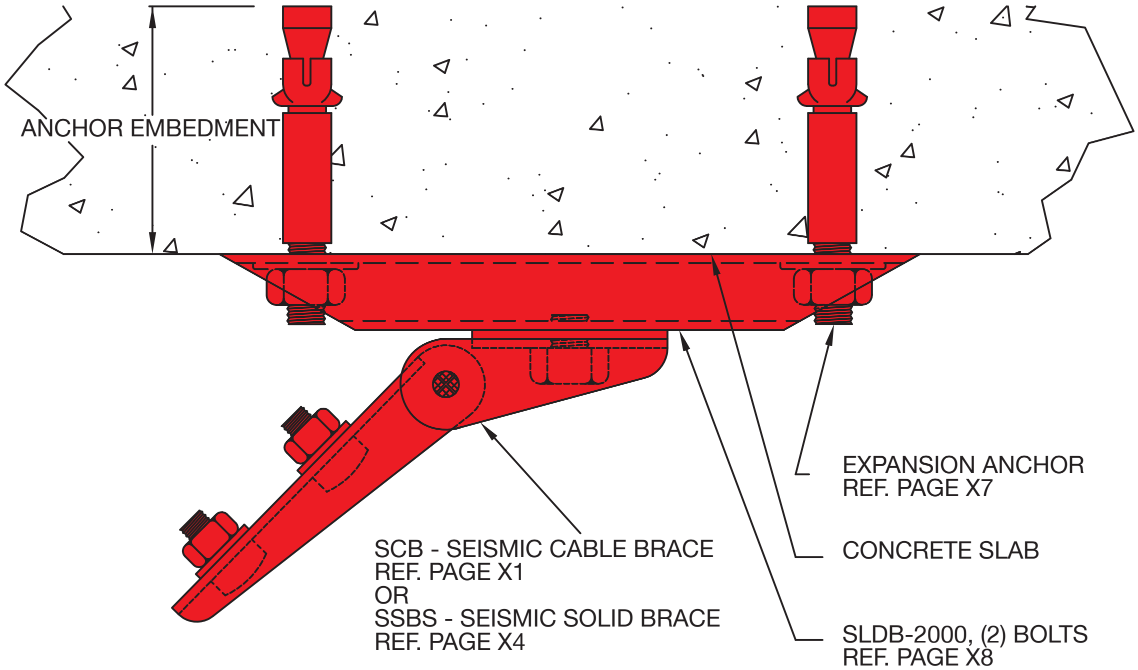
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

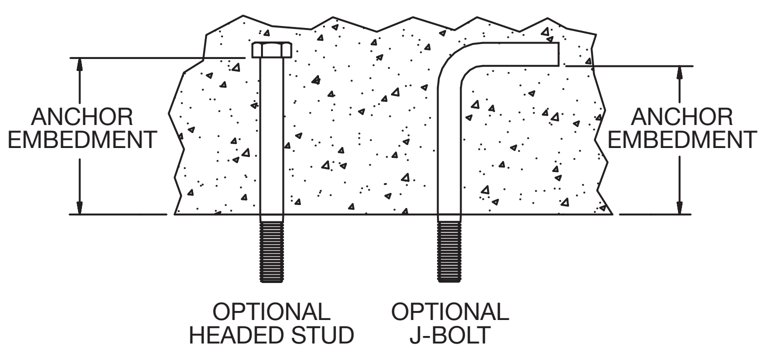
Dhiru Mali
Structural Engineer
California SE No. 2811

SCB OR SSBS ATTACHMENT
TO A CONCRETE SLAB WITH (2) EXPANSION ANCHORS



MAXIMUM SLDB-2000 LOADS
TO STRUCTURE UP TO 2:1 BRACE ANGLE

SCB SIZE	SSBS SIZE	TENSION (lbs) ( )	SHEAR (lbs) ( )
2	20, 25	1680	1440



NOTE: SCB AND SSBS Seismic Braces must be aligned with long axis of the SLDB-2000 as shown above.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

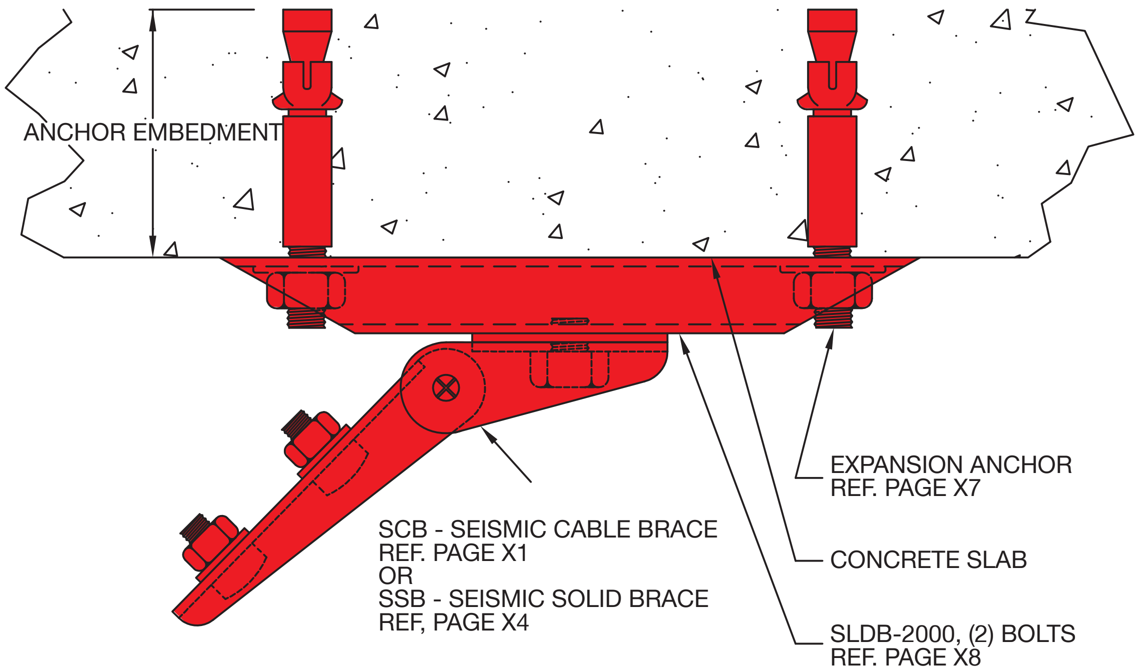
Page
H2

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

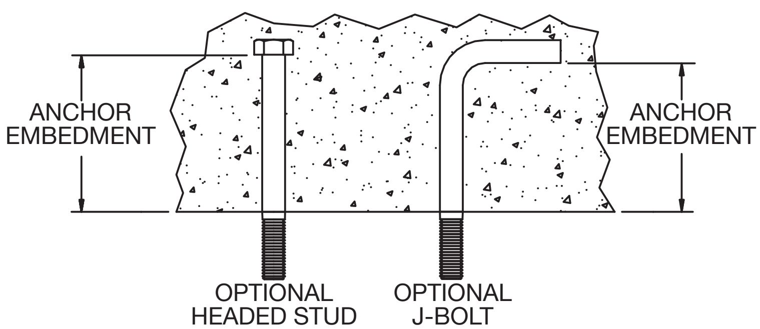
Bill Staehlin (916) 654-3362

SCB OR SSB ATTACHMENT
TO A CONCRETE SLAB WITH (4) EXPANSION ANCHORS



MAXIMUM SLDB-4000 LOADS
TO STRUCTURE UP TO 2:1 BRACE ANGLE

SCB/SSB SIZE	TENSION (lbs) ( )	SHEAR (lbs) ( )
3	2805	2200
4	4000	4000



NOTE: SCB AND SSB Seismic Braces may be rotated in plan view to suit field conditions.

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

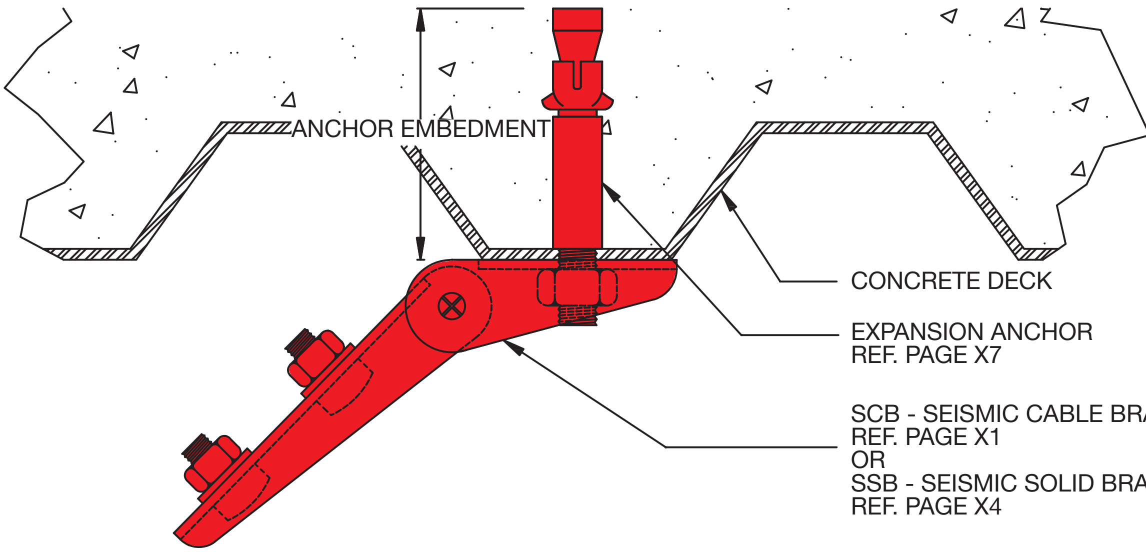
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

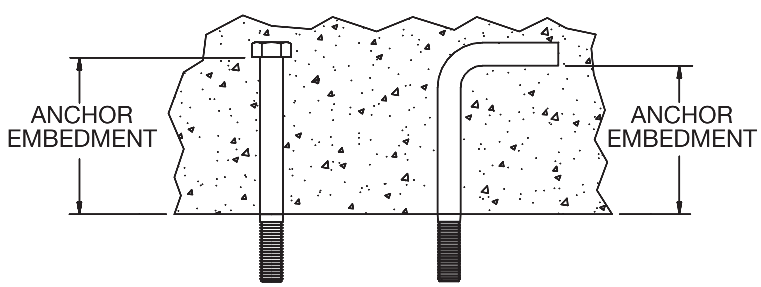
Dhiru Mali
Structural Engineer
California SE No. 2811

SCB, SSB OR SSBS ATTACHMENT
TO A CONCRETE DECK WITH (1) EXPANSION ANCHORS



MAXIMUM EXPANSION ANCHOR LOADS
TO STRUCTURE UP TO 2:1 BRACE ANGLE

SCB SIZE	SSB/SSBS SIZE	TENSION (lbs) ( )	SHEAR (lbs) ( )
1	SSBS-12	540	360
2	SSBS-20,25	790	560
3	SSB	665	480



NOTE: SCB, SSB AND SSBS Seismic Braces may be rotated in plan view to suit field conditions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Page

H4

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

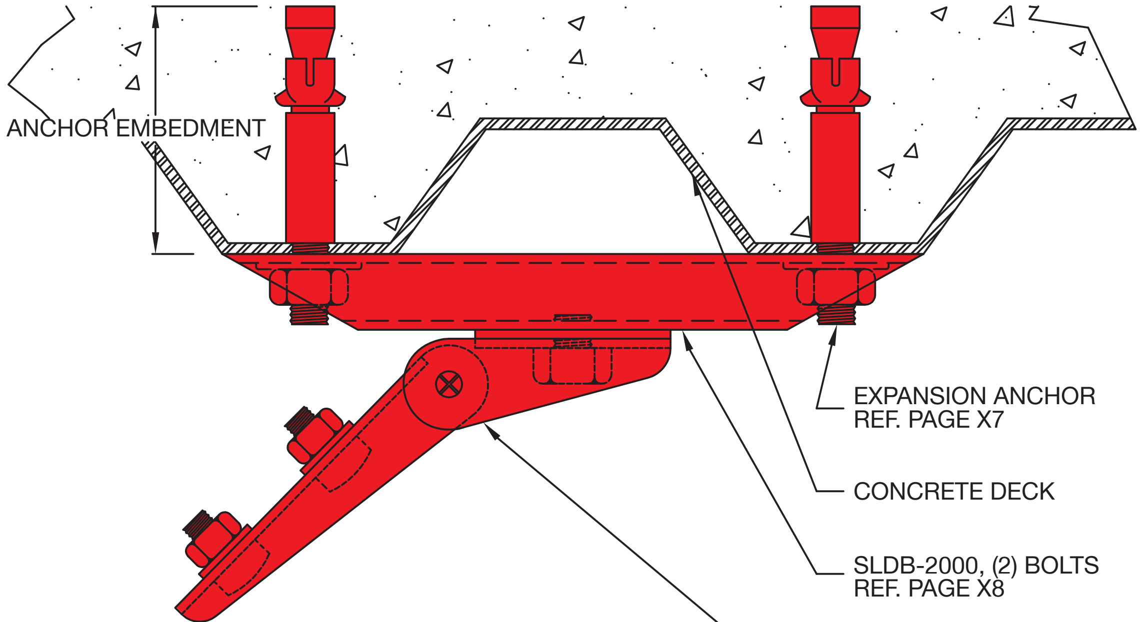
California Office of Statewide
Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

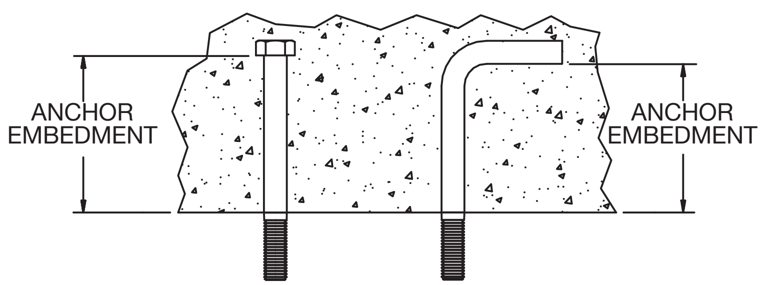
Bill Staehlin (916) 654-3362

SCB OR SSB ATTACHMENT
TO A CONCRETE DECK WITH (2) EXPANSION ANCHORS



MAXIMUM SLDB-2000 LOADS
TO STRUCTURE UP TO 2:1 BRACE ANGLE

SCB/SSB SIZE	TENSION (lbs) ( )	SHEAR (lbs) ( )
1	800	680
2	1520	1400



NOTE: SCB AND SSB Seismic Braces must be aligned with long axis of the SLDB-2000 as shown above.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

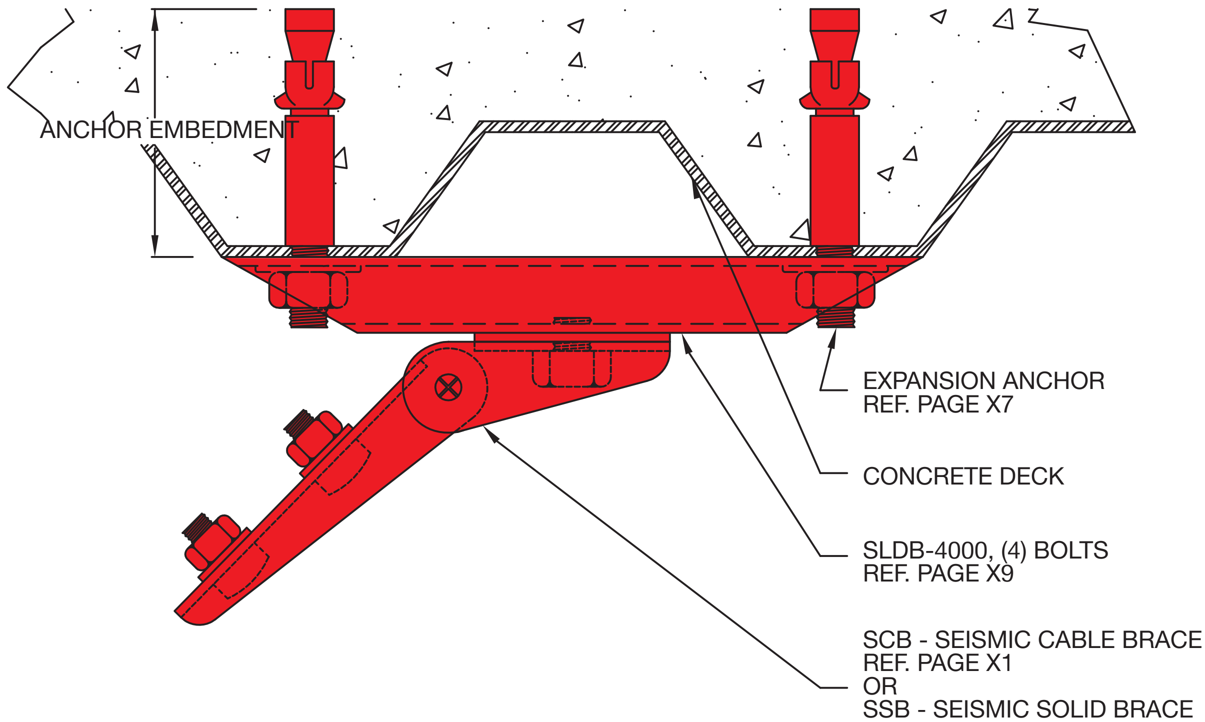
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

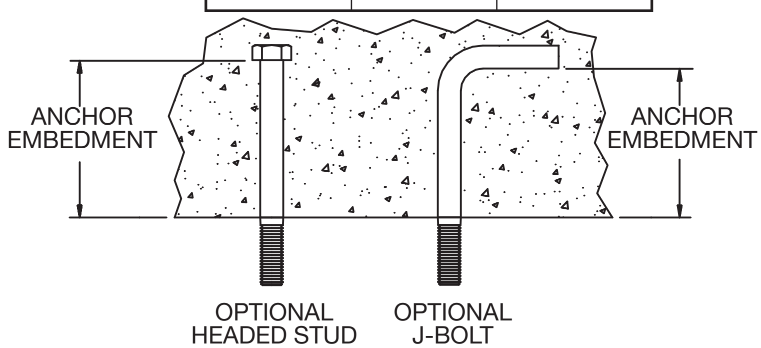
Dhiru Mali
Structural Engineer
California SE No. 2811

SCB OR SSB ATTACHMENT
TO A CONCRETE DECK WITH (4) EXPANSION ANCHORS



MAXIMUM SLDB-4000 LOADS
TO STRUCTURE UP TO 2:1 BRACE ANGLE

SCB/SSB SIZE	TENSION (lbs) ( )	SHEAR (lbs) ( )
3	2800	2200
4	3120	2840



NOTE: SCB AND SSB Seismic Braces may be rotated in plan view to suit field conditions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

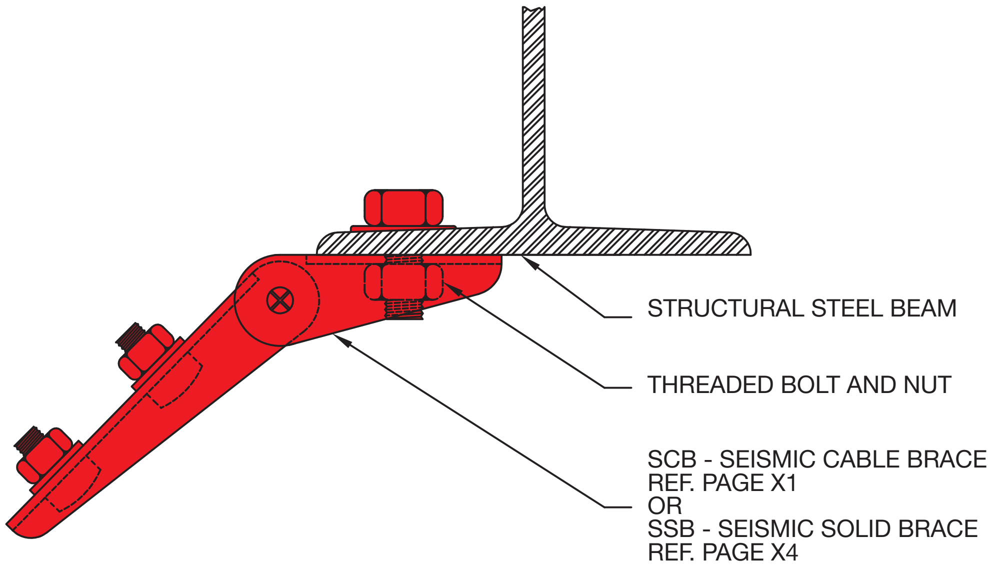
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

SCB OR SSB BOLTED ATTACHMENT TO A STRUCTURAL STEEL BEAM



MAXIMUM ANCHOR BOLT LOADS
TO STRUCTURE UP TO 1:1 BRACE ANGLE

SCB/SSB SIZE	TENSION* (lbs) ( )	SHEAR (lbs) ( )
1	935	680
2	1835	1440
3	2910	2200
4	6830	4625

*For up to 1.5:1 or 2:1 brace angle, multiply by 1.4 or 1.6 respectively.

NOTE 1: The structural engineer of record must check the structural steel for the seismic loads from the seismic restraint system.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

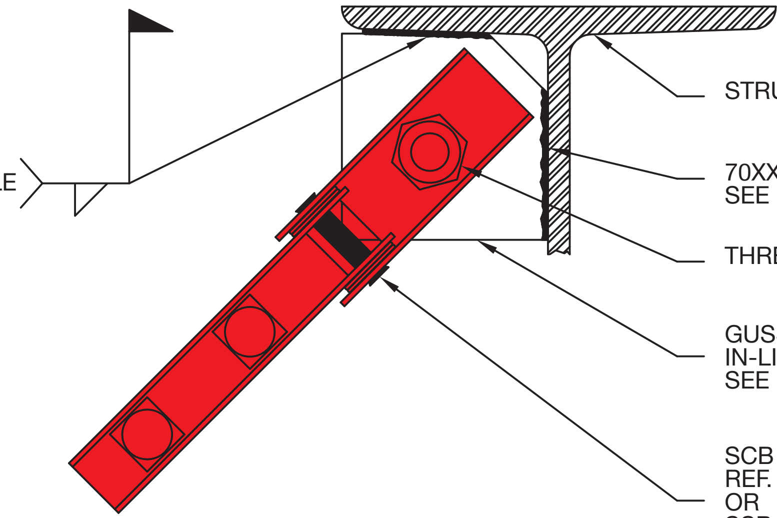
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SCB OR SSB/SSBS BOLTED ATTACHMENT TO A GUSSET PLATE OF A STRUCTURAL STEEL BEAM



MAXIMUM SCB/SSB LOADS
TO STRUCTURE UP TO 1:1 BRACE ANGLE

SCB SIZE	SSB/SSBS SIZE	TENSION* lbs (kN)	SHEAR lbs (kN)
1	SSBS-12	690	690
2	SSBS-20, 25	1450	1450
3	SSB-3	2230	2230
4	SSB-4	4865	4865

*For up to 1.5:1 or 2:1 brace angle, multiply by 1.2 or 1.3 respectively.

SCB SIZE	SSB/SSBS SIZE	PLATE SIZE (in) (mm)	HOLE DIA. (in) (mm)	FILLET WELD SIZE (in) (mm)
1	SSBS-12	3 x 3 x 1/4 (76 x 76 x 6)	9/16	3/16
2	SSBS-20, 25	4 x 4 x 1/4 (76 x 76 x 6)	11/16	3/16
3	SSBS-3	5 x 5 x 3/8 (127 x 127 x 10)	13/16	1/4
4	SSBS-4	6 x 6 x 3/8 (152 x 152 x 10)	15/16	1/4

NOTE 1: The structural engineer of record must check the structural steel for the seismic loads from the seismic restraint system.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Page

H8

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

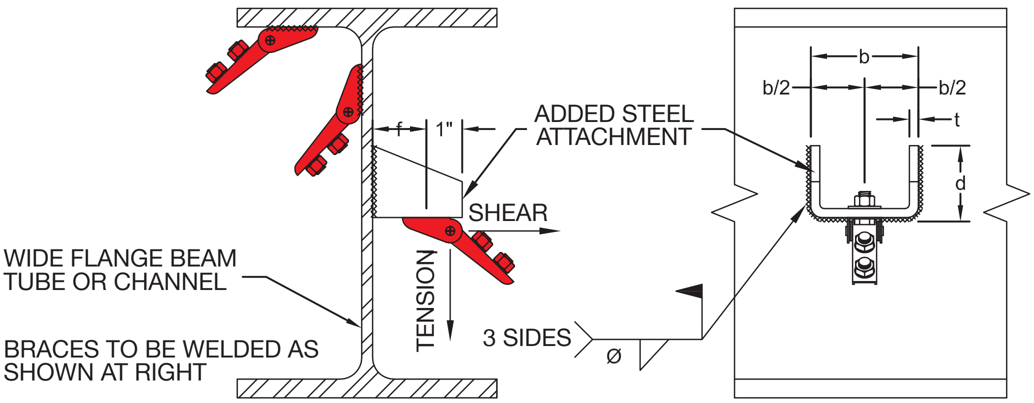
California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

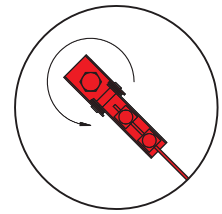
Bill Staehlin (916) 654-3362

SCB OR SSB WELDED ATTACHMENT PERPENDICULAR TO A STRUCTURAL STEEL MEMBER

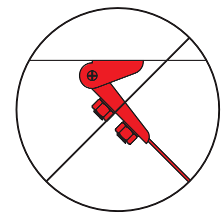


SIDE VIEW

FRONT VIEW



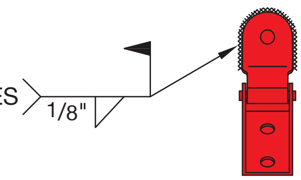
BRACE CAN BE ROTATED
TO ANY ANGLE AS SHOWN

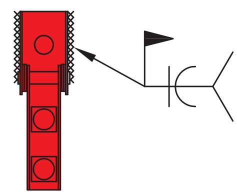


DO NOT BEND
BRACE PAST 90°

ADDED STEEL ATTACHMENT DIMENSIONS (in)						
BRACE SIZE	WIDTH (b)	HEIGHT (d)	THICK-NESS (t)	BOLT HOLE (f)	BOLT HOLE DIA.	WELD DIA. (Ø)
SCB-0	2	1-1/2	1/4	1-1/4	7/16	1/8
SCB-1 SSB-1 SSBS-12	3	2	1/4	1-1/2	9/16	1/8
SCB-2 SSB-2 SSBS-20	4	2-1/2	3/8	2	11/16	3/16
SCB-3 SSB-3	5	3-1/4	3/8	2-1/2	13/16	3/16
SCB-4 SSB-4	6	4-1/2	3/8	3-1/2	1-5/16	1/4

SSBS WELDED (3) SIDES





SCB/SSB
WELDED
(2) SIDES

Mason Seismic Brace Size	E70XX Weld Size
SCB-0	1/16"
SCB/SSB-1	1/8"
SCB/SSB-2	1/8"
SCB/SSB-3	3/16"
SCB/SSB-4	3/16"

Maximum Seismic Brace Loads To Structure At Various Brace Angles (lbs)										
Brace Angle (Rise:Run)	SCB-0		SCB-1 / SSB-1 SSBS-12		SCB-2 / SSB-2 SSBS-20 (Up to 1.5:1)		SCB-3 / SSB-3		SCB-4 / SSB-4	
	Vertical	Shear	Vertical	Shear	Vertical	Shear	Vertical	Shear	Vertical	Shear
2:1	447	224	872	436	1834	917	2817	1409	6149	3075
1.5:1	416	277	811	541	1706	1137	2621	1747	5720	3814
1:1	354	354	689	689	1450	1450	2227	2227	4861	4861
1:1.5	277	416	541	811	1137	1706	1747	2621	3814	5720
1:2	224	447	436	872	917	1834	1409	2817	3075	6149

NOTE: The structural engineer of record must check the structural steel for the attachment location and seismic loads from the seismic restraint system.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
July 22, 2009

Jerry Yee **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

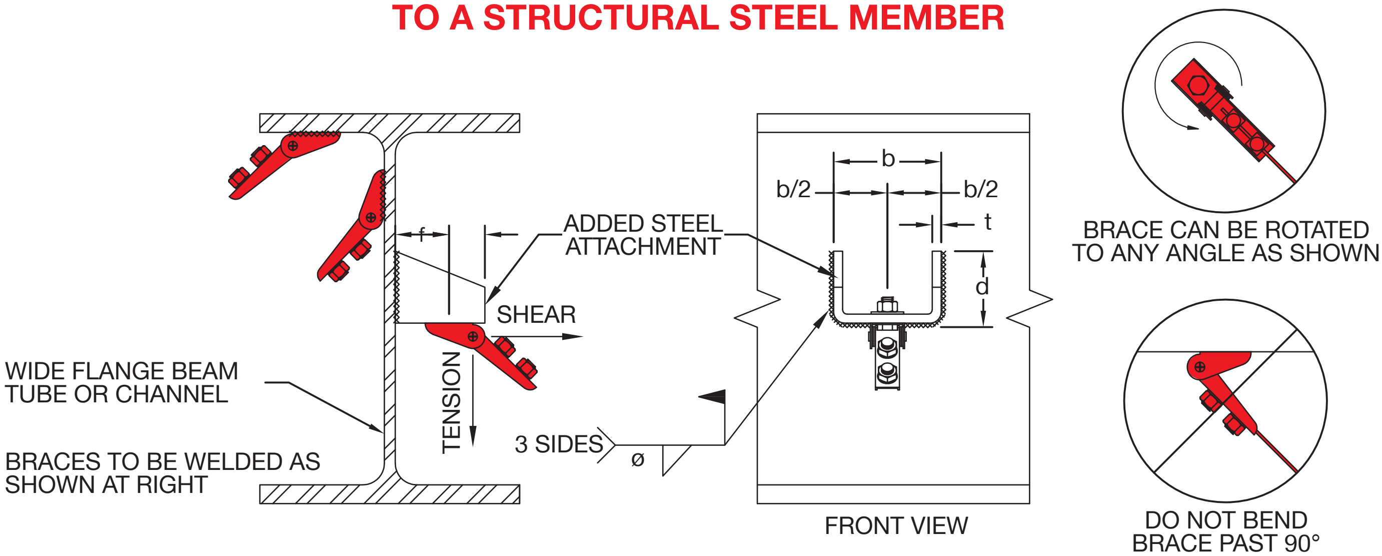
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

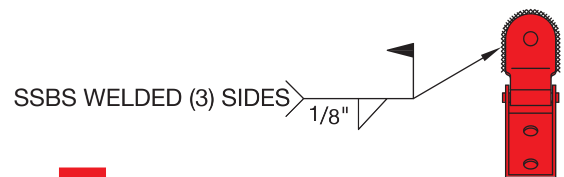
Info@Mason-Ind.com • www.Mason-Ind.com

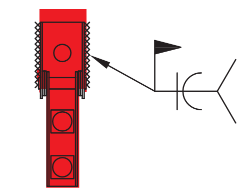
Dhiru Mali
Structural Engineer
California SE No. 2811

SCB OR SSB WELDED ATTACHMENT PERPENDICULAR TO A STRUCTURAL STEEL MEMBER



ADDED STEEL ATTACHMENT DIMENSIONS (mm)						
BRACE SIZE	WIDTH (b)	HEIGHT (d)	THICK-NESS (t)	BOLT HOLE (f)	BOLT HOLE DIA.	WELD SIZE (Ø)
SCB-0	51	38	6	32	11	3
SCB-1 SSB-1 SSBS-12	76	51	6	38	14	3
SCB-2 SSB-2 SSBS-20	102	64	10	51	17	5
SCB-3 SSB-3	127	83	10	64	21	5
SCB-4 SSB-4	152	114	10	89	33	6





SCB/SSB WELDED (2) SIDES

Mason Seismic Brace Size	E70XX Weld Diameter
SCB-0	2
SCB/SSB-1	3
SCB/SSB-2	3
SCB/SSB-3	5
SCB/SSB-4	5

Maximum Seismic Brace Loads To Structure At Various Brace Angles (kN)										
Brace Angle (Rise:Run)	SCB-0		SCB-1/SSB-1 SSBS-12		SCB-2/SSB-2 SSBS-20 (Up to 1.5:1)		SCB-3/SSB-3		SCB-4 /SSB-4	
	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
2:1	2.0	1.0	3.9	1.9	8.2	4.1	12.5	6.3	27.4	13.7
1.5:1	1.9	1.2	3.6	2.4	7.6	5.1	11.7	7.8	23.4	15.2
1:1	1.6	1.6	3.1	3.1	6.4	6.4	9.9	9.9	21.6	21.6
1:1.5	1.2	1.9	2.4	3.6	5.1	7.6	7.8	11.7	15.2	23.4
1:2	1.0	2.0	1.9	3.9	4.1	8.2	6.3	12.5	13.7	27.4

NOTE: The structural engineer of record must check the structural steel for the attachment location and seismic loads from the seismic restraint system.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

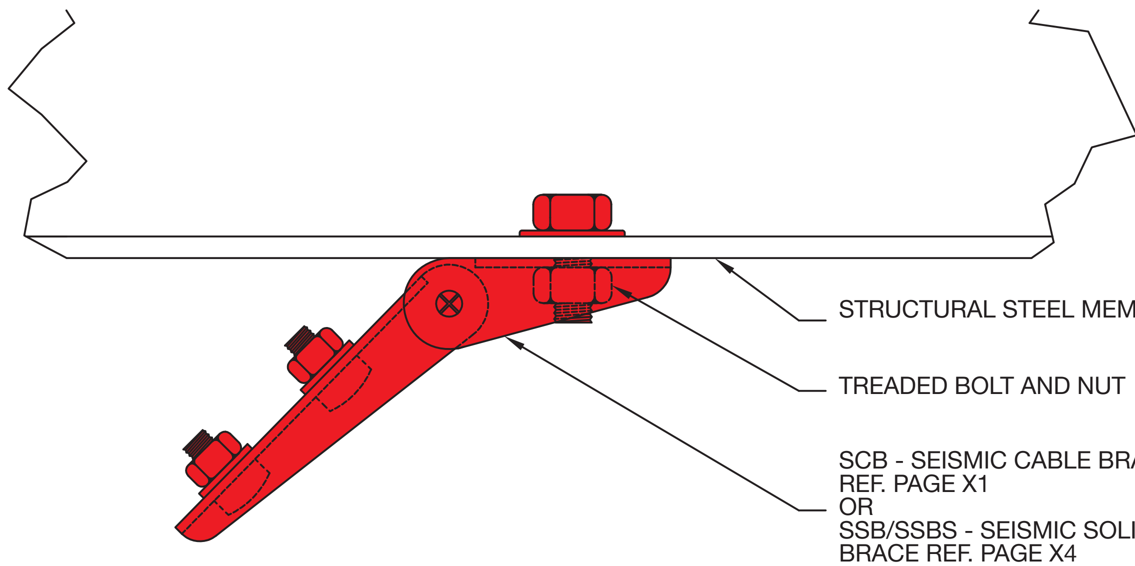
OPA-0349
on
July 22, 2009

Jerry Yee **(916) 654-3362**

Page
H8Am

Dhiru Mali
Structural Engineer
California SE No. 2811

SCB OR SSB BOLTED ATTACHMENT TO A STRUCTURAL STEEL MEMBER



MAXIMUM ANCHOR BOLT LOADS TO STRUCTURE UP TO 1:1 BRACE ANGLE

SCB SIZE	SCB/SSB SIZE	TENSION* (lbs) ( )	SHEAR (lbs) ( )
1	SSBS-12	935	680
2	SSBS-20, 25	1835	1440
3	SSB-3	2910	2200
4	SSB-4	6830	4625

*For up to 1.5:1 or 2:1 brace angle, multiply by 1.4 or 1.6 respectively.

NOTE 1: The structural engineer of record must check the structural steel for the seismic loads from the seismic restraint system.

NOTE 2: For tightening requirements of bolts, nuts and strut nuts reference H15.

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

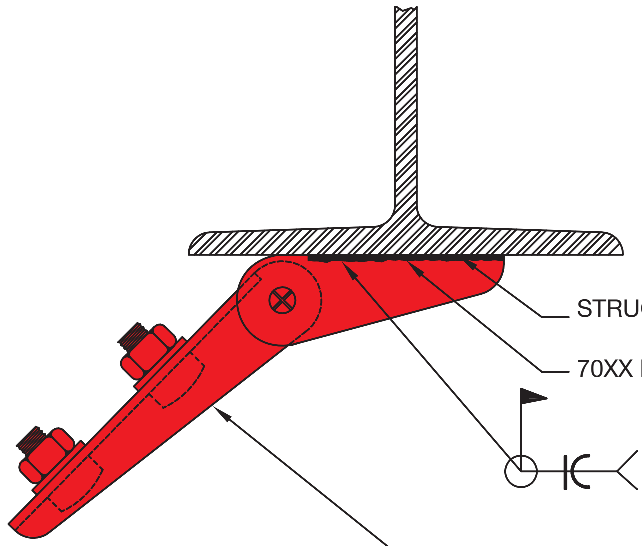
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SCB OR SSB/SSBS WELDED ATTACHMENT
TO A STRUCTURAL STEEL BEAM



SCB SIZE	SCB/SSBS SIZE	WELD SIZE
1	SSBS-12	1/8"
2	SSBS-20, 25	1/8"
3	SSB-3	3/16"
4	SSB-4	3/16"

MAXIMUM SCB/SSB LOADS
TO STRUCTURE UP TO 1:1 BRACE ANGLE

SCB SIZE	SCB/SSBS SIZE	TENSION* (lbs) ( )	SHEAR (lbs) ( )
1	SSBS-12	690	690
2	SSBS-20, 25	1450	1450
3	SSB-3	2230	2230
4	SSB-4	4865	4865

* For up to 1.5:1 or 2:1 brace angle,
multiply by 1.2 or 1.3 respectively.

NOTE: The structural engineer of record must check the structural steel for the seismic loads from the seismic restraint system.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

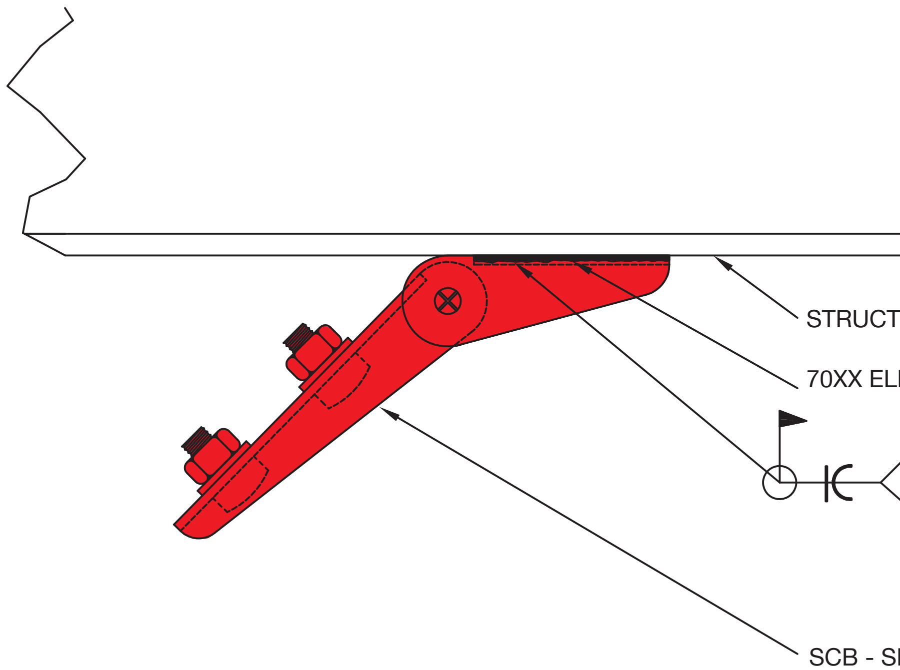
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

SCB OR SSB WELDED ATTACHMENT TO A STRUCTURAL STEEL MEMBER



SCB SIZE	SCB/SSBS SIZE	WELD SIZE
1	SSBS-12	1/8"
2	SSBS-20, 25	1/8"
3	SSB-3	3/16"
4	SSB-4	3/16"

MAXIMUM SCB/SSB LOADS TO STRUCTURE UP TO 1:1 BRACE ANGLE

SCB SIZE	SCB/SSBS SIZE	TENSION* (lbs) ( )	SHEAR (lbs) ( )
1	SSBS-12	690	690
2	SSBS-20, 25	1450	1450
3	SSB-3	2230	2230
4	SSB-4	4865	4865

* For up to 1.5:1 or 2:1 brace angle, multiply by 1.2 or 1.3 respectively.

NOTE: The structural engineer of record must check the structural steel for the seismic loads from the seismic restraint system.

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

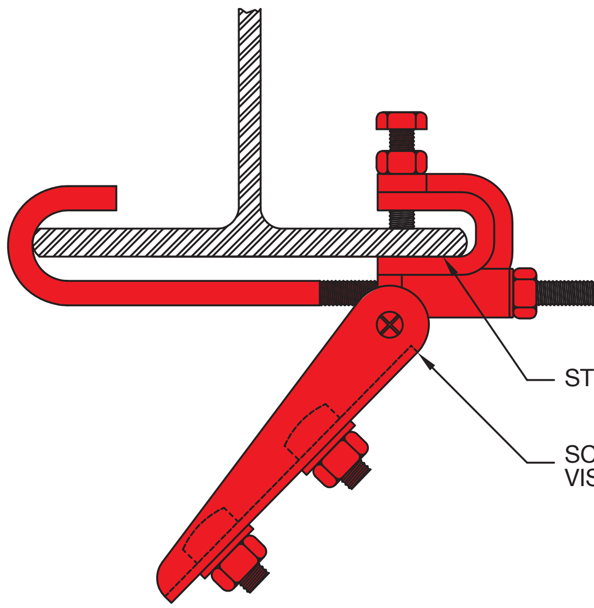
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SCBV - SEISMIC CABLE BRACE VISE ATTACHMENT TO A STRUCTURAL STEEL BEAM



MAXIMUM SCB/SSB LOADS TO STRUCTURE UP TO 1:1 BRACE ANGLE

SCBV SIZE	TENSION* (lbs) ( )	SHEAR (lbs) ( )
1	690	690
2	1450	1450
3	2230	2230

* For up to 1.5:1 or 2:1 brace angle, multiply by 1.2 or 1.3 respectively.

NOTE: The structural engineer of record must check the structural steel for the seismic loads from the seismic restraint system.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

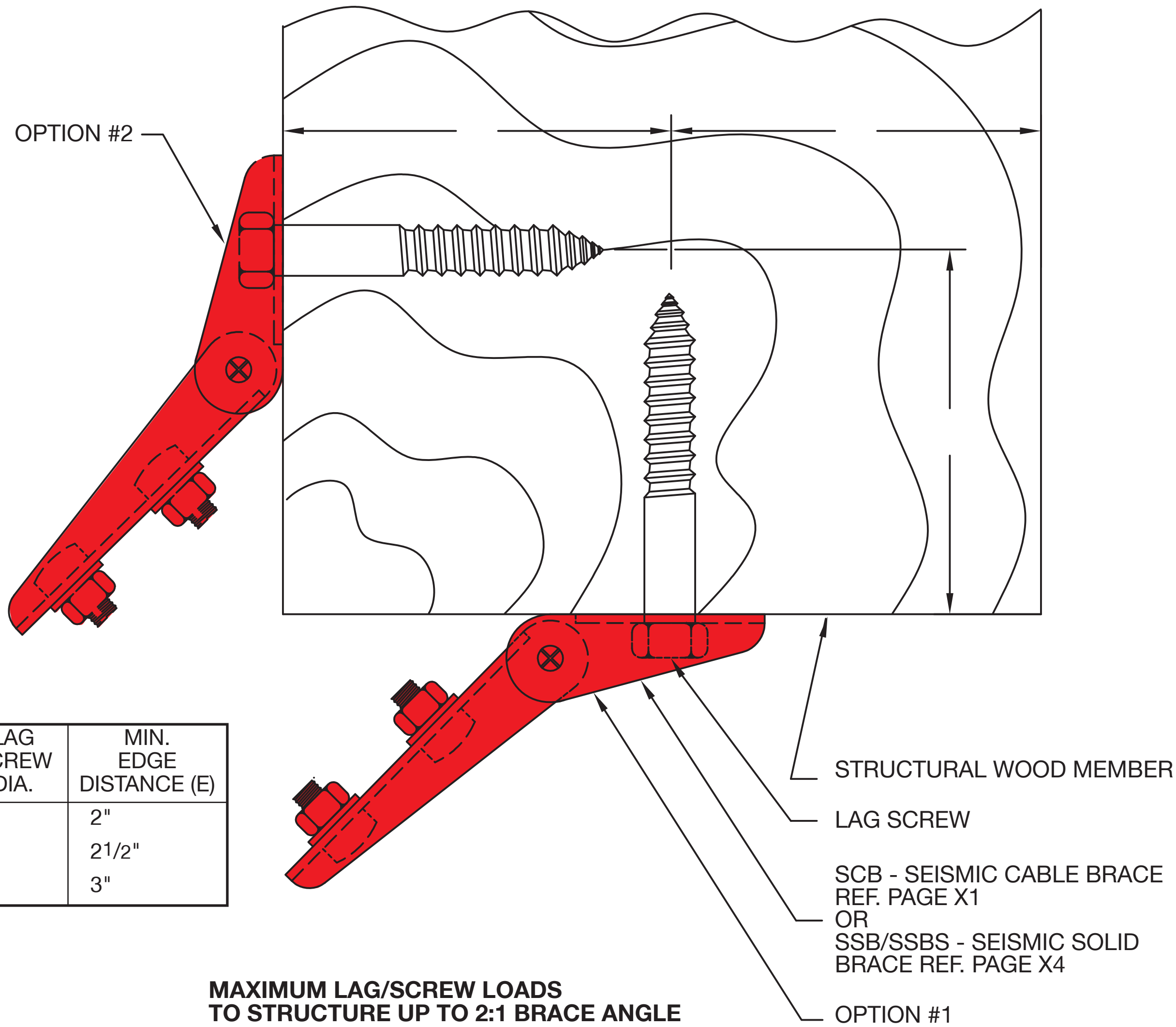
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

SCB OR SSB/SSBS LAG SCREW ATTACHMENT TO A STRUCTURAL WOOD MEMBER



LAG SCREW DIA.	MIN. EDGE DISTANCE (E)
1/2"	2"
5/8"	21/2"
3/4"	3"

MAXIMUM LAG/SCREW LOADS TO STRUCTURE UP TO 2:1 BRACE ANGLE

SCB SIZE	SCB/SSBS SIZE	TENSION (lbs) ( )	SHEAR (lbs) ( )
1	SSBS-12	570	360
2	SSBS-20, 25	920	560
3	SSB-3	1330	760

NOTE: The structural engineer of record must check the structural wood member for the seismic loads from the seismic restraint system.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

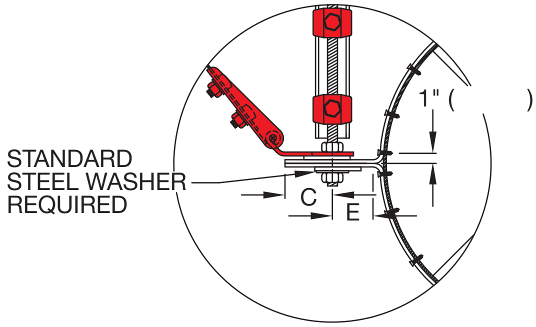
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

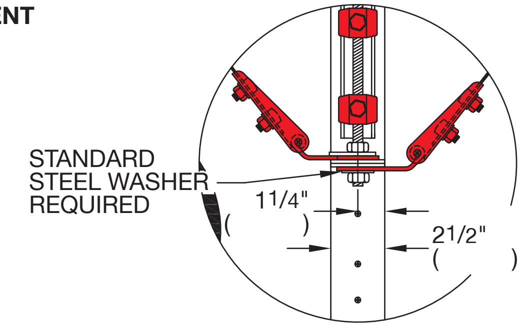
Dhiru Mali
Structural Engineer
California SE No. 2811

REQUIRED CLEARANCE DETAILS
FOR SCBH/SSB/SSBS ATTACHMENT TO DUCT

ROUND DUCT ATTACHMENT

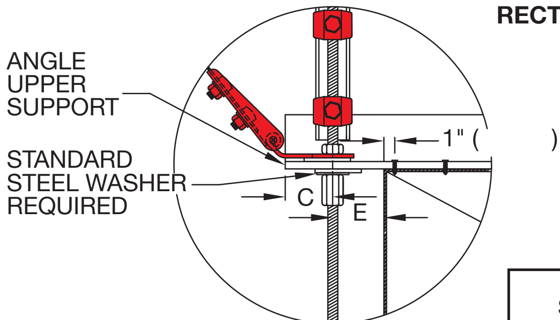


FRONT ELEVATION

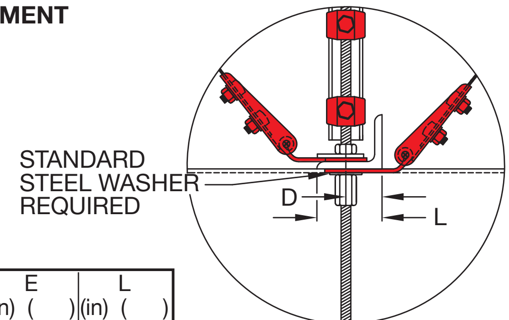


SIDE ELEVATION

RECTANGULAR DUCT ATTACHMENT

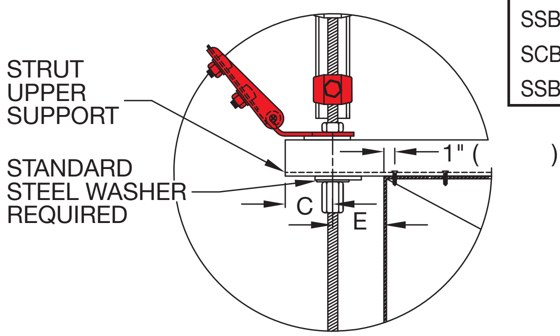


FRONT ELEVATION

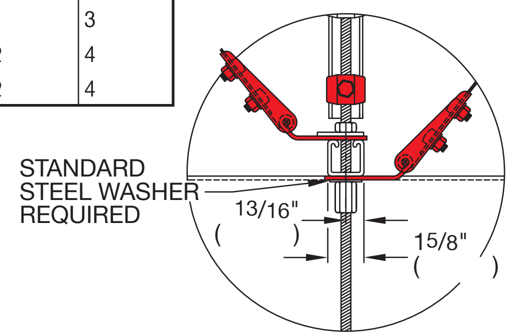


SIDE ELEVATION

SIZE	C (in) ( )	D (in) ( )	E (in) ( )	L (in) ( )
SCBH-1	1	11/2	1	21/2
SSBS-12	1	11/2	1	21/2
SCBH-2	13/4	21/4	13/4	3
SSBS-20,25	11/2	21/4	1	3
SCBH-3	2	25/8	2	4
SSB-3	2	25/8	2	4



FRONT ELEVATION



SIDE ELEVATION

NOTE: Ref. Page E4 for upper support sizes and maximum upper support extensions. The (E) dimension listed above is the minimum extension required for SCBH/SSB clearance.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

TIGHTENING REQUIREMENTS

TORQUE FOR A307 BOLTS AND A36 THREADED ROD

DIAMETER SIZE	TORQUE ft-lbs ( )
3/8	20
1/2	49
5/8	97
3/4	173

TURN OF NUT METHOD

For turn-of-nut tightening, hand-adjust the bolt snug tight where there is firm contact between the bolt and connected metal components.

LENGTH OF BOLT	ADDITIONAL TIGHTENING
Up to and including 4 diameters	1/3 Turn
Over 4 diameters and not more than 8 diameter	1/2 Turn
Over 8 diameter and not more than 12 diameter	2/3 Turn

TORQUE FOR STRUT NUTS

DIAMETER SIZE	TORQUE ft-lbs ( )
3/8	19
1/2	50
5/8	100
3/4	125

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

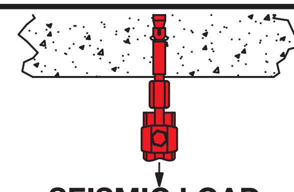
Dhiru Mali
Structural Engineer
California SE No. 2811

End of
Section

VERTICAL SUPPORT GUIDELINES

SSB LOCATIONS

SEISMIC LOAD ON SUPPORT RODS FOR USE WITH PAGES A1 AND D1



AT INDIVIDUAL SUPPORTS:

Pipe Diameter (in)	Support Rod Diameter (in)	Seismic Tension Load* (lbs)
1–2	3/8	425
2 1/2–3	1/2	560
4–5	5/8	560
6	3/4	870
8–10	7/8	1445
12	7/8	2180
14–18	1	2200
20–24	1 1/4	3760

AT TRAPEZE SUPPORTS:

Size	Support Rod Diameter (in)	Seismic Tension Load* (lbs)
SSBS-12	1/2	560
SSBS-20,25	5/8	1440
SSB-3	3/4	2200
SSB-4	1	4000

* The attachment point of the support rod to the structure must be designed to accept the addition of the seismic tension load tabulated above and the gravity load of the item supported. THIS IS ONLY REQUIRED FOR SUPPORT RODS WHERE THE SEISMIC SOLID BRACE IS ATTACHED.

Example: For a 10" diameter pipe supported by a minimum 7/8" diameter rod, assume the gravity load is 800 lbs. The total tension load on the support rod

= 1445 lbs. (see table above) + 800 lbs. = 2245 lbs.

Select a concrete expansion anchor (Ref. Page X7), concrete insert anchor, or any other approved attachment which can accept this total tension load.

To reduce the total tension load on the support rod to meet the allowable tension load of the attachment, reduce the seismic brace spacing or the support spacing or both.

Example: Assume the total tension load on the support is 2245 lbs. from the example above. If the allowable tension load of the attachment is 1400 lbs., reduce the brace spacing by 50% and the support spacing by 20%. The revised total tension load on the support rod

= 1445 lbs. x 50% + 800 lbs. x 80% = 1362.5 lbs. < 1400 lbs.

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

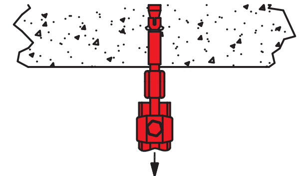
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL SUPPORT GUIDELINES

SSB/SSBS LOCATIONS

SEISMIC LOAD ON SUPPORT RODS FOR USE WITH PAGES A1 AND D1


SEISMIC LOAD

AT INDIVIDUAL SUPPORTS:

Pipe Diameter (mm)	Support Rod Diameter (mm)	Seismic Tension Load* (kN)
25–51	10	1.9
64–76	13	2.5
102–127	16	2.5
152	19	3.9
203–254	22	6.5
305	22	9.7
356–457	25	9.8
508–610	32	16.8

AT TRAPEZE SUPPORTS:

Size	Support Rod Diameter (mm)	Seismic Tension Load* (kN)
SSBS-12	13	2.5
SSBS-20,25	16	6.5
SSB-3	19	9.8
SSB-4	25	17.8

* The attachment point of the support rod to the structure must be designed to accept the addition of the seismic tension load tabulated above and the gravity load of the item supported. THIS IS ONLY REQUIRED FOR SUPPORT RODS WHERE THE SEISMIC SOLID BRACE IS ATTACHED.

Example: For a   diameter pipe supported by a minimum   diameter rod, assume the gravity load is 3.6 kN. The total tension load on the support rod
= 6.5 kN (see table above) + 3.6 kN = 10.1 kN

Select a concrete expansion anchor (Ref. Page X7), concrete insert anchor, or any other approved attachment which can accept this total tension load.

To reduce the total tension load on the support rod to meet the allowable tension load of the attachment, reduce the seismic brace spacing or the support spacing or both.

Example: Assume the total tension load on the support is 10.1 kN. from the example above. If the allowable tension load of the attachment is 6.3 kN, reduce the brace spacing by 50% and the support spacing by 20%. The revised total tension load on the support rod
= 6.5 kN x 50% + 3.6 kN x 80% = 6.1 kN < 6.3 kN

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

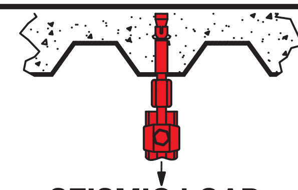
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

VERTICAL SUPPORT GUIDELINES

SSB/SSBS LOCATIONS

SEISMIC LOAD ON SUPPORT RODS FOR USE WITH PAGES A2 AND D2



SEISMIC LOAD

AT INDIVIDUAL SUPPORTS:

Pipe Diameter (in)	Support Rod Diameter (in)	Seismic Tension Load* (lbs)
1–2	3/8	375
2 1/2–3	1/2	375
4–5	5/8	375
6	3/4	560
8–10	7/8	1380
12	7/8	2180
14–18	1	2200
20–24	1 1/4	2785

AT TRAPEZE SUPPORTS:

Size	Support Rod Diameter (in)	Seismic Tension Load* (lbs)
SSBS-12	1/2	680
SSBS-20,25	5/8	1440
SSB-3	3/4	2200
SSB-4	1	3800

* The attachment point of the support rod to the structure must be designed to accept the addition of the seismic tension load tabulated above and the gravity load of the item supported. THIS IS ONLY REQUIRED FOR SUPPORT RODS WHERE THE SEISMIC SOLID BRACE IS ATTACHED.

Example: For a 10" Diameter pipe supported by a minimum 7/8" diameter rod, assume the gravity load is 800 lbs. The total tension load on the support rod

= 1380 lbs. (see table above) + 800 lbs. = 2180 lbs.

Select a concrete expansion anchor (Ref. Page X7), concrete insert anchor, or any other approved attachment which can accept this total tension load.

To reduce the total tension load on the support rod to meet the allowable tension load of the attachment, reduce the seismic brace spacing or the support spacing or both.

Example: Assume the total tension load on the support is 2180 lbs. from the example above. If the allowable tension load of the attachment is 1400 lbs., reduce the brace spacing by 50% and the support spacing by 20%. The revised total tension load on the support rod

= 1380 lbs. x 50% + 800 lbs. x 80% = 1330 lbs. < 1400 lbs.

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

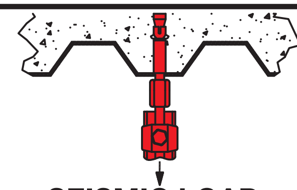
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL SUPPORT GUIDELINES

SSB LOCATIONS

SEISMIC LOAD ON SUPPORT RODS FOR USE WITH PAGES A2 AND D2



SEISMIC LOAD

AT INDIVIDUAL SUPPORTS:

Pipe Diameter (mm)	Support Rod Diameter (mm)	Seismic Tension Load* (kN)
25–51	10	1.7
64–76	13	1.7
102–127	16	1.7
152	19	2.5
203–254	22	6.2
305	22	9.7
356–457	25	9.8
508–610	32	12.4

AT TRAPEZE SUPPORTS:

SSB Size	Support Rod Diameter (mm)	Seismic Tension Load* (kN)
1	13	3.0
2	16	6.3
3	19	9.8
4	25	16.9

* The attachment point of the support rod to the structure must be designed to accept the addition of the seismic tension load tabulated above and the gravity load of the item supported. THIS IS ONLY REQUIRED FOR SUPPORT RODS WHERE THE SEISMIC SOLID BRACE IS ATTACHED.

Example: For a diameter pipe supported by a minimum diameter rod, assume the gravity load is 3.6 kN. The total tension load on the support rod

= 6.2 kN (see table above) + 3.6 kN = 9.8 kN

Select a concrete expansion anchor (Ref. Page X7), concrete insert anchor, or any other approved attachment which can accept this total tension load.

To reduce the total tension load on the support rod to meet the allowable tension load of the attachment, reduce the seismic brace spacing or the support spacing or both.

Example: Assume the total tension load on the support is 9.8 kN. from the example above. If the allowable tension load of the attachment is 6.3 kN, reduce the brace spacing by 50% and the support spacing by 20%. The revised total tension load on the support rod

= 6.2 kN x 50% + 3.6 kN x 80% = 6.0 kN < 6.3 kN

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

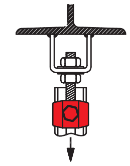
A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

VERTICAL SUPPORT GUIDELINES

SSB/SSBS LOCATIONS

SEISMIC LOAD ON SUPPORT RODS FOR USE WITH PAGES A3 AND D3



SEISMIC LOAD

AT INDIVIDUAL SUPPORTS:

Pipe Diameter (in)	Support Rod Diameter (in)	Seismic Tension Load* (lbs)
1–2	3/8	425
2 1/2–3	1/2	685
4–5	5/8	685
6	3/4	1430
8–10	7/8	1445
12	7/8	2180
14–18	1	2200
20–24	1 1/4	4710

AT TRAPEZE SUPPORTS:

Size	Support Rod Diameter (in)	Seismic Tension Load* (lbs)
SSBS-12	1/2	680
SSBS-20,25	5/8	1440
SSB-3	3/4	2200
SSB-4	1	4840

* The attachment point of the support rod to the structure must be designed to accept the addition of the seismic tension load tabulated above and the gravity load of the item supported. THIS IS ONLY REQUIRED FOR SUPPORT RODS WHERE THE SEISMIC SOLID BRACE IS ATTACHED.

Example: For a 10" Diameter pipe supported by a minimum 7/8" diameter rod, assume the gravity load is 800 lbs. The total tension load on the support rod

= 1445 lbs. (see table above) + 800 lbs. = 2245 lbs.

Select a concrete expansion anchor (Ref. Page X7), concrete insert anchor, or any other approved attachment which can accept this total tension load.

To reduce the total tension load on the support rod to meet the allowable tension load of the attachment, reduce the seismic brace spacing or the support spacing or both.

Example: Assume the total tension load on the support is 2245 lbs. from the example above. If the allowable tension load of the attachment is 1400 lbs., reduce the brace spacing by 50% and the support spacing by 20%. The revised total tension load on the support rod

= 1445 lbs. x 50% + 800 lbs. x 80% = 1362.5 lbs. < 1400 lbs.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

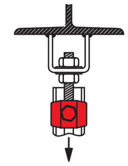
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL SUPPORT GUIDELINES

SSB/SSBS LOCATIONS

SEISMIC LOAD ON SUPPORT RODS FOR USE WITH PAGES A3 AND D3



SEISMIC LOAD

AT INDIVIDUAL SUPPORTS:

Pipe Diameter (mm)	Support Rod Diameter (mm)	Seismic Tension Load* (kN)
25–51	10	1.9
64–76	13	3.1
102–127	16	3.1
152	19	6.4
203–254	22	6.5
305	22	9.7
356–457	25	9.8
508–610	32	21.0

AT TRAPEZE SUPPORTS:

Size	Support Rod Diameter (mm)	Seismic Tension Load* (kN)
SSBS-12	13	3.0
SSBS-20, 25	16	6.5
SSB-3	19	9.8
SSB-4	25	21.6

* The attachment point of the support rod to the structure must be designed to accept the addition of the seismic tension load tabulated above and the gravity load of the item supported. THIS IS ONLY REQUIRED FOR SUPPORT RODS WHERE THE SEISMIC SOLID BRACE IS ATTACHED.

Example: For a diameter pipe supported by a minimum diameter rod, assume the gravity load is 3.6 kN. The total tension load on the support rod

= 6.5 kN (see table above) + 3.6 kN = 10.1 kN

Select a concrete expansion anchor (Ref. Page X7), concrete insert anchor, or any other approved attachment which can accept this total tension load.

To reduce the total tension load on the support rod to meet the allowable tension load of the attachment, reduce the seismic brace spacing or the support spacing or both.

Example: Assume the total tension load on the support is 1018 kg. from the example above. If the allowable tension load of the attachment is 6.3 kN, reduce the brace spacing by 50% and the support spacing by 20%. The revised total tension load on the support rod

= 6.5 kN x 50% + 3.6 kN x 80% = 6.2 kN < 6.3 kN

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

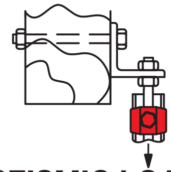
Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL SUPPORT GUIDELINES

SSB/SSBS LOCATIONS

SEISMIC LOAD ON SUPPORT RODS FOR USE WITH PAGES A4 AND D4



SEISMIC LOAD

AT INDIVIDUAL SUPPORTS:

Pipe Diameter (in)	Support Rod Diameter (in)	Seismic Tension Load* (lbs)
1–2	3/8	250
2 1/2–3	1/2	250
4–5	5/8	250
6	3/4	350
8–12	7/8	350

AT TRAPEZE SUPPORTS:

Size	Support Rod Diameter (in)	Seismic Tension Load* (lbs)
SSBS-12	1/2	240
SSBS-20,25	5/8	360
SSB-3	3/4	480

* The attachment point of the support rod to the structure must be designed to accept the addition of the seismic tension load tabulated above and the gravity load of the item supported. THIS IS ONLY REQUIRED FOR SUPPORT RODS WHERE THE SEISMIC SOLID BRACE IS ATTACHED.

Example: For a 10" Diameter pipe supported by a minimum 7/8" diameter rod, assume the gravity load is 800 lbs. The total tension load on the support rod

= 350 lbs. (see table above) + 800 lbs. = 1150 lbs.

Select a concrete expansion anchor (Ref. Page X7), concrete insert anchor, or any other approved attachment which can accept this total tension load.

To reduce the total tension load on the support rod to meet the allowable tension load of the attachment, reduce the seismic brace spacing or the support spacing or both.

Example: Assume the total tension load on the support is 1150 lbs. from the example above. If the allowable tension load of the attachment is 900 lbs., reduce the brace spacing by 50% and the support spacing by 20%. The revised total tension load on the support rod

= 350 lbs. x 50% + 800 lbs. x 80% = 815 lbs. < 900 lbs.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

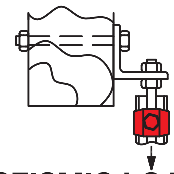
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

VERTICAL SUPPORT GUIDELINES

SSB/SSBS LOCATIONS

SEISMIC LOAD ON SUPPORT RODS FOR USE WITH PAGES A4 AND D4



SEISMIC LOAD

AT INDIVIDUAL SUPPORTS:

Pipe Diameter (mm)	Support Rod Diameter (mm)	Seismic Tension Load* (kN)
25–51	10	1.2
64–76	13	1.2
102–127	16	1.2
152	19	1.6
203–305	22	1.6

AT TRAPEZE SUPPORTS:

Size	Support Rod Diameter (mm)	Seismic Tension Load* (kg)
SSBS-12	13	1.1
SSBS-20, 25	16	1.6
SSB-3	19	2.2

* The attachment point of the support rod to the structure must be designed to accept the addition of the seismic tension load tabulated above and the gravity load of the item supported. THIS IS ONLY REQUIRED FOR SUPPORT RODS WHERE THE SEISMIC SOLID BRACE IS ATTACHED.

Example: For a diameter pipe supported by a minimum diameter rod, assume the gravity load is 3.6 kN. The total tension load on the support rod

= 1.6 kN (see table above) + 3.6 kN = 5.2 kN

Select a concrete expansion anchor (Ref. Page X7), concrete insert anchor, or any other approved attachment which can accept this total tension load.

To reduce the total tension load on the support rod to meet the allowable tension load of the attachment, reduce the seismic brace spacing or the support spacing or both.

Example: Assume the total tension load on the support is 5.2 kN. from the example above. If the allowable tension load of the attachment is 4.0 kN, reduce the brace spacing by 50% and the support spacing by 20%. The revised total tension load on the support rod

= 1.6 kN x 50% + 3.6 kN x 80% = 3.7 kN < 4.0 kN

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

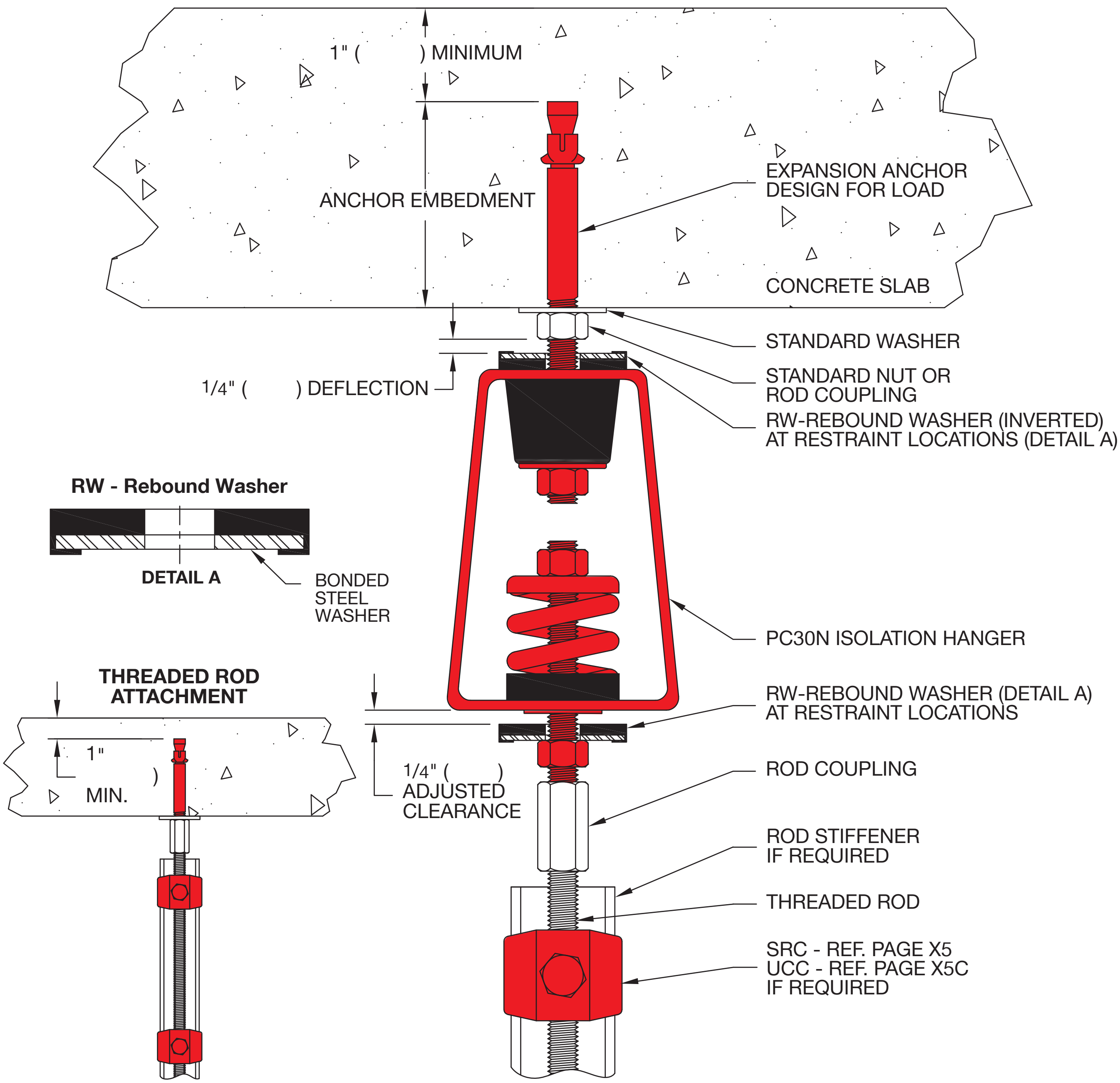
FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

PC30N ISOLATION HANGER ATTACHMENT TO A CONCRETE SLAB WITH (1) EXPANSION ANCHOR



NOTE 1: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 2: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

OPA-0349
on
April 6, 2009

Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

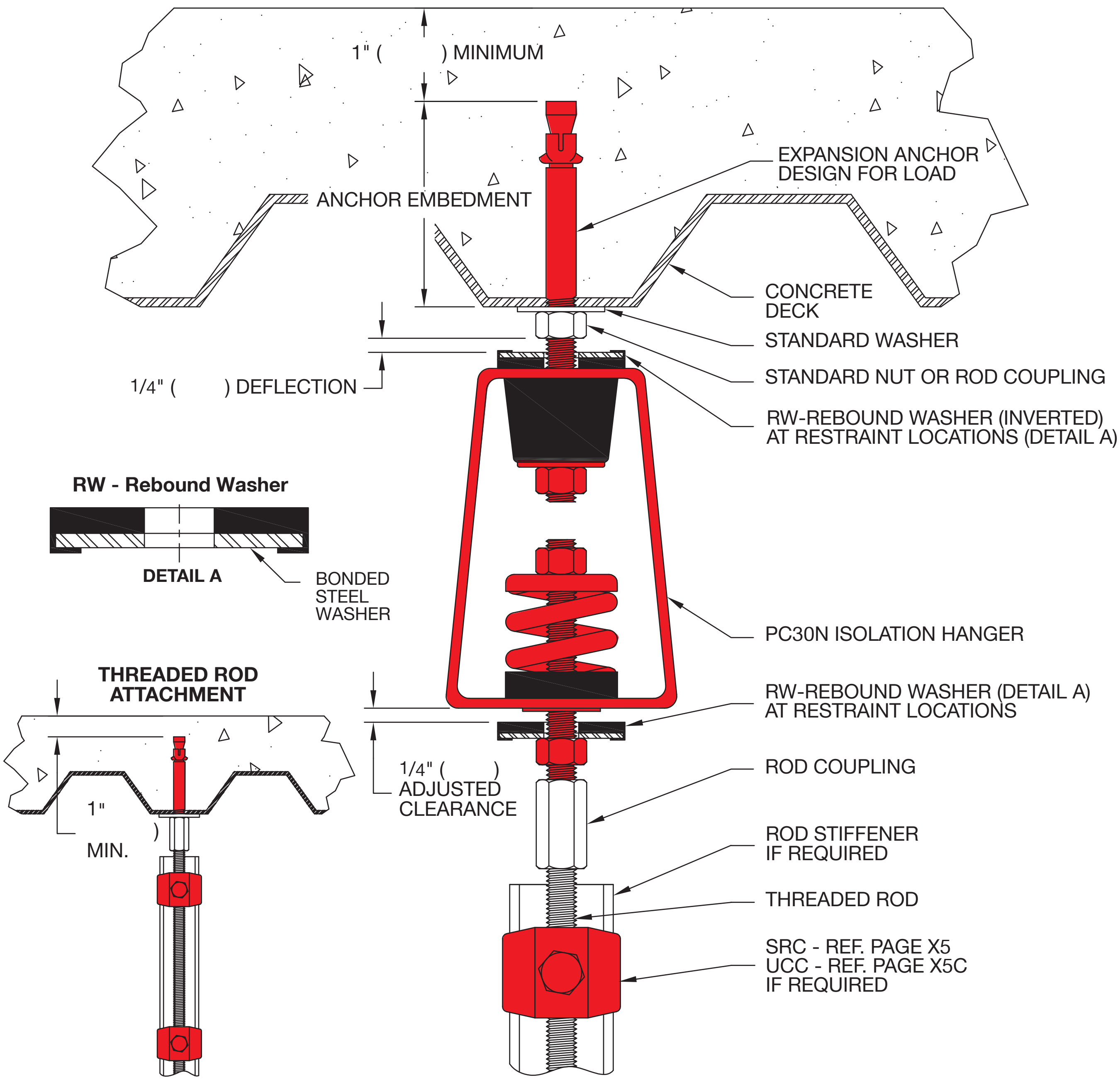
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

PC30N ISOLATION HANGER ATTACHMENT
TO A CONCRETE DECK WITH (1) EXPANSION ANCHOR



NOTE 1: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 2: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

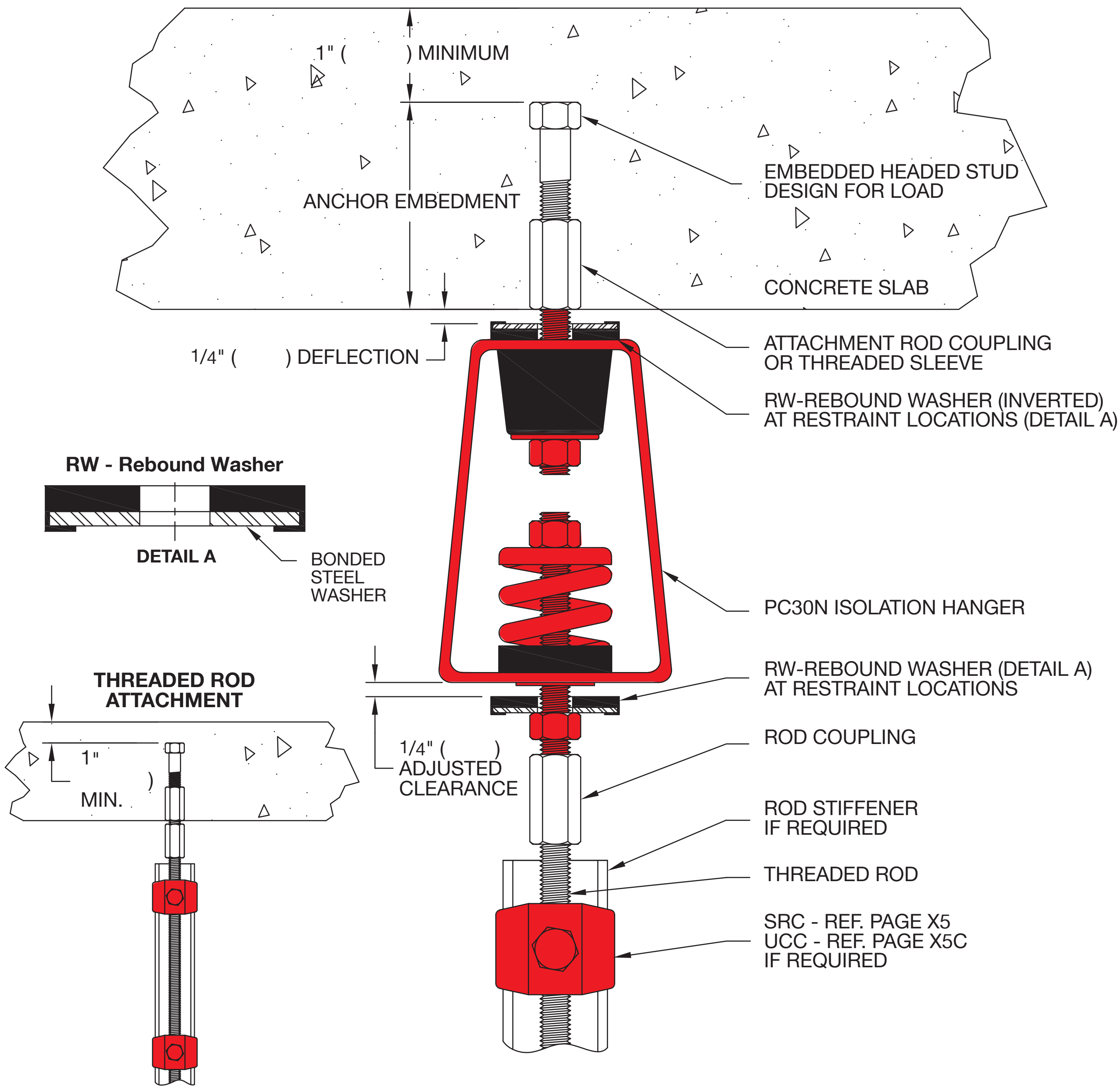
OPA-0349
on
April 6, 2009

Anthony R. Pike **(916) 654-3362**

Page
L2

Dhiru Mali
Structural Engineer
California SE No. 2811

PC30N ISOLATION HANGER ATTACHMENT TO A CONCRETE SLAB WITH (1) EMBEDDED HEADED STUD



NOTE 1: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 2: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
April 6, 2009

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

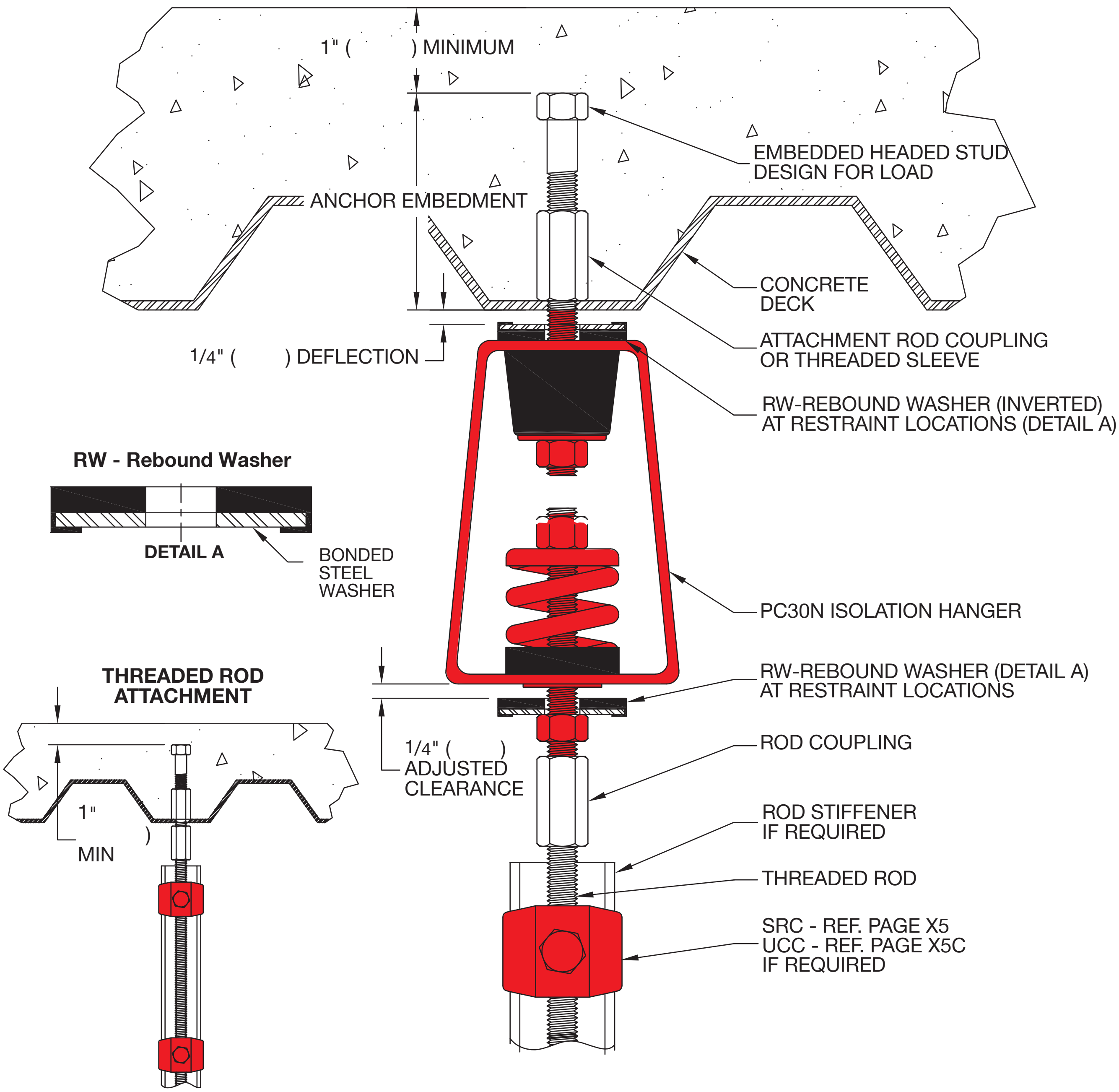
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

PC30N ISOLATION HANGER ATTACHMENT
TO A CONCRETE DECK WITH (1) EMBEDDED HEADED STUD



NOTE 1: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 2: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
April 6, 2009

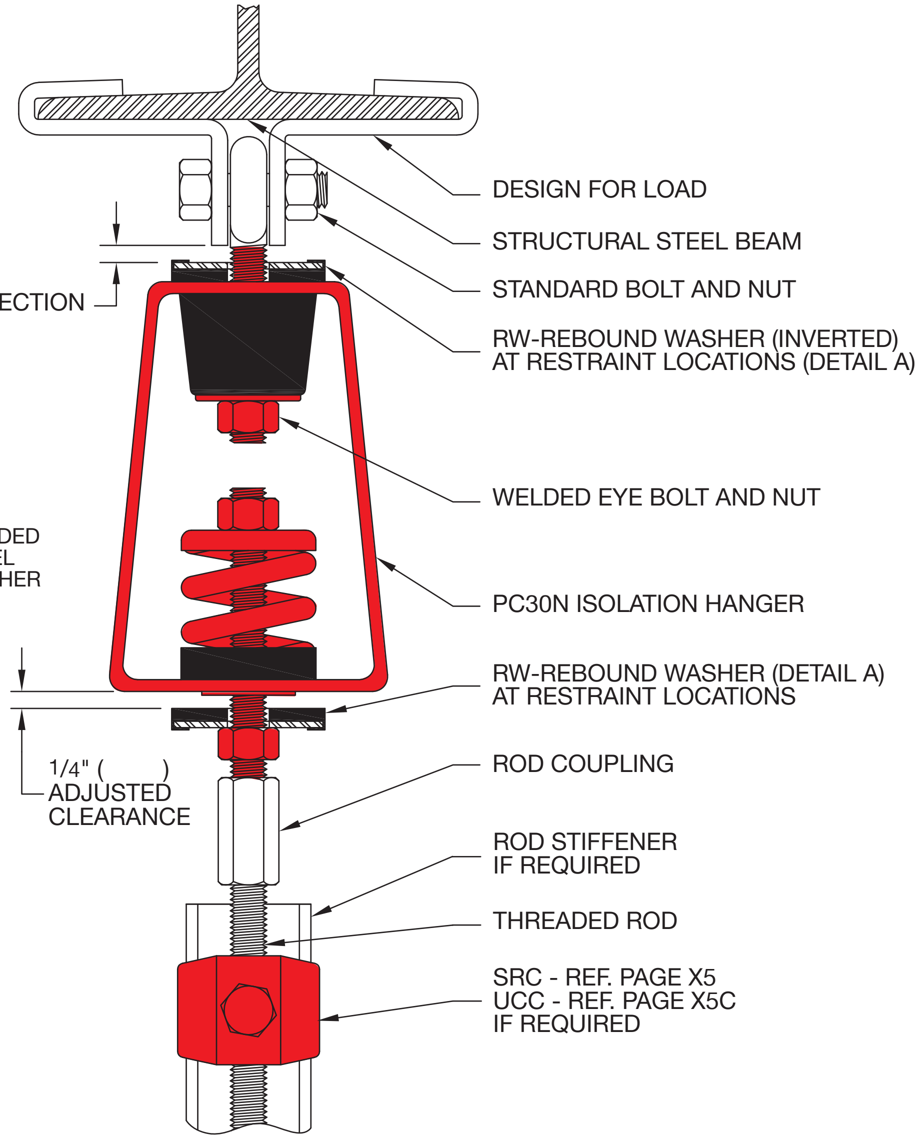
THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA

Anthony R. Pike **(916) 654-3362**

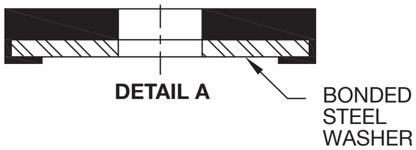
Page
L3A

Dhiru Mali
Structural Engineer
California SE No. 2811

PC30N ISOLATION HANGER ATTACHMENT TO A STRUCTURAL STEEL BEAM WITH A BEAM CLAMP

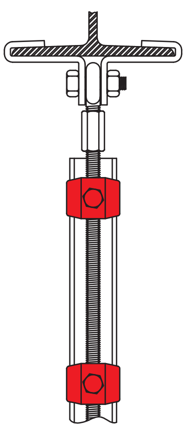


RW - Rebound Washer



DETAIL A

THREADED ROD ATTACHMENT



NOTE 1: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 2: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA

OPA-0349
on
April 6, 2009

Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

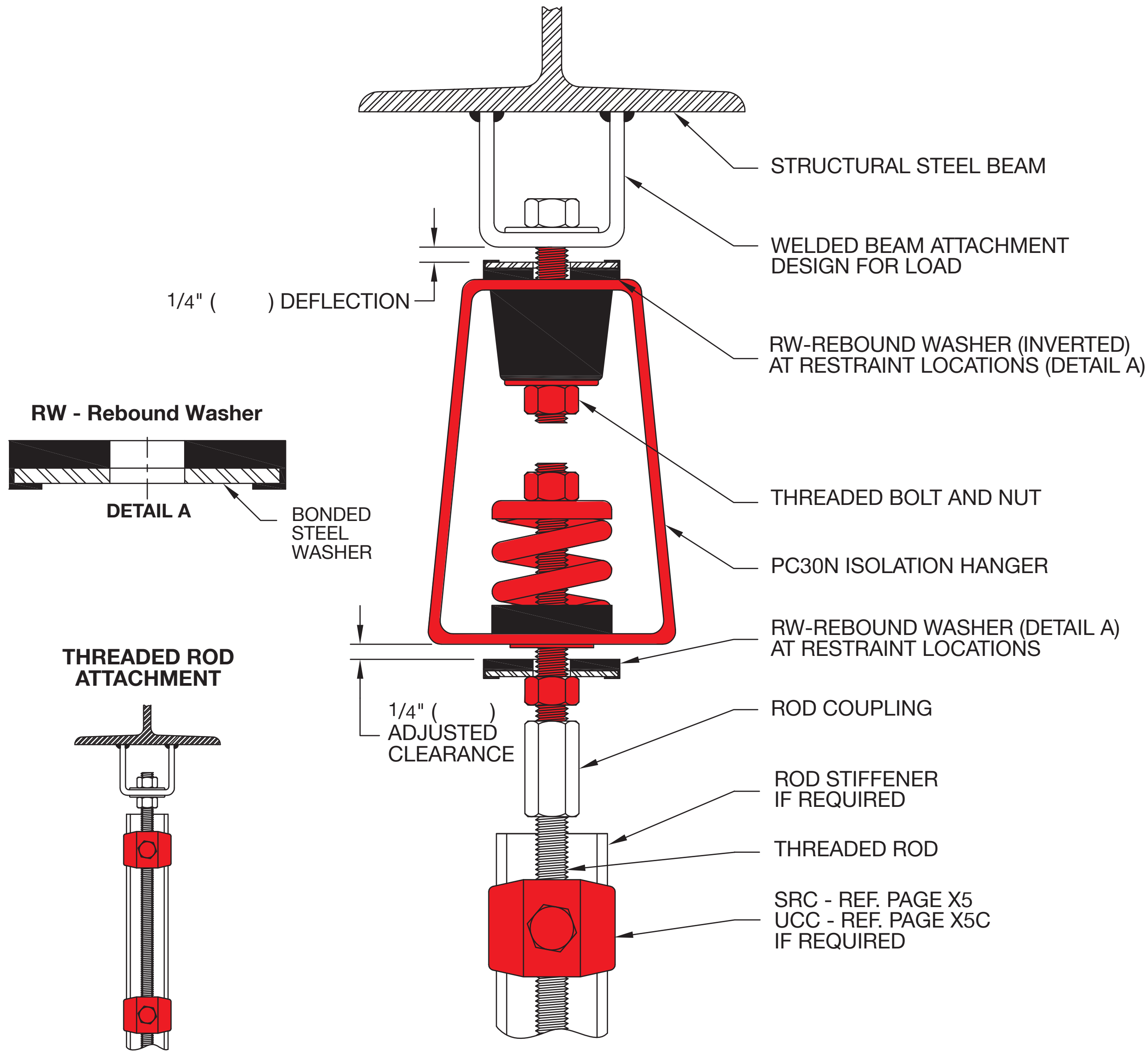
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Dhiru Mali
Structural Engineer
California SE No. 2811

PC30N ISOLATION HANGER ATTACHMENT TO A MODIFIED STRUCTURAL STEEL BEAM WITH (1) ANCHOR



NOTE 1: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 2: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

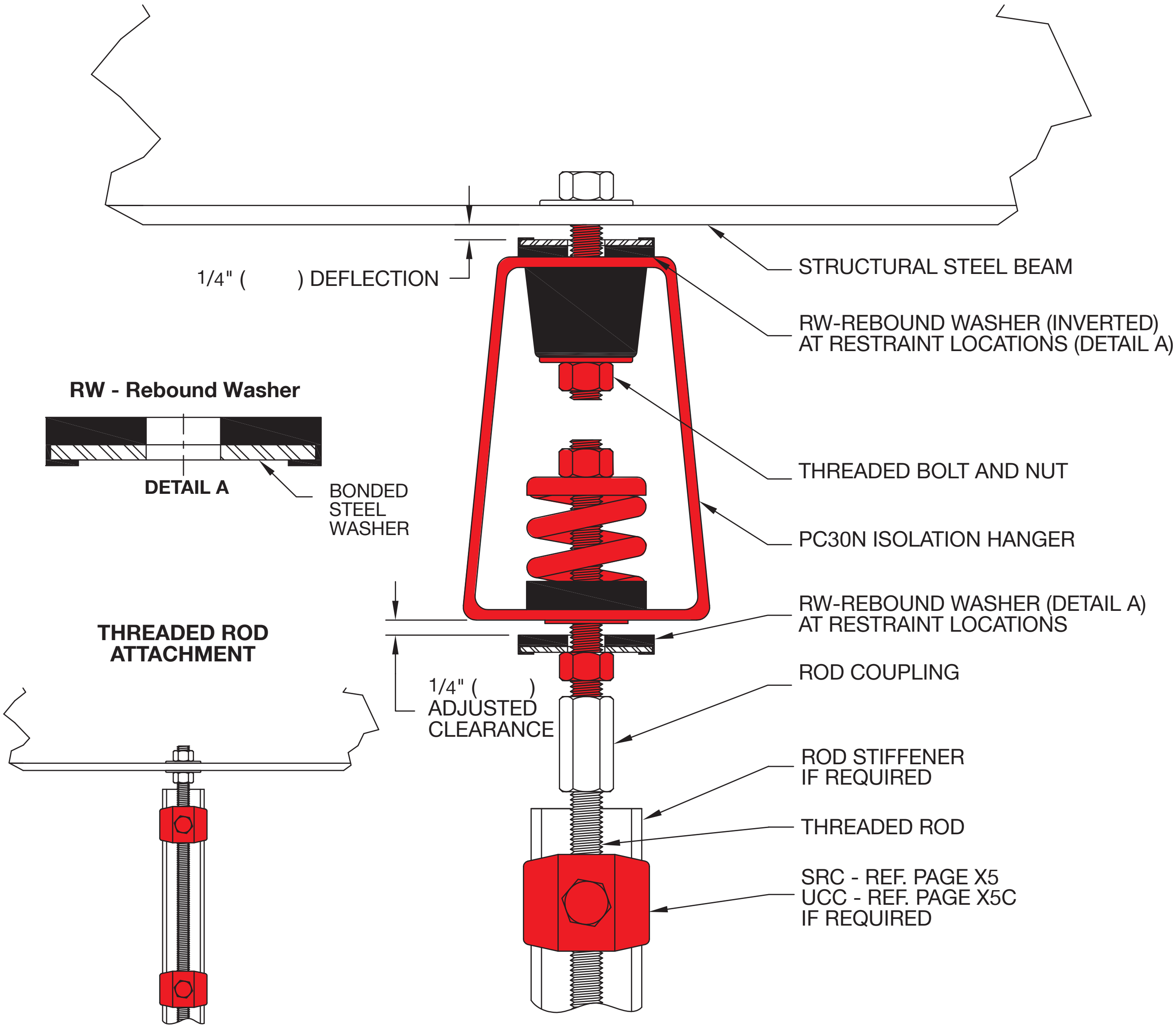
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
April 6, 2009

Anthony R. Pike
Anthony R. Pike **(916) 654-3362**

Dhiru Mali
Dhiru Mali
Structural Engineer
California SE No. 2811

PC30N ISOLATION HANGER ATTACHMENT TO A MODIFIED STRUCTURAL STEEL BEAM WITH (1) ANCHOR



NOTE 1: For tightening requirements of bolts, nuts and strut nuts reference H15.

NOTE 2: Install with hanger box snug to upper rebound washer, with washer tight to overhead surface. Upper hanger element deflects under load, leaving space on top.

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
April 6, 2009

Anthony R. Pike (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

End of
Section

PIPE WEIGHTS

STEEL PIPE

Pipe Diameter (in)	Pipe Schedule	Insulation Thickness (in)	Weight per Foot (lbs)			
			Pipe	Water	Insulation	Total
1	40	1	1.7	0.4	0.7	2.8
1 1/4	40	1	2.3	0.7	0.8	3.8
1 1/2	40	1	2.7	0.9	0.9	4.5
2	40	1	3.7	1.5	1.0	6.2
2 1/2	40	1	5.8	2.1	1.2	9.1
3	40	1	7.6	3.2	1.3	12.1
4	40	1	11.0	5.5	1.8	18.3
5	40	1 1/2	15.0	8.7	2.9	26.6
6	40	1 1/2	19.0	12.5	3.3	34.8
8	40	1 1/2	29.0	22.0	4.1	55.1
10	40	1 1/2	41.0	34.0	5.2	80.2
12	40	1 1/2	54.0	49.0	6.0	109.0
14	30	1 1/2	55.0	60.0	7.0	122.0
16	30	1 1/2	63.0	79.0	7.5	150.0
18	30	1 1/2	82.0	100.0	8.0	190.0
20	20	1 1/2	79.0	126.0	8.5	214.0
24	20	1 1/2	95.0	184.0	10.0	289.0

COPPER PIPE

Pipe Diameter (in)	Copper Type	Insulation Thickness (in)	Weight per Foot (lbs)			
			Pipe	Water	Insulation	Total
1	L	1	0.7	0.4	0.7	1.8
1 1/4	L	1	0.9	0.6	0.8	2.3
1 1/2	L	1	1.1	0.8	0.9	2.8
2	L	1	1.8	1.4	1.0	4.2
2 1/2	L	1	2.5	2.1	1.2	5.8
3	L	1	3.3	3.0	1.3	7.6
3 1/2	L	1	4.3	4.0	1.5	9.8
4	L	1	5.4	5.2	1.8	12.4
5	L	1 1/2	7.6	8.1	2.9	18.6
6	L	1 1/2	10.2	11.6	3.3	25.1
8	L	1 1/2	19.3	20.3	4.1	43.7
10	L	1 1/2	30.1	31.6	5.2	66.9
12	L	1 1/2	40.4	45.4	6.0	91.8

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

PIPE WEIGHTS

STEEL PIPE

Pipe Diameter (mm)	Pipe Schedule	Insulation Thickness (mm)	Weight per Meter (kg)			
			Pipe	Water	Insulation	Total
25	40	25	2.5	0.6	1.0	4.1
32	40	25	3.4	1.0	1.2	5.6
38	40	25	4.0	1.3	1.3	6.6
51	40	25	5.5	2.2	1.5	9.2
64	40	25	8.6	3.1	1.8	13.5
76	40	25	11.3	4.8	1.9	18.0
102	40	25	16.4	8.2	2.7	27.3
127	40	38	22.3	12.9	4.3	39.5
152	40	38	28.3	18.6	4.9	51.8
203	40	38	43.2	32.7	6.1	82.0
254	40	38	61.0	50.6	7.7	119.3
305	40	38	80.4	72.9	8.9	162.2
356	30	38	81.8	89.3	10.4	181.5
406	30	38	93.8	117.6	11.2	222.6
457	30	38	122.0	148.8	11.9	282.7
508	20	38	117.6	187.5	12.6	317.7
610	20	38	141.4	273.8	14.9	430.1

COPPER PIPE

Pipe Diameter (mm)	Copper Type	Insulation Thickness (mm)	Weight per Meter (kg)			
			Pipe	Water	Insulation	Total
25	L	25	1.0	0.6	1.0	2.6
32	L	25	1.3	0.9	1.2	3.4
38	L	25	1.6	1.2	1.3	4.1
51	L	25	2.7	2.1	1.5	6.3
64	L	25	3.7	3.1	1.8	8.6
76	L	25	4.9	4.5	1.9	11.3
89	L	25	6.4	6.0	2.2	14.6
102	L	25	8.0	7.7	2.7	18.4
127	L	38	11.3	12.1	4.3	27.7
152	L	38	15.2	17.3	4.9	37.4
203	L	38	28.7	30.2	6.1	65.0
254	L	38	44.8	47.0	7.7	99.5
305	L	38	60.1	67.3	8.9	136.3

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

PIPE WEIGHTS (continued)

SCHEDULE 40 PVC PIPE

Pipe Diameter (in)	Wall Thickness (in)	Weight per Foot (lbs)		
		Pipe	Water	Total
1/2	0.109	0.15	0.13	0.28
3/4	0.113	0.20	0.23	0.43
1	0.133	0.30	0.37	0.67
1 1/4	0.140	0.40	0.65	1.05
1 1/2	0.145	0.48	0.88	1.36
2	0.154	0.64	1.45	2.10
2 1/2	0.203	1.02	2.07	3.09
3	0.216	1.33	3.20	4.53
3 1/2	0.226	1.60	4.28	5.88
4	0.237	1.90	5.51	7.41
5	0.258	2.77	8.66	11.43
6	0.280	3.34	12.15	15.49
8	0.322	5.28	21.60	26.88
10	0.366	7.51	34.10	41.61
12	0.406	10.02	48.50	58.52

SCHEDULE 80 PVC PIPE

Pipe Diameter (in)	Wall Thickness (in)	Weight per Foot (lbs)		
		Pipe	Water	Total
1/2	0.147	0.15	0.10	0.25
3/4	0.154	0.26	0.19	0.45
1	0.179	0.38	0.31	0.69
1 1/4	0.191	0.53	0.56	1.08
1 1/2	0.200	0.64	0.77	1.40
2	0.218	0.88	1.28	2.16
2 1/2	0.276	1.35	1.83	3.18
3	0.300	1.80	2.86	4.66
3 1/2	0.318	2.20	3.85	6.05
4	0.337	2.64	4.98	7.62
5	0.375	4.13	7.87	12.00
6	0.432	5.03	11.29	16.32
8	0.500	8.02	19.80	27.82
10	0.593	11.89	31.10	42.99
12	0.687	16.37	44.00	60.37

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

PIPE WEIGHTS (continued)

SCHEDULE 40 PVC PIPE

Pipe Diameter (mm)	Wall Thickness (mm)	Weight per Meter (kg)		
		Pipe	Water	Total
13	2.8	0.22	0.19	0.41
19	2.9	0.30	0.34	0.64
25	3.4	0.45	0.55	1.00
32	3.6	0.60	0.97	1.57
38	3.7	0.71	1.31	2.02
51	3.9	0.95	2.16	3.11
64	5.2	1.52	3.08	4.60
76	5.5	1.98	4.76	6.74
89	5.7	2.38	6.37	8.75
102	6.0	2.83	8.20	11.03
127	6.6	4.12	12.89	17.01
152	7.1	4.97	18.08	23.05
203	8.2	7.86	32.14	40.00
254	9.3	11.18	50.75	61.93
305	10.3	14.91	72.18	87.06

SCHEDULE 80 PVC PIPE

Pipe Diameter (mm)	Wall Thickness (mm)	Weight per Meter (kg)		
		Pipe	Water	Total
13	3.7	0.22	0.15	0.37
19	3.9	0.39	0.28	0.57
25	4.6	0.57	0.46	1.03
32	4.9	0.79	0.83	1.62
38	5.1	0.95	1.15	2.10
51	5.5	1.31	1.90	3.21
64	7.0	2.01	2.72	4.73
76	7.6	2.68	4.26	6.94
89	8.1	3.27	5.73	9.00
102	8.6	3.93	7.41	11.34
127	9.5	6.15	11.71	17.86
152	11.0	7.49	16.80	24.29
203	12.7	11.94	29.47	41.41
254	15.1	17.69	46.28	63.97
305	17.5	24.36	65.48	89.84

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

PIPE WEIGHTS (continued)

CAST IRON PIPE

Pipe Diameter (in)	Class	Weight per Foot (lbs)		
		Pipe	Water	Total
3	150	12.2	3.7	15.9
4	150	16.4	5.7	22.1
6	150	25.7	12.8	38.5
8	150	36.7	23.1	59.8
10	150	48.7	35.5	84.2
12	150	62.9	51.0	113.9
14	150	78.8	69.3	148.1
16	150	95.0	90.3	185.3
18	150	114.7	114.0	228.7
20	150	135.9	141.5	277.4
24	150	190.4	201.0	391.4

STEEL CONDUIT

Conduit Diameter (in)	Wall Thickness (in)	Conduit Wt./Ft. (lbs)	Max. Wt./Ft. of Conduit and Conductor (lbs)	
			Lead Covered	Not Lead Covered
1/2	0.112	0.852	1.172	1.042
3/4	0.124	1.134	1.754	1.398
1	0.124	1.684	2.614	2.347
1 1/4	0.155	2.281	4.311	3.581
1 1/2	0.167	2.731	5.891	4.546
2	0.172	3.678	8.528	7.208
2 1/2	0.219	5.819	11.509	10.219
3	0.219	7.616	16.506	14.506
3 1/2	0.219	9.202	19.052	17.491
4	0.219	10.889	24.749	21.479
5	0.367	14.810	35.870	30.830
6	0.367	19.185	50.685	43.425

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

PIPE WEIGHTS (continued)

CAST IRON PIPE

Pipe Diameter (mm)	Class	Weight per Meter (kg)		
		Pipe	Water	Total
76	150	18.2	5.5	23.7
102	150	24.4	8.5	32.9
152	150	38.2	19.0	57.2
203	150	54.6	34.4	89.0
254	150	72.5	52.8	125.3
305	150	93.6	75.9	169.5
356	150	117.3	103.1	220.4
406	150	141.4	134.4	275.8
457	150	170.7	169.7	370.4
508	150	202.2	210.6	412.8
610	150	283.3	299.1	582.4

STEEL CONDUIT

Conduit Diameter (mm)	Wall Thickness (mm)	Conduit Wt./m (kg)	Max. Wt./m of Conduit and Conductor (kg)	
			Lead Covered	Not Lead Covered
13	2.8	1.27	1.74	1.55
19	3.1	1.69	2.61	2.08
25	3.1	2.51	3.89	3.49
32	3.9	3.39	6.42	5.33
38	4.2	4.06	8.77	6.77
51	4.4	5.47	12.69	10.73
64	5.6	8.66	17.13	15.21
76	5.6	11.33	24.56	21.59
89	5.6	13.69	28.35	26.03
102	5.6	16.20	36.83	31.96
127	9.3	22.04	53.38	45.88
152	9.3	28.55	75.42	64.62

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

DUCT WEIGHTS

GALVANIZED RECTANGULAR DUCT
24 Gauge - Sizes 3" x 3" to 28" x 28"
(lbs/foot)

Size (in)	3	4	5	6	7	8	9	10	12	14	16	18	20	22	24	26	28
3	1.28	1.49	1.70	1.96	2.13	2.34	2.55	2.77	3.19	3.62	4.04	4.47	4.80	5.42	5.85	6.20	6.84
4		1.70	1.96	2.13	2.34	2.55	2.77	2.98	3.40	3.82	4.26	4.69	5.10	5.64	6.07	6.50	7.07
5			2.13	2.34	2.55	2.77	2.98	3.19	3.62	4.04	4.47	4.80	5.42	5.85	6.29	6.72	7.25
6				2.55	2.77	2.98	3.19	3.40	3.82	4.26	4.69	5.10	5.64	6.01	6.50	6.94	7.40
7					2.98	3.19	3.40	3.62	4.04	4.47	4.80	5.42	5.85	6.29	6.72	7.15	7.55
8						3.40	3.62	3.82	4.26	4.69	5.10	5.64	6.07	6.50	6.94	7.37	7.80
9							3.82	4.04	4.47	4.89	5.42	5.85	6.29	6.72	7.15	7.59	8.09
10								4.26	4.69	5.10	5.64	6.07	6.50	6.94	7.37	7.80	8.24
12									5.10	5.64	6.07	6.50	6.94	7.37	7.80	8.24	8.67
14										6.07	6.50	6.94	7.37	7.80	8.24	8.67	9.10
16											6.94	7.37	7.80	8.24	8.67	9.10	9.54
18												7.80	8.64	8.67	9.10	9.54	9.97
20													8.67	9.10	9.54	9.97	10.42
22														9.54	9.97	10.42	10.85
24															10.42	10.85	11.29
26																11.29	11.72
28																	12.13

NOTES: Weights include allowance for laps and seams.
Refer to page N10 for different gauge weight conversions.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

DUCT WEIGHTS

GALVANIZED RECTANGULAR DUCT
0.61 mm Thick - Sizes 76 mm x 76 mm to 711 mm x 711 mm
(kg/m)

Size (mm)	76	102	127	152	178	203	229	254	305	356	406	457	508	559	610	660	711
76	1.90	2.22	2.53	2.92	3.17	3.48	3.79	4.12	4.75	5.39	6.01	6.65	7.14	8.07	8.71	9.23	10.2
102		2.53	2.92	3.17	3.48	3.79	4.12	4.43	5.06	5.68	6.34	6.98	7.59	8.39	9.03	9.67	10.5
127			3.17	3.48	3.79	4.12	4.43	4.75	5.39	6.01	6.65	7.14	8.07	8.71	9.36	10.0	10.8
152				3.79	4.12	4.43	4.75	5.06	5.68	6.34	6.98	7.59	8.39	8.94	9.67	10.3	11.0
178					4.43	4.75	5.06	5.39	6.01	6.65	7.14	8.07	8.71	9.36	10.0	10.6	11.2
203						5.06	5.39	5.68	6.34	6.98	7.59	8.39	9.03	9.67	10.3	11.0	11.6
229							5.82	6.01	6.65	7.28	8.07	8.71	9.36	10.0	10.6	11.3	12.0
254								6.34	6.98	7.59	8.39	9.03	9.67	10.3	11.0	11.6	12.3
305									7.59	8.39	9.03	9.67	10.3	11.0	11.6	12.3	12.9
356										9.03	9.67	10.3	11.0	11.6	12.3	12.9	13.5
406											10.3	11.0	11.6	12.3	12.9	13.5	14.2
457												11.6	12.9	12.9	13.5	14.2	14.8
508													12.9	13.5	14.2	14.8	15.5
559														14.2	14.8	15.5	16.2
610															15.5	16.2	16.8
660																16.8	17.4
711																	18.1

NOTES: Weights include allowance for laps and seams.
Refer to page N10m for different duct thickness weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
22 Gauge - Sizes 30" x 3" to 40" x 40"
(lbs/foot)

Size (in)	30	32	34	36	38	40
3	8.6	8.8	9.1	9.3	9.9	10.5
4	8.8	9.1	9.3	9.6	10.5	11.0
5	9.1	9.3	9.6	9.8	10.8	11.3
6	9.3	9.6	9.8	10.1	11.1	11.6
7	9.6	9.8	10.1	10.3	11.3	11.8
8	10.1	10.6	11.1	11.6	11.8	12.1
9	10.3	10.8	11.3	11.8	12.1	12.3
10	10.6	11.1	11.6	12.1	12.3	12.6
12	11.1	11.6	12.1	12.3	12.6	13.1
14	11.6	12.1	12.6	13.1	13.4	13.6
16	12.1	12.6	13.1	13.6	13.9	14.1
18	12.6	13.1	13.6	14.1	14.4	14.6
20	13.1	13.6	14.1	14.6	14.8	15.0
22	13.6	14.1	14.6	15.1	15.4	15.6
24	14.1	14.6	15.1	15.6	15.8	16.1
26	14.6	15.1	15.6	16.1	16.4	16.6
28	15.1	15.6	16.1	16.6	16.9	17.1
30	15.6	16.1	16.6	17.1	17.4	17.7
32		16.6	17.1	17.6	17.9	18.1
34			17.6	18.1	18.3	18.5
36				18.6	18.9	19.1
38					19.1	19.5
40						20.9

NOTES: Weights include allowance for laps and seams.
Refer to page N10 for different gauge weight conversions.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
0.76 mm Thick - Sizes 762 mm x 76 mm to 1016 mm x 1016 mm
(kg/m)

Size (mm)	762	813	864	914	965	1016
76	12.8	13.1	13.5	13.8	14.7	15.6
102	13.1	13.5	13.8	14.3	15.6	16.4
127	13.5	13.8	14.3	14.6	16.1	16.8
152	13.8	14.3	14.6	15.0	16.5	17.3
178	14.3	14.6	15.0	15.3	16.8	17.6
203	15.0	15.8	16.5	17.3	17.6	18.0
229	15.3	16.1	16.8	17.6	18.0	18.3
254	15.8	16.5	17.3	18.0	18.3	18.8
305	16.5	17.3	18.0	18.3	18.8	19.5
356	17.3	18.0	18.8	19.5	19.9	20.2
406	18.0	18.8	19.5	20.2	20.7	21.0
457	18.8	19.5	20.2	21.0	21.4	21.7
508	19.5	20.2	21.0	21.7	22.0	22.3
559	20.2	21.0	21.7	22.5	22.9	23.2
610	21.0	21.7	22.5	23.2	23.5	24.0
660	21.7	22.5	23.2	24.0	24.4	24.7
711	22.5	23.2	24.0	24.7	25.1	25.4
762	23.2	24.0	24.7	25.4	25.9	26.3
813		24.7	25.4	26.2	26.6	26.9
864			26.2	26.9	27.2	27.5
914				27.7	28.1	28.4
965					28.4	29.0
1016						31.1

NOTES: Weights include allowance for laps and seams.
Refer to page N10m for different thickness weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide
Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
20 Gauge - Sizes 142" x 3" to 58" x 58"
(lbs/foot)

Size (in)	42	44	46	48	50	52	54	56	58
3	13.3	13.9	14.5						
4	13.6	14.2	14.8						
5	13.9	14.5	15.1						
6	14.2	14.8	15.4	16.0	16.6	17.2	17.7	18.4	18.9
7	14.5	15.1	15.7						
8	14.8	15.4	16.0	16.6	17.2	17.7	18.4	18.9	19.6
9	15.4	15.7	16.3						
10	15.7	16.0	16.6	17.2	17.7	18.4	18.9	19.6	20.1
12	16.0	16.6	17.2	17.7	18.4	18.9	19.6	20.1	20.7
14	16.6	17.2	17.7	18.4	18.9	19.6	20.1	20.7	21.3
16	17.2	17.7	18.4	18.9	19.6	20.1	20.7	21.3	21.9
18	17.7	18.4	18.9	19.6	20.1	20.7	21.3	21.9	22.5
20	18.4	18.9	19.5	20.1	20.7	21.3	21.9	22.5	23.1
22	18.9	19.5	20.1	20.7	21.3	21.9	22.5	23.1	23.7
24	19.5	20.1	20.7	21.3	21.9	22.5	23.1	23.7	24.3
26	20.1	20.7	21.3	21.9	22.5	23.1	23.7	24.3	24.9
28	20.7	21.3	21.8	22.5	23.1	23.7	24.3	24.9	25.3
30	21.3	21.8	22.5	23.1	23.7	24.3	24.9	25.3	26.1
32	21.5	22.5	23.0	23.7	24.3	24.9	25.3	26.1	26.7
34	22.5	23.0	23.6	24.3	24.9	25.3	26.1	26.7	27.3
36	23.0	23.6	24.8	24.9	25.3	26.1	26.7	27.3	27.8
38	23.6	24.8	25.4	25.3	26.1	26.7	27.3	27.8	28.4
40	24.8	25.4	26.0	26.1	26.7	27.3	27.8	28.4	29.0
42	25.4	26.0	26.5	26.7	27.3	27.8	28.4	29.0	29.6
44		26.5	27.1	27.3	27.8	28.4	29.0	29.6	30.2
46			27.7	27.8	28.4	29.0	29.6	30.2	30.8
48				28.4	29.0	29.6	30.2	30.8	31.4
50					29.6	30.2	30.8	31.4	32.0
52						30.8	31.4	32.0	32.6
54							32.0	32.6	33.2
56								33.2	33.6
58									34.4

NOTES: Weights include allowance for laps and seams.
Refer to page N10 for different gauge weight conversions.

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
0.91 mm Thick - Sizes 1067 mm x 76 mm to 1473 mm x 1473 mm
(kg/m)

Size (mm)	1067	1118	1168	1219	1270	1321	1372	1422	1473
76	19.8	20.7	21.6						
102	20.2	21.1	22.0						
127	20.7	21.6	22.5						
152	21.1	22.0	22.9	23.8	24.7	25.6	26.3	27.4	28.1
178	21.6	22.5	23.4						
203	22.0	22.9	23.8	24.7	25.6	26.3	27.4	28.1	29.2
229	22.9	23.4	24.3						
254	23.4	23.8	24.7	25.6	26.3	27.4	28.1	29.2	29.9
305	23.8	24.7	25.6	26.3	27.4	28.1	29.2	29.9	30.8
356	24.7	25.6	26.3	27.4	28.1	29.2	29.9	30.8	31.7
406	25.6	26.3	27.4	28.1	29.2	29.9	30.8	31.7	32.6
457	26.3	27.4	28.1	29.2	29.9	30.8	31.7	32.6	33.5
508	27.4	28.1	29.2	29.9	30.8	31.7	32.6	33.5	34.4
559	28.1	29.2	29.9	30.8	31.7	32.6	33.5	34.4	35.3
610	29.2	29.9	30.8	31.7	32.6	33.5	34.4	35.3	36.2
660	29.9	30.8	31.7	32.6	33.5	34.4	35.3	36.2	37.1
711	30.8	31.7	32.6	33.5	34.4	35.3	36.2	37.1	37.7
762	31.7	32.6	33.5	34.4	35.3	36.2	37.1	37.7	38.8
813	32.6	33.5	34.4	35.3	36.2	37.1	37.7	38.8	39.7
864	33.5	34.4	35.3	36.2	37.1	37.7	38.8	39.7	40.6
914	34.4	35.3	36.2	37.1	37.7	38.8	39.7	40.6	41.4
965	35.5	36.2	37.1	37.7	38.8	39.7	40.6	41.4	42.3
1016	36.2	37.1	37.7	38.8	39.7	40.6	41.4	42.3	43.2
1067	37.1	37.7	38.8	39.7	40.6	41.4	42.3	43.2	44.0
1118		38.8	39.7	40.6	41.4	42.3	43.2	44.0	44.9
1168			40.6	41.4	42.3	43.2	44.0	44.9	45.8
1219				42.3	43.2	44.0	44.9	45.8	46.7
1270					44.0	44.9	45.8	46.7	47.6
1321						45.8	46.7	47.6	48.5
1372							47.6	48.5	49.4
1422								49.4	50.0
1473									51.2

NOTES: Weights include allowance for laps and seams.
Refer to page N10m for different thickness weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

GALVANIZED RECTANGULAR DUCT
18 Gauge - Sizes 60" x 6" to 78" x 58"
(lbs/foot)

Size (in)	60	62	64	66	68	70	72	74	76	78
6	25.4	26.2	27.0	27.7	28.5	29.3	30.0	30.8	31.6	32.5
8	26.2	27.0	27.7	28.5	29.3	30.0	30.8	31.6	32.5	33.1
10	27.0	27.7	28.5	29.3	30.0	30.8	31.6	32.5	33.1	33.9
12	27.7	28.5	29.3	30.0	30.8	31.6	32.5	33.1	33.9	34.6
14	28.5	29.3	30.0	30.8	31.6	32.5	33.1	33.9	34.6	35.4
16	29.3	30.0	30.8	31.6	32.5	33.1	33.9	34.6	35.4	36.2
18	30.0	30.8	31.6	32.5	33.1	33.9	34.6	35.4	36.2	37.0
20	30.8	31.6	32.5	33.1	33.9	34.6	35.4	36.2	37.0	37.7
22	31.6	32.5	33.1	33.9	34.6	35.4	36.2	37.0	37.7	38.5
24	32.5	33.1	33.9	34.6	35.4	36.2	37.0	37.7	38.5	39.3
26	33.1	33.9	34.6	35.4	36.2	37.0	37.7	38.5	39.3	40.0
28	33.9	34.6	35.4	36.2	37.0	37.7	38.5	39.3	40.0	40.8
30	34.6	35.4	36.2	37.0	37.7	38.5	39.3	40.0	40.8	41.6
32	35.4	36.2	37.0	37.7	38.5	39.3	40.0	40.8	41.6	42.4
34	36.2	37.0	37.7	38.5	39.3	40.0	40.8	41.6	42.4	43.1
36	37.0	37.7	38.5	39.3	40.0	40.8	41.6	42.4	43.1	43.9
38	37.7	38.5	39.3	40.0	40.8	41.6	42.4	43.1	43.9	44.6
40	38.5	39.3	40.0	40.8	41.6	42.4	43.1	43.9	44.6	45.4
42	39.3	40.0	40.8	41.6	42.4	43.1	43.9	44.6	45.4	46.2
44	40.0	40.8	41.6	42.4	43.1	43.9	44.6	45.4	46.2	47.0
46	40.8	41.6	42.4	43.1	43.9	44.6	45.4	46.2	47.0	47.7
48	41.6	42.4	43.1	43.9	44.6	45.4	46.2	47.0	47.7	48.5
50	42.4	43.1	43.9	44.6	45.4	46.2	47.0	47.7	48.5	49.3
52	43.1	43.9	44.6	45.4	46.2	47.0	47.7	48.5	49.3	50.0
54	43.9	44.6	45.4	46.2	47.0	47.7	48.5	49.3	50.0	50.8
56	44.6	45.4	46.2	47.0	47.7	48.5	49.3	50.0	50.8	51.6
58	45.4	46.2	47.0	47.7	48.5	49.3	50.0	50.8	51.6	52.4

NOTES: Weights include allowance for laps and seams.
Refer to page N10 for different gauge weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive, Hauppauge, NY 11788, 631/348-0282, FAX 631/348-0279
2101 W. Crescent Ave., Suite D, Anaheim, CA 92801, 714/535-2727, FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
1.21mm Thick - Sizes 1524 mm x 152 mm to 1981 mm x 1473 mm
(kg/m)

Size (mm)	1524	1575	1626	1676	1727	1778	1829	1880	1930	1981
152	37.8	39.0	40.2	41.2	42.4	43.6	44.6	45.8	47.0	48.4
203	39.0	40.2	41.2	42.4	43.6	44.6	45.8	47.0	48.4	49.3
254	40.2	41.2	42.4	43.6	44.6	45.8	47.0	48.4	49.3	50.4
305	41.2	42.4	43.6	44.8	45.8	47.0	48.4	49.3	50.4	51.5
356	42.4	43.6	44.8	45.8	47.0	48.4	49.3	50.4	51.5	52.7
406	43.6	44.8	45.8	47.0	48.4	49.3	50.4	51.5	52.7	53.9
457	44.8	45.8	47.0	48.4	49.3	50.4	51.5	52.7	53.9	55.1
508	45.8	47.0	48.4	49.3	50.4	51.5	52.7	53.9	55.1	56.1
559	47.0	48.4	49.3	50.4	51.5	52.7	53.9	55.1	56.1	57.3
610	48.4	49.3	50.4	51.5	52.7	53.9	55.1	56.1	57.3	58.5
660	49.3	50.4	51.5	52.7	53.9	55.1	56.1	57.3	58.5	59.5
711	50.4	51.5	52.7	53.9	55.1	56.1	57.3	58.5	59.5	60.7
762	51.5	52.7	53.9	55.1	56.1	57.3	58.5	59.5	60.7	61.9
813	52.7	53.9	55.1	56.1	57.3	58.5	59.5	60.7	61.9	63.1
864	53.9	55.1	56.1	57.3	58.5	59.5	60.7	61.9	63.1	64.1
914	55.1	56.1	57.3	58.5	59.5	60.7	61.9	63.1	64.1	65.3
965	56.1	57.3	58.5	59.5	60.7	61.9	63.1	64.1	65.3	66.4
1016	57.3	58.5	59.5	60.7	61.9	63.1	64.1	65.3	66.4	67.6
1067	58.5	59.5	60.7	61.9	63.1	64.1	65.3	66.4	67.6	68.8
1118	59.5	60.7	61.9	63.1	64.1	65.3	66.4	67.6	68.8	69.6
1168	60.7	61.9	63.1	64.1	65.3	66.4	67.6	68.8	69.9	71.0
1219	61.9	63.1	64.1	65.3	66.4	67.6	68.8	69.9	71.0	72.2
1270	63.1	64.1	65.3	66.4	67.6	68.8	69.9	71.0	72.2	73.4
1321	64.1	65.3	66.4	67.6	68.8	69.9	71.0	72.2	73.4	74.4
1372	65.3	66.4	67.6	68.8	69.9	71.0	72.2	73.4	74.4	75.6
1422	66.4	67.6	68.8	69.9	71.0	72.2	73.4	74.4	75.6	76.8
1473	67.6	68.8	69.9	71.0	72.2	73.4	74.4	75.6	76.8	78.0

NOTES: Weights include allowance for laps and seams.
Refer to page N10m for different thickness weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
18 Gauge - Sizes 80" x 6" to 98" x 58"
(lbs/foot)

Size (in)	80	82	84	86	88	90	92	94	96	98
6	33.1	33.9	34.6	35.4	36.2	37.0	37.7	38.5	39.3	40.0
8	33.9	34.6	35.4	36.2	37.0	37.7	38.5	39.3	40.0	40.8
10	34.6	35.4	36.2	37.0	37.7	38.5	39.3	40.0	40.8	41.6
12	35.4	36.2	37.0	37.7	38.5	39.3	40.0	40.8	41.6	42.4
14	36.2	37.0	37.7	38.5	39.3	40.0	40.8	41.6	42.2	43.1
16	37.0	37.7	38.5	39.3	40.0	40.8	41.6	42.4	43.1	43.9
18	37.7	38.5	39.3	40.0	40.8	41.6	42.4	43.1	43.9	44.6
20	38.5	39.3	40.0	40.8	41.6	42.4	43.1	43.9	44.6	45.4
22	39.3	40.0	40.8	41.6	42.4	43.1	43.9	44.6	45.4	46.2
24	40.0	40.8	41.6	42.4	43.1	43.9	44.6	45.4	46.2	47.0
26	40.8	41.6	42.4	43.1	43.9	44.6	45.4	46.2	47.0	47.7
28	41.6	42.4	43.1	43.9	44.6	45.4	46.2	47.0	47.7	48.5
30	42.4	43.1	43.9	44.6	45.4	46.2	47.0	47.7	48.5	49.3
32	43.1	43.9	44.6	45.4	46.2	47.0	47.7	48.5	49.3	50.0
34	43.9	44.6	45.4	46.2	47.0	47.7	48.5	49.3	50.0	50.8
36	44.6	45.4	46.2	47.0	47.7	48.5	49.3	50.0	50.8	51.6
38	45.4	46.2	47.0	47.7	48.5	49.3	50.0	50.8	51.6	52.4
40	46.2	47.0	47.7	48.5	49.3	50.0	50.8	51.6	52.4	53.1
42	47.0	47.7	48.5	49.3	50.0	50.8	51.6	52.4	53.1	53.9
44	47.7	48.5	49.3	50.0	50.8	51.6	52.4	53.1	53.9	54.5
46	48.5	49.3	50.0	50.8	51.6	52.4	53.1	53.9	54.5	55.5
48	49.3	50.0	50.8	51.6	52.4	53.1	53.9	54.5	55.5	56.3
50	50.0	50.8	51.6	52.4	53.1	53.9	54.5	55.5	56.3	57.0
52	50.8	51.6	52.4	53.1	53.9	54.5	55.5	56.3	57.0	57.7
54	51.6	52.4	53.1	53.9	54.5	55.5	56.3	57.0	57.7	58.5
56	52.4	53.1	53.9	54.5	55.5	56.3	57.0	57.7	58.5	59.4
58	53.1	53.9	54.5	55.5	56.3	57.0	57.7	58.5	59.4	60.0

NOTES: Weights include allowance for laps and seams.
Refer to page N10 for different thickness weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive, Hauppauge, NY 11788, 631/348-0282, FAX 631/348-0279
2101 W. Crescent Ave., Suite D, Anaheim, CA 92801, 714/535-2727, FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com
Dhiru Mali
Structural Engineer
California SE No. 2811

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
1.21 mm Thick - Sizes 2032 mm x 152 mm to 2489 mm x 1473 mm
(kg/m)

Size (mm)	2032	2083	2134	2184	2235	2286	2337	2388	2184	2489
152	49.3	50.4	51.5	52.7	53.9	55.1	56.1	57.3	58.5	59.5
203	50.4	51.5	52.7	53.9	55.1	56.1	57.3	58.5	59.5	60.7
254	51.5	52.7	53.9	55.1	56.1	57.3	58.5	59.5	60.7	61.9
305	52.7	53.9	55.1	56.1	57.3	58.5	59.5	60.7	61.9	63.1
356	53.9	55.1	56.1	57.3	58.5	59.5	60.7	61.9	63.1	64.1
406	55.1	56.1	57.3	58.5	59.5	60.7	61.9	63.1	64.1	65.3
457	56.1	57.3	58.5	59.5	60.7	61.9	63.1	64.1	65.3	66.4
508	57.3	58.5	59.5	60.7	61.9	63.1	64.1	65.3	66.4	67.6
559	58.5	59.5	60.7	61.9	63.1	64.1	65.3	66.4	67.6	68.8
610	59.5	60.7	61.9	63.1	64.1	65.3	66.4	67.6	68.8	69.9
660	60.7	61.9	63.1	64.1	65.3	66.4	67.6	68.8	69.9	71.0
711	61.9	63.1	64.1	65.3	66.4	67.6	68.8	69.9	71.0	72.2
762	63.1	64.1	65.3	66.4	67.6	68.8	69.9	71.0	72.2	73.4
813	64.1	65.3	66.4	67.6	68.8	69.9	71.0	72.2	73.4	74.4
864	65.3	66.4	67.6	68.8	69.9	71.0	72.2	73.4	74.4	75.6
914	66.4	67.6	68.8	69.9	71.0	72.2	73.4	74.4	75.6	76.8
965	67.6	68.8	69.9	71.0	72.2	73.4	74.4	75.6	76.8	78.0
1016	68.8	69.9	71.0	72.2	73.4	74.4	75.6	76.8	78.0	79.0
1067	69.9	71.0	72.2	73.4	74.4	75.6	76.8	78.0	79.0	80.2
1118	71.0	72.2	73.4	74.4	75.6	76.8	78.0	79.0	80.2	81.1
1168	72.2	73.4	74.4	75.6	76.8	78.0	79.0	80.2	81.1	82.6
1219	73.4	74.4	75.6	76.8	78.0	79.0	80.2	81.1	82.6	83.8
1270	74.4	75.6	76.8	78.0	79.0	80.2	81.1	82.6	83.8	84.8
1321	75.6	76.8	78.0	79.0	80.2	81.1	82.6	83.8	84.8	85.9
1372	76.8	78.0	79.0	80.2	81.1	82.6	83.8	84.8	85.9	87.1
1422	78.0	79.0	80.2	81.1	82.6	83.8	84.8	85.9	87.1	88.4
1473	79.0	80.2	81.1	82.6	83.8	84.8	85.9	87.1	88.4	89.3

NOTES: Weights include allowance for laps and seams.
Refer to page N10m for different thickness weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
18 Gauge - Sizes 60" x 60" to 78" x 78"
(lbs/foot)

Size (in)	60	62	64	66	68	70	72	74	76	78
60	46.2	47.0	47.7	48.5	49.3	50.0	50.8	51.6	52.4	53.1
62		47.7	48.5	49.3	50.0	50.8	51.6	52.4	53.1	53.9
64			49.3	50.0	50.8	51.6	52.4	53.1	53.9	54.6
66				50.8	51.6	52.4	53.1	53.9	54.6	55.5
68					52.4	53.1	53.9	54.6	55.5	56.3
70						53.9	54.6	55.5	56.3	57.0
72							55.5	56.3	57.0	57.7
74								57.0	57.7	58.5
76									58.5	59.4
78										60.0

NOTES: Weights include allowance for laps and seams.
Refer to page N10 for different gauge weight conversions.

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
1.21mm Thick - Sizes 1524mm x 1524mm to 1981mm x 1981mm
(kg/m)

Size (mm)	1524	1575	1626	1676	1727	1778	1829	1880	1930	1981
1524	68.8	69.9	71.0	72.3	73.4	74.4	75.6	76.8	78.0	79.0
1575		71.0	72.3	73.4	74.4	75.6	76.8	78.0	79.0	80.2
1626			73.4	74.4	75.6	76.8	78.0	79.0	80.2	81.3
1676				75.6	76.8	78.0	79.0	80.2	81.3	82.6
1727					78.0	79.0	80.2	81.3	82.6	83.8
1778						80.2	81.3	82.6	83.8	84.8
1829							82.6	83.8	84.8	85.9
1880								84.8	85.9	87.1
1930									87.1	88.4
1981										89.3

NOTES: Weights include allowance for laps and seams.
Refer to page N10m for different thickness weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
18 Gauge - Sizes 80" x 60" to 98" x 98"
(lbs/foot)

Size (in)	80	82	84	86	88	90	92	94	96	98
60	53.9	54.6	55.5	56.3	57.0	57.7	58.5	59.4	60.0	60.8
62	54.6	55.5	56.3	57.0	57.7	58.5	59.4	60.0	60.8	61.6
64	55.5	56.3	57.0	57.7	58.5	59.4	60.0	60.8	61.6	62.4
66	56.3	57.0	57.7	58.5	59.4	60.0	60.8	61.6	62.4	63.1
68	57.0	57.7	58.5	59.4	60.0	60.8	61.6	62.4	63.1	63.9
70	57.7	58.5	59.4	60.0	60.8	61.6	62.4	63.1	63.9	64.6
72	58.5	59.4	60.0	60.8	61.6	62.4	63.1	63.9	64.6	65.5
74	59.4	60.0	60.8	61.6	62.4	63.1	63.9	64.6	65.5	66.3
76	60.0	60.8	61.6	62.4	63.1	63.9	64.6	65.5	66.3	67.0
78	60.8	61.6	62.4	63.1	63.9	64.6	65.5	66.3	67.0	67.7
80	61.6	62.4	63.1	63.9	64.6	65.5	66.3	67.0	67.7	68.5
82		63.1	63.9	64.6	65.5	66.3	67.0	67.7	68.5	69.3
84			64.6	65.5	66.3	67.0	67.7	68.5	69.3	70.0
86				66.3	67.0	67.7	68.5	69.3	70.0	70.7
88					67.7	68.5	69.3	70.0	70.7	71.5
90						69.3	70.0	70.7	71.5	72.4
92							70.7	71.5	72.4	73.1
94								72.4	73.1	73.9
96									73.9	74.6
98										75.5

NOTES: Weights include allowance for laps and seams.
Refer to page N10 for different gauge weight conversions.

DUCT WEIGHTS (continued)

GALVANIZED RECTANGULAR DUCT
1.21 mm Thick - Sizes 2032 mm x 1524 mm to 2489 mm x 2489 mm
(kg/m)

Size (mm)	2032	2083	2134	2184	2235	2286	2337	2388	2438	2489
1524	80.2	81.3	82.6	83.8	84.8	85.9	87.1	88.4	89.3	90.5
1575	81.3	82.6	83.8	84.8	85.9	87.1	88.4	89.3	90.5	91.7
1626	82.6	83.8	84.8	85.9	87.1	88.4	89.3	90.5	91.7	92.9
1676	83.8	84.8	85.9	87.1	88.4	89.3	90.5	91.7	92.9	93.9
1727	84.8	85.9	87.1	88.4	89.3	90.5	91.7	92.9	93.9	95.1
1778	85.9	87.1	88.4	89.3	90.5	91.7	92.9	93.9	95.1	96.1
1829	87.1	88.4	89.3	90.5	91.7	92.9	93.9	95.1	96.1	97.5
1880	88.4	89.3	90.5	91.7	92.9	93.9	95.1	96.1	97.5	98.7
1930	89.3	90.5	91.7	92.9	93.9	95.1	96.1	97.5	98.7	99.7
1981	90.5	91.7	92.9	93.9	95.1	96.1	97.5	98.7	99.7	100.7
2032	91.7	92.9	93.9	95.1	96.1	97.5	98.7	99.7	100.7	101.9
2083		93.9	95.1	96.1	97.5	98.7	99.7	100.7	101.9	103.1
2134			96.1	97.5	98.7	99.7	100.7	101.9	103.1	104.2
2184				98.7	99.7	100.7	101.9	103.1	104.2	105.2
2235					100.7	101.9	103.1	104.2	105.2	106.4
2286						103.1	104.2	105.2	106.4	107.7
2337							105.2	106.4	107.7	108.8
2388								107.7	108.8	110.0
2438									110.0	111.0
2489										112.4

NOTES: Weights include allowance for laps and seams.
Refer to page N10m for different thickness weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

DUCT WEIGHTS (continued)

GALVANIZED ROUND DUCT
30 to 24 Gauge - Sizes 3" to 84"
(lbs/foot)

Dia. (in)	30 Gauge Seam Gauge		28 Gauge Seam Gauge		26 Gauge Seam Gauge		24 Gauge Seam Gauge	
	Spiral	Long.	Spiral	Long.	Spiral	Long.	Spiral	Long.
3	0.6	0.60	0.7	0.71	0.9	0.82	1.0	1.05
4	0.8	0.77	0.9	0.92	1.2	1.06	1.3	1.60
5	0.9	0.94	1.1	1.12	1.4	1.30	1.6	1.66
6	1.1	1.11	1.4	1.32	1.7	4.54	2.0	1.96
7	1.3	1.28	1.6	1.53	1.9	1.77	2.4	2.26
8	1.5	1.46	1.9	1.73	2.1	2.01	2.6	2.57
9	1.6	1.63	2.0	1.94	2.3	2.25	3.0	2.87
10	1.9	1.80	2.2	2.14	2.5	2.48	3.3	3.17
11	2.0	1.97	2.4	2.35	2.8	2.72	3.6	3.48
12	2.2	2.14	2.6	2.55	3.0	2.96	3.8	3.78
14		2.49	3.0	2.96	3.5	3.43	4.4	4.38
16		2.83	3.4	3.37	4.0	3.91	5.1	4.99
18		3.18	3.8	3.78	4.4	4.38	5.7	5.59
20			4.2	4.19	5.0	4.86	6.4	6.20
22			4.7	4.60	5.4	5.33	7.0	6.80
24			5.2	5.01	6.0	5.80	7.8	7.41
26					6.6	6.28	8.5	8.02
28					7.0	6.75	8.9	8.62
30					7.1	7.23	9.3	9.23
32						7.70	10.1	9.83
34						8.18		10.44
36						8.65	11.5	11.05
40						9.60	12.8	12.26
44						10.55	14.4	13.47
48						11.50	15.4	14.68
50							16.0	15.28
54								16.50
56								17.10
60								18.31
72								21.95
84								25.58

NOTES: Weights include allowance for laps and seams.
Refer to page N10 for different gauge weight conversions.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

DUCT WEIGHTS (continued)

GALVANIZED ROUND DUCT
0.30 to 0.61 mm Thick - Sizes 76 mm to 2134 mm Diameter
(kg/m)

Dia. (in)	0.30mm Seam Gauge		0.38mm Seam Gauge		0.45mm Seam Gauge		0.61mm Seam Gauge	
	Spiral	Long.	Spiral	Long.	Spiral	Long.	Spiral	Long.
76	0.9	0.89	1.0	1.06	1.3	1.22	1.5	1.56
102	1.2	1.15	1.3	1.37	1.8	1.58	1.9	2.38
127	1.3	1.40	1.6	1.67	2.1	1.93	2.4	2.47
152	1.6	1.65	2.1	1.96	2.5	6.76	3.0	2.92
178	1.9	1.90	2.4	2.28	2.8	2.63	3.6	3.36
203	2.2	2.17	2.8	2.57	3.1	2.99	3.9	3.82
229	2.4	2.43	3.0	2.89	3.4	3.35	4.5	4.27
254	2.8	2.68	3.3	3.18	3.7	3.69	4.9	4.72
279	3.0	2.93	3.9	3.50	4.2	4.05	5.4	5.18
305	3.3	3.18	3.9	3.79	4.5	4.40	5.7	5.63
356		3.71	4.5	4.40	5.2	5.10	6.5	6.52
406		4.21	5.1	5.01	6.0	5.82	7.6	7.43
457		4.73	5.7	5.63	6.5	6.52	8.5	8.32
508			6.3	6.24	7.4	7.23	9.5	9.23
559			7.0	6.85	8.0	7.93	10.4	10.1
610			7.7	7.46	8.9	8.63	11.6	11.0
660					9.8	9.34	12.6	11.9
711					10.4	10.0	13.2	12.8
762					10.6	10.8	13.8	13.7
813						11.5	15.0	14.6
864						12.2		15.5
914						12.9	17.1	16.4
1016						14.3	19.0	18.2
1118						15.7	21.4	20.0
1219						17.1	22.9	21.8
1270							23.8	22.7
1372								24.6
1422								25.4
1524								27.2
1829								32.7
2134								38.1

NOTES: Weights include allowance for laps and seams.
Refer to page N10m for different gauge weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

DUCT WEIGHTS (continued)

GALVANIZED ROUND DUCT
22 to 16 Gauge - Sizes 3" to 84" Diameter
(lbs/foot)

Dia. (in)	22 Gauge Seam Gauge Spiral	22 Gauge Seam Gauge Long.	20 Gauge Seam Gauge Spiral	20 Gauge Seam Gauge Long.	18 Gauge Seam Gauge Spiral	18 Gauge Seam Gauge Long.	16 Gauge Seam Gauge Spiral	16 Gauge Seam Gauge Long.
3	1.2	1.28	1.3	1.51	2.0	1.97		2.42
4	1.5	1.65	1.8	1.94	2.6	2.53		3.12
5	2.0	2.02	2.3	2.38	3.2	3.10		3.81
6	2.4	2.39	2.6	2.81	3.7	3.66	5.0	4.51
7	2.8	2.75	3.3	3.24	4.3	4.23	5.8	5.20
8	3.2	3.12	3.7	3.68	4.8	4.79	6.7	5.90
9	3.5	3.49	4.0	4.11	5.3	5.36	7.5	6.60
10	4.0	3.86	4.7	4.54	6.0	5.92	8.3	7.29
11	4.4	4.23	5.1	4.98	6.7	6.49	9.1	7.98
12	4.7	4.60	5.2	5.41	7.2	7.05	10.0	8.68
14	5.4	5.33	6.4	6.28	8.3	8.19	11.7	10.8
16	6.2	6.07	7.3	7.15	9.4	9.32	13.4	11.47
18	6.9	6.80	8.1	8.01	10.5	10.45	15.0	12.86
20	7.8	7.54	9.0	8.88	11.7	11.58	16.7	14.25
22	8.4	8.28	9.9	9.75	12.9	12.71	18.4	15.84
24	9.5	9.01	11.0	10.83	14.4	13.84	20.0	17.04
26	10.3	9.75	12.2	11.48	15.8	14.97	21.7	18.43
28	11.0	10.49	12.9	12.35	16.5	16.10	23.4	19.82
30	11.8	11.22	13.6	13.22	17.2	17.23	25.0	21.21
32	12.6	11.96	14.6	14.09	18.9	18.36	26.7	22.60
34		12.70		14.95		19.49		24.00
36	14.2	13.43	16.6	15.82	21.5	20.62	30.0	25.38
40	15.5	14.91	18.5	17.56	23.8	22.88	33.4	28.17
44	17.4	16.38	20.5	19.29	26.7	25.15	36.7	30.96
48	18.7	17.85	22.2	21.03	29.2	27.41	40.1	33.74
50	19.5	18.59	23.3	21.89	30.0	28.54	41.7	35.13
54		20.06		23.63		30.80	45.1	37.91
56		20.79		24.50		31.93	46.7	39.31
60		22.27		26.23		34.19	50.1	42.09
72		26.69		31.44		40.98		50.44
84		31.11		36.64		47.76		58.79

NOTES: Weights include allowance for laps and seams.
Refer to page N10 for different gauge weight conversions.

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

DUCT WEIGHTS (continued)

GALVANIZED ROUND DUCT
0.76 to 1.52 mm Thick - Sizes 76 mm to 2134 mm Diameter
(kg/m)

Dia. (mm)	0.76mm Seam Gauge		0.91mm Seam Gauge		1.21mm Seam Gauge		1.52mm Seam Gauge	
	Spiral	Long.	Spiral	Long.	Spiral	Long.	Spiral	Long.
76	1.8	1.90	1.9	2.25	3.0	2.93		3.60
102	2.2	2.46	2.7	2.89	3.9	3.77		4.64
127	3.0	3.01	3.4	3.54	4.8	4.61		5.67
152	3.6	3.56	3.9	4.18	5.5	5.45	7.4	6.71
178	4.2	4.09	4.9	4.82	6.4	6.29	8.6	7.74
203	4.8	4.64	5.5	5.48	7.1	7.13	10.0	8.78
229	5.2	5.19	6.0	6.12	7.9	7.98	11.2	9.82
254	6.0	5.74	7.0	6.76	8.9	8.81	12.4	10.85
279	6.5	6.29	7.6	7.41	10.0	9.66	13.5	11.88
305	7.0	6.85	7.7	8.05	10.7	10.49	15.0	12.92
356	8.0	7.93	9.5	9.35	12.4	12.19	17.4	15.00
406	9.2	9.03	10.9	10.64	14.0	13.87	19.9	17.07
457	10.3	10.12	12.1	11.92	15.6	15.55	22.3	19.14
508	11.6	11.22	13.4	13.21	17.4	17.23	24.9	21.21
559	12.5	12.32	14.7	14.51	19.2	18.91	27.4	23.57
610	14.1	13.41	16.4	16.12	21.4	20.60	30.0	25.36
660	15.3	14.51	18.2	17.08	23.5	22.28	32.3	27.43
711	16.4	15.61	19.2	18.38	24.6	23.96	34.8	29.50
762	17.6	16.70	20.2	19.67	25.6	25.64	37.2	31.56
813	18.8	17.80	21.7	20.97	28.1	27.32	39.7	33.63
864		18.90		22.25		29.00		35.72
914	21.1	19.99	24.7	23.54	32.0	30.69	44.6	37.77
1016	23.1	22.19	27.5	26.13	35.4	34.05	49.7	41.92
1118	25.9	24.38	30.5	28.71	39.7	37.43	54.6	46.07
1219	27.8	26.56	33.0	31.30	43.5	40.79	59.7	50.21
1270	29.0	27.66	34.7	32.58	44.6	42.47	62.1	52.28
1372		29.85		35.17		45.84	67.1	56.42
1422		30.94		36.46		47.52	69.5	58.50
1524		33.14		39.03		50.88	74.6	62.64
1829		39.72		46.79		60.98		75.06
2134		46.30		54.53		71.07		87.49

NOTES: Weights include allowance for laps and seams.
Refer to page N10m for different gauge weight conversions.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

DUCT WEIGHTS (continued)

GALVANIZED SHEET METAL CONVERSION CHARTS

Table A - Converting Lighter Gauges to Heavier Gauges

Gauge	26	24	22	20	18	16
28	1.16	1.48	1.85	2.12	2.76	3.40
26		1.27	1.55	1.83	2.38	2.93
24			1.22	1.43	1.87	2.30
22				1.18	1.53	1.89
20					1.30	1.60
18						1.23

Table B - Converting Heavier Gauges to Lighter Gauges

Gauge	26	24	22	20	18	16
28	0.86	0.67	0.55	0.47	0.36	0.29
26		0.78	0.65	0.55	0.42	0.34
24			0.82	0.70	0.53	0.43
22				0.85	0.65	0.53
20					0.77	0.63
18						0.81

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

DUCT WEIGHTS (continued)

GALVANIZED SHEET METAL CONVERSION CHARTS

Table A - Converting to Thicker Sheet Metal Duct

Thick (mm)	0.45	0.61	0.76	0.91	1.21	1.52
0.38	1.16	1.48	1.85	2.12	2.76	3.40
0.45		1.27	1.55	1.83	2.38	2.93
0.61			1.22	1.43	1.87	2.30
0.76				1.18	1.53	1.89
0.91					1.30	1.60
1.21						1.23

Table B - Converting to Thinner Sheet Metal Duct

Thick (mm)	0.45	0.61	0.76	0.91	1.21	1.52
0.38	0.86	0.67	0.55	0.47	0.36	0.29
0.45		0.78	0.65	0.55	0.42	0.34
0.61			0.82	0.70	0.53	0.43
0.76				0.85	0.65	0.53
0.91					0.77	0.63
1.21						0.81

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

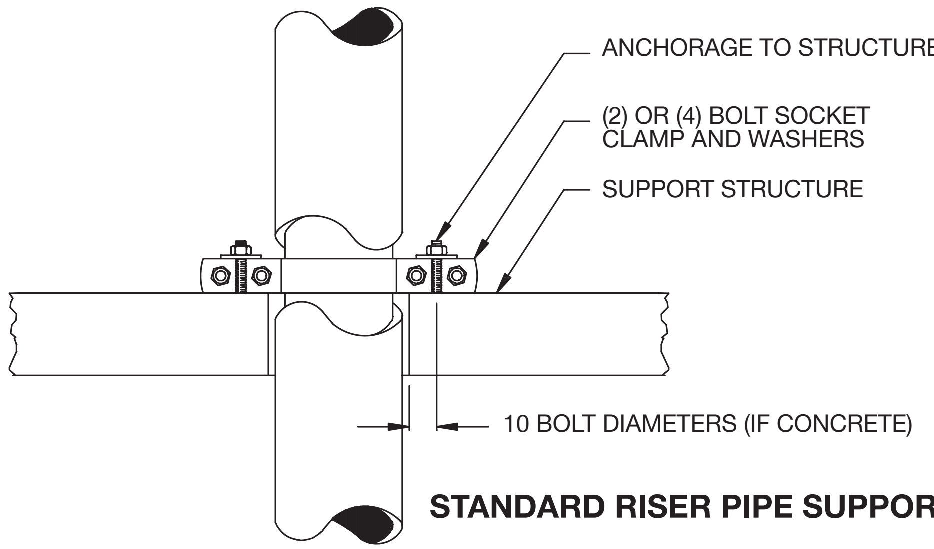
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

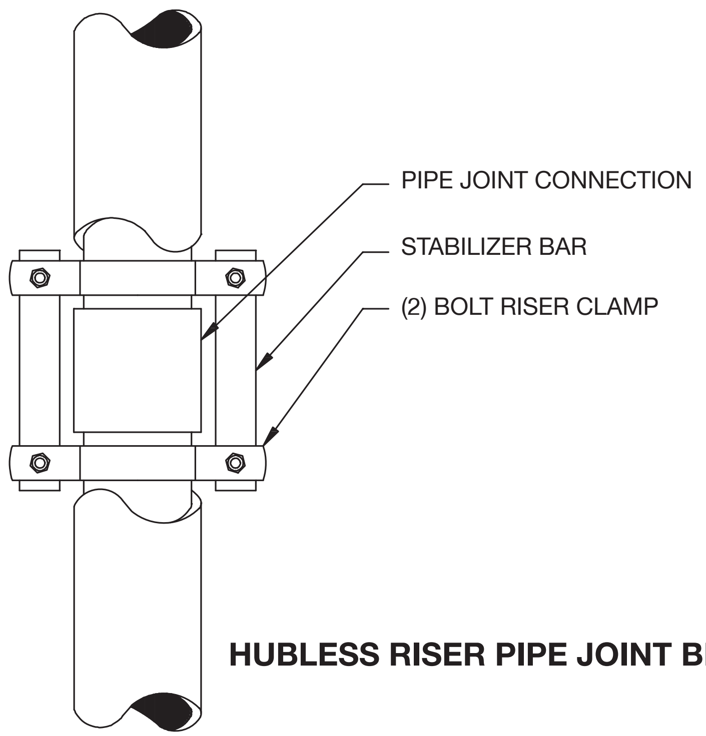
A P P R O V E D
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

RISER PIPING



STANDARD RISER PIPE SUPPORT



HUBLESS RISER PIPE JOINT BRACE

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

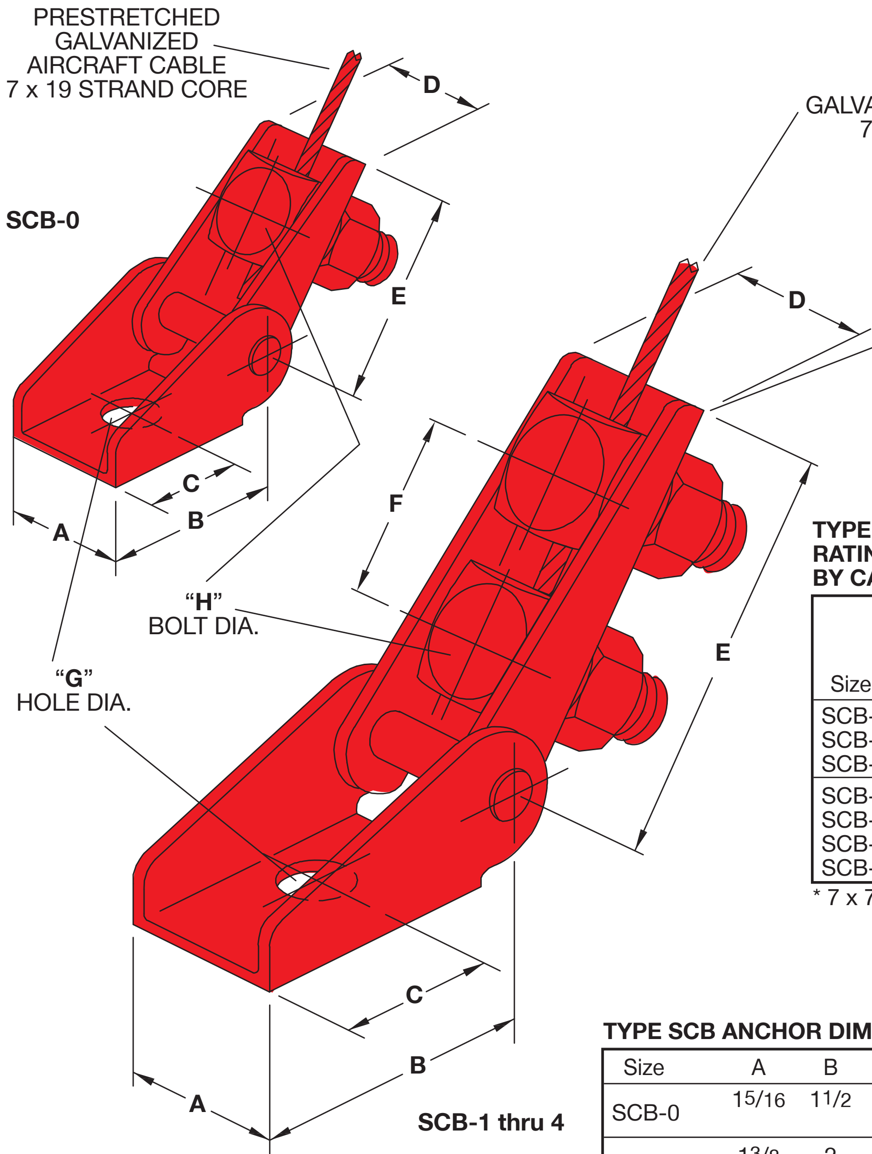
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

End of Section

SCB - SEISMIC CABLE BRACE



TYPE SCB ASSEMBLY RATINGS AS CONTROLLED BY CABLE BREAKING STRENGTH

Size	Cable Diameter (in) ( )	OSHP Max. Ratings (lbs) ( )	Min. Torque on Bolts (ft/lbs) ( )
SCB-0	1/16*	235	30
SCB-0	3/32*	460	30
SCB-0	3/32	500	30
SCB-1	1/8	975	25
SCB-2	3/16	2050	45
SCB-3	1/4	3150	55
SCB-4	3/8	6875	200

* 7 x 7 Strand Core

TYPE SCB ANCHOR DIMENSIONS (inches) ( )

Size	A	B	C	D	E	F	G	H
SCB-0	15/16	11/2	3/4	15/16	13/4	–	7/16	1/2
SCB-1	13/8	2	1	15/16	33/8	11/2	9/16	1/2
SCB-2	15/8	23/4	13/8	13/16	43/8	13/4	11/16	5/8
SCB-3	2	31/2	13/4	17/16	43/4	2	13/16	3/4
SCB-4	31/8	5	21/2	115/16	53/4	21/4	15/16	1

NOTE: Bracket Material is A36 Steel

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

OPA-0349
on
December 22, 2006

Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

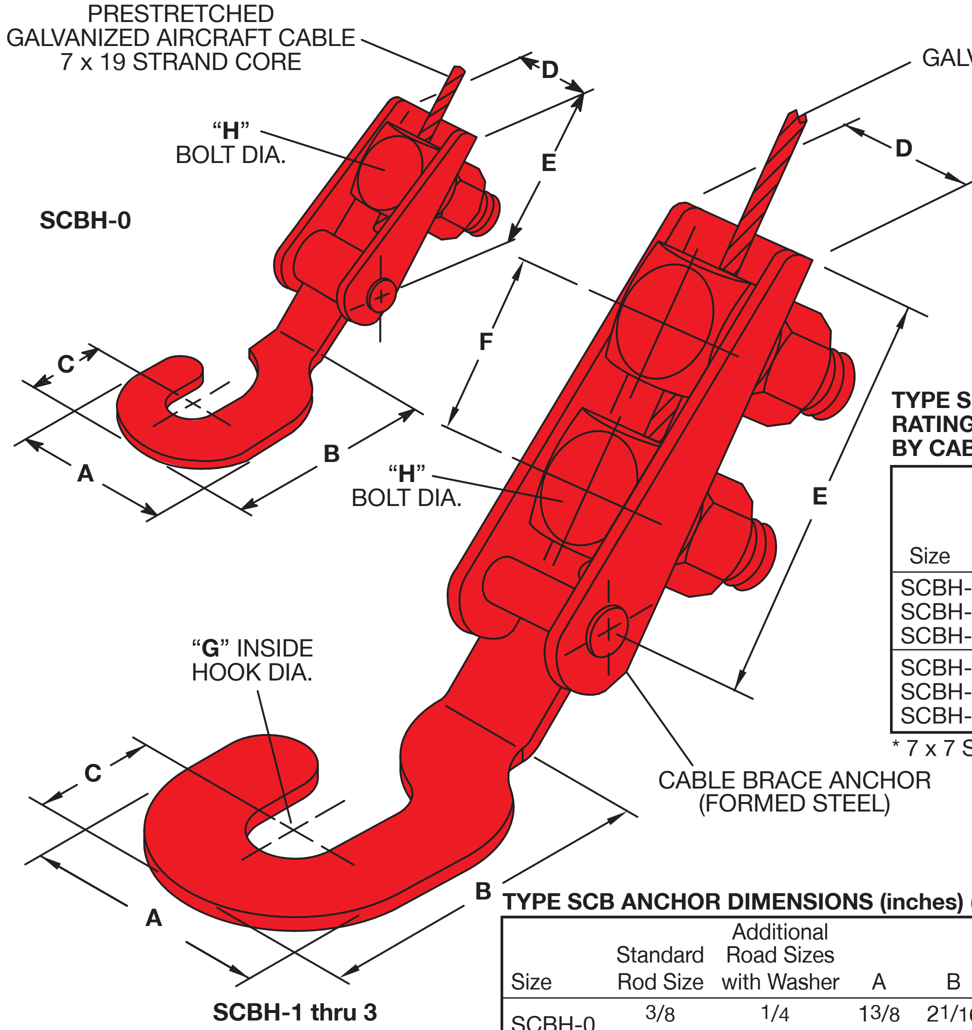
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Dhiru Mali
Structural Engineer
California SE No. 2811

SCBH - SEISMIC CABLE BRACE WITH HOOK ATTACHMENT



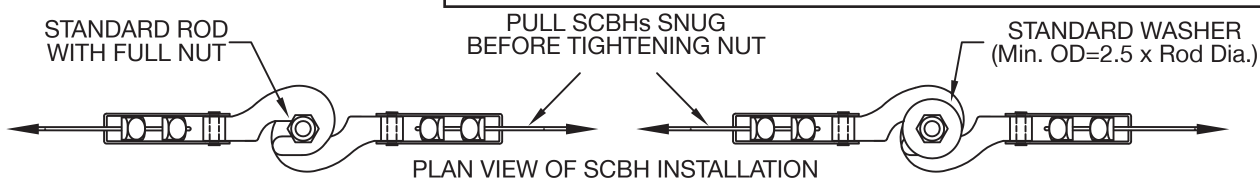
TYPE SCBH ASSEMBLY RATINGS AS CONTROLLED BY CABLE BREAKING STRENGTH

Size	Cable Diameter (in) ( )	OSHPD Max. Ratings (lbs) ( )	Min. Torque on Bolts (ft/lbs) ( )
SCBH-0	1/16*	235	30
SCBH-0	3/32*	460	30
SCBH-0	3/32	500	30
SCBH-1	1/8	975	25
SCBH-2	3/16	2050	45
SCBH-3	1/4	3150	55

* 7 x 7 Strand Core

TYPE SCB ANCHOR DIMENSIONS (inches) ( )

Size	Standard Rod Size	Additional Road Sizes with Washer	A	B	C	D	E	F	G	H
SCBH-0	3/8	1/4	1 3/8	2 1/16	11/16	15/16	1 3/4	–	3/8	1/2
SCBH-1	5/8	3/8 – 1/2	1 7/8	2 3/8	1	1	3 3/8	1 1/2	5/8	1/2
SCBH-2	7/8	1/2 – 3/4	2 7/8	3 3/4	1 3/8	1 3/16	4 3/8	1 3/4	7/8	5/8
SCBH-3	1 1/8	5/8 – 1	3 1/2	4 3/4	1 3/4	1 7/16	4 3/4	2	1 1/8	3/4



PLAN VIEW OF SCBH INSTALLATION

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

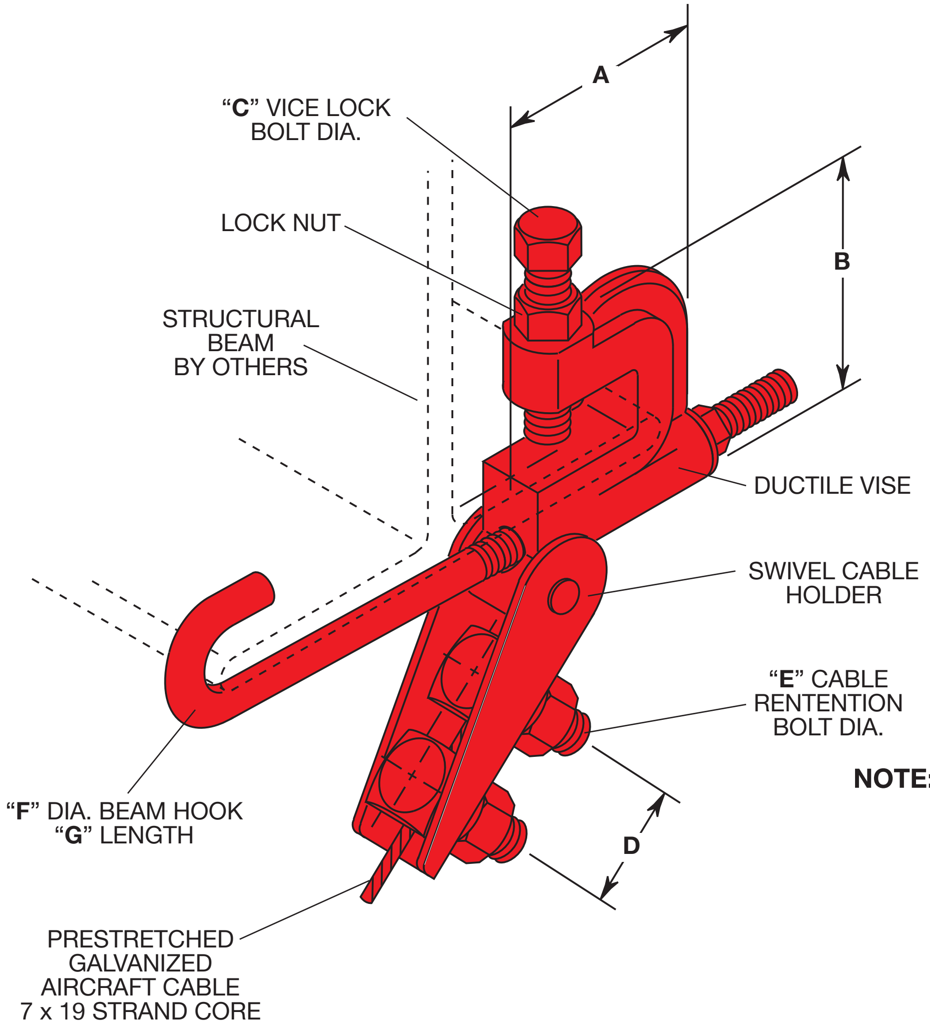
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
December 22, 2006

Anthony R. Pike (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

SCBV - SEISMIC CABLE BRACE
WITH BEAM CLAMP ATTACHMENT



TYPE SCBV ASSEMBLY RATINGS AS CONTROLLED BY CABLE BREAKING STRENGTH

Size	Cable Diameter (in) ( )	OSHPD Max. Ratings (lbs) ( )	Min. Torque on Bolts (ft/lbs) ( )
SCBV-1	1/8	975	25
SCBV-2	3/16	2050	45
SCBV-3	1/4	3150	55

NOTE: Not to be used as a vertical hanger for equipment, ductwork or piping. To be used as a seismic restraint only.
The structural engineer of record must check the structural steel for the seismic loads from the seismic restraint system.

TYPE SCBV ANCHOR DIMENSIONS (inches) ( )

Size	Width	VICE JAW Clearance	Depth	A	B	C	D	E	F	G	Beam Flange Width Range
SCBV-1	1 7/8	2 3/8	7/16	1 7/8	2 3/8	7/16	1 1/2	1/2	3/8	10	3 1/2 - 8 1/2
SCBV-2	2 7/8	3	1/2	2 7/8	3	1/2	1 3/4	5/8	3/8	12	3 1/2 - 10
SCBV-3	3 3/8	3 3/4	5/8	3 3/8	3 3/4	5/8	2	3/4	1/2	12	4 - 9 1/2

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

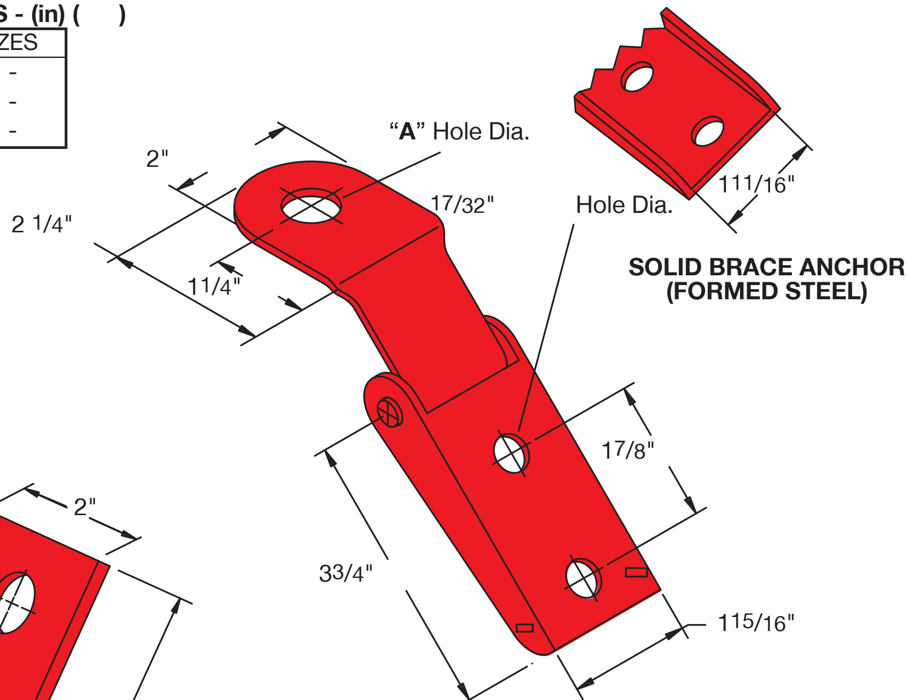
Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SSB(U) & SSBS - SEISMIC SOLID BRACE

TYPE SSBS ANCHORS DIMENSIONS - (in) ( )

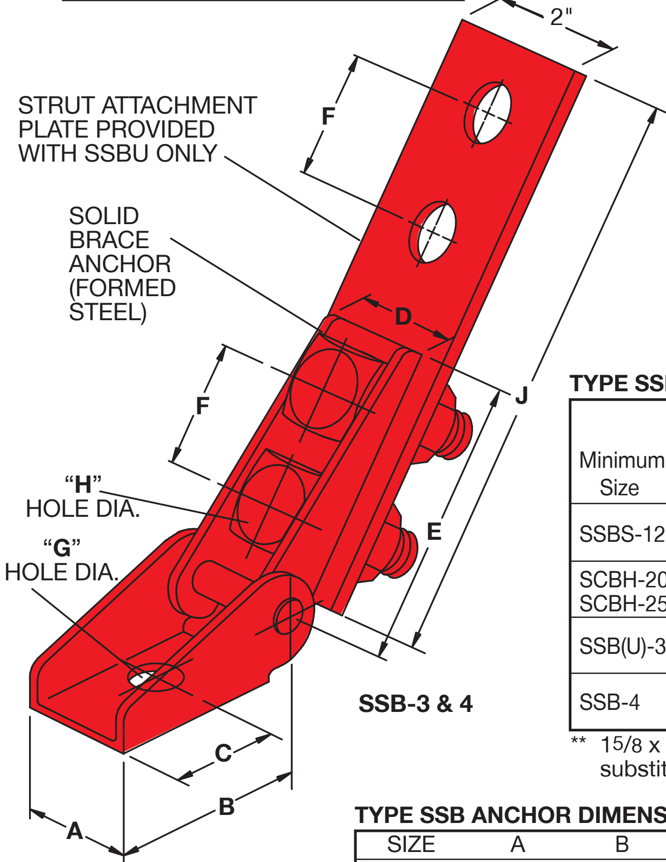
SIZE	A	FOR ROD SIZES	
SSBS-12	17/32	3/8 - 1/2	-
SSBS-20	25/32	5/8 - 3/4	-
SSBS-25	1 1/32	7/8 - 1	-



SSBS-12, 20 & 25

TYPE SSB(U) & SSBS ANCHOR RATINGS

Size	OSHPD Max. Ratings (lbs) ( )	Min. Torque on Bolts (ft/lbs) ( )
SSBS-12	1250	50
SSBS-20, 25	3000	50
SSBS(U)-3	5000	55
SSB-4	8750	200



SSB-3 & 4

TYPE SSB & SSBS ANCHOR RATINGS WITH STEEL BRACE MEMBERS

Minimum Size	OSHPD Max. Ratings (lbs) ( )	Minimum Steel Brace Member - (in) (at Maximum Brace Length		
		5' - 0"	9' - 6"	14' - 6"
SSBS-12	1250	1 5/8 x 1 5/8 Strut 41 x 41 Strut	1 5/8 x 1 5/8 Strut 41 x 41 Strut	1 5/8 x 3 1/4 Strut 41 x 83 Strut
SCBH-20 SCBH-25	3000	1 5/8 x 1 5/8 Strut 41 x 41 Strut	1 5/8 x 3 1/4 Strut 41 x 83 Strut	N/A
SSB(U)-3	5000	2 x 2 x 1/4 Angle** 51 x 51 x 6 Angle**	3 x 3 x 1/4 Angle** 76 x 76 x 6 Angle**	4 x 4 x 1/4 Angle 102 x 102 x 6 Angle
SSB-4	8125	3 x 3 x 1/4 Angle 76 x 76 x 6 Angle	5 x 5 x 1/4 Angle 102 x 102 x 6 Angle	5 x 5 x 3/8 Angle 127 x 127 x 10 Angle

** 1 5/8 x 3 3/4 x 12ga formed strut may be substituted using the Type SSBU component.

TYPE SSB ANCHOR DIMENSIONS (inches) ( )

SIZE	A	B	C	D	E	F	G	H	J
SSB(U)-3	2	3 1/2	1 3/4	1 7/16	4 3/4	2	13/16	3/4	9
SSB-4	3 1/8	5	2 1/2	1 15/16	5 3/4	2 1/4	15/16	1	——

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

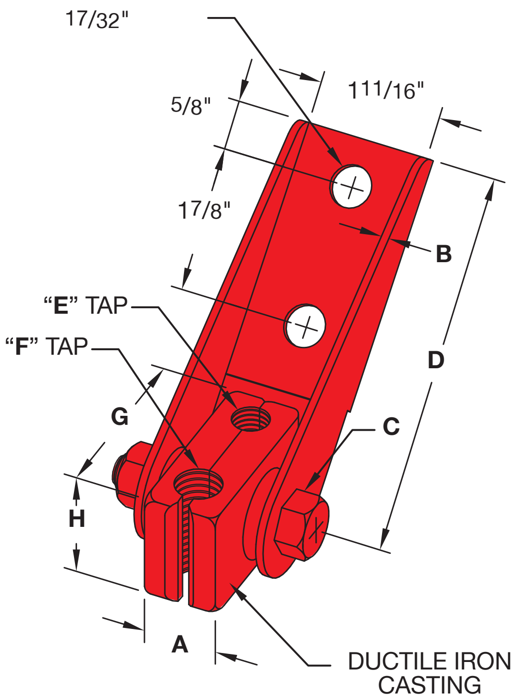
Bill Staehlin (916) 654-3362

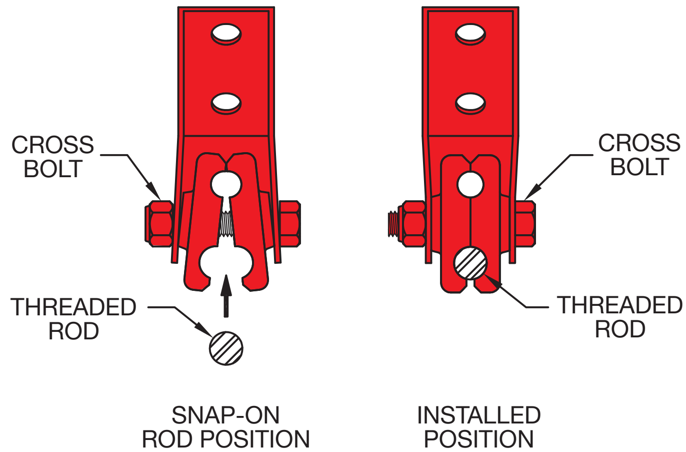
Page

X4

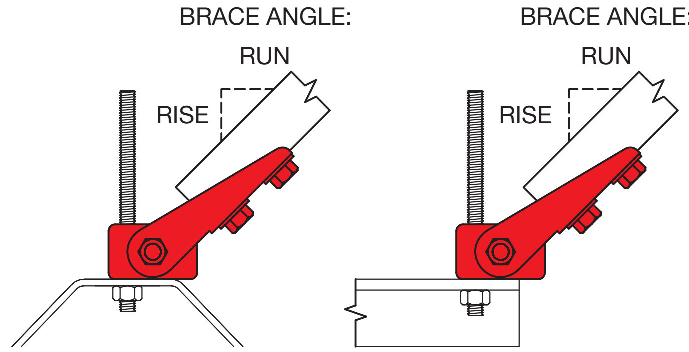
Dhiru Mali
Structural Engineer
California SE No. 2811

SSRF - SEISMIC SOLID RETROFIT BRACE





INSTALLATION PROCEDURE



INSTALL SSRF TIGHT TO CLEVIS OR TRAPEZE MEMBER

TORQUE NUT ON THREADED ROD AND STRUT NUTS PER H15

TYPE SSRF ASSEMBLY RATING

Size	Rod Size (in)	Allowable Load at 45° (lbs) ( )	Cross Bolt Torque (ft/lbs) ( )
SSRF-1	3/8 1/2	820 1460	20
SSRF-2	5/8 3/4	2080 2500	49

TYPE SSRF ANCHOR DIMENSIONS (inches) ( )

SIZE	A	B	C	D	E	F	G	H
SSRF-1	3/4	1/8	3/8-16 UNC x 2 1/2	4 5/8	3/8-16 UNC	1/2-13 UNC	2	1 1/4
SSRF-2	1 1/8	1/8	1/2-13 UNC x 2 1/2	5	5/8-11 UNC	3/4-10 UNC	2 5/8	1 5/8

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA

OPA-0349
on
January 16, 2009

Anthony R. Pike

Anthony R. Pike **(916) 654-3362**

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

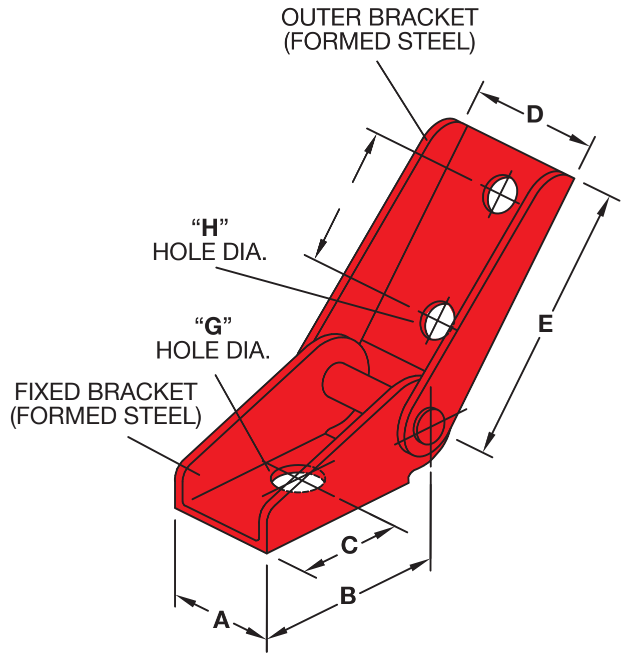
Dhiru Mali

Dhiru Mali
Structural Engineer
California SE No. 2811

SSB-1 & SSB-2 - SEISMIC SOLID BRACE

TYPE SSB ANCHOR RATINGS

Size	OSHPD Maximum Ratings (lbs) ( )	Brace Attachment Bolt Size (in) ( )	Minimum Torque on Bolts (ft/lbs) ( )
SSB-1	1500	1/2	50
SSB-2	3000	1/2	50



SSB-1, 2

TYPE SSB MATERIALS

Size	Fixed Bracket Thickness (in) (au e)	Outer Bracket Thickness (in) (au e)	Brace Pin Diameter (in) ( )
SSB-1	0.092	0.120	3/8
SSB-2	0.135	0.120	3/8

TYPE SSB ANCHOR DIMENSIONS (inches) ( )

SIZE	A	B	C	D	E	F	G	H
SSB-1	1 3/8	2	1	1 15/16	3 3/4	1 7/8	9/16	17/32
SSB-2	1 5/8	2 3/4	1 3/8	1 15/16	3 3/4	1 7/8	11/16	17/32

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA
EUREKA

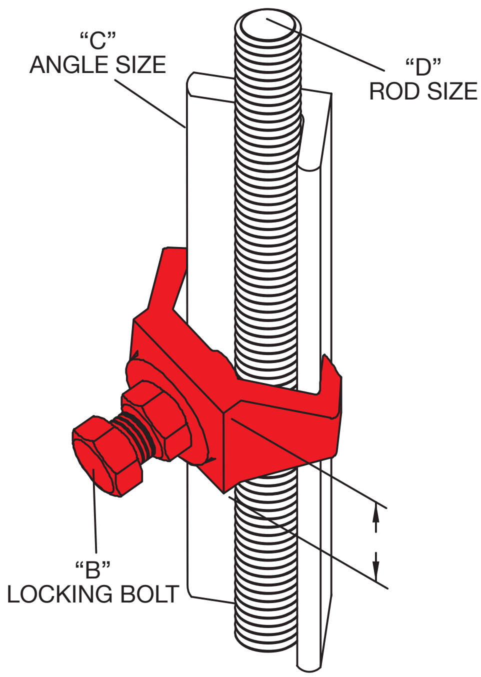
OPA-0349
on
January 16, 2009

Anthony R. Pike
Anthony R. Pike **(916) 654-3362**

Page
X4B

Dhiru Mali
Dhiru Mali
Structural Engineer
California SE No. 2811

SRC - SEISMIC ROD CLAMP



TYPE SRC WITH STEEL ANGLE ASSEMBLY RATINGS

Rod Size (in) ( )	Maximum Compr. Force (lbs) ( )	Steel Angle Stiffener Minimum Size (in) ( )	Steel Angle Stiffener Maximum Length (in) ( )	Maximum SRC Spacing (in) ( )
1/4	75	1 x 1 x 1/8	96	14
3/8	425	1 x 1 x 1/8	96	22
1/2	1275 1200	1 x 1 x 1/8 1 1/2 x 1 1/2 x 1/4	96 120	31 31
5/8	1475 1325	1 x 1 x 1/8 1 1/2 x 1 1/2 x 1/4	96 120	39 39
3/4	2500	1 1/2 x 1 1/2 x 1/4	144	48
7/8	4600 4400	1 1/2 x 1 1/2 x 1/4 2 x 2 x 1/4	132 144	56 56
1	5800 6900	1 1/2 x 1 1/2 x 1/4 2 x 2 x 1/4	132 144	65 65
1 1/8	9600	2 x 2 x 1/4	144	73
1 1/4	12000	2 x 2 x 1/4	144	82

Note: Refer to page G1 for SRC installation details.

TYPE SRC ANCHOR DIMENSIONS (inches) ( )

SIZE	A	B		C	D Acceptable Rod Size
SRC-1	1 3/8	1/2 x 1 3/4 Long	*on*	1 x 1 x 1/8	1/4 - 5/8
SRC-1 1/2	1 9/16	5/8 x 2 Long	*on*	1 1/2 x 1 1/2 x 1/4	1/2 - 1
SRC-2	1 3/4	5/8 x 3 Long	*on*	2 x 2 x 1/4	7/8 - 1 1/4

NOTE: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

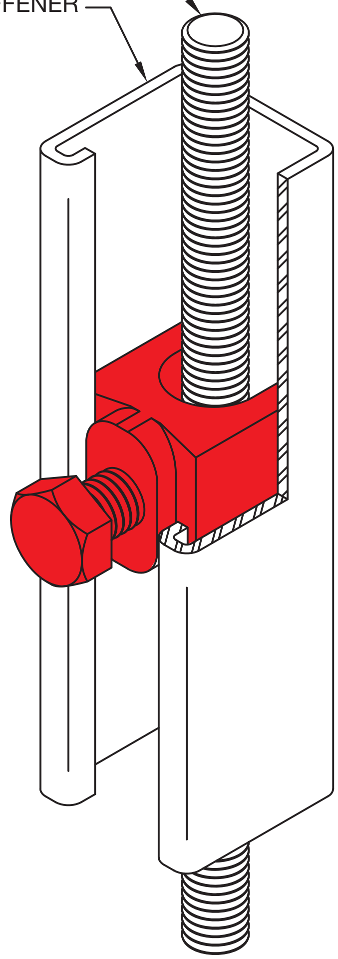
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

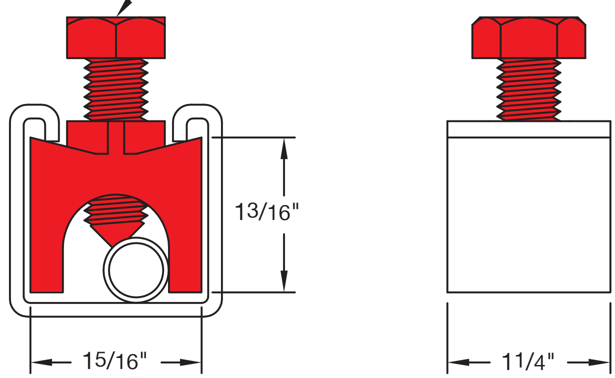
Dhiru Mali
Structural Engineer
California SE No. 2811

UCC - SEISMIC ROD CLAMPS
FOR STRUT CHANNELS



TYPE UCC WITH STEEL STRUT ASSEMBLY RATINGS

Rod Size (in) ( )	Maximum Compr. Force (lbs) ( )	Steel Angle Stiffener Minimum Size (in) ( )	Steel Angle Stiffener Maximum Length (in) ( )	Maximum SRC Spacing (in) ( )
3/8	425	1 5/8 x 1 5/8 x 12 Gage	96	22
1/2	1275	1 5/8 x 1 5/8 x 12 Gage	96	31
	1200	1 5/8 x 1 5/8 x 12 Gage	120	31
5/8	1475	1 5/8 x 1 5/8 x 12 Gage	96	39
	1325	1 5/8 x 1 5/8 x 12 Gage	120	39
3/4	2500	1 5/8 x 1 5/8 x 12 Gage	144	48



MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA-0349
on
January 16, 2009

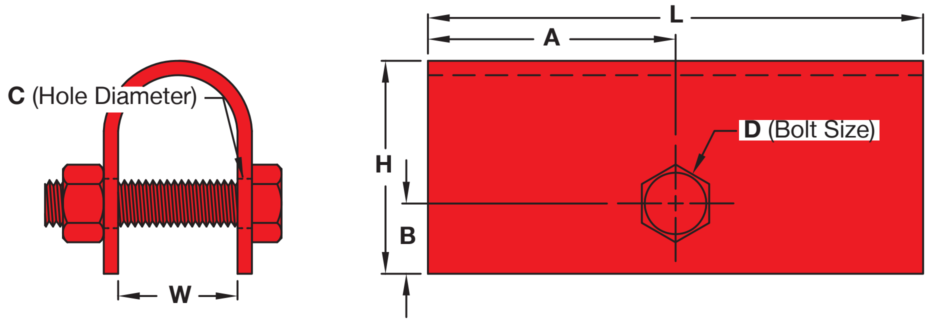
Anthony R. Pike **(916) 654-3362**

Page
X5C

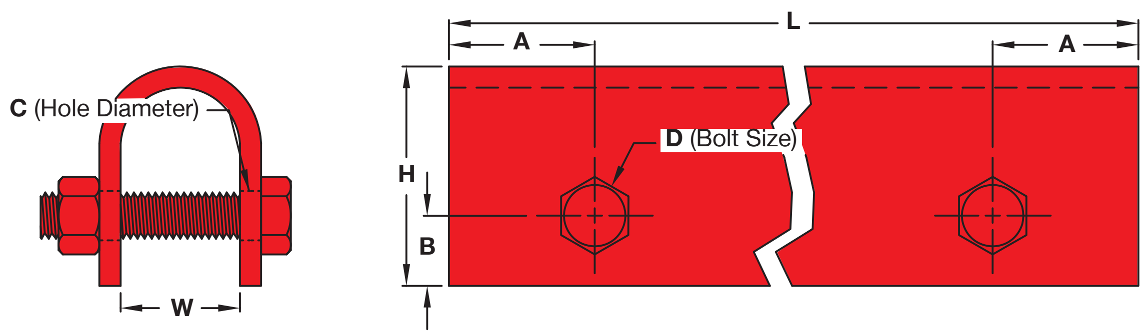
Dhiru Mali
Structural Engineer
California SE No. 2811

CCB - CLEVIS CROSSBOLT BRACE

(1) BOLT CLEVIS CROSSBOLT BRACE - Clevis Sizes 1 1/2" - 2 1/2"



(2) BOLT CLEVIS CROSSBOLT BRACE - Clevis Sizes 3" - 30"



CCB DIMENSIONS (inches) (   )

SIZE	L	W	H	A	B	C	D	
CCB-1 1/2	1 7/8	1/4	1	15/16	1/2	7/16	3/8-16 UNC x 1 1/4	C
CCB-2	2 3/8	1/4	1	13/16	1/2	7/16	3/8-16 UNC x 1 1/4	C
CCB-2 1/2	2 7/8	3/8	1 1/8	17/16	1/2	7/16	3/8-16 UNC x 1 1/4	C
CCB-3	3 1/2	3/8	1 1/8	3/4	1/2	7/16	3/8-16 UNC x 1 1/4	C
CCB-4	4 1/2	3/8	1 1/8	1	1/2	7/16	3/8-16 UNC x 1 1/4	C
CCB-5	5 9/16	1/2	1 5/16	1	1/2	7/16	3/8-16 UNC x 1 3/4	C
CCB-6	6 5/8	1/2	1 5/16	1 1/2	1/2	7/16	3/8-16 UNC x 1 3/4	C
CCB-8	8 5/8	5/8	1 7/16	2	1/2	7/16	3/8-16 UNC x 1 3/4	C
CCB-10	10 3/4	3/4	1 9/16	2 1/2	1/2	7/16	3/8-16 UNC x 1 3/4	C
CCB-12	12 3/4	3/4	1 9/16	3 1/2	1/2	7/16	3/8-16 UNC x 1 3/4	C
CCB-14	14	7/8	1 11/16	3 1/2	1/2	7/16	3/8-16 UNC x 1 3/4	C
CCB-16	16	1	1 7/8	4	1/2	7/16	3/8-16 UNC x 2	C
CCB-18	18	1 1/8	2	4 1/2	1/2	7/16	3/8-16 UNC x 2	C
CCB-20	20	1 1/4	2 1/2	5	3/4	9/16	1/2-13 UNC x 2 1/2	C
CCB-24	24	1 1/4	2 1/2	6	3/4	9/16	1/2-13 UNC x 2 1/2	C
CCB-30	30	1 1/4	2 1/2	7 1/2	3/4	9/16	1/2-13 UNC x 2 1/2	C

NOTE: For tightening requirements of bolts, nuts and strut nuts reference H15.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

EXPANSION ANCHORS

Table 1 - ITW Ramset/Red Head Trubolt Wedge Anchor Ratings into 3000 psi (Pa) Stone Aggregate Concrete, ICBO Report ER-1372, Tables 7, 8 and 9.

Anchor Size (in) ( )	Installation Torque (ft/lbs) ( )	Minimum Anchor Embedment (in) ( )	Minimum Edge Distance (in) ( )	Minimum Anchor Spacing (in) ( )	Standard Tension (lbs) ( )	Standard Shear (lbs) ( )	Shear with IR-26-6 Reduction (lbs) ( )
3/8	25	1 1/2	2 5/8	5 1/4	245	615	492
3/8	25	3	3 3/4	6	585	1015	812
1/2	55	2 1/4	4	7 7/8	610	1190	952
1/2	55	4 1/8	5 1/4	6 1/4	890	1810	1448
5/8	90	2 3/4	4 7/8	9 5/8	860	1780	1424
5/8	90	5 1/8	6 1/2	7 3/4	1340	2685	2148
3/4	175	3 1/4	5 3/4	11 3/8	1120	2935	2348
3/4	175	6 5/8	8 3/8	10	1790	5500	4400

Table 2 - ITW Ramset/Red Head Trubolt Wedge Anchor Ratings into Lower Flute of Minimum 20 gage ( ) Steel Deck with 3000 psi (Pa) Lightweight Concrete Fill, ICBO Report ER-1372, Tables 7, 8 and 14.

Anchor Size (in) ( )	Installation Torque (ft/lbs) ( )	Minimum Anchor Embedment (in) ( )	Minimum Edge Distance (in) ( )	Minimum Anchor Spacing (in) ( )	Standard Tension (lbs) ( )	Standard Shear (lbs) ( )	Shear with IR-26-6 Reduction (lbs) ( )
3/8	25	1 1/2	2 5/8	5 1/4	237	790	632
3/8	25	3	3 3/4	6	355	1000	800
1/2	55	2 1/4	4	7 7/8	425	1345	1076
1/2	55	3	5 1/4	6 1/4	560	1655	1324
5/8	90	3	4 7/8	9 5/8	590	1375	1100
5/8	90	5	6 1/2	7 3/4	822	2285	1828
3/4	175	3 1/4	5 3/4	11 3/8	730	2220	1776
3/4	175	5 5/8	8 3/8	10	880	n/a	n/a

NOTES:

Anchors must be installed in compliance with manufacturer's recommendations and the respective ICBO Report including tabulated edge distances and spacings listed above.

For combined tension and shear loads on anchors, use the following equation:

$$\left(\frac{P_S}{P_T}\right)^{\frac{5}{3}} + \left(\frac{V_S}{V_T}\right)^{\frac{5}{3}} \le 1$$

Where:

Ps, Vs = Applied Loads

Pt, Vt = Allowable Loads

Ratings may not be increased to accommodate periodic loads such as wind or seismic loads.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

EXPANSION ANCHOR TEST VALUES

Anchor Size (in) ( )	Option 1 Concrete Slab Test Values (lbs) ( )	Option 2 Concrete Deck Test Values (lbs) ( )	Torque Test Values (ft/lbs) ( )
3/8	1170	710	25
1/2	1780	1120	50
5/8	2680	1644	80
3/4	3580	1760	150

NOTES:

1. Anchor diameter refers to the thread size.
2. Apply proof test loads to anchors without removing the nut if possible. If not, remove nut and install a threaded coupler to the same tightness of the original nut using a torque wrench and apply load.
3. Reaction loads from test fixtures may be applied close to the anchor being tested, provided the anchor is not restrained from withdrawing by the fixture(s).
4. Test equipment is to be calibrated by an approved testing laboratory in accordance with standard recognized procedures.
5. Torque testing can occur on an individual basis when test procedures are submitted and approved by the enforcement agency. Tabulated values may be forthcoming once the enforcement agency has more data to evaluate the feasibility of standard torque values.
6. The following criteria apply for the acceptance of installed anchors:

   HYDRAULIC RAM METHOD: The anchor should have no observable movement at the applicable test load. A practical way to determine observable movement is that the washer under the nut becomes loose.

   TORQUE WRENCH METHOD: The applicable test torque must be reached within 1/4 turn of the nut for 3/8" (   ) diameter anchors and 1/2 turn of the nut for all others.
7. Testing should occur 24 hours minimum after installation of the subject anchors.

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

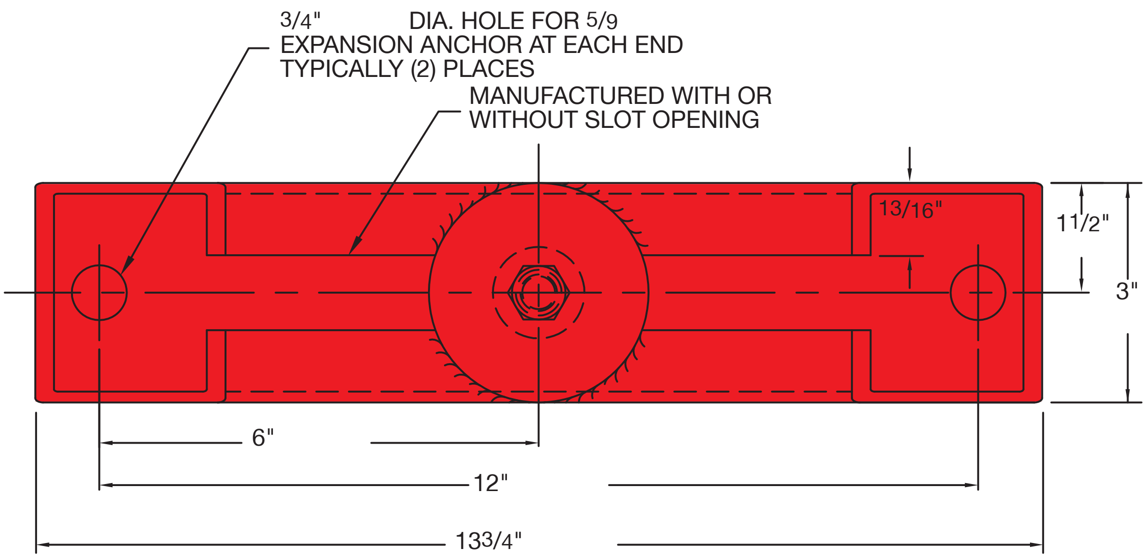
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

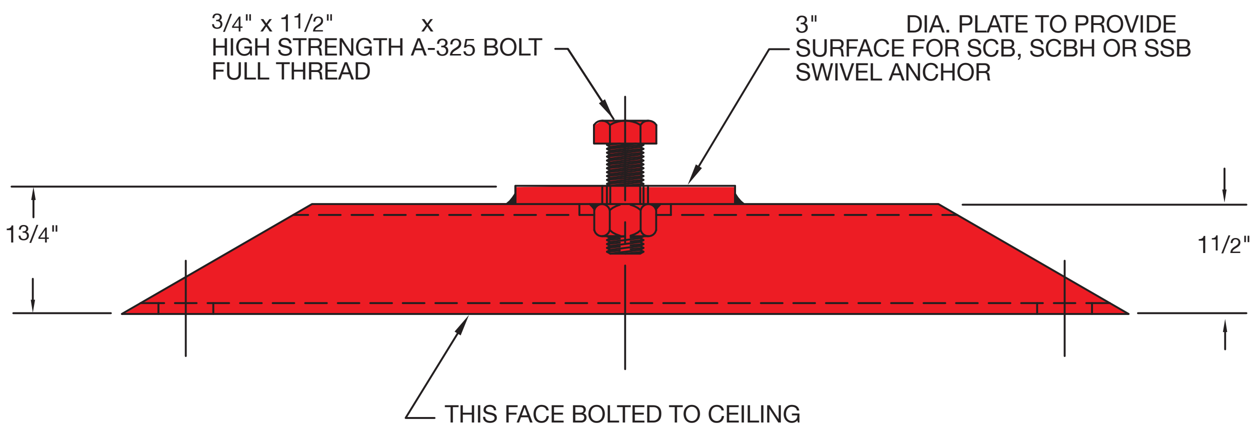
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SLDB - SEISMIC LOAD DISTRIBUTION BRACKET





SLDB-2000

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

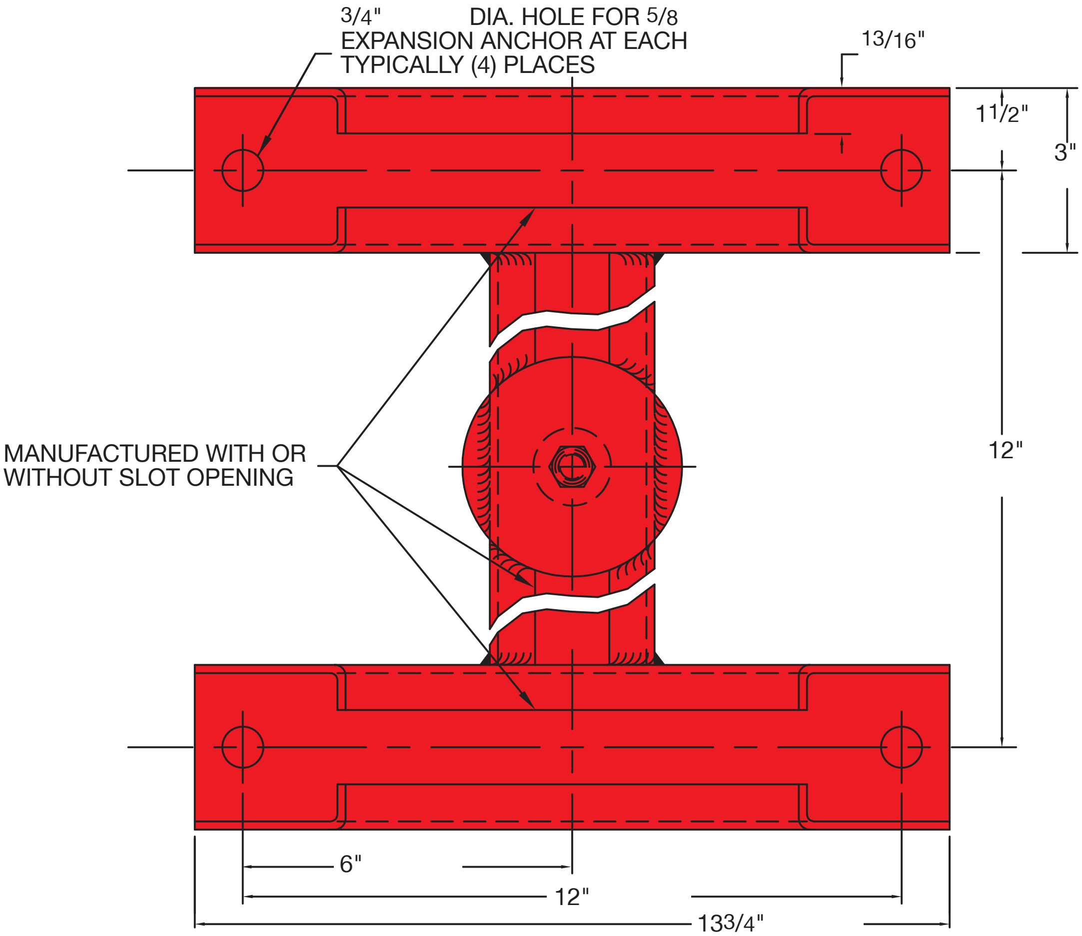
Bill Staehlin (916) 654-3362

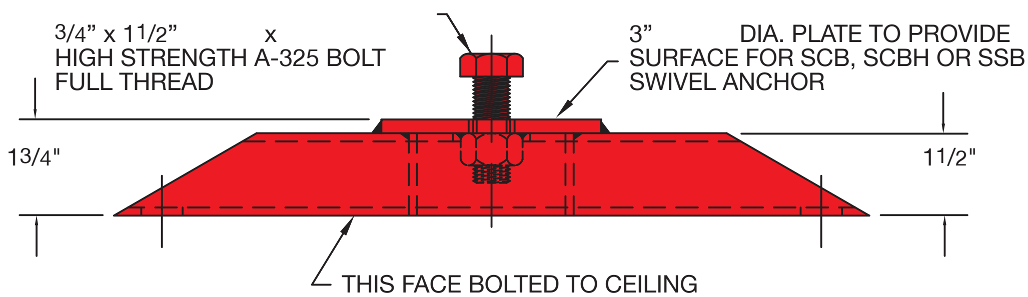
Page

X9

Dhiru Mali
Structural Engineer
California SE No. 2811

SLDB - SEISMIC LOAD DISTRIBUTION BRACKET





SLDB-4000

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 August 5, 2002

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

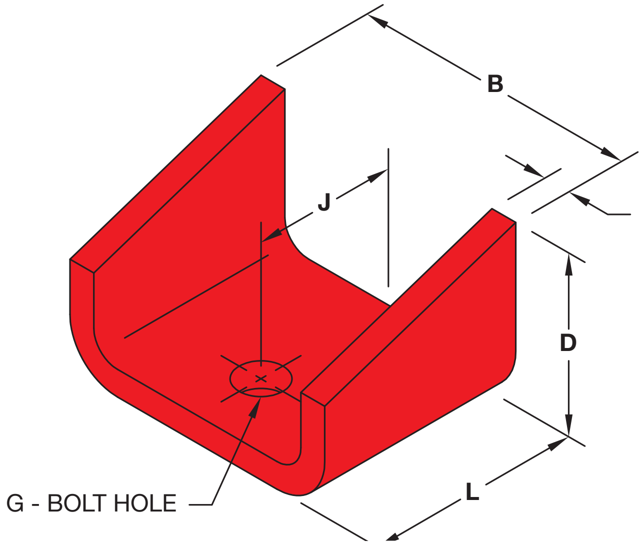
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

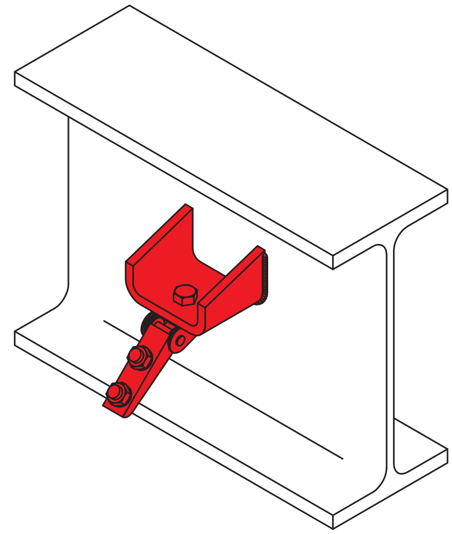
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Dhiru Mali
Structural Engineer
California SE No. 2811

SACW - SEISMIC ATTACHMENT CLIP FOR WELDING





SACW SHOWN WELDED TO STRUCTURAL BEAM WITH BOLTED SCB

TYPE SACW DIMENSIONS (inches) (   )

Size	Width (B) (in) ( )	Height (D) (in) ( )	Thickness (T) (in) ( )	Length (L) (in) ( )	Bolt Hole Location (J) (in) ( )	Bolt Hole Diameter (G) (in) ( )	Compatible Seismic Braces
SACW-0	2	1 1/2	1/4	2 1/4	1 1/4	7/16	SCB-0
SACW-1	3	2	1/4	2 1/2	1 1/2	9/16	SCB-1 SSB-1 SSBS-12
SACW-2	4	2 1/2	3/8	3	2	1 1/16	SCB-2 SSB-2 SSBS-20
SACW-3	5	3 1/4	3/8	3 1/2	2 1/2	13/16	SCB-3 SSB-3
SACW-3	6	5	3/8	5	3 1/2	15/16	SCB-4 SSB-4

NOTE: Refer to page HBA for SACW attachment information and maximum loads.

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

THE GREAT SEAL OF THE STATE OF CALIFORNIA EUREKA

OPA-0349
on
July 22, 2009

Jerry Yee (916) 654-3362

Dhiru Mali
Structural Engineer
California SE No. 2811

SEISMIC RESTRAINT GUIDELINES for FLOOR and ROOF MOUNTED EQUIPMENT

TABLE OF CONTENTS

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

VIBRATION ISOLATION AND SEISMIC RESTRAINT APPLICATIONS

03/2020

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

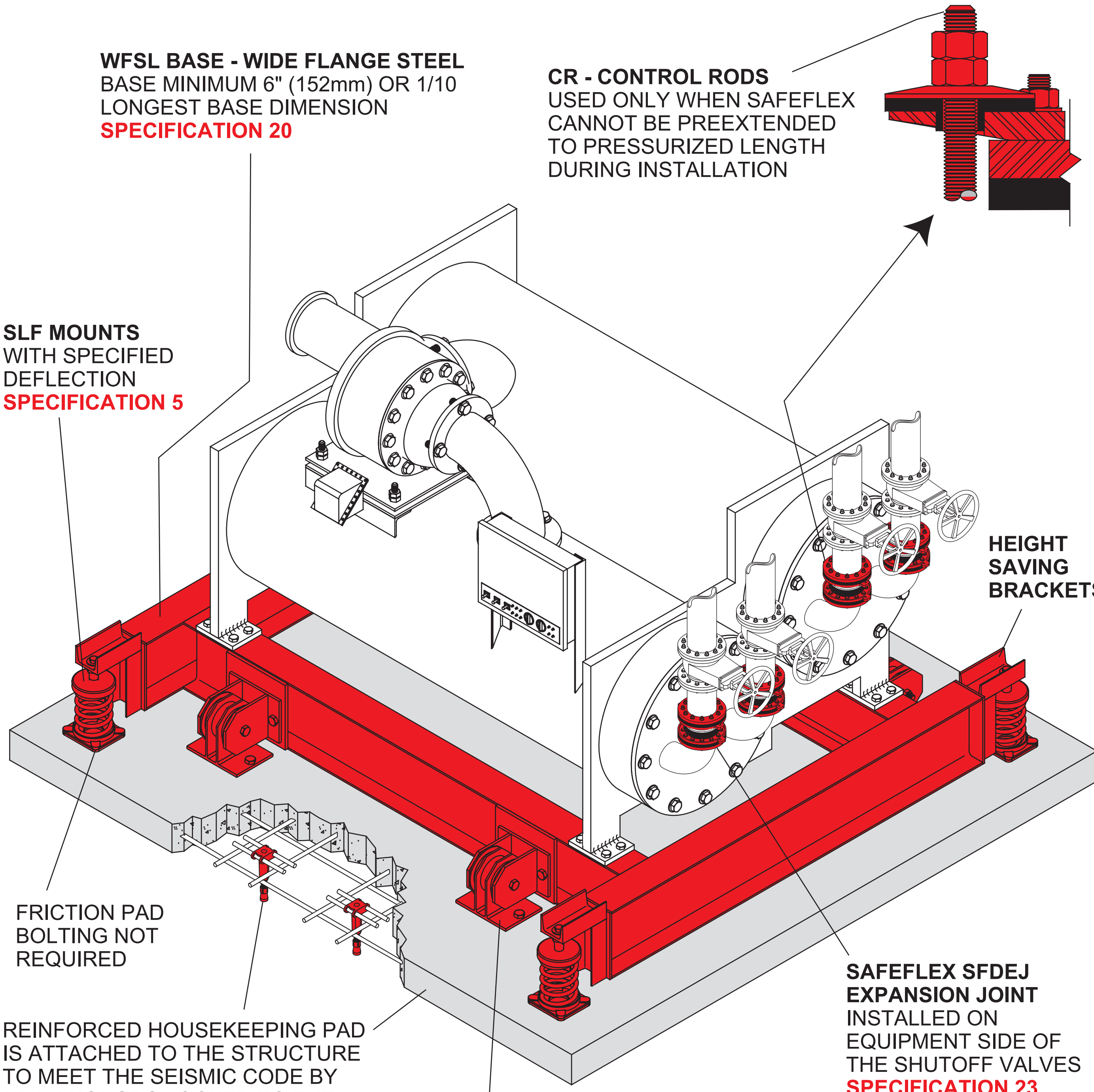
CENTRIFUGAL CHILLER on WFSL Base with height saving brackets and high deflection SLF Mounts and Z-1011 Seismic Restraints. Reinforced housekeeping pad secured by HPA Anchors. SAFEFLEX Expansion Joints are installed in pipelines to reduce blade frequency vibration and noise and to allow for seismic displacement.

WFSL BASE - WIDE FLANGE STEEL
BASE MINIMUM 6" (152mm) OR 1/10
LONGEST BASE DIMENSION
SPECIFICATION 20

CR - CONTROL RODS
USED ONLY WHEN SAFEFLEX
CANNOT BE PREEXTENDED
TO PRESSURIZED LENGTH
DURING INSTALLATION

SLF MOUNTS
WITH SPECIFIED
DEFLECTION
SPECIFICATION 5

HEIGHT SAVING BRACKETS



FRICTION PAD
BOLTING NOT
REQUIRED

SAFEFLEX SFDEJ EXPANSION JOINT
INSTALLED ON
EQUIPMENT SIDE OF
THE SHUTOFF VALVES
SPECIFICATION 23

REINFORCED HOUSEKEEPING PAD
IS ATTACHED TO THE STRUCTURE
TO MEET THE SEISMIC CODE BY
HPA ANCHORS LOCKED TO THE
PAD REINFORCING STEEL AND
SCREWED TO **SAS FLOOR STUDS**.
SPECIFICATION 29

RESILIENT Z-1011 SEISMIC SNUBBERS
SPECIFICATION 17
MUST BE SECURED WITH **SAST ANCHORS**
SPECIFICATION 19

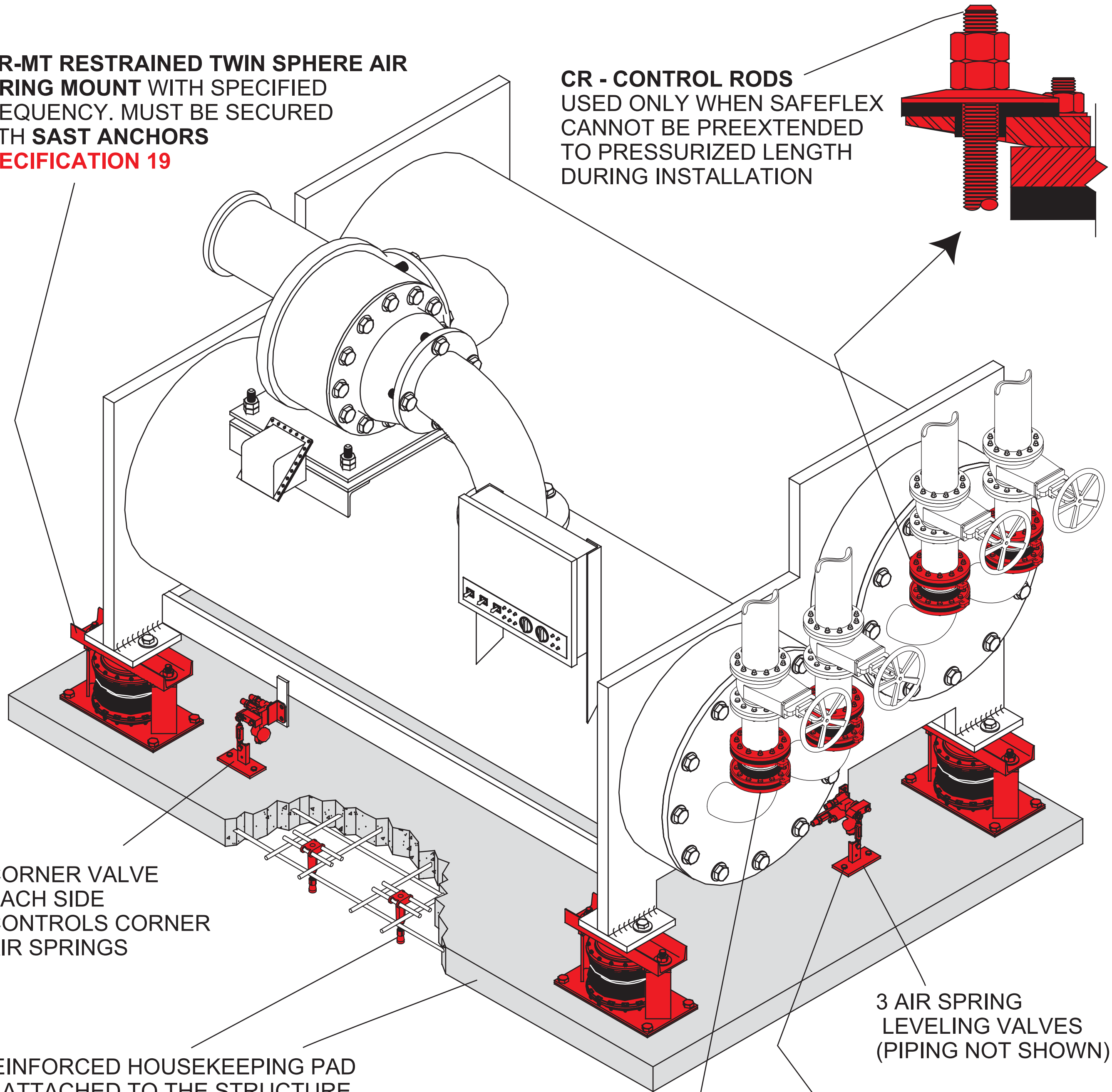
03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

CENTRIFUGAL CHILLER directly mounted on seismically rated SLR-MT Restrained Twin Sphere Air Spring Mounts. Reinforced housekeeping pad secured by HPA Anchors. SAFEFLEX Expansion Joints are installed in pipelines to reduce blade frequency vibration and noise and to allow for seismic displacement.

SLR-MT RESTRAINED TWIN SPHERE AIR SPRING MOUNT WITH SPECIFIED FREQUENCY. MUST BE SECURED WITH **SAST ANCHORS**
SPECIFICATION 19

CR - CONTROL RODS
USED ONLY WHEN SAFEFLEX CANNOT BE PREEXTENDED TO PRESSURIZED LENGTH DURING INSTALLATION



CORNER VALVE EACH SIDE CONTROLS CORNER AIR SPRINGS

3 AIR SPRING LEVELING VALVES (PIPING NOT SHOWN)

CONTROLS 2 END AIR SPRINGS

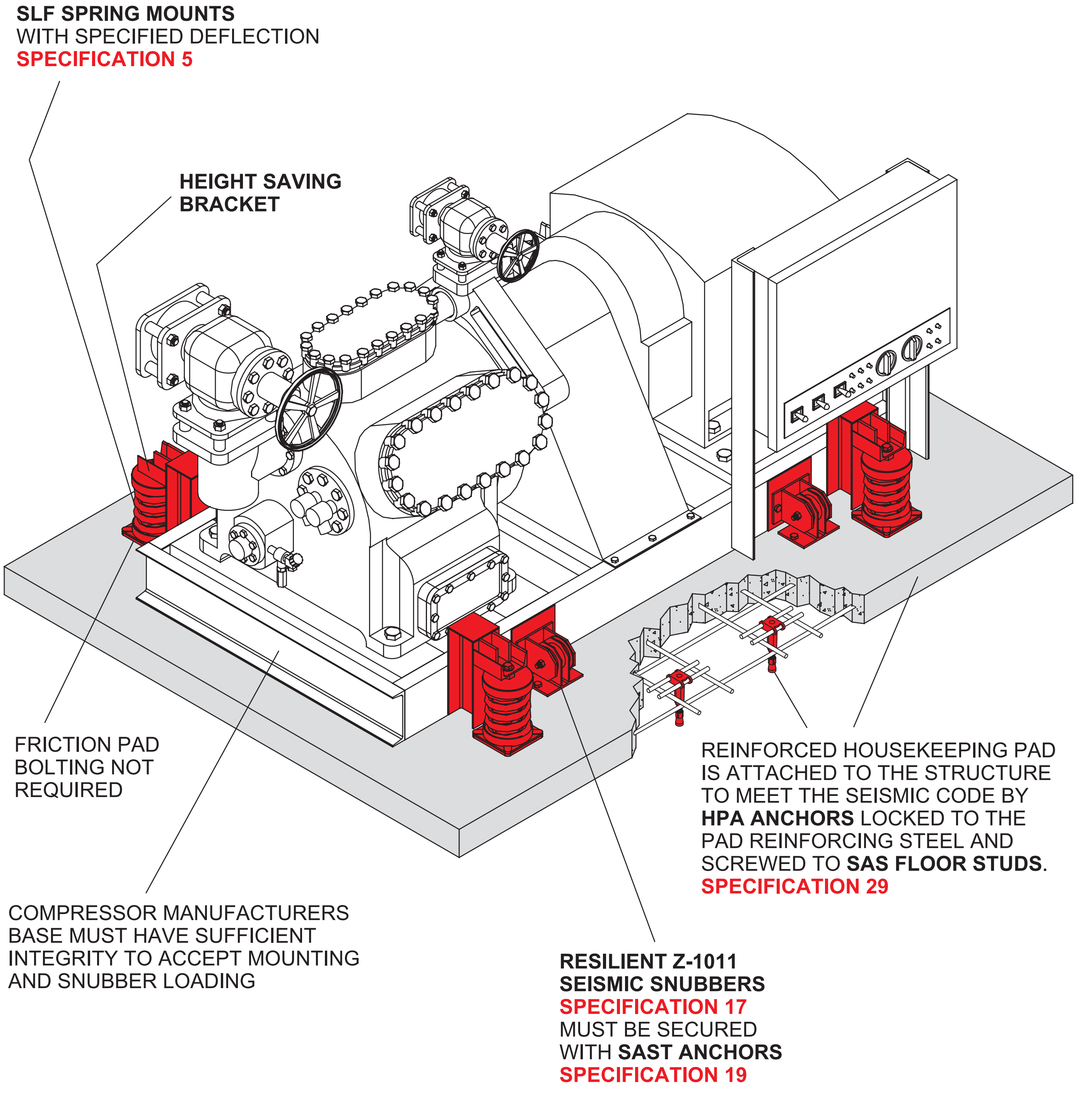
REINFORCED HOUSEKEEPING PAD IS ATTACHED TO THE STRUCTURE TO MEET THE SEISMIC CODE BY **HPA ANCHORS** LOCKED TO THE PAD REINFORCING STEEL AND SCREWED TO **SAS FLOOR STUDS**.
SPECIFICATION 29

SAFEFLEX SFDEJ EXPANSION JOINT INSTALLED ON EQUIPMENT SIDE OF THE SHUTOFF VALVES
SPECIFICATION 23

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

RECIPROCATING DIRECT DRIVE COMPRESSOR with height saving brackets on high deflection SLF Mounts and Z-1011 Seismic Restraints. Reinforced housekeeping pad secured by HPA Anchors.

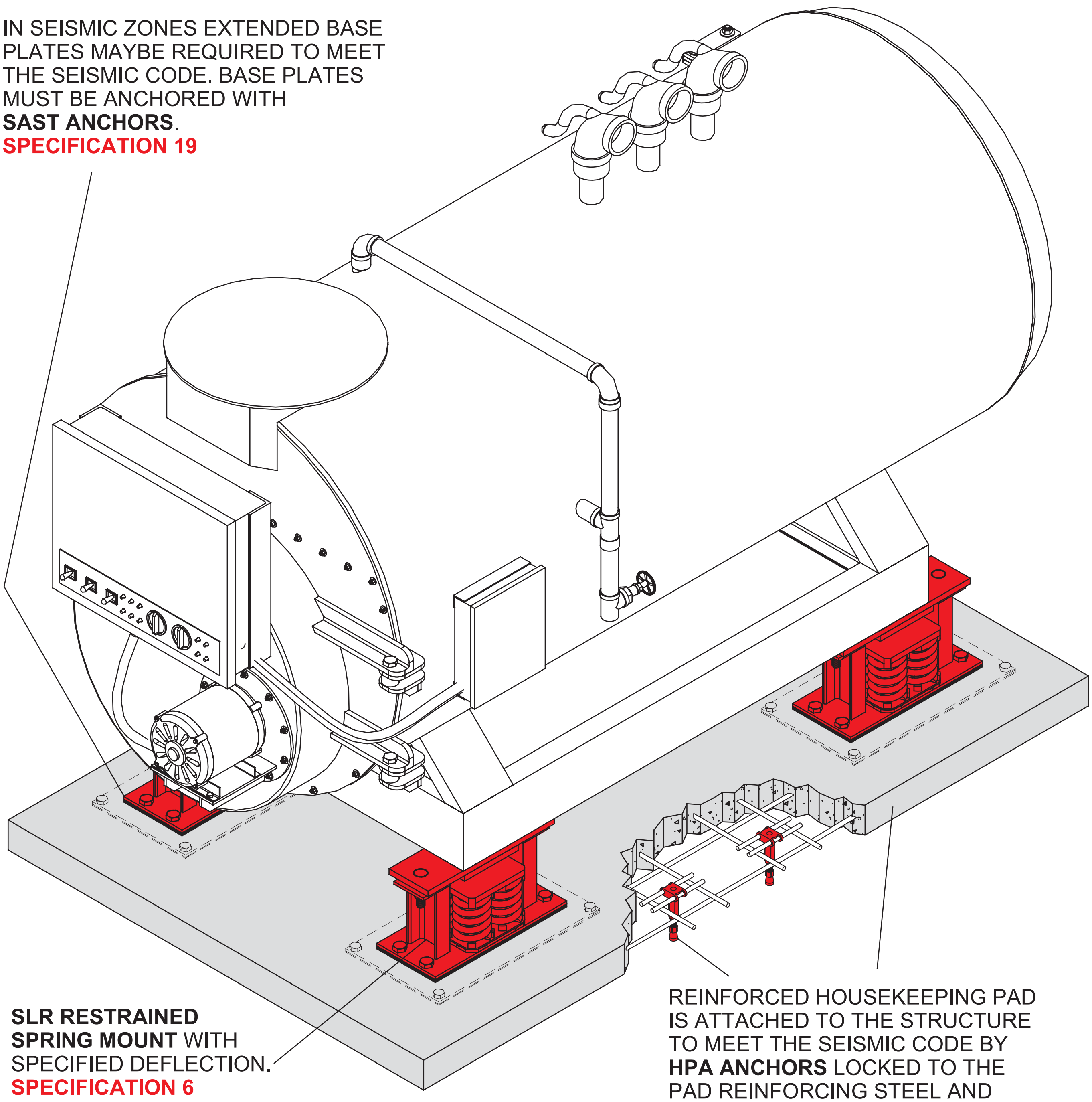


03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

STEAM GENERATOR directly mounted on **SLR** Restrained Spring Mounts. Reinforced housekeeping pad secured by **HPA** Anchors.

IN SEISMIC ZONES EXTENDED BASE PLATES MAYBE REQUIRED TO MEET THE SEISMIC CODE. BASE PLATES MUST BE ANCHORED WITH **SAST ANCHORS**.
SPECIFICATION 19



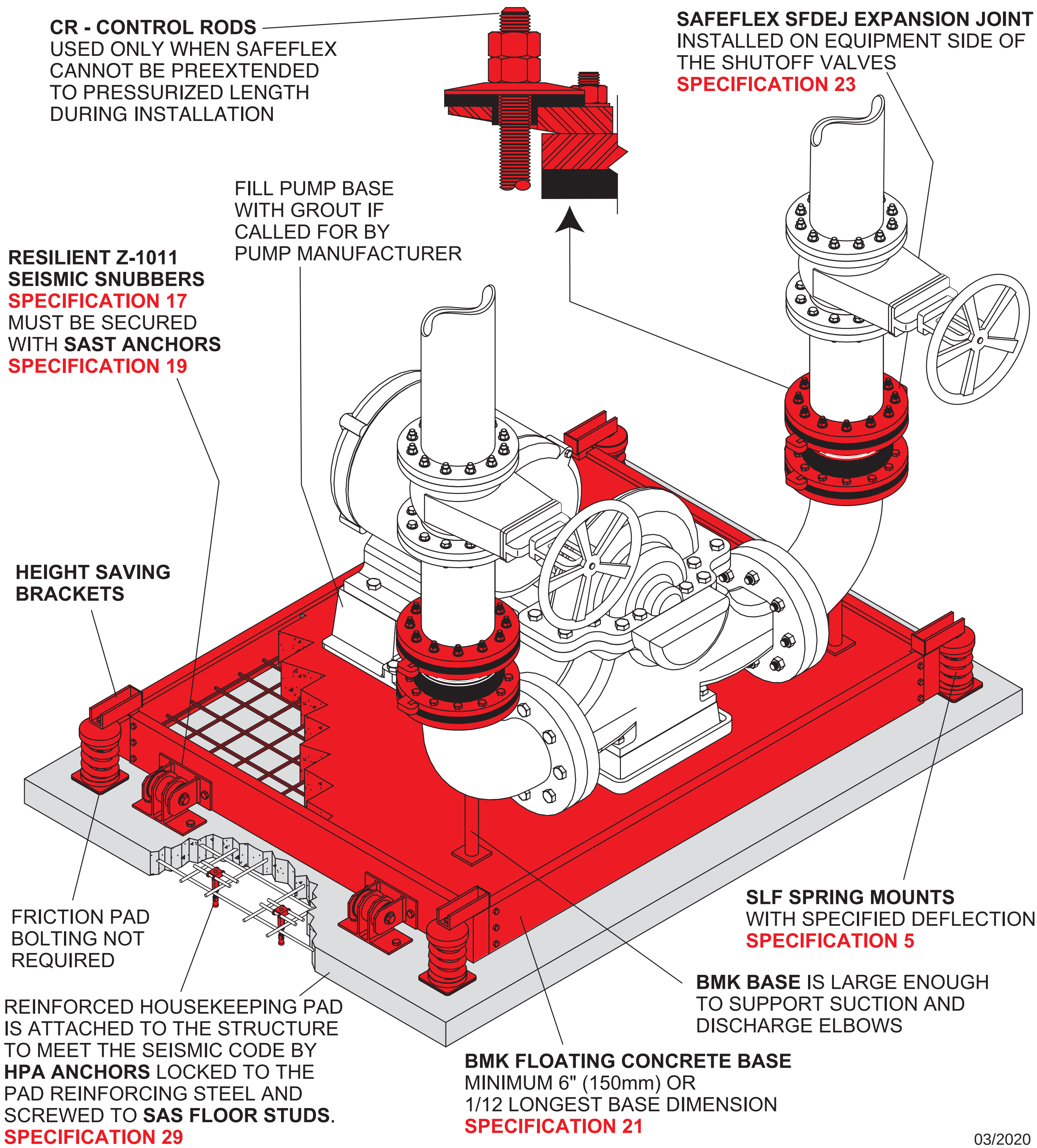
SLR RESTRAINED SPRING MOUNT WITH SPECIFIED DEFLECTION.
SPECIFICATION 6

REINFORCED HOUSEKEEPING PAD IS ATTACHED TO THE STRUCTURE TO MEET THE SEISMIC CODE BY **HPA ANCHORS** LOCKED TO THE PAD REINFORCING STEEL AND SCREWED TO **SAS FLOOR STUDS**.
SPECIFICATION 29

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

DOUBLE SUCTION PUMP on concrete filled **BMK** Base with height saving brackets, high deflection **SLF** Spring Mounts and **Z-1011** Seismic Restraints. Reinforced housekeeping pad secured by **HPA** Anchors. **SAFEFLEX** Expansion Joints are installed in pipelines to reduce blade frequency vibration and noise and to allow for seismic displacement.



03/2020

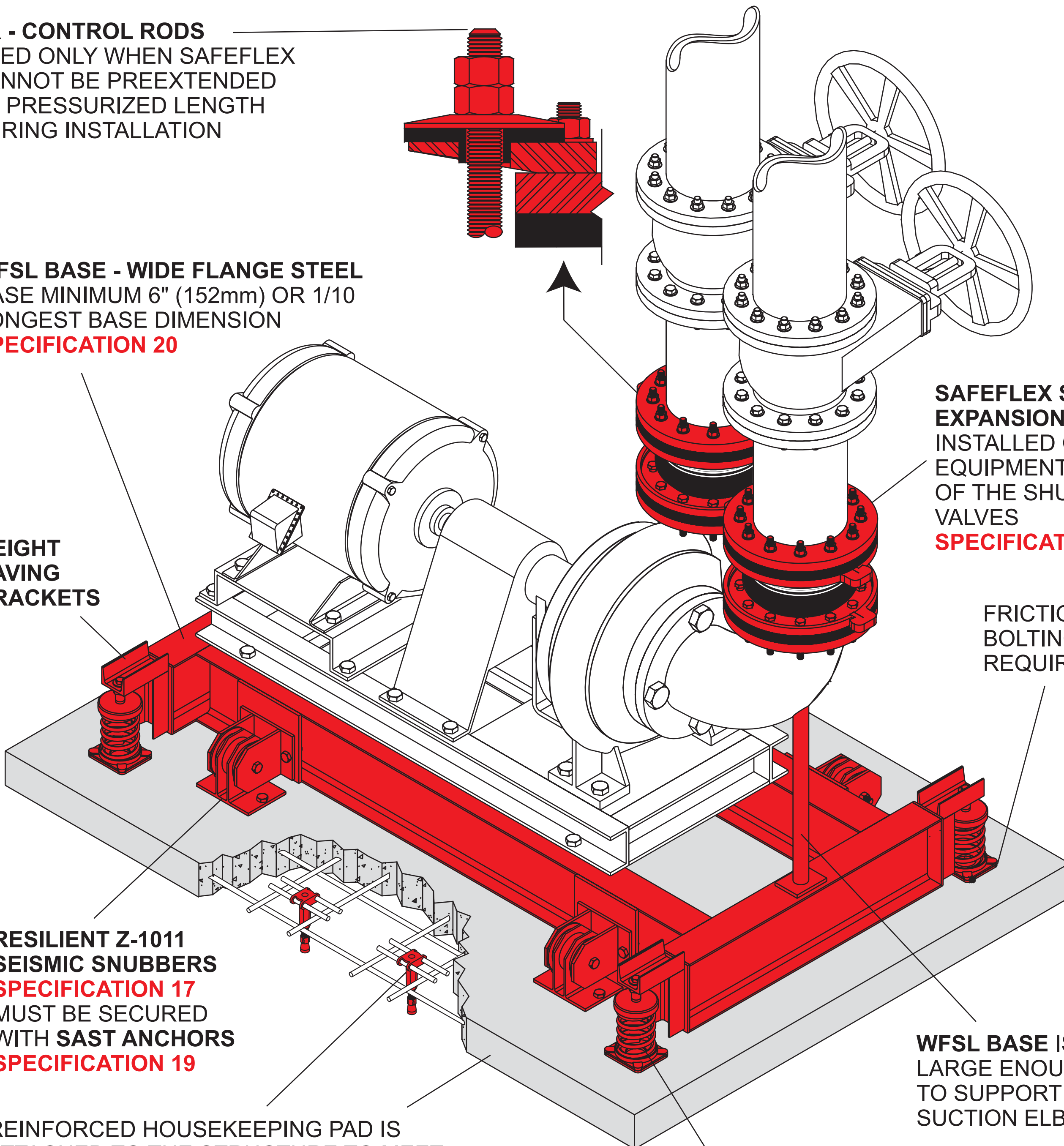
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

END SUCTION PUMP on WFSL Base with height saving brackets, high deflection SLF Mounts and Z-1011 Seismic Restraints. Reinforced housekeeping pad secured by HPA Anchors. SAFEFLEX Expansion Joints are installed in pipelines to reduce blade frequency vibration and noise and to allow for seismic displacement.

CR - CONTROL RODS
USED ONLY WHEN SAFEFLEX CANNOT BE PREEXTENDED TO PRESSURIZED LENGTH DURING INSTALLATION

WFSL BASE - WIDE FLANGE STEEL
BASE MINIMUM 6" (152mm) OR 1/10 LONGEST BASE DIMENSION
SPECIFICATION 20

HEIGHT SAVING BRACKETS



SAFEFLEX SFDEJ EXPANSION JOINT
INSTALLED ON EQUIPMENT SIDE OF THE SHUTOFF VALVES
SPECIFICATION 23

FRICTION PAD BOLTING NOT REQUIRED

RESILIENT Z-1011 SEISMIC SNUBBERS
SPECIFICATION 17
MUST BE SECURED WITH **SAST ANCHORS**
SPECIFICATION 19

WFSL BASE IS LARGE ENOUGH TO SUPPORT SUCTION ELBOW

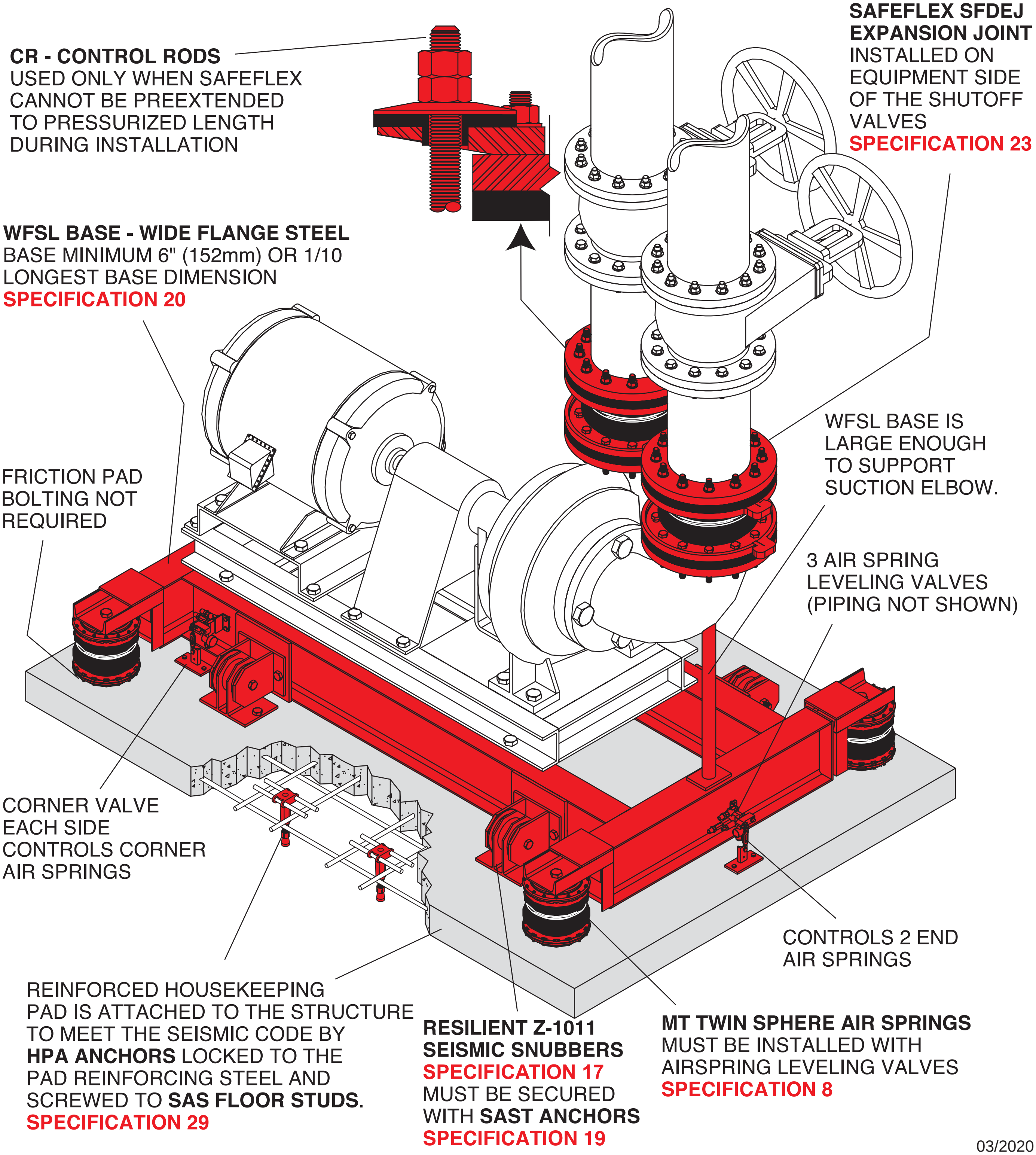
REINFORCED HOUSEKEEPING PAD IS ATTACHED TO THE STRUCTURE TO MEET THE SEISMIC CODE BY **HPA ANCHORS** LOCKED TO THE PAD REINFORCING STEEL AND SCREWED TO **SAS FLOOR STUDS**.
SPECIFICATION 29

SLF SPRING MOUNTS
WITH SPECIFIED DEFLECTION
SPECIFICATION 5

03/2020

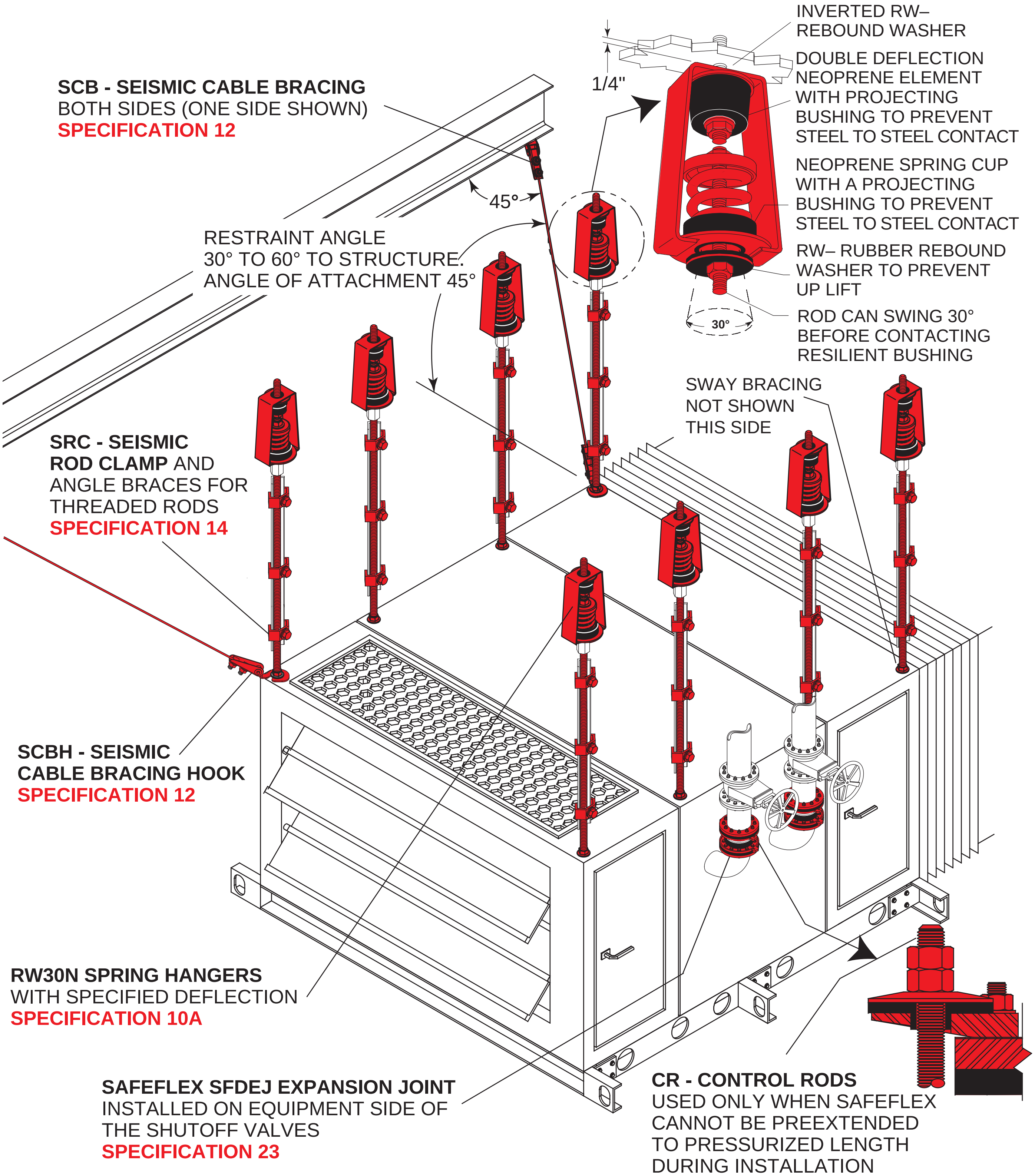
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

END SUCTION PUMP on WFSL Base with height saving brackets, MT Air Springs and Z-1011 Seismic Restraints. Reinforced housekeeping pad secured by HPA Anchors. SAFEFLEX Expansion Joints are installed in pipelines to reduce blade frequency vibration and noise and to allow for seismic displacement.



03/2020

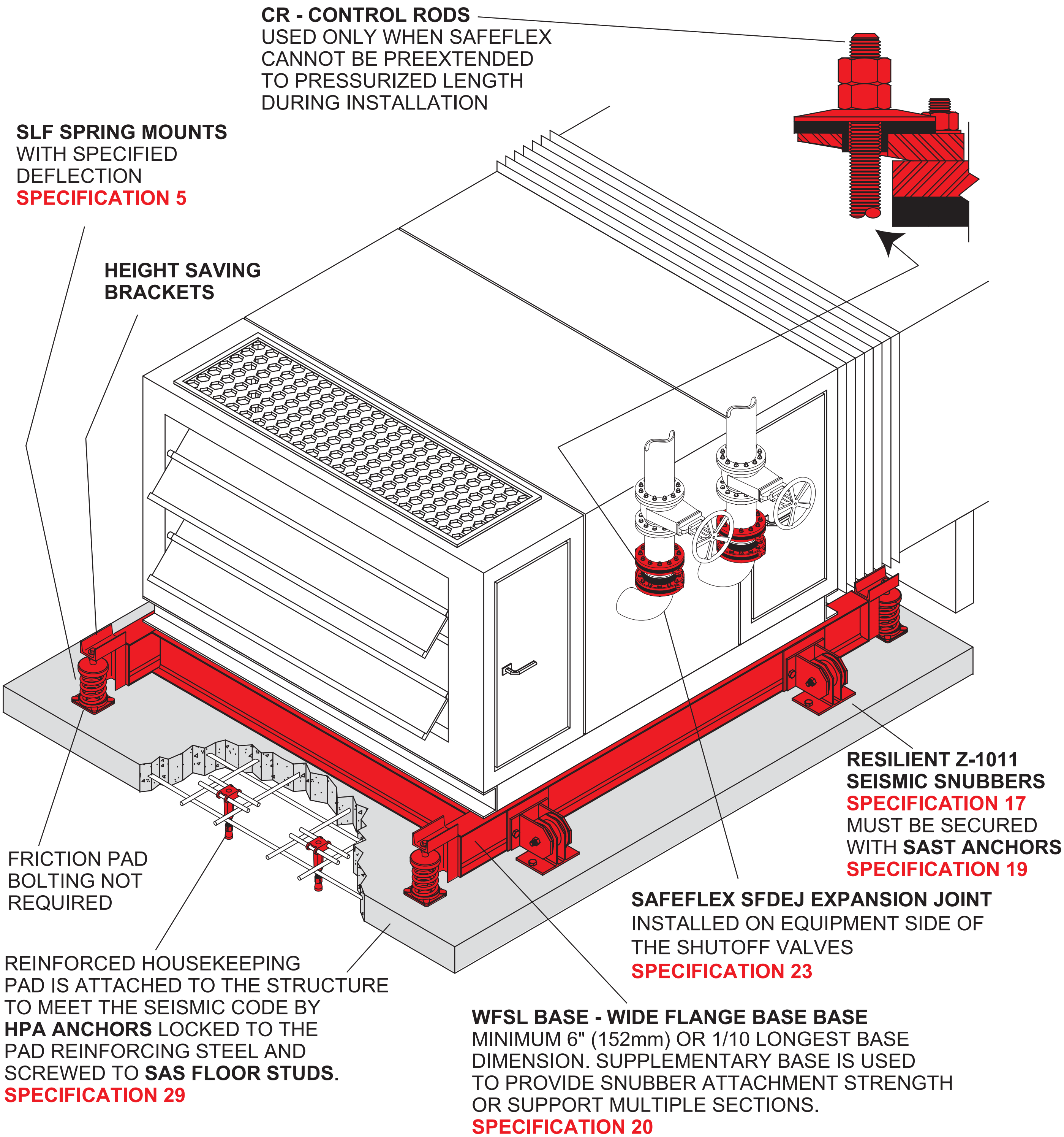
HVAC UNIT suspended from RW30N Hangers and restrained by SCB Cable Assemblies in four corners. SAFEFLEX Expansion Joints are installed in pipelines to reduce blade frequency vibration and noise and to allow for seismic displacement.



03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

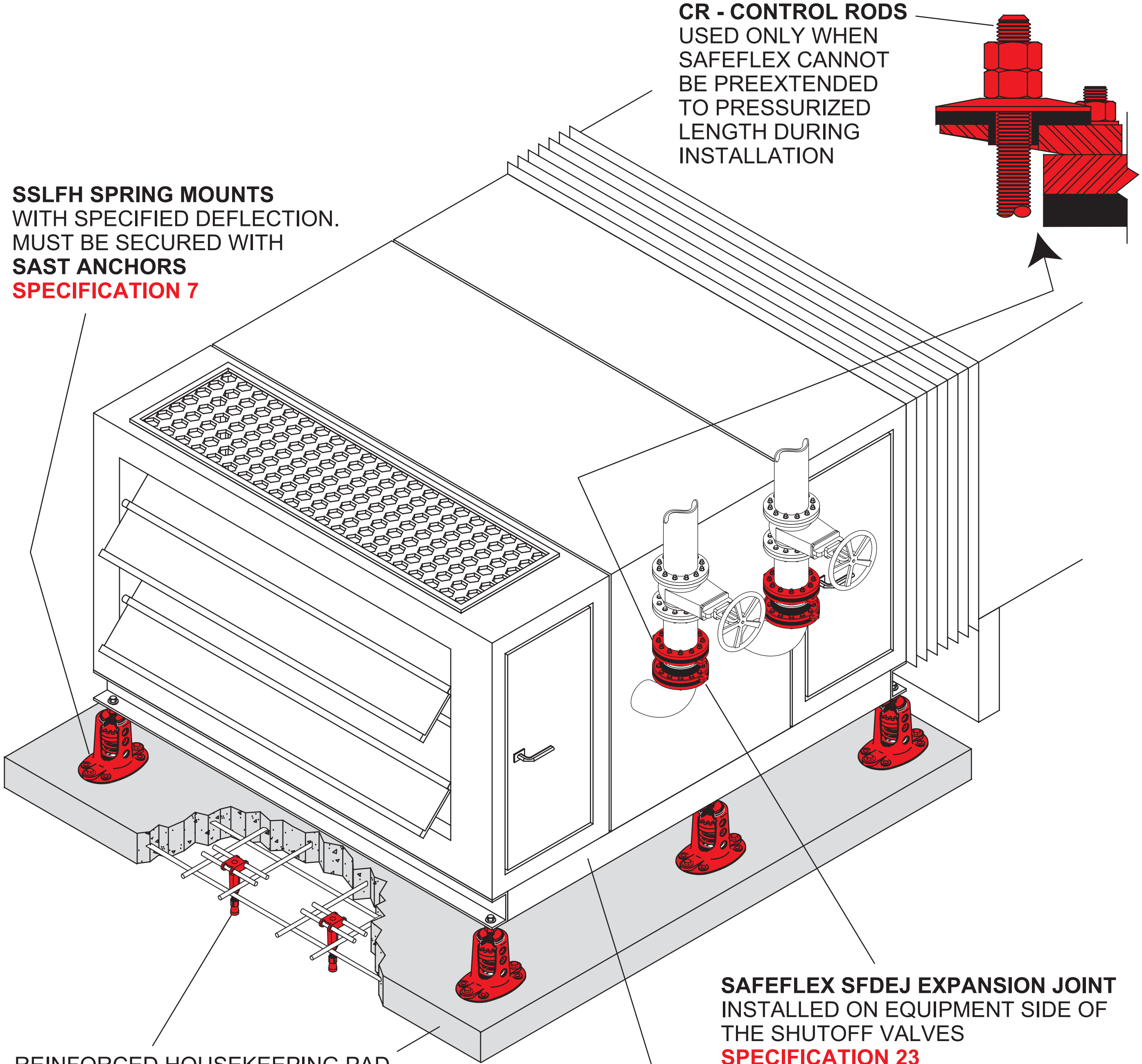
HVAC UNIT on steel base with height saving brackets, high deflection **SLF** Spring Mounts and **Z-1011** Seismic Restraints. Reinforced housekeeping pad secured by **HPA** Anchors. **SAFEFLEX** Expansion Joints are installed in pipelines to reduce blade frequency vibration and noise and to allow for seismic displacement.



03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

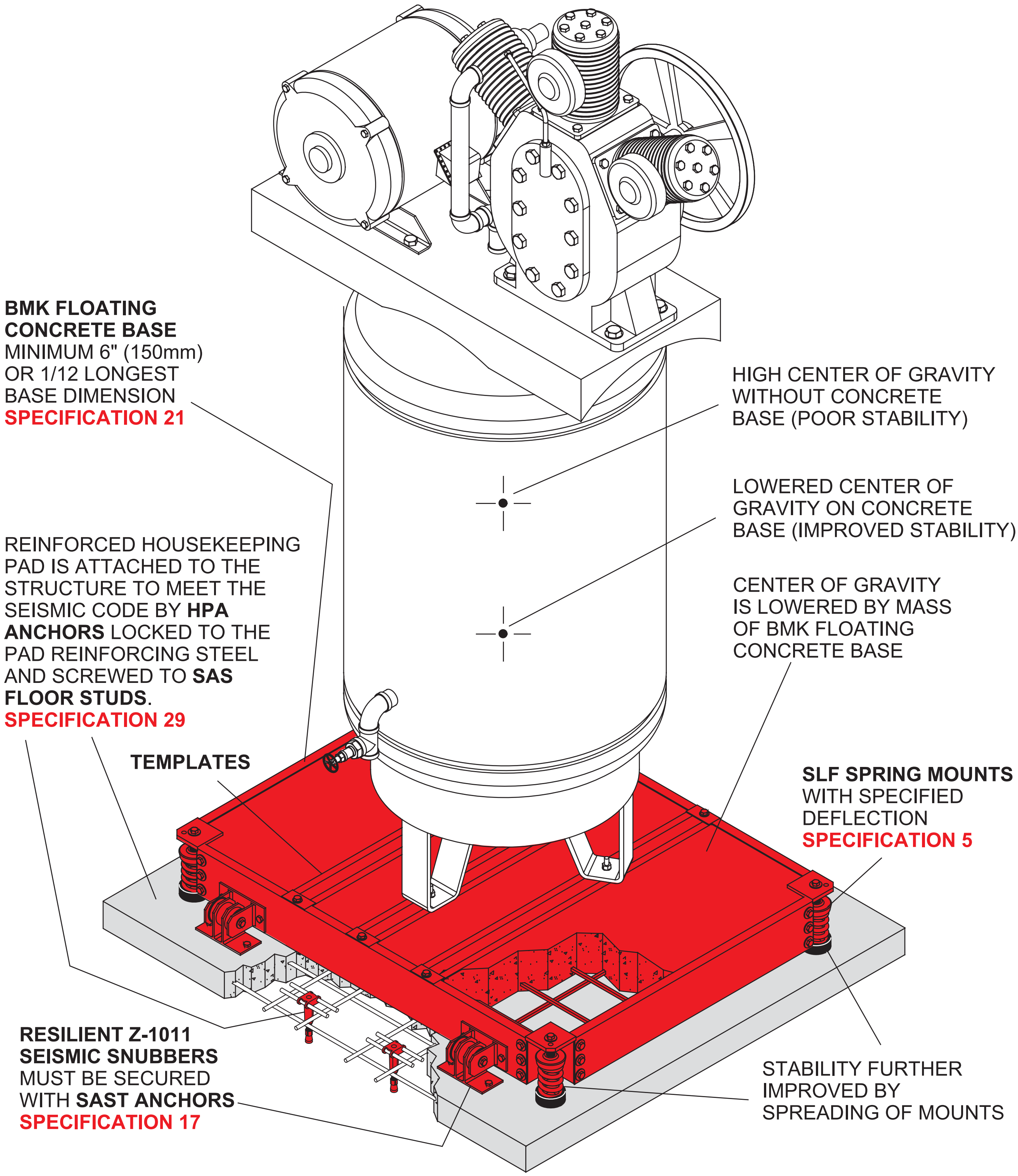
HVAC UNIT directly mounted on 1" deflection **SSLFH** Spring Mounts. Reinforced housekeeping pad secured by **HPA** Anchors. **SAFEFLEX** Expansion Joints are installed in pipelines to reduce blade frequency vibration and noise and to allow for seismic displacement.



03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

VERTICAL TANK TYPE COMPRESSOR directly mounted on BMK Concrete Filled Base, 1" deflection SLF Mounts and Z-1011 Seismic Restraints. Reinforced housekeeping pad secured by HPA Anchors.

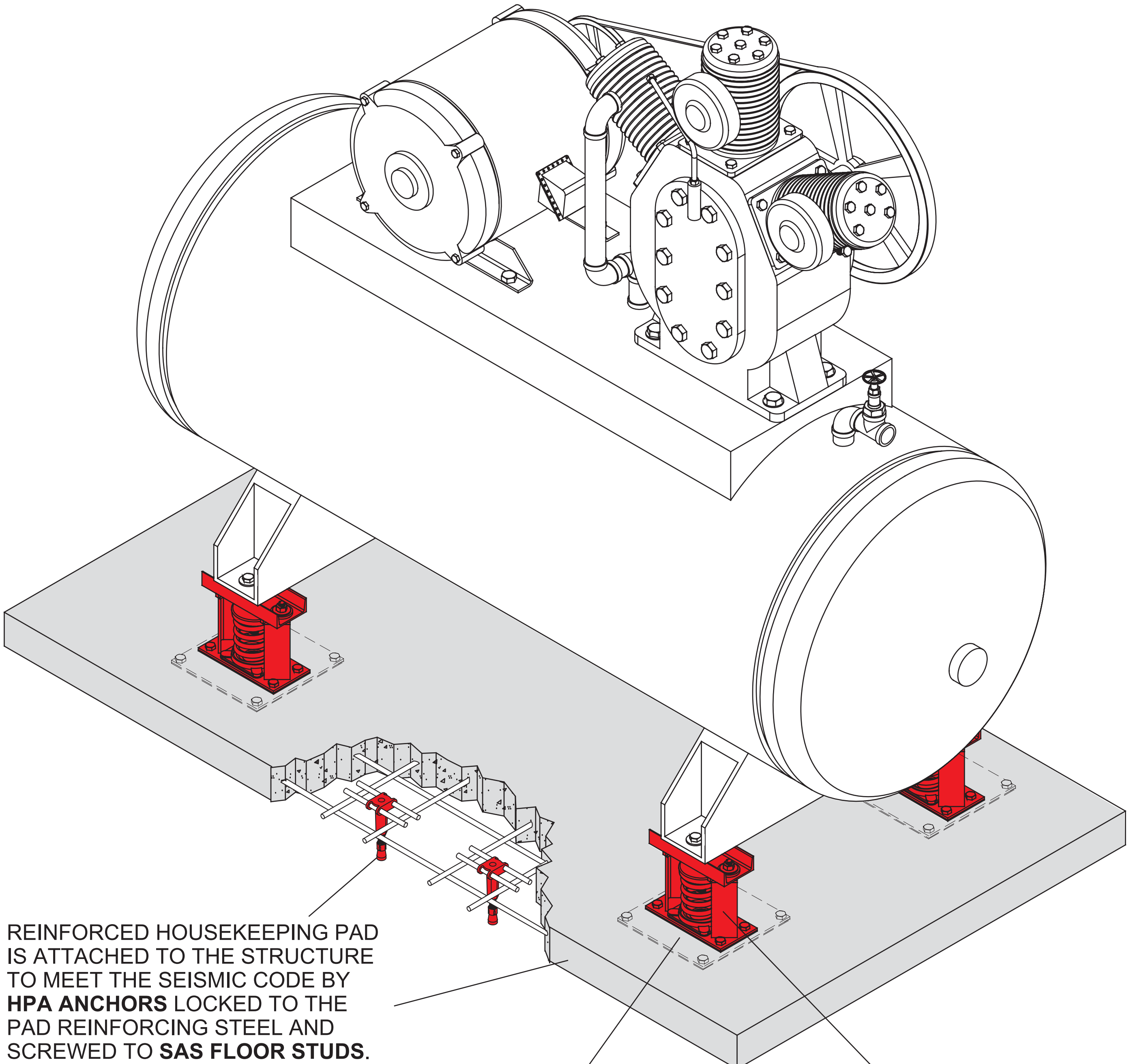


03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

HORIZONTAL TANK TYPE COMPRESSOR

directly mounted on SLR Restrained Spring Mounts.
Reinforced housekeeping pad secured by HPA Anchors.



REINFORCED HOUSEKEEPING PAD IS ATTACHED TO THE STRUCTURE TO MEET THE SEISMIC CODE BY **HPA ANCHORS** LOCKED TO THE PAD REINFORCING STEEL AND SCREWED TO **SAS FLOOR STUDS**.
SPECIFICATION 29

IN SEISMIC ZONES EXTENDED BASE PLATES MAYBE REQUIRED TO MEET THE SEISMIC CODE. BASE PLATES MUST BE ANCHORED WITH **SAST ANCHORS**.
SPECIFICATION 19

SLR RESTRAINED SPRING MOUNT WITH SPECIFIED DEFLECTION.
SPECIFICATION 6

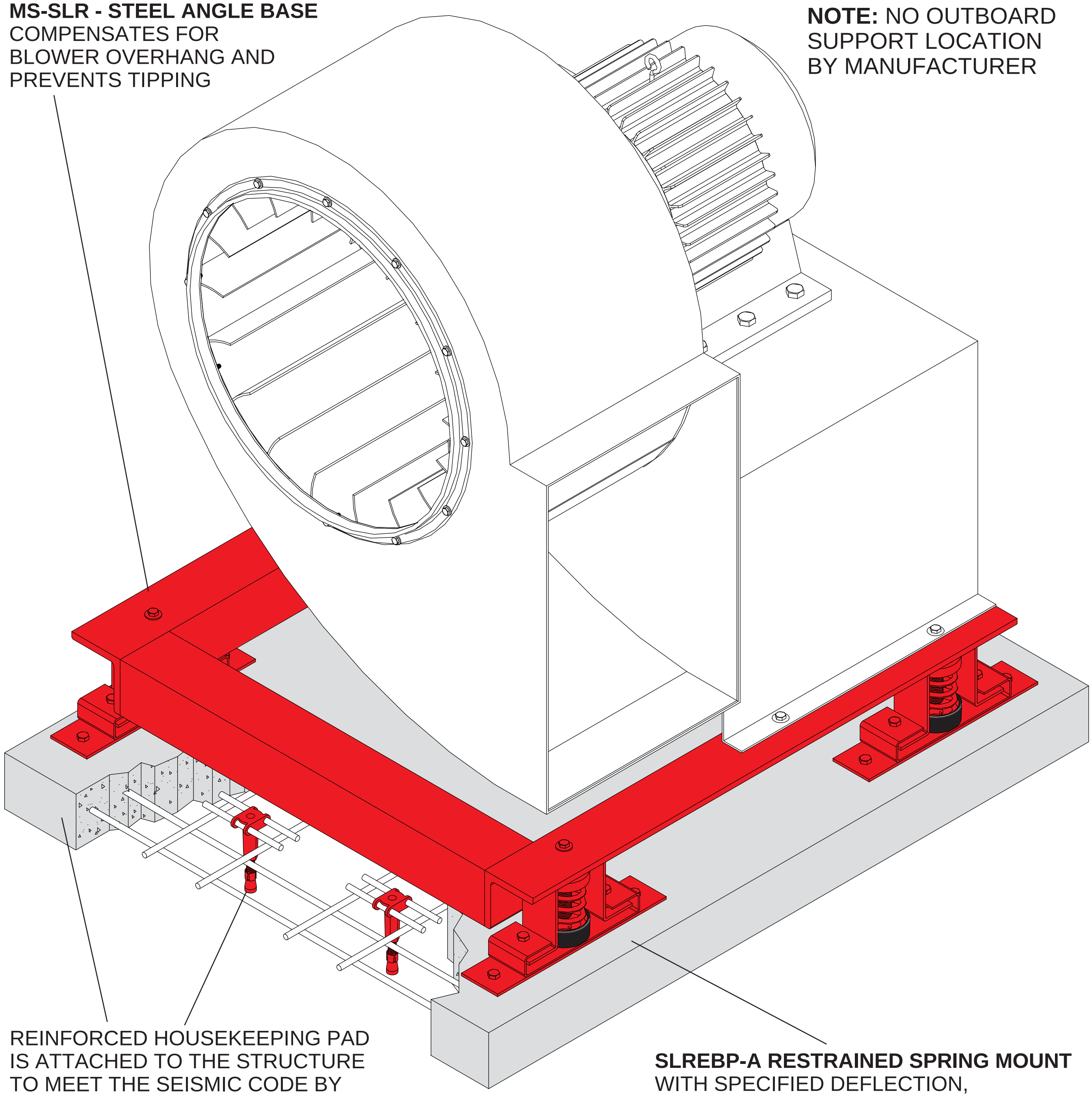
03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

DIRECT DRIVE BLOWER **bolted to** MS-SLR **Steel Angle Base supported by** SLREBP-A **Restrained Spring Mounts. Reinforced housekeeping pad secured by** HPA **Anchors.**

MS-SLR - STEEL ANGLE BASE
COMPENSATES FOR
BLOWER OVERHANG AND
PREVENTS TIPPING

NOTE: NO OUTBOARD
SUPPORT LOCATION
BY MANUFACTURER



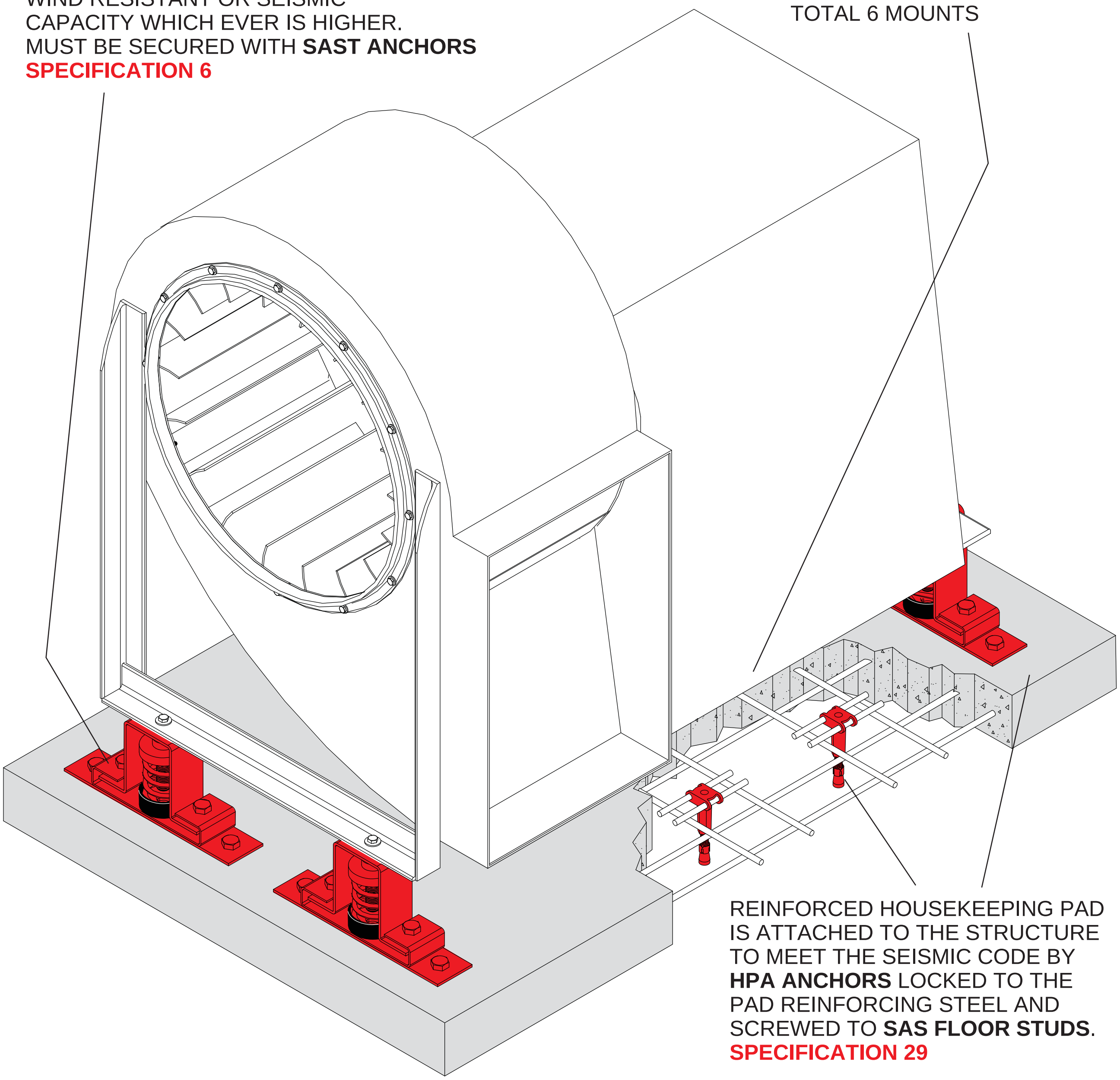
REINFORCED HOUSEKEEPING PAD
IS ATTACHED TO THE STRUCTURE
TO MEET THE SEISMIC CODE BY
HPA ANCHORS LOCKED TO THE
PAD REINFORCING STEEL AND
SCREWED TO **SAS FLOOR STUDS**.
SPECIFICATION 29

SLREBP-A RESTRAINED SPRING MOUNT
WITH SPECIFIED DEFLECTION,
WIND RESISTANT OR SEISMIC
CAPACITY WHICH EVER IS HIGHER.
MUST BE SECURED WITH **SAST ANCHORS**
SPECIFICATION 6

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

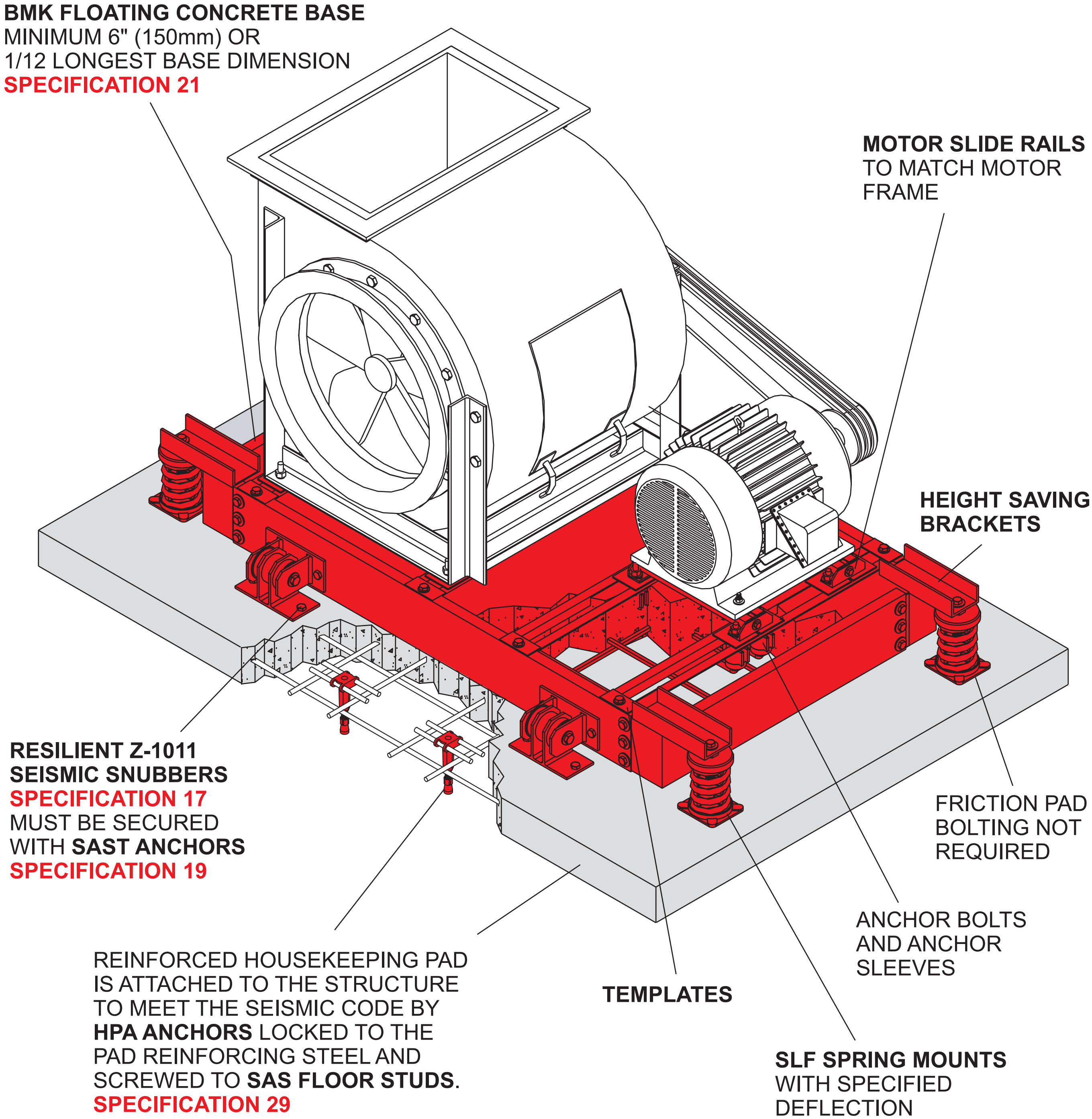
UTILITY BLOWER directly mounted on seismically restrained SLREBP-A Mounts. Reinforced housekeeping pad secured by HPA Anchors. Also useful for non seismic outdoor windy locations.



03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

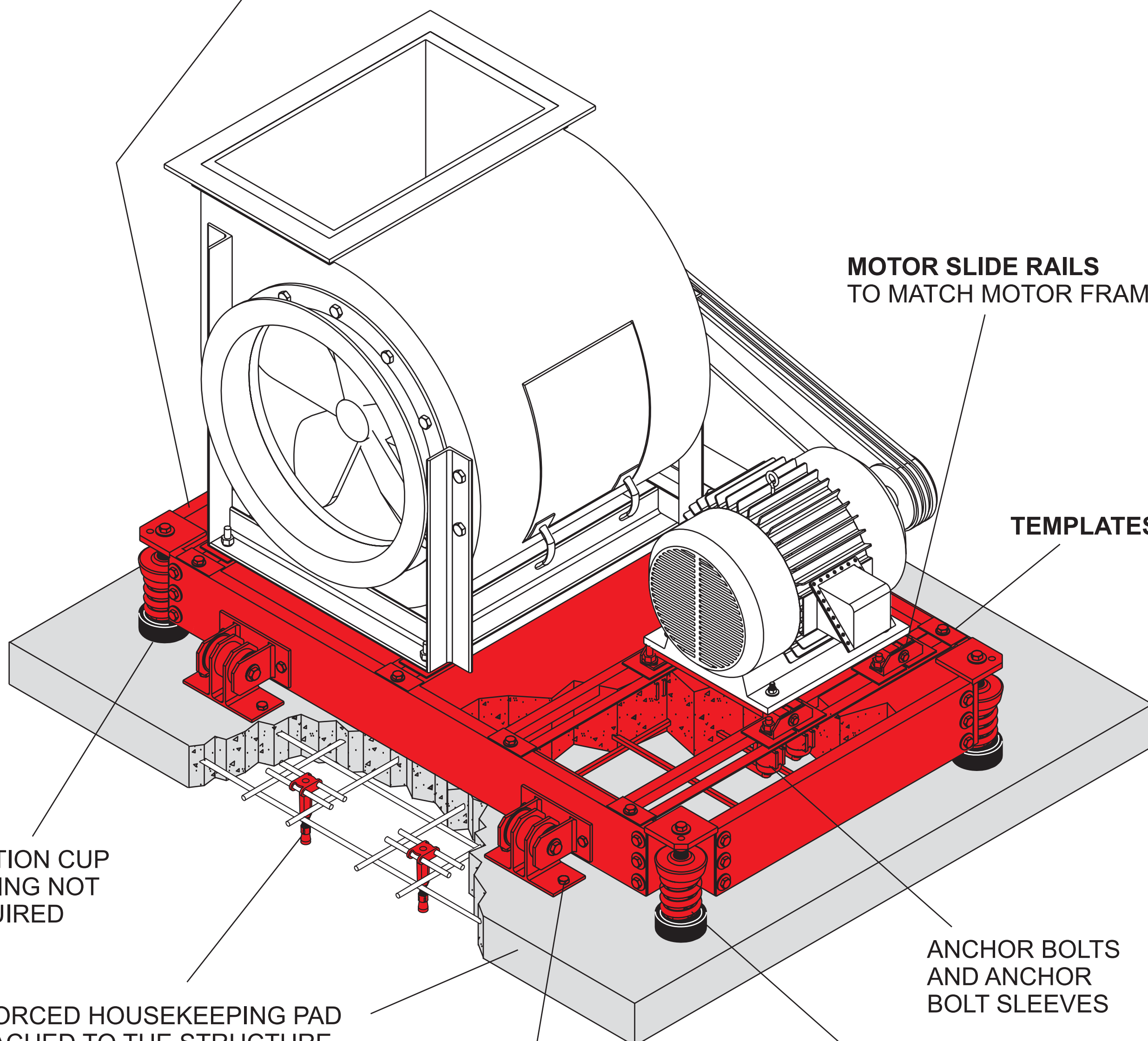
CENTRIFUGAL BLOWER on concrete filled BMK Base with height saving brackets, high deflection SLF Spring Mounts and Z-1011 Seismic Snubbers. Reinforced housekeeping pad secured by HPA Anchors.



03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

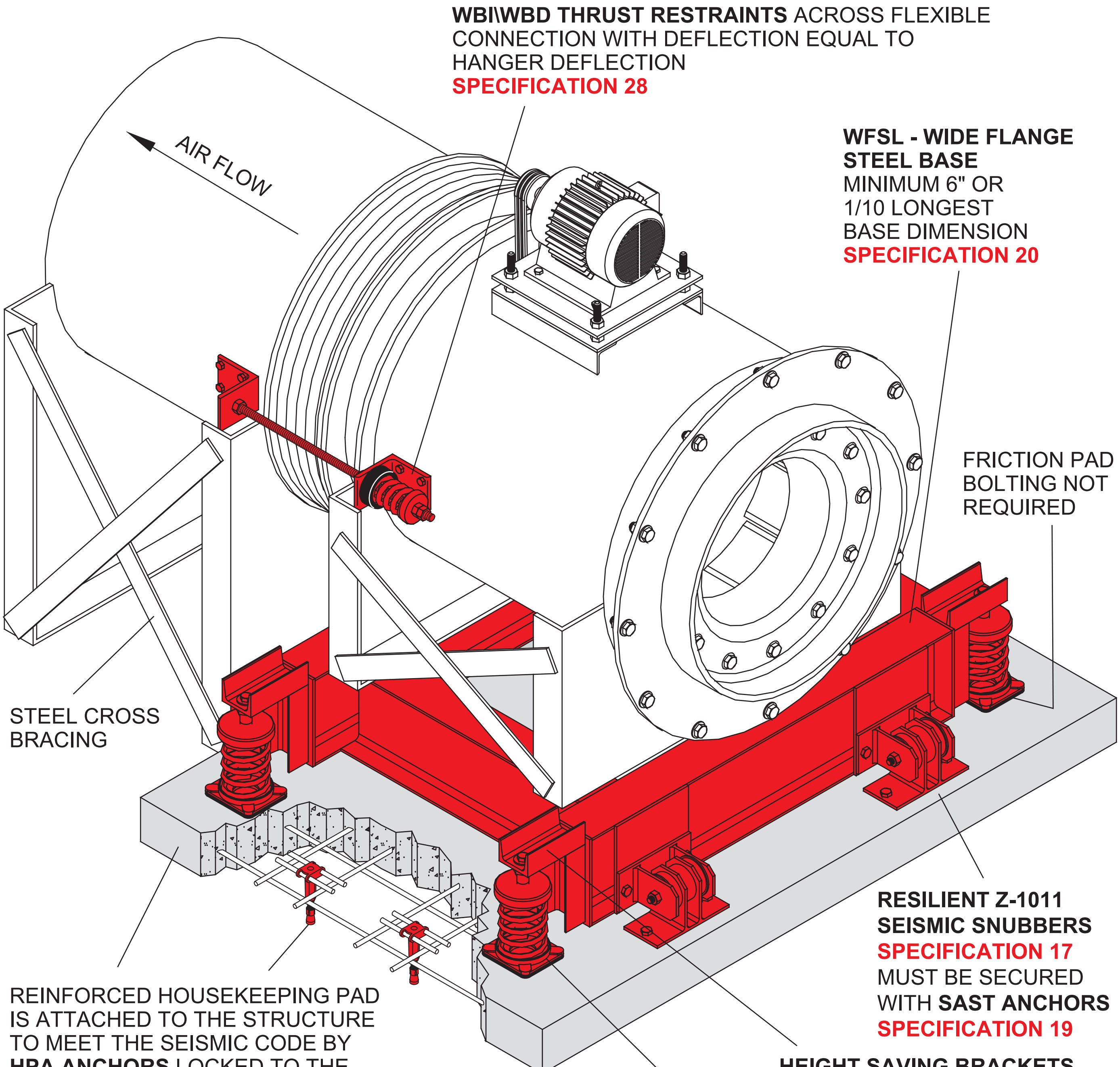
CENTRIFUGAL BLOWER on concrete filled **BMK** Base with built in corners, 1" deflection **SLF** Spring Mounts and **Z-1011** Seismic Restraints. Reinforced housekeeping pad secured by **HPA** Anchors.



03/2020

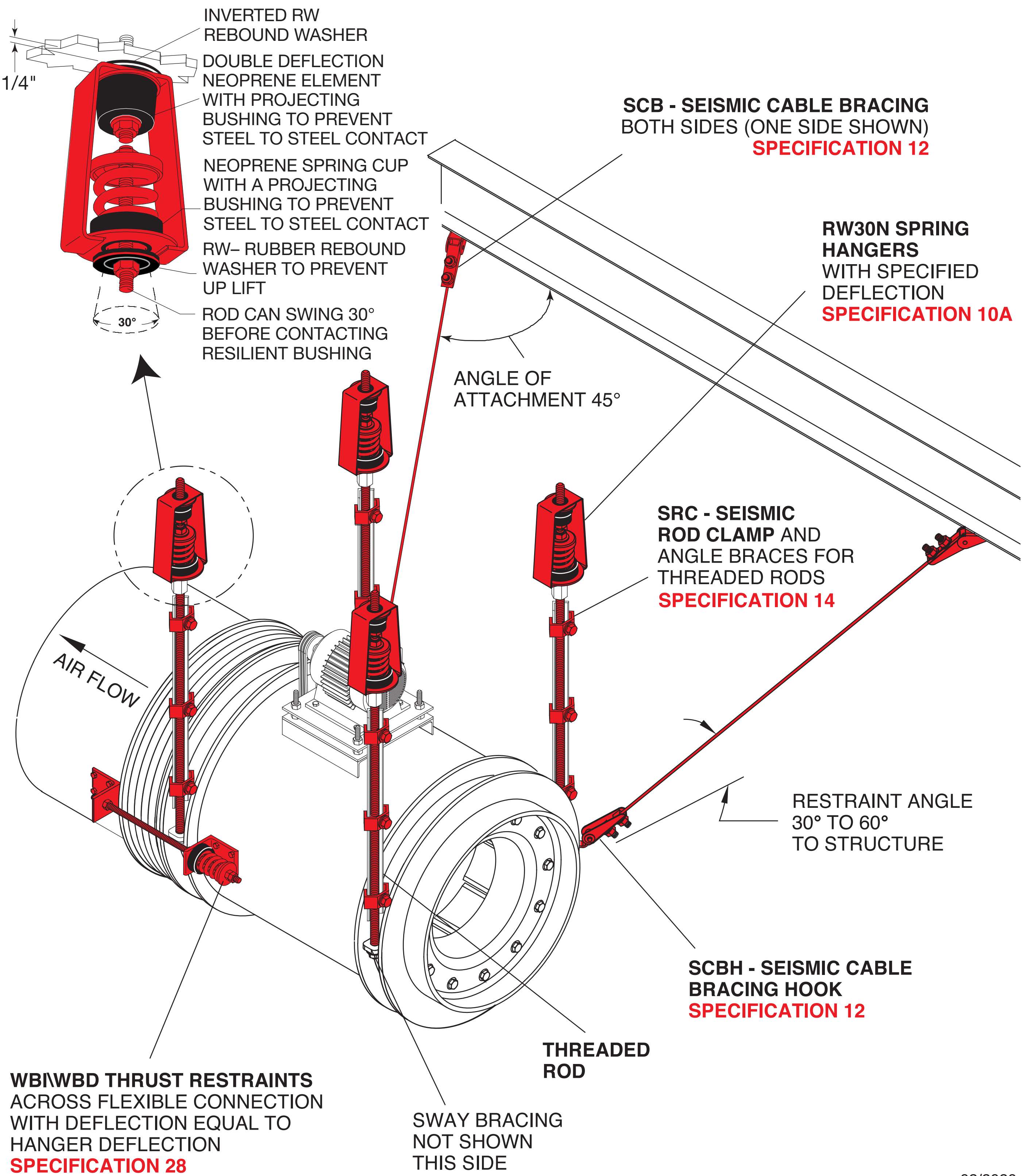
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

AXIAL BLOWER with WBI/WBD Thrust Restraints mounted on WFSL Base with height saving brackets, high deflection SLF Mounts and Z-1011 Seismic Restraints. Reinforced housekeeping pad secured by HPA Anchors.



03/2020

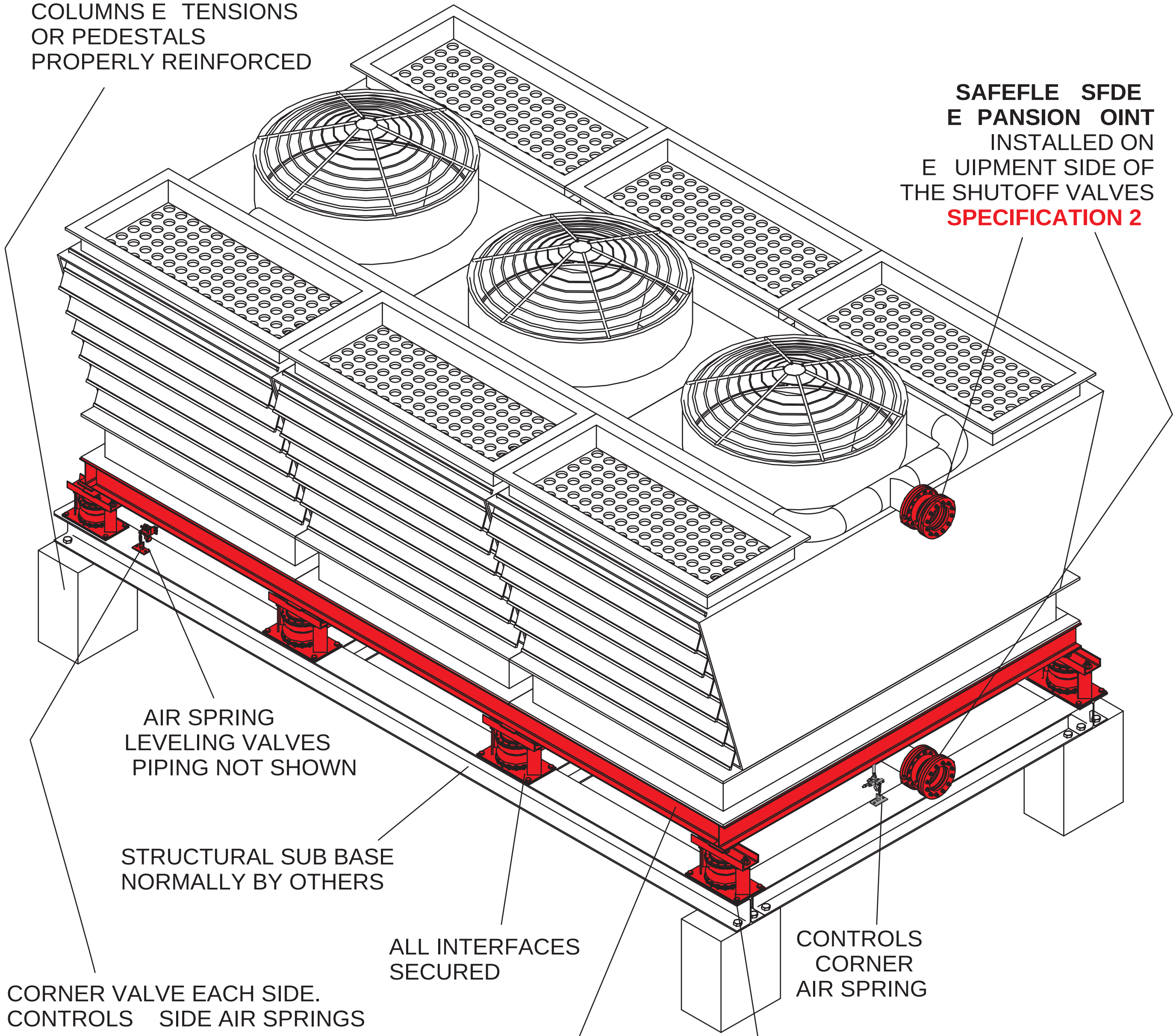
AXIAL BLOWER with WBI/WBD Thrust Restraints suspended by RW30N Hangers and restrained by SCB Cable Assemblies



03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

LAR E MULTI-SECTIO ED COOLI TOWER secured to steel base and beam supports using SLR-MT Restrained Air Spring Mounts. SA E LE E pansion oints are installed in pipelines to reduce blade fre uency ibration and noise and to allow for seismic displacement.

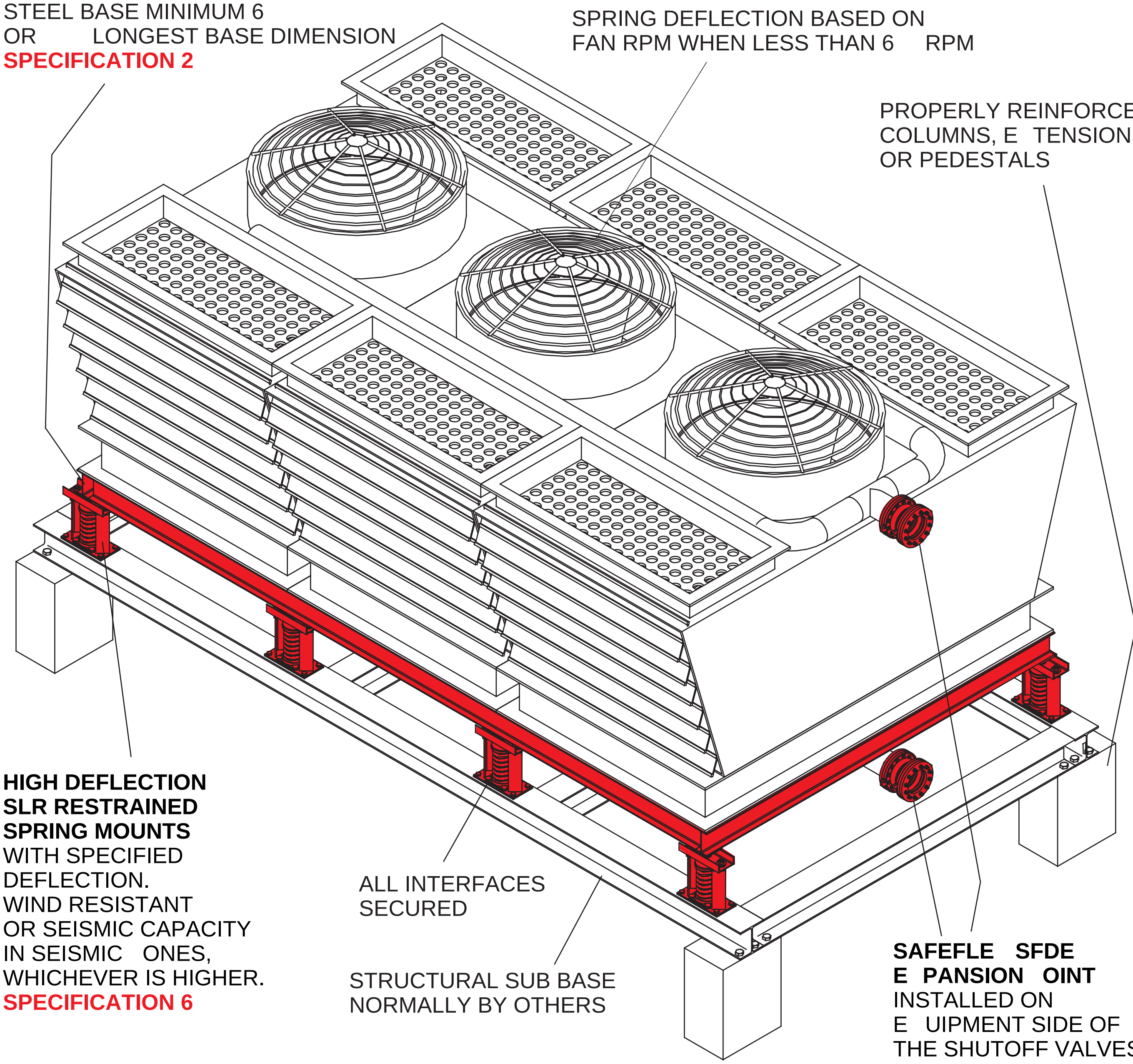


03/2020

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

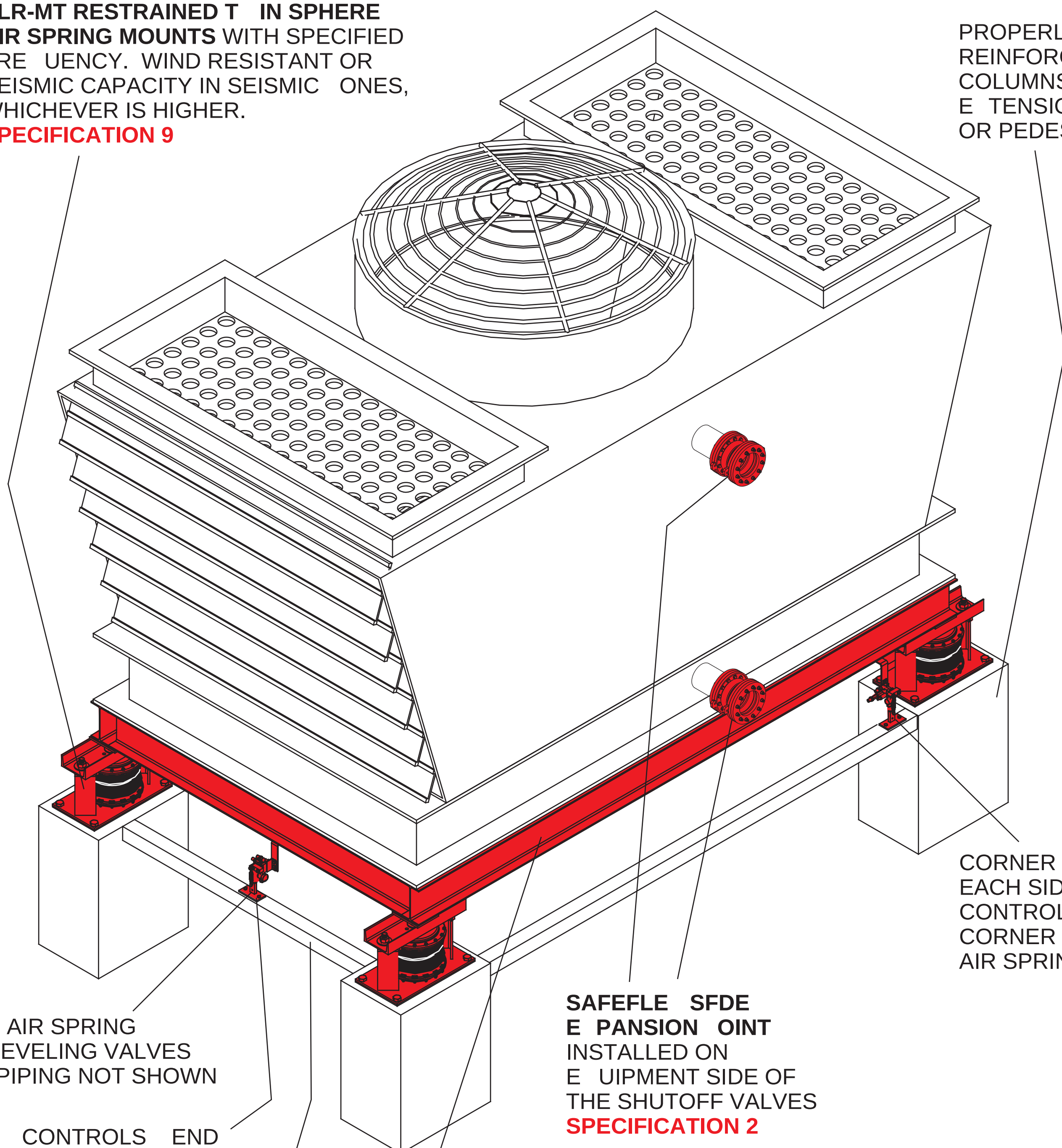
LAR E MULTI-SECTIO ED COOLI TOWER secured to steel base and beam supports using high deflection SLR Restrained Spring Mounts. SA E LE E pansion oints are installed in pipelines to reduce blade fre uency ibration and noise and to allow for seismic displacement.



03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

PAC A ED HVAC COOLI   TOWER on steel base with SLR-MT Restrained Twin Sphere Air Spring Mounts. SA E LE   E pansion oints are installed in pipelines to reduce blade fre uency ibration and noise and to allow for seismic displacement.



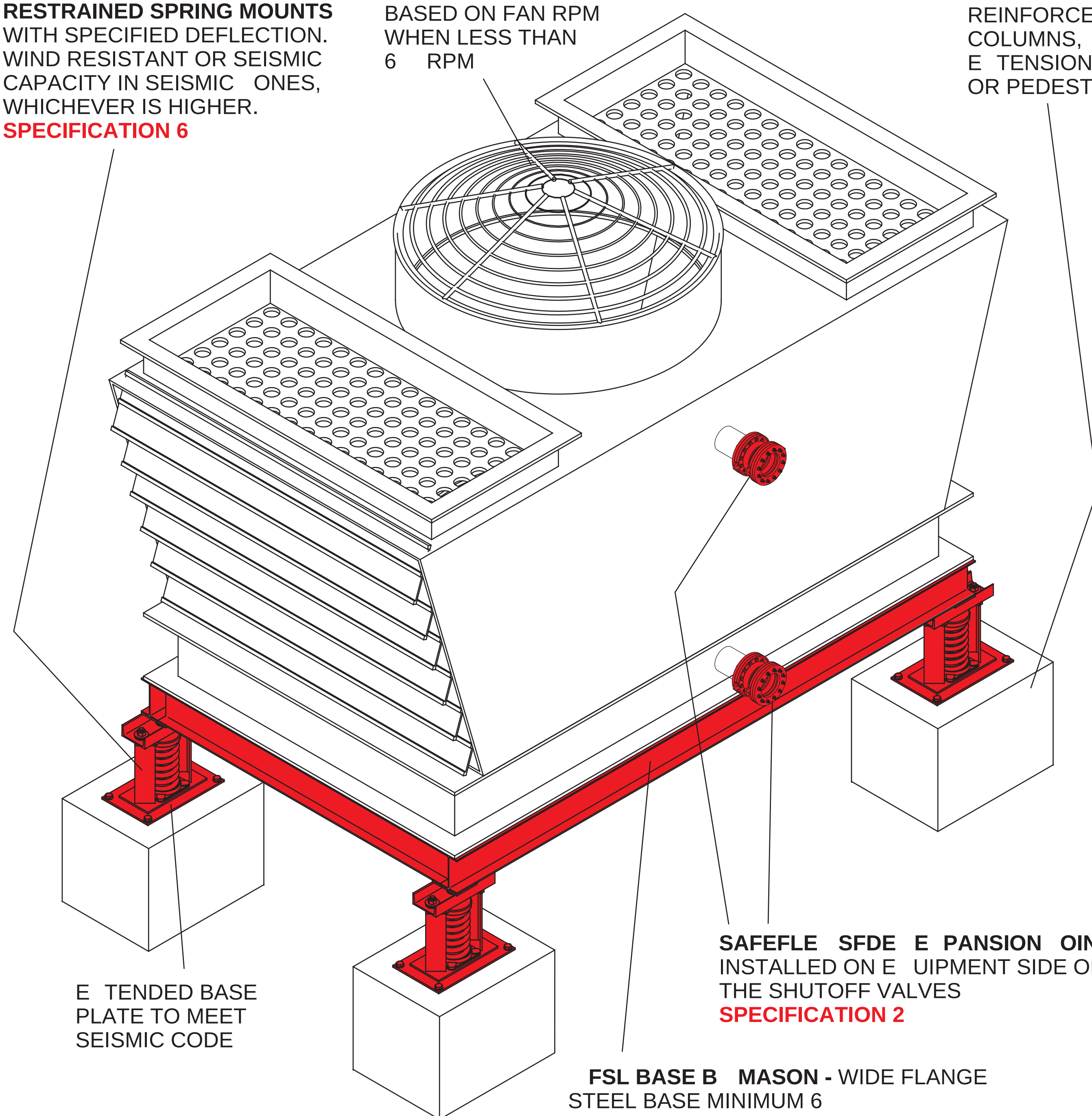
03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

PAC A ED HVAC COOLI TOWER

on steel base and SLR Restrained Spring Mounts.

SA E LE E pansion oints are installed in pipelines to reduce blade fre uency ibration and noise and to allow for seismic displacement.



03/2020

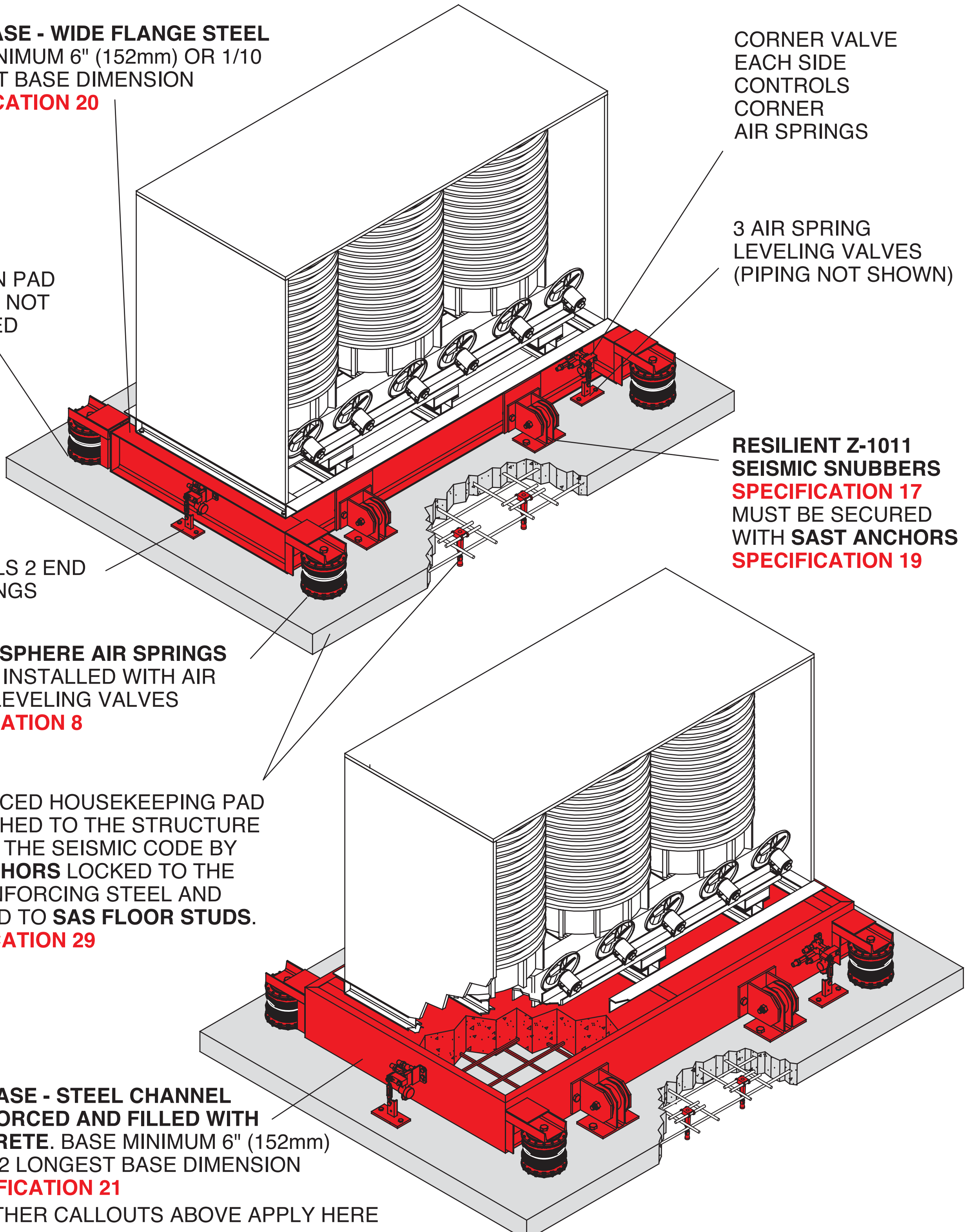
Page

FM24

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

LARGE TRANSFORMER mounted on a WFSL or KSL Base supported by MT Air Spring Mounts and Z-1011 Seismic Restraints. Reinforced housekeeping pad secured by HPA Anchors. Schematic Only– Final installation to meet all safety regulations as well as electrical and other codes.



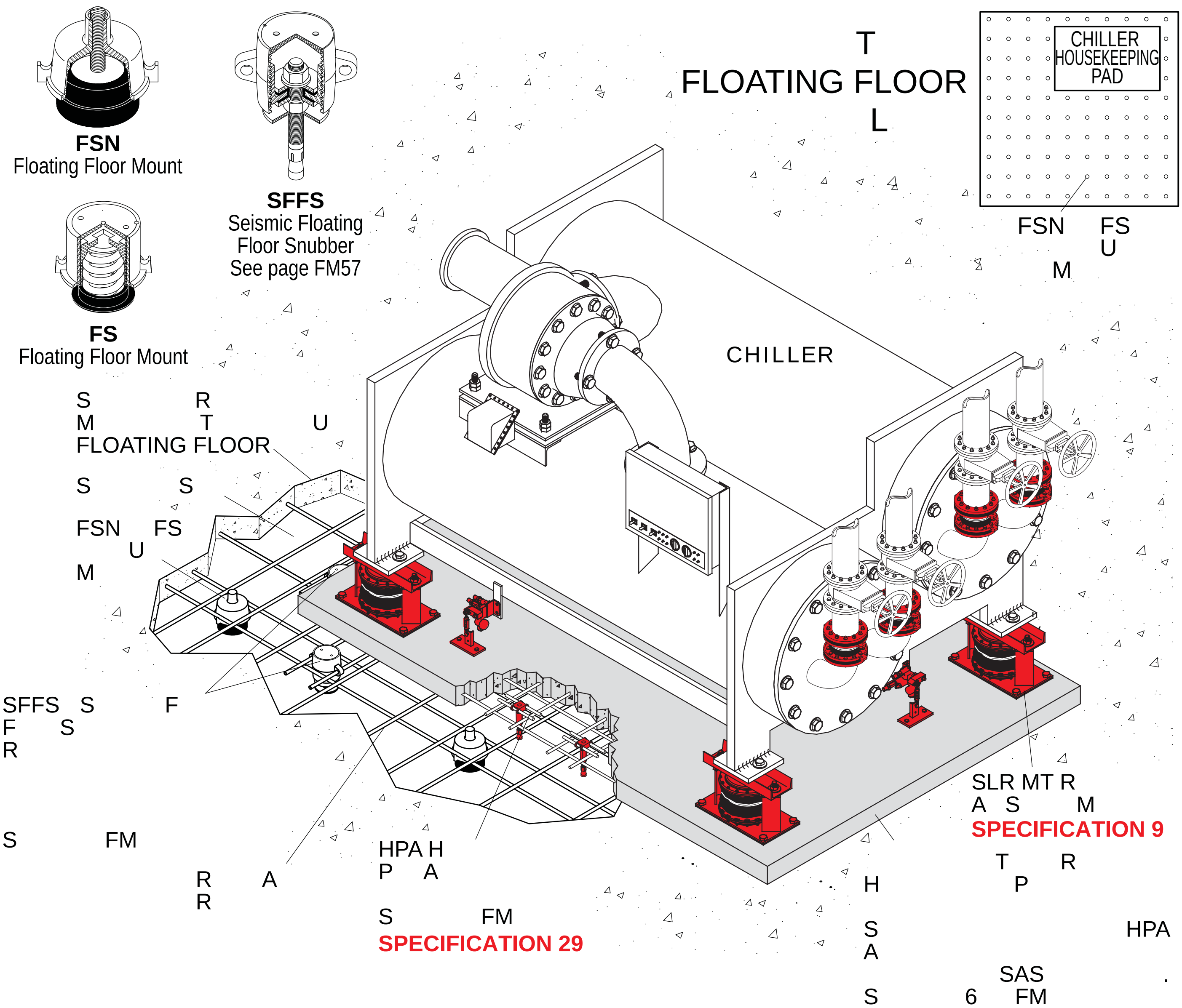
03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

CENTRIFUGAL CHILLER directly mounted on seismically rated SLR-MT Restrained Twin Sphere Air Spring Mounts. Reinforced housekeeping pad secured by HPA Anchors. SAFEFLEX Expansion Joints are installed in pipelines to reduce blade frequency vibration and noise and to allow for seismic displacement.

Many mechanical rooms are located over or adjacent to sensitive occupied space so a concrete floating floor is used to decrease the airborne noise. Our **FSN Low Dynamic Stiffness Bridge Bearing Rubber or FS Steel Spring** supported concrete floating floors can improve the STC rating by 25 points and the INR by 44.

Equipment mounted on these floating floors must be seismically attached. Because the floating floor is raised above the structural floor and supported by resilient mounts, the floating floor must be seismically mated with the structural slab. This is accomplished by using our style **SFFS OSHPD Approved Floating Floor Snubbers**. The **SFFS** has OSHPD approval OPA-321. **SFFS snubbers** are located close to the house-keeping pads to prevent the equipment overturning moment from breaking or buckling the floating floor.



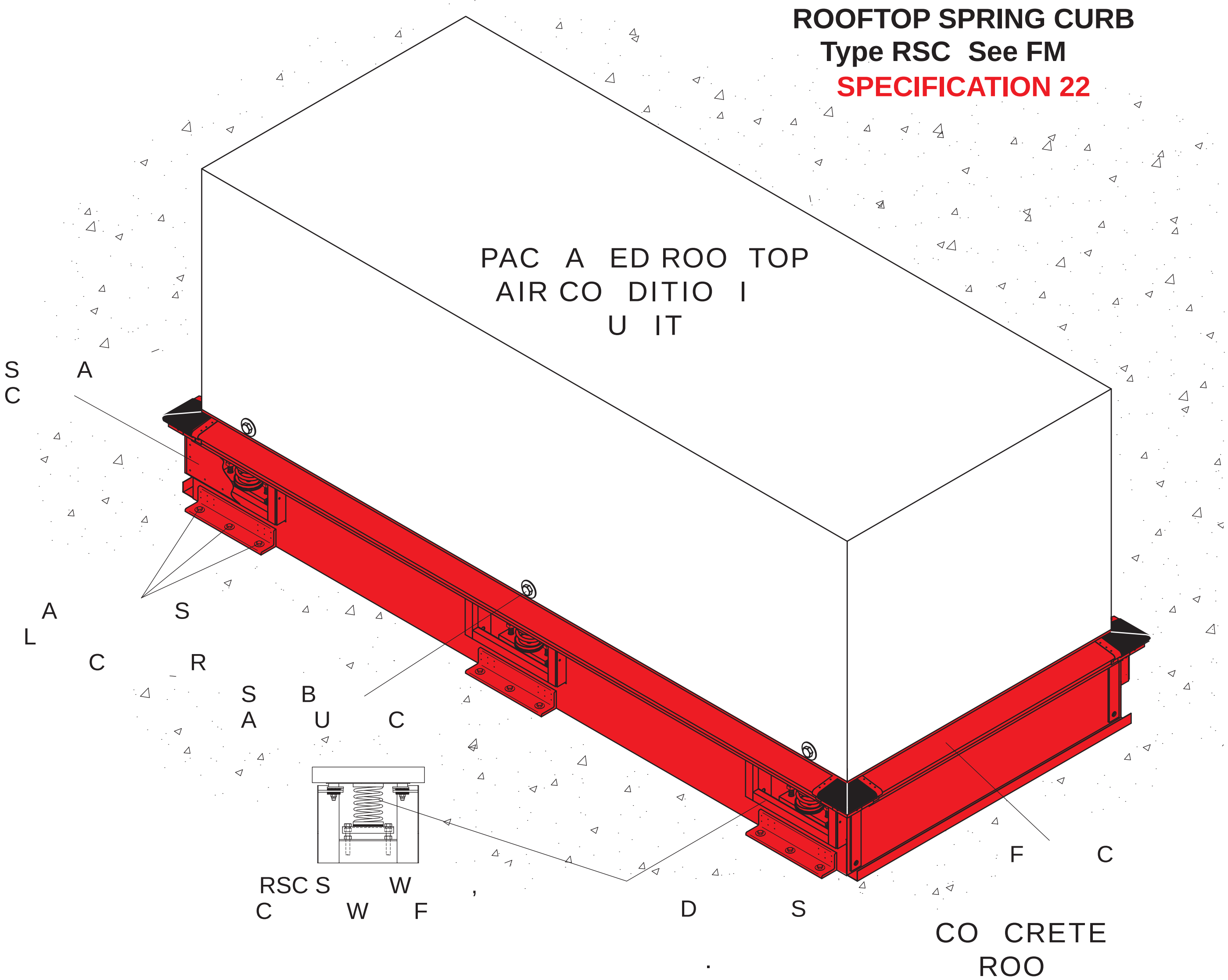
03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

PACKAGED ROOFTOP AIR CONDITIONING UNITS
on RSC Spring Isolated Roof Curb with Seismic Restraints

Packaged Air conditioning units are located on the roof of many commercial buildings. Internal isolation may not sufficiently reduce vibration and does not reduce noise. The best solution is our **RSC Roof Curb**, a 3” deflection vibration isolated curb with an added noise reduction package.

Adding vibration isolators on top of a manufacturer’s sheet metal curb is a poor substitute for a complete vibration isolated curb. Our **RSC Roof Curb** replaces the manufacturer’s curb and includes large diameter 3” deflection steel springs and rubber pads in a welded steel housing to provide vibration isolation and seismic and wind restraint.



The **Mason RSC curb** has been tested and approved by OSHPD and has OSHPD pre-approved OPA-0207. Refer to FM43 for more information.

The equipment attachment of the curb and the curb anchorage to the roof must be designed per code.

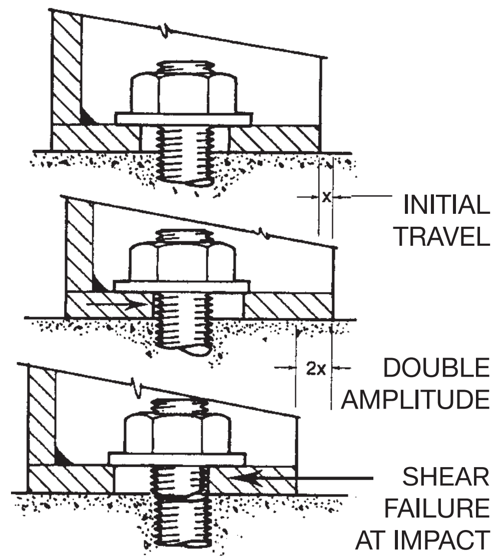
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

OVERSIZE EQUIPMENT BOLT HOLE SOLUTIONS

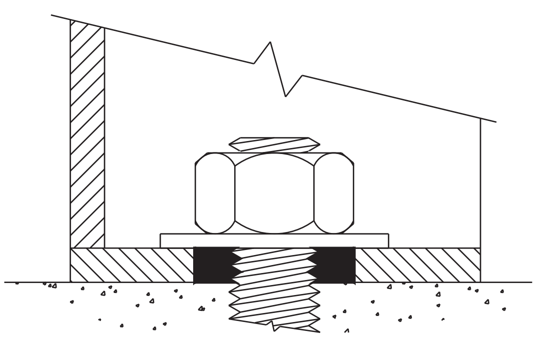
Earthquakes are dynamic events and when there is excessive clearance between anchor bolts and equipment holes, the equipment has a tendency to shear off the anchor bolts during earthquakes at accelerations as low as 0.2 G. The reason as explained in the figure is a velocity buildup because of sliding.

In an earthquake the floor shifts violently side to side. The anchor bolts must be designed to keep the equipment in place as the building moves. Friction due to gravity or from bolt installation torque cannot be considered.

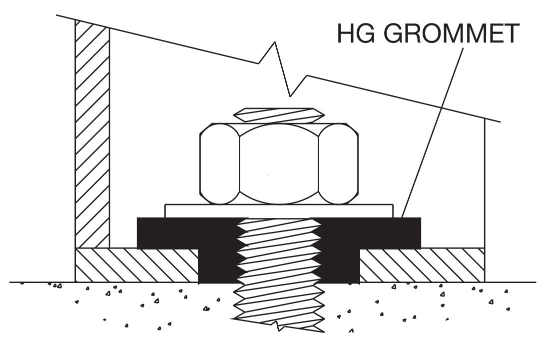
Type HG [FM61] neoprene grommet and Type HCF hole clearance filler provide quick solutions as they fill this clearance created by practical tolerances, off center bolts or the extreme situation where holes are enlarged on the job site by drilling or burning. HG grommets surround the bolt shaft and cushion the system. HCF filler fills the airgap completely.



IMPACT SHEAR FAILURE



HCF REMEDY
(Hole Clearance Filler)



HG REMEDY [FM61]
(Neoprene Grommet)

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

HOUSEKEEPING PADS

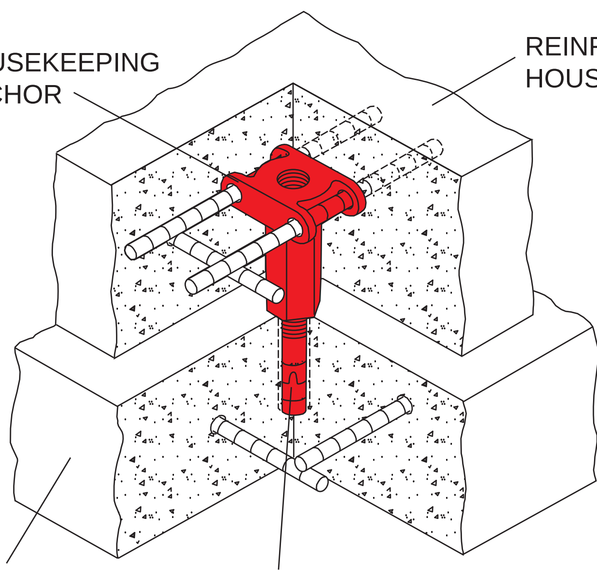
A major cause of equipment restraint failure is the breaking up of housekeeping pads. Virtually all housekeeping pads are poured independently after completion of the structure. In many cases there is no mechanical attachment to the structural floor and the pad itself may not be reinforced.

The floor diaphragm vibrates vertically and under resonant conditions generates more than 1G. This tosses the pad and the machine attached to it. As the pad crashes back it breaks up and the equipment loses all anchorage.

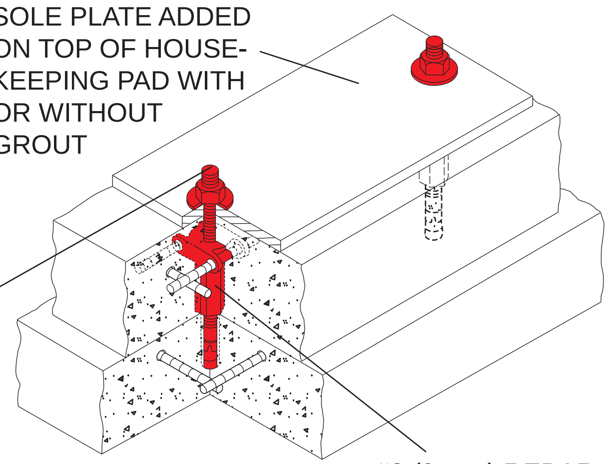
Since housekeeping pad sizes and locations are not established until after a machine room floor is poured, there is no way to cast in rebar pad stirrups. There is an undefined engineering area as to who should design and what type of cast in restraints should be used. In designing the HPA anchor system we have assumed the responsibility as part of our system certification. See Tables 6 & 7 on page FM30 HPA Anchorage Guidelines.

The HPA anchor [FM58] is manufactured in three sizes and has three anchoring capacities. The inverted hexagonal pyramid locks into the cured housekeeping pad and has provision for passing 2 #3 rebars through the holes on top for positioning the pad reinforcement system.

HOUSEKEEPING PAD ANCHOR ONLY



COMBINED HOUSEKEEPING PAD AND SOLE PLATE ANCHOR



03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

The number of anchors that are needed depend on the HPA size and the vertical rating of the SAS stud anchor as listed.

TABLE 6

F_P Up To 0.5G (see example FM31)

Housekeeping Pad Area FT² (*M²*)	Reinforcing 12" *(300mm)* on Center Each Way	Perimeter HPA Size 24" *(600mm)* on Center	Interior HPA Size 36" *(900mm)* on Center	Maximum Weight of Pad and Equipment lbs *(kg)*
Up to 40 *(3.7)*	# 3 *(T8)*	HPA-1/2	HPA-1/2	8000 *(3,600)*
41 *(3.8)* to 100 *(9.3)*	# 4 *(T12)*	HPA-5/8	HPA-5/8	15,000 *(6,800)*
101 *(9.4)* to 250 (23)	# 4 *(T12)*	HPA-5/8	HPA-5/8	25,000 (11,400)
251 *(23)* to 400 (37)	# 5 *(T16)*	HPA-3/4	HPA-3/4	50,000 (22,800)

TABLE 7

F_P = 0.5G To 1.0G (see example FM31)

Housekeeping Pad Area FT² (*M²*)	Reinforcing 12" *(300mm)* on Center Each Way	Perimeter HPA Size and Centers	Interior HPA Size 36" *(900mm)* on Center	Maximum Weight of Pad and Equipment lbs *(kg)*
Up to 40 *(3.7)*	# 3 *(T8)*	HPA-5/8 24"*(600mm)* on Center	HPA-5/8	8000 *(3,600)*
41 *(3.8)* to 100 *(9.3)*	# 4 *(T12)*	HPA-5/8 24"*(600mm)* on Center	HPA-5/8	15,000 *(6,800)*
101 *(9.4)* to 250 (23)	# 4 *(T12)*	HPA-3/4 18"*(450mm)* on Center	HPA-3/4	25,000 *(11,400)*
251 *(23)* to 400 *(37)*	# 5 *(T16)*	HPA-3/4 18"*(450mm)* on Center	HPA-3/4	50,000 *(22,800)*

Notes for TABLES 6 & 7

1. These tables apply to systems where the center of gravity of the combined weight of the pad, equipment and isolation system is less than the width of the pad.

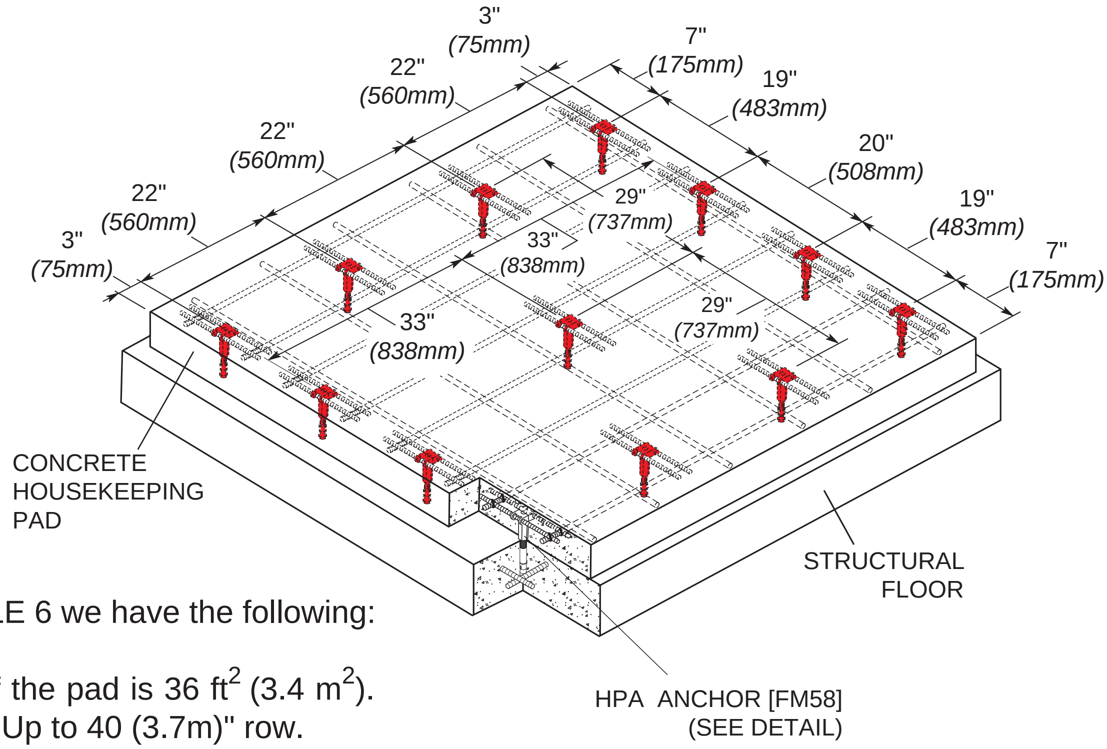
2. Reinforcing is to be placed at the centerline of the pad.

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Example No.1– Housekeeping Pad

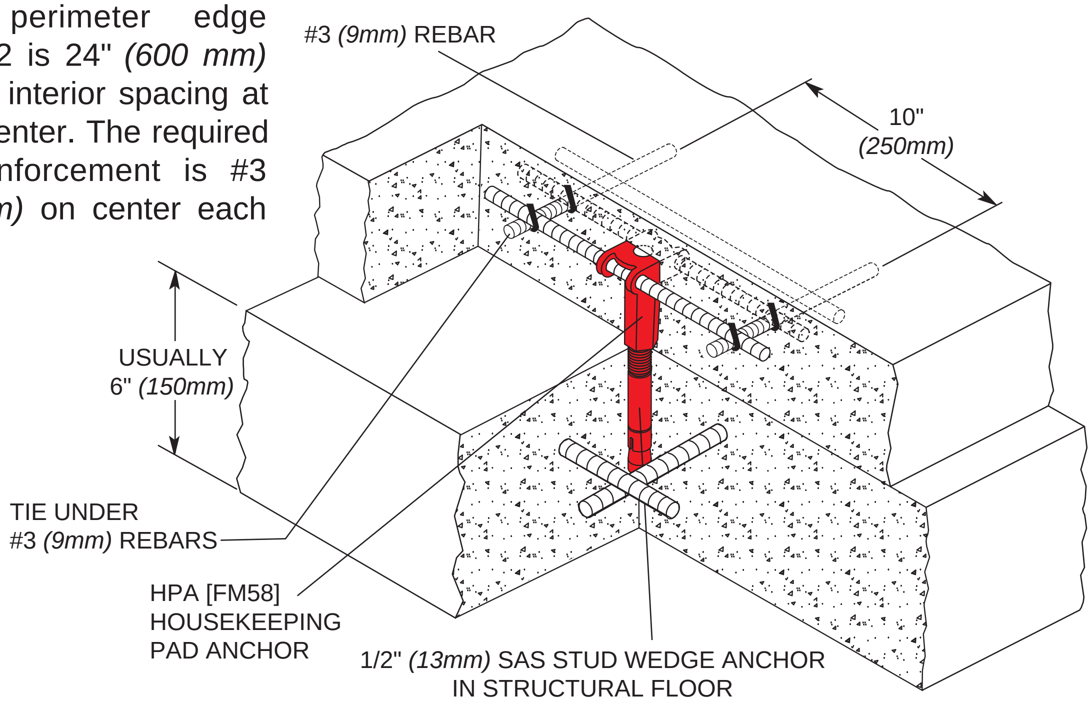
The housekeeping pad for a pump on a concrete inertia base is 6' x 6' x 4" (1830 x 1830 x100 mm). The combined weight of the pump, motor, housekeeping pad and concrete inertia *base*



Using TABLE 6 we have the following:

The area of the pad is 36 ft^2 (3.4 m^2). so use the "Up to 40 (3.7m)" row.

The maximum perimeter edge spacing of HPA-1/2 is 24" *(600 mm)* on center, and the interior spacing at 36" *(900 mm)* on center. The required minimum pad reinforcement is #3 rebar 12" *(300 mm)* on center each way (O.C.E.W.).



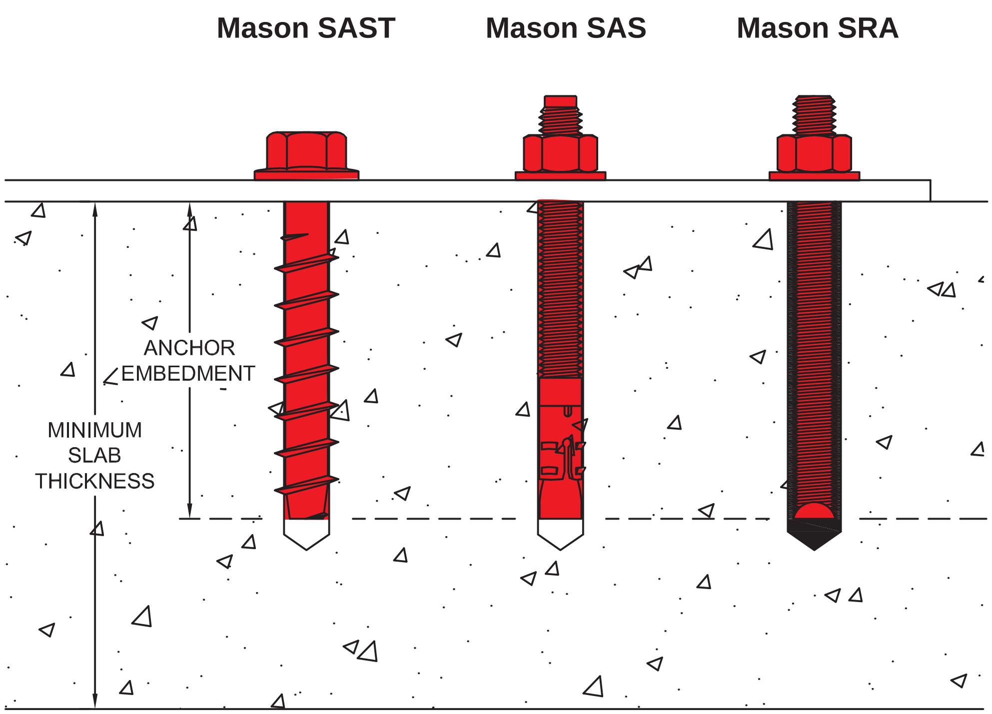
ATTACHMENT TO CONCRETE

Equipment is often anchored to concrete floors or housekeeping pads. IBC requires that all concrete anchorage including cast-in-place anchors and post-installed anchors must be designed per the requirements of ACI 318 Appendix D. IBC also requires that post-installed are pre-qualified per ACI 355.2. ICC Evaluation Reports list basic allowable values of anchors, required embedment and slab thickness. These values are then used in anchorage calculations to determine the actual allowable values of anchors.

Concrete anchorage can be difficult to qualify in thin slabs, decks and housekeeping pads. Edge distance is critical and the requirements have increased over previous design standards. Concrete anchorage in narrow piers is particularly difficult to qualify. Special concrete reinforcing design and coordination with the project structural engineer may be necessary. Cast in place equipment anchors must be set before pouring concrete housekeeping pads or floors, often before equipment is submitted or approved for a project. Through-bolting is expensive and very difficult to coordinate. For cost and practicality post-installed anchors are typically used to anchor equipment to concrete.

Mason Industries offers several types of prequalified post-installed concrete anchors as shown in Figure 1. Each type of anchor has unique installation requirements and attributes which are listed on the following page.

Figure 1 Concrete Anchor Types



03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Mason Industries Post Installed Concrete Anchor Information

Mason SAST Anchors (Seismic Anchor Self Tapping) are concrete screws:

1. SAST anchors are available in zinc plated hardened steel, and are primarily used in dry interior locations.
2. SAST anchors have no minimum installation torque.
3. SAST anchors can be used with smaller edge distances than expansion anchors.
4. SAST anchors have an ICC ES Report and a City of Los Angeles Research Report for installation in cracked and un-cracked concrete and installation into masonry.
5. Recommended for anchoring floor mounted equipment including restrained isolators and snubbers where periodic removal and inspection can be made without lifting the equipment or restraint over a protruding stud.
6. Refer to page FM63 for more information.

Mason SAS Anchors (Seismic Anchor Stud) are wedge style expansion anchors and are our primary choice for concrete anchorage:

1. SAS anchors are approved for installation into normal weight and lightweight concrete and in the underside of a concrete filled sheet-metal deck.
2. Zinc-plated anchors are primarily used in dry, interior locations.
3. Stainless steel SAS can be used in all locations including outdoors and in damp areas.
4. SAS anchors must be torque set.
5. SAS anchors have an ICC ES Report and a City of Los Angeles Research Report for installation in cracked and un-cracked concrete and have an IAPMO ER and Los Angeles Research Report for installation in masonry.
6. Recommended for general use including anchorage of seismic bracing of piping and suspended equipment using Mason SCB and SSBS seismic braces.
7. Refer to page FM62 for more information.

Mason SRA Anchors (Seismic Rod Anchor) are adhesive anchors:

1. SRA anchors have no minimum torque.
2. SRA anchors are approved for installation in normal weight concrete only, so we can’t use them in lightweight concrete.
3. SRA anchors can’t be used overhead.
4. SRA anchors can be used with smaller edge distances than expansion anchors.
5. SRA anchors can be provided with standard or high strength zinc plated threaded rods for dry, indoor locations, or two grades of stainless steel rods in all locations including damp, outdoor locations.
6. SRA anchors have an ICC ES Report and a City of Los Angeles Research Report for installation in cracked and un-cracked concrete.
7. Recommended for anchoring floor mounted equipment, restrained mounts and snubbers.
8. Refer to page FM64 for more information.

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

1. Two layers of 3/4” (19mm) thick neoprene pad consisting of 2” (50mm) square waffle modules separated horizontally by a 16 (1.5mm) gauge galvanized shim. Load distribution plates shall be used as required. Pads shall be type **Super W** as manufactured by Mason Industries, Inc.

2. Bridge bearing neoprene mountings shall have a minimum static deflection of 0.2” (5mm) and all directional seismic capability. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. The shock absorbing neoprene materials shall be compounded to bridge bearing specifications. Mountings shall have an OPA preapproval from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings. Mountings shall be type **BR** as manufactured by Mason Industries, Inc.

3. Sheet metal panels shall be bolted to the walls or supporting structure by assemblies consisting of a neoprene bushing cushioned between 2 steel sleeves. The outer sleeve prevents the sheet metal from cutting into the neoprene. Enlarge panel holes as required. Neoprene elements pass over the bushing to cushion the back panel horizontally. A steel disc covers the inside neoprene element and the inner steel sleeve is elongated to act as a stop so tightening the anchor bolts does not interfere with panel isolation in 3 planes. Bushing assemblies can be applied to the ends of steel cross members where applicable. All neoprene shall be bridge bearing quality. Bushing assemblies shall be type **PB** as manufactured by Mason Industries, Inc.

4. A one piece molded bridge bearing neoprene washer/bushing. The bushing shall surround the anchor bolt and have a flat washer face to avoid metal to metal contact. Neoprene bushings shall be type **HG** as manufactured by Mason Industries, Inc.

5. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4” (6mm) neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall have be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height. Mountings shall be type **SLF** as manufactured by Mason Industries, Inc.

6. Restrained spring mountings shall have an SLF mounting as described in Specification 5, within a rigid housing that includes vertical limit stops to prevent spring extension when weight is removed. The housing shall serve as blocking during erection. Installed and operating heights are equal. Restraining Bolts shall have a neoprene bushing between the bolt and the housing. A clearance of 1/4” (6mm) shall be maintained around restraining bolts and the bushing so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Since housings will be bolted or welded in position there must be an internal isolation pad. Housing shall be designed to resist all seismic forces. Mountings shall have an OPA preapproval from OSHPD in the state of California certifying the maximum certified horizontal and vertical load ratings. Mountings shall be type **SLR** or **SLRS** as manufactured by Mason Industries, Inc.

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279

2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

7. Spring mountings as in specification 5 built into a ductile iron or steel housing to provide all directional seismic snubbing. The snubber shall be adjustable vertically and allow a maximum of 1/4” (6mm) travel in all directions before contacting the resilient snubbing collars. Mountings shall have an Anchorage Preapproval OPA number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings. Mountings shall be type **SSLFH** as manufactured by Mason Industries, Inc.

8. Air Springs shall be manufactured with upper and lower steel sections connected by a replaceable flexible nylon reinforced neoprene element. Air spring configuration shall be multiple bellows to achieve a maximum natural frequency of 3 Hz. Air Springs shall be designed for a burst pressure that is a minimum of three times the published maximum operating pressure. All air spring systems shall be connected to either the building control air or a supplementary air supply and equipped with three leveling valves to maintain leveling within plus or minus 1/8” (3mm). Submittals shall include natural frequency and load ratings. Air Springs shall be type **MT** and leveling valves type **LV** as manufactured by Mason Industries, Inc.

9. Restrained air spring mountings shall have an MT air spring as described in Specification 8, within a rigid housing that includes vertical limit stops to prevent air spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A clearance of 1/4” (6mm) shall be maintained around restraining bolts and between the housing and the air spring so as not to interfere with the air spring action. Limit stops shall be out of contact during normal operation. Housing shall be designed to resist all seismic forces. Mountings shall be type **SLRMT** as manufactured by Mason Industries, Inc.

10. Hangers shall consist of rigid steel frames containing minimum 1-1/4” (32mm) thick molded rubber elements at the top and a steel spring with general characteristics as in specification 5 seated in a steel washer reinforced rubber cup on the bottom. The rubber element and the cup shall have rubber bushings projecting through the steel box. To maintain stability the boxes shall not be articulated as clevis hangers nor the rubber element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc from side to side before contacting the rod bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30 degree capability. Hangers shall be type **30N** as manufactured by Mason Industries, Inc.

10A. Hangers shall be as described in 10, but they shall be supplied with a combination rubber and steel rebound washer as the seismic up stop for suspended piping, ductwork, equipment and electrical cable trays. Rubber thickness shall be a minimum of 1/4” (6mm). Submittals shall include a drawing of the hanger showing the installation of the rebound washer. Hangers shall be type **RW30N** as manufactured by Mason Industries, Inc.

11. Hangers shall be as described in 10, but they shall be pre-compressed and locked at the rated deflection by means of a resilient seismic up stop to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30 degree capability. Hangers shall be type **PC30N** as manufactured by Mason Industries, Inc.

12. Seismic Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all directional restraint. Cables must be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables must not be allowed to bend across sharp edges. Cable assemblies shall have an OPA preapproval from OSHPD in the State of California verifying the maximum certified load ratings. Cable assemblies shall be type **SCB** at the ceiling and at the clevis bolt, **SCBH** between the hanger rod nut and the clevis or equipment, or **SCBV** if clamped to a beam, all as manufactured by Mason Industries, Inc.

13. Seismic solid braces shall consist of steel angles or channels to resist seismic loads with a minimum safety factor of 2 and arranged to provide all directional restraint. Seismic solid brace end connectors shall be steel assemblies that swivel to the final installation angle and utilize two through bolts to provide proper attachment. Seismic solid brace assembly shall have an OPA Preapproval from OSHPD in the state of California verifying the maximum certified load ratings. Solid seismic brace assemblies shall be type **SSB**, **SHB** or **SSBS** as manufactured by Mason Industries, Inc.

    Note: Specifications 12 – 14 apply to trapeze as well as clevis hanger locations. At trapeze anchor locations piping must be clamped to the trapeze. Specifications apply to hanging equipment as well.

14. Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall have an OPA Preapproval from OSHPD in the State of California. Rod clamp assemblies shall be type **SRC** or **UCC** as manufactured by Mason Industries, Inc.

15. Pipe clevis cross bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross braces shall have an OPA Preapproval from OSHPD in the State of California. Clevis cross brace shall be type **CCB** as manufactured by Mason Industries, Inc.

16. All directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4” (6mm) thick. Rated loadings shall not exceed 1000 psi (.7kg/mm^2). A maximum air gap of 1/4” (6mm) shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to insure no short circuits exist before systems are activated. Snubbers shall have an OPA Preapproval from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings. Snubber shall be type **Z-1225** as manufactured by Mason Industries, Inc.

17. All directional seismic snubbers shall consist of interlocking steel members restrained by shock absorbent natural rubber compounded to Bridge Bearing specifications. Natural Rubber sections shall be replaceable and a minimum of 3/4” (19mm) thick and manufactured from a low dynamic stiffness compound. Rated Loadings shall not exceed 1000 psi (0.7 kg/mm2). Snubbers shall be manufactured with an airgap between the hard and resilient surfaces of not less than 1/8” (3mm)

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

and not more than 1/4” (6mm). Snubbers shall be installed with factory set clearances. Snubbers shall have certified tests by an independent lab in accordance with Test Protocol FM 1950 of FM Approvals, verifying the maximum horizontal and vertical load ratings. Seismic snubbers shall have an OPM Preapproval from OSHPD in the State of California. Snubbers shall be type **Z-1011** as manufactured by Mason Industries, Inc.

18. Stud wedge anchors shall be manufactured from full diameter wire, not from undersized wire that is rolled to create the thread. The stud anchor shall also have a safety shoulder which fully supports the wedge ring under load. The stud anchor shall be zinc-coated steel for interior applications and stainless steel for exterior applications. The stud anchors shall have an evaluation report number from the ICC-ES verifying its allowable loads. Drill-in stud wedge anchors shall be type **SAS** or **SASE** as manufactured by Mason Industries, Inc.

19. Screw type anchors are preferred in floor locations so anchors can be installed after isolators or equipment is in place. Anchors shall be manufactured from hardened steel and zinc electroplated for corrosion resistance. Screw type anchors shall have an evaluation report number from the ICC-ES verifying its allowable loads. Screw type anchors shall be type **SAST** as manufactured by Mason Industries, Inc.

19A. Adhesive type anchors shall include a two-component epoxy-based adhesive with zinc plated threaded anchor rods for interior application and stainless steel anchor rods for exterior application. The adhesive anchor shall have been tested and qualified for performance in cracked and un-cracked concrete per ICC-ES AC308. Anchors shall have an evaluation report from ICC-ES verifying allowable loads. Adhesive anchors shall be type **SRA** as manufactured by Mason Industries, Inc.

20. Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Centrifugal refrigeration machines and pump bases may be T or L shaped where space is a problem. Pump bases for split case pump shall include supports for suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14” (350mm) provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1” (25mm). Bases shall be type **WF** as manufactured by Mason Industries, Inc.

21. Vibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating and inertia foundations. Bases for split case pumps shall be large enough to provide for suction and discharge elbows. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6” (150mm). The base depth need not exceed 12” (300mm) unless specifically recommended by the base manufacturer for mass or rigidity. Forms shall include minimum concrete reinforcing consisting of 1/2” (12mm) bars welded in place on 6” (150mm) centers running both ways in a layer 1-1/2” (38mm) above the bottom. Forms shall be furnished with steel templates to hold the anchor bolts sleeves and anchors while concrete is being poured. Height saving brackets shall be employed in all mounting locations to maintain a 1” (25mm) clearance below the base. Wooden formed bases leaving a concrete rather then a steel finish are not acceptable. Base shall be type **BMK** or **K** as manufactured by Mason Industries, Inc.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

22. Curb mounted rooftop equipment shall be mounted on spring isolation curbs. The lower member shall consist of a sheet metal or structural steel sections containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind and seismic forces. All directional neoprene snubber bushings shall be a minimum of 1/4” (6mm) thick. Steel springs shall be laterally stable and rest on 1/4” (6mm) thick neoprene acoustical pads. Hardware must be plated and the springs provided with a rust resistant finish. The curbs waterproofing shall consist of a continuous flexible flashing nailed over the lower curbs waterproofing. All spring locations shall have accessibility to adjust springs. Lower curbs shall have provision for 2” (50mm) of insulation. The roof curbs shall be built to seismically restrain the rooftop unit. The unit must be solidly fastened to the top floating rail, and the lower section anchored to the roof structure. Curb shall have an OPA Preapproval from OSHPD in the State of California attesting to the maximum certified horizontal and vertical load ratings. Curb shall be type **RSC** as manufactured by Mason Industries, Inc.

23. Flexible spherical expansion joints shall employ peroxide cured EPDM in the covers, liners and Kevlar tire cord frictioning. Any substitutions must have equal or superior physical and chemical characteristics. Solid steel rings shall be used within the raised face rubber flanged ends to prevent pullout. Flexible cable bead wire is not acceptable. Sizes 2” (50mm) and larger shall have two spheres reinforced with a ductile iron external ring between spheres. Flanges shall be split ductile iron or steel with hooked or similar interlocks. Sizes 3/4” (19mm) to 1-1/2” (38mm) may have threaded two piece bolted flange assemblies, one sphere and cable retention. Connectors shall be rated at 250 psi (1.72MPa) up to 170°F (77°C) with a uniform drop in allowable pressure to 215 psi (1.48MPa) at 250°F (121°C) in sizes through 14” (350mm). 16” (400mm) through 24” (600mm) single sphere minimum ratings are 180 psi (1.24MPa) at 170°F (77°C) and 150 psi (1.03MPa) at 250°F (121°C). Higher rated connectors may be used to accommodate service conditions. All expansion joints must be factory tested to 150% of rated pressure for 12 minutes before shipment. Safety factors to burst and flange pullout shall be a minimum of 3/1. Concentric reducers to the above ratings may be substituted for equal ended expansion joints.

    Expansion joints shall be installed in piping gaps equal to the length of the expansion joints under pressure. Control rods need only be used in unanchored piping locations where the manufacturer determines the installation exceeds the pressure requirement without control rods. If control rods are used, they must have 1/2” (12mm) thick Neoprene washer bushings large enough in diameter to take the thrust at 1000 psi (.7 kg/mm^2) maximum on the washer area.

    Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves. Expansion joints shall be type **SAFEFLEX SFDEJ, SFEJ, SFDCR** or **SFU** and Control Rods **CR** as manufactured by Mason Industries, Inc.

24. Flexible braided hose shall consist of corrugated tube with braided wire to prevent elongation due to pressure thrust. Flexible braided stainless steel hose shall be manufactured using type 304 stainless steel braid and hose with one raised-face fixed and one floating steel plate flange. Grooved ends may be used in sizes 2” through 12” (50mm through 300mm). Welding is not acceptable. Sizes 2-1/2” (65mm) and smaller may have threaded male nipples. Flexible braided hose 4” (100mm) or smaller, with copper sweat ends, may have stainless steel hose and braid for gas service or bronze hose and braid for water service.

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Flexible braided stainless steel hose shall have close pitch with the following minimum number of corrugations per foot (CPF) of hose length:

Size (in)	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6	8	10	12	14	16
Size (mm)	15	20	25	32	40	50	65	80	100	125	150	200	250	300	350	400
CPF	92	80	72	67	63	58	48	46	32	29	25	23	21	20	18	16

Flexible braided bronze hose shall have close pitch with the following minimum number of corrugations per foot (CPF) of hose length:

Size (in)	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4
Size (mm)	15	20	25	32	40	50	65	80	100
CPF	73	67	58	55	53	51	34	30	28

Flexible braided hose shall have the minimum hose overall length as follows:

Flexible Stainless Braided Hose		Flexible Bronze Braided Hose	
Size	Min. Length	Size	Min. Length
1/2” - 2-1/2” (15-65mm)	24” (600mm)	1/2” – 3” (15-80mm)	18” (450mm)
3” – 16” (80-400mm)	36” (900mm)	4” (100mm)	24” (600mm)

Flexible braided hose shall have the minimum hose live length as follows:

Flexible Stainless Braided Hose		Flexible Bronze Braided Hose	
Size	Min. Live Length	Size	Min. Live Length
1/2” - 2-1/2” (15-65mm)	17” (425mm)	1/2” – 3” (15-80mm)	10-1/2” (263mm)
3” – 16” (80-400mm)	26” (650mm)	4” (100mm)	15-1/2” (388mm)

Flexible braided hose shall have a minimum burst pressure of four times the rated pressure at 70° F (21° C). Forces required to displace hoses at operating pressure shall be determined by testing, and certified by a professional engineer. Submittals shall include original test data showing force/displacement at operating pressure, fittings, material, live lengths, number of corrugations per foot and safety factor at pressure ratings. Hoses shall be type **FFL**, **MN**, **GWN** or **CPSB** as manufactured by Mason Industries, Inc.

25. All directional acoustical pipe anchor, consisting of two sizes of steel tubing separated by a minimum 1/2” (12mm) thick 60 durometer neoprene. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction. Allowable loads on the isolation material should not exceed 500 psi (.35 kg/mm^2) and the design shall be balanced for equal resistance in any direction. All directional anchors shall be type **ADA** as manufactured by Mason Industries, Inc.

26. Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2” (12mm) thickness of 60 durometer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Shear pin shall

be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of ±5/8” (41mm) motion, or to meet location requirements. Pipe guides shall be type **VSG** as manufactured by Mason Industries, Inc.

27. Split Wall Seals consist of two bolted pipe halves with minimum 3/4” (19mm) thick neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of 1” (25mm) past either face of the wall. Where temperatures exceed 240°F (115°C), 10# (4.5kg) density fiberglass may be used in lieu of the sponge. Seals shall be type **SWS** as manufactured by Mason Industries, Inc.

28. The horizontal thrust restraint shall consist of a spring element in series with a neoprene molded cup as described in specification 5 with the same deflection as specified for the mountings or hangers. The spring element shall be designed so it can be preset for thrust at the factory and adjusted in the field to allow for a maximum of 1/4” (6mm) movement at start and stop. The assembly shall be furnished with 1 rod and angle brackets for attachment to both the equipment and the ductwork or the equipment and the structure. Horizontal restraints shall be attached at the centerline of thrust and symmetrical on either side of the unit. Horizontal thrust restraints shall be type **WBI/WBD** as manufactured by Mason Industries, Inc.

29. Housekeeping pad anchors shall consist of a ductile iron casting that is tapered and hexagonal, smaller at its base than at its top. The upper portion shall have holes for rebar to pass through. The anchor shall be continuously threaded from top to bottom for the attachment of soleplates. Housekeeping pad anchors shall be attached to the structural slab using a stud wedge anchor. Housekeeping pad anchors shall be type **HPA** and stud wedge anchor shall be type **SAS** both as manufactured by Mason Industries, Inc.

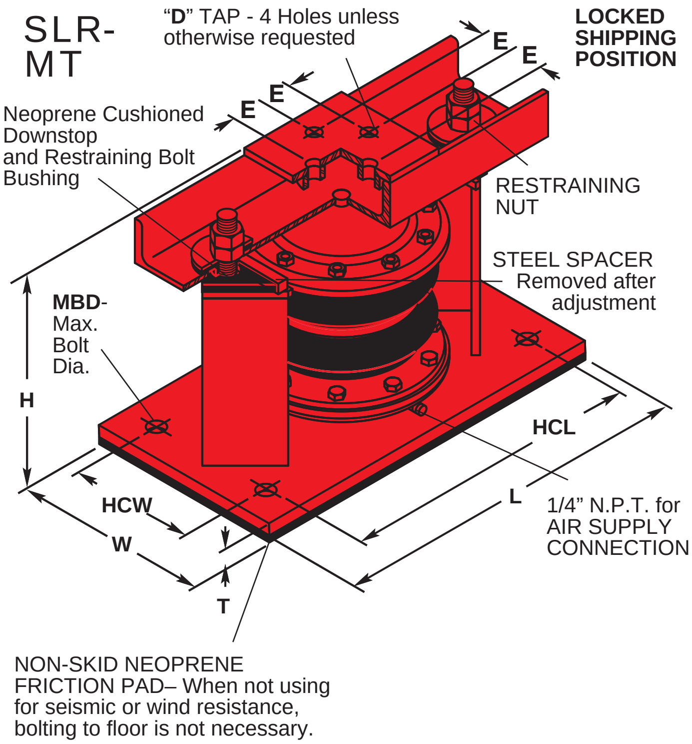
MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

TABLE OF CONTENTS

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

SLR-MT Air Spring Mounts



TYPE SLR-MT RATINGS

Size	Min Load @ 25 psi (lbs)	Max Recom-mended Load @ 80 psi (lbs)	Max Load @ 100 psi (lbs)	Approximate Frequency C.P.M.	Approximate Frequency Hertz
SLR-MT-3	345	1100	1375	138	2.3
SLR-MT-4	540	1720	2150	120	2.0
SLR-MT-6	1175	3760	4700	108	1.8
SLR-MT-8	2120	6780	8475	102	1.8

TYPE SLR-MT METRIC RATINGS

Size	Min Load @ 1.8 kg/cm^2 (*kgs*)	Max Recom-mended Load @ 5.6 kg/cm^2 (*kgs*)	Max Load @ 7 kg/cm^2 (*kgs*)	Approximate Frequency C.P.M.	Approximate Frequency Hertz
SLR-MT-3	*155*	*505*	*625*	*138*	*2.3*
SLR-MT-4	*245*	*780*	*980*	*120*	*2.0*
SLR-MT-6	*535*	*1710*	*2135*	*108*	*1.8*
SLR-MT-8	*960*	*3080*	*3850*	*102*	*1.8*

NOTE: Air Springs should be selected for 80% of maximum capacity to allow for errors in published equipment weights or weight distribution.

CAUTION: Never inflate Air Springs prior to installation.

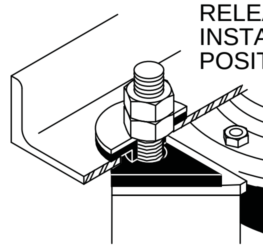
SLR mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

TYPE SLR-MT DIMENSIONS (inches)

Size	D	E	H	L	T	W	HCL	HCW	MBD
SLR-MT-3	3/4	1 3/8	10	13	1/2	7	11	4 1/2	5/8
SLR-MT-4	3/4	1 3/8	10	13	1/2	7	11	4 1/2	5/8
SLR-MT-6	3/4	1 3/8	10	17	5/8	10	15	7	5/8
SLR-MT-8	3/4	1 3/8	10	21 3/4	5/8	14	18 3/4	7	5/8

TYPE SLR-MT DIMENSIONS (mm)

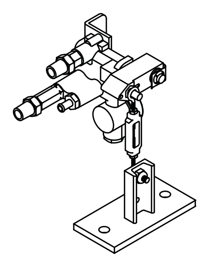
Size	D	E	H	L	T	W	HCL	HCW	MBD
SLR-MT-3	*19*	*35*	*254*	*330*	*13*	*178*	*280*	*114*	*16*
SLR-MT-4	*19*	*35*	*254*	*330*	*13*	*178*	*280*	*114*	*16*
SLR-MT-6	*19*	*35*	*254*	*432*	*16*	*254*	*380*	*178*	*16*
SLR-MT-8	*19*	*35*	*254*	*552*	*16*	*355*	*476*	*178*	*16*



RELEASED INSTALLED POSITION

All Air Spring Systems must be installed with Leveling Valves and Air Supply Systems.

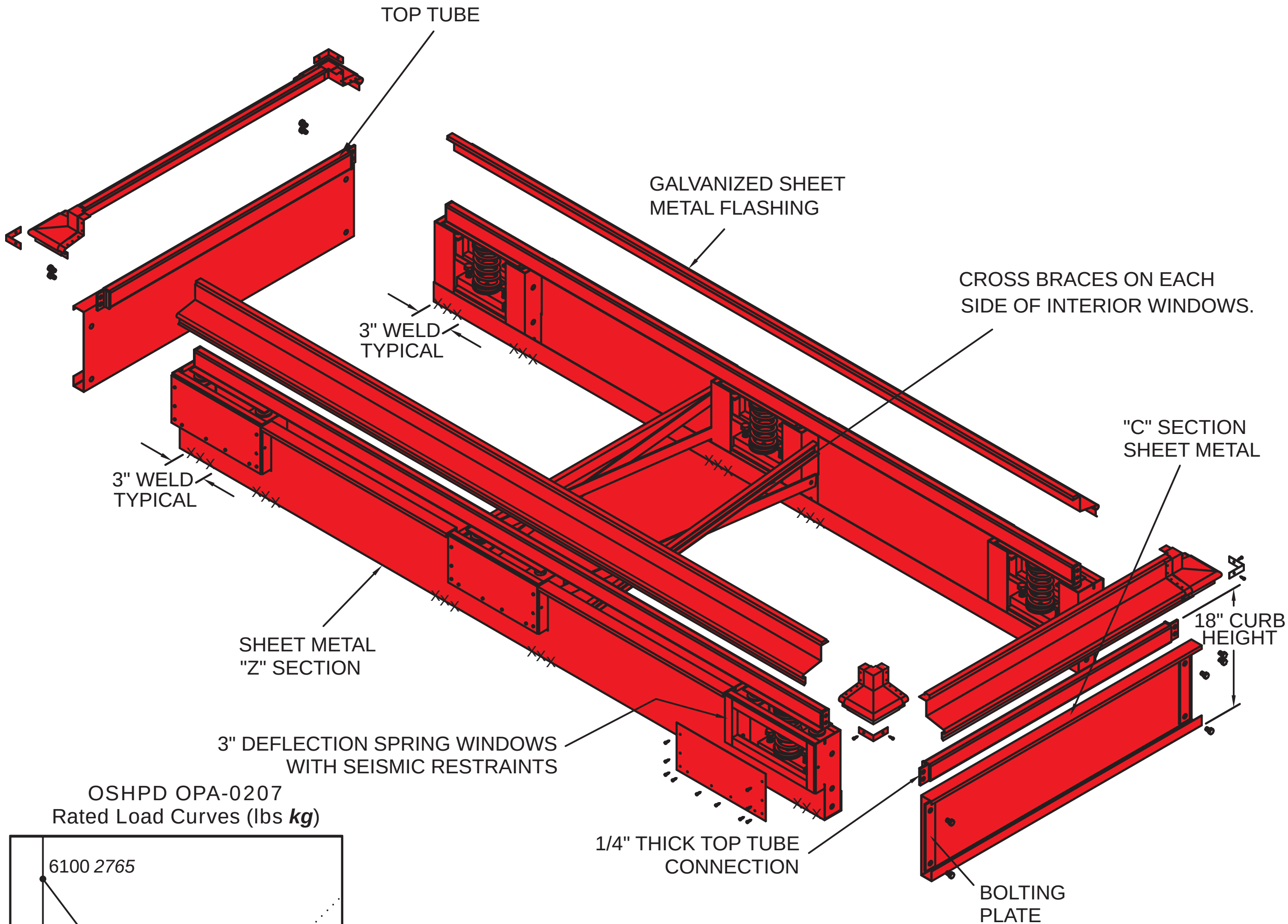
SeeC ertification Sheet S-302 for additional information



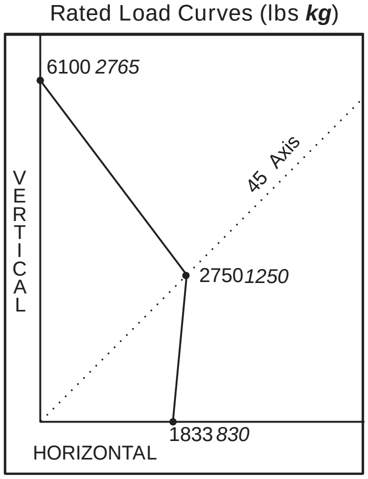
03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

RSC 3"(*75mm*) Defl. Seismic Roof Curb



OSHPD OPA-0207
Rated Load Curves (lbs ***kg***)



Horizontal and Vertical plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0207. Testing and calculations were performed to meet OSHPD criteria. Ratings are for a single window.

To use approved OSHPD rated load curves
1) Calculate Vertical and Horizontal Forces on window including translations and overturning.
2) Plot Horizontal Load vs Vertical Load. The point must fall within the area below the OSHPD curve.

RSC curbs include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

03/2020

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

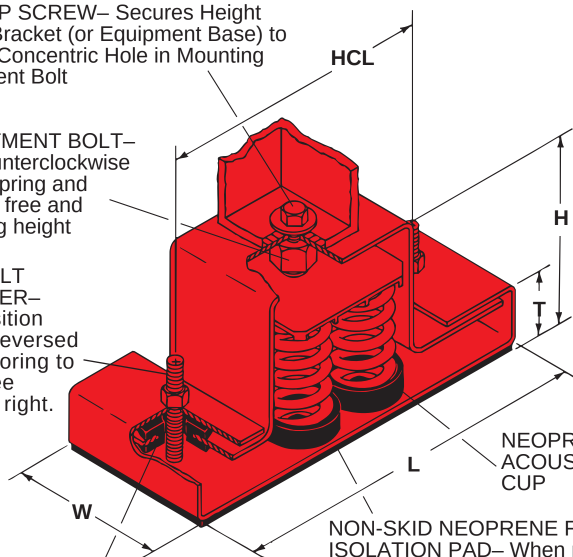
Page
FM43

SLR 1"(*25mm*) Defl. A Springs

"**CS**" CAP SCREW– Secures Height Saving Bracket (or Equipment Base) to Tapped Concentric Hole in Mounting Adjustment Bolt

ADJUSTMENT BOLT– Turn counterclockwise to load spring and maintain free and operating height

"**BD**" BOLT DIAMETER– Bolt Position can be reversed for anchoring to floor. See detail at right.



NEOPRENE ACOUSTICAL CUP

NON-SKID NEOPRENE FRICTION ISOLATION PAD– When not using for seismic or wind resistance, bolting to floor is not necessary. Pad can be removed if mounts are welded in position. See detail at right.

NEOPRENE VERTICAL LIMIT STOPS– Out of contact during normal operation

Illustration shows a 4 spring SLR-4A. SLR-A has 1 spring and SLR-2A has 2 springs.

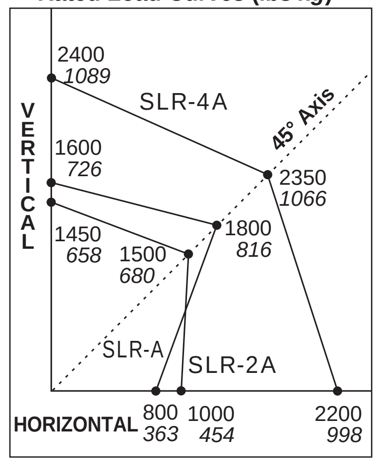
Mounts are galvanized.

All springs have additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times Rated Deflection.

OSHPD OPA-0195

Rated Load Curves (lbs *kg*)†



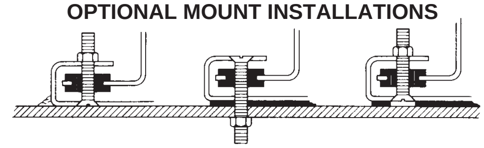
†For kN divide kg by 102

Horizontal and Vertical plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0195. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves: 1) Calculate Vertical and Horizontal Forces on mounting including translations and overturning moments.
2) Plot Horizontal Load vs Vertical Load. The point must fall within the area below the OSHPD curve.

NOTE: Maximum G rating applies to mounting only without base plate

OPTIONAL MOUNT INSTALLATIONS



WELDED IN POSITION | BOLTED IN POSITION | HELD IN PLACE BY FRICTION PAD

SLR mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

TYPE SLR RATINGS

Type & Size	Rated Capacity (lbs) *(kg)*	Rated Defl (in) *(mm)*	Spring Constant (lbs/in)*(kg/mm)*	Spring Color	Max. Horiz Static G Rating‡
SLR-A-45	45 *20*	1.60 *41*	28 *0.5*	Blue	17.8
SLR-A-75	75 *34*	1.50 *38*	50 *0.9*	Orange	10.7
SLR-A-125	125 *57*	1.33 *34*	94 *1.7*	Brown	6.4
SLR-A-200	200 *91*	1.15 *29*	174 *3.1*	Black	4.0
SLR-A-310	310 *141*	1.00 *25*	310 *5.6*	Yellow	2.6
SLR-A-400	400 *181*	1.00 *25*	400 *7.2*	Green	2.0
SLR-A-510	510 *231*	1.00 *25*	510 *9.2*	Red	1.6
SLR-A-625	625 *283*	1.00 *25*	625 *11.3*	White	1.3
SLR-2A-620	620 *281*	1.00 *25*	620 *11.2*	Yellow	1.6
SLR-2A-800	800 *363*	1.00 *25*	800 *14.5*	Green	1.3
SLR-2A-1020	1020 *463*	1.00 *25*	1020 *18.5*	Red	1.0
SLR-2A-1250	1250 *567*	1.00 *25*	1250 *22.7*	White	0.8
SLR-4A-1240	1240 *563*	1.00 *25*	1240 *22.5*	Yellow	1.8
SLR-4A-1600	1600 *726*	1.00 *25*	1600 *29.0*	Green	1.4
SLR-4A-2040	2040 *925*	1.00 *25*	2040 *37.0*	Red	1.1
SLR-4A-2500	2500 *1134*	1.00 *25*	2500 *45.4*	White	0.9

‡Horizontal G Ratings are for quick reference only– Use OSHPD Rated Load Curves.

Housing load ratings expressed in max. G's are based on tests with bolted connections to steel top and bottom. SLR housings require uniform support under entire base plate.

TYPE SLR DIMENSIONS (inches *mm*)

Size	H	L	T	W	BD	CS	HCL
SLR-A	5 1/8 *130*	8 3/4 *222*	1 5/8 *41*	2 1/2 *64*	3/8 *10*	3/8"-16UNC x 1 *3/8"-16UNC x 25*	6 *152*
SLR-2A	5 1/8 *130*	11 5/8 *295*	1 3/4 *41*	2 1/2 *64*	3/8 *10*	3/8"-16UNC x 1 *3/8"-16UNC x 25*	8 3/4 *222*
SLR-4A	5 1/8 *130*	11 1/8 *283*	1 3/4 *41*	4 1/2 *114*	1/2 *13*	1/2"-13UNC x1 1/4 *1/2"-13UNC x 32*	8 *203*

SPRING DATA

Size	Spring OD (in) (mm)	Free Ht. (in) (mm)	Ratio Kx/Ky	Ratio OD/OH
A	1 3/4 *44*	3-3 3/8 *76-86*	0.50-0.90	0.74-1.25

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Page

FM44

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

SLREBP (Extended Base Plate)

1"(*25mm*) Defl. A Springs

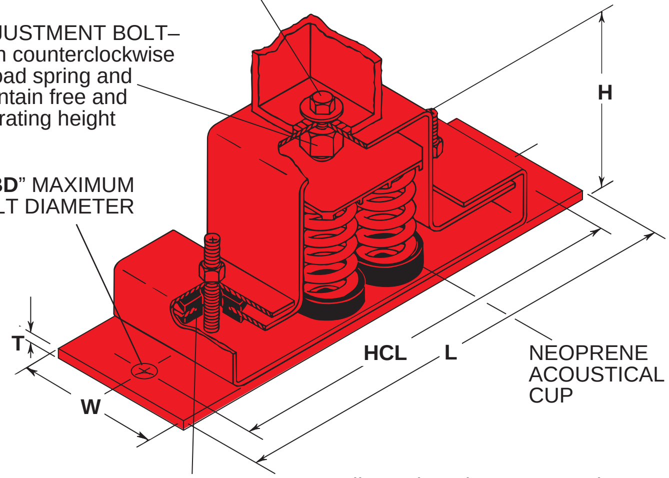
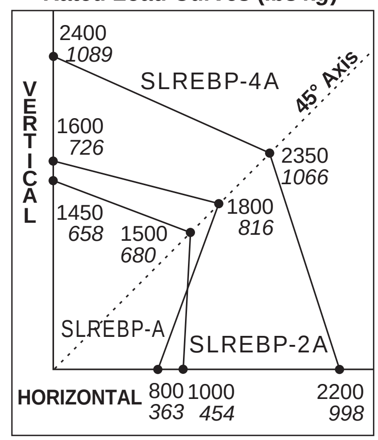


Illustration shows a 4 spring SLREBP-4A. SLREBP-A has 1 spring and SLREBP-2A has 2 springs. Mounts are galvanized.

All springs have additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times Rated Deflection.

OSHPD OPA-0195
Rated Load Curves (lbs *kg*)†



†For kN divide kg by 102

Horizontal and Vertical plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0195. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves: 1) Calculate Vertical and Horizontal Forces on mounting including translations and overturning moments. 2) Plot Horizontal Load vs Vertical Load. The point must fall within the area below the OSHPD curve.

Housing load ratings expressed in max. G's are based on tests with bolted connections to steel top and bottom. SLREBP housings require uniform support under entire base plate.

*NOTE: Maximum G rating applies to mounting only without extended base plate. Typical base plate shown. Extended base plates are submitted for approval on a job by job basis.

SLR mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

TYPE SLREBP RATINGS

Type & Size	Rated Capacity (lbs) (*kg*)	Rated Defl (in) (*mm*)	Spring Constant (lbs/in)(*kg/mm*)	Spring Color	Max. Horiz Static G Rating‡
SLREBP-A-45	45 *20*	1.60 *41*	28 *0.5*	Blue	17.8
SLREBP-A-75	75 *34*	1.50 *38*	50 *0.9*	Orange	10.7
SLREBP-A-125	125 *57*	1.33 *34*	94 *1.7*	Brown	6.4
SLREBP-A-200	200 *91*	1.15 *29*	174 *3.1*	Black	4.0
SLREBP-A-310	310 *141*	1.00 *25*	310 *5.6*	Yellow	2.6
SLREBP-A-400	400 *181*	1.00 *25*	400 *7.2*	Green	2.0
SLREBP-A-510	510 *231*	1.00 *25*	510 *9.2*	Red	1.6
SLREBP-A-625	625 *283*	1.00 *25*	625 *11.3*	White	1.3
SLREBP-2A-620	620 *281*	1.00 *25*	620 *11.2*	Yellow	1.6
SLREBP-2A-800	800 *363*	1.00 *25*	800 *14.5*	Green	1.3
SLREBP-2A-1020	1020 *463*	1.00 *25*	1020 *18.5*	Red	1.0
SLREBP-2A-1250	1250 *567*	1.00 *25*	1250 *22.7*	White	0.8
SLREBP-4A-1240	1240 *563*	1.00 *25*	1240 *22.5*	Yellow	1.8
SLREBP-4A-1600	1600 *726*	1.00 *25*	1600 *29.0*	Green	1.4
SLREBP-4A-2040	2040 *925*	1.00 *25*	2040 *37.0*	Red	1.1
SLREBP-4A-2500	2500 *1134*	1.00 *25*	2500 *45.4*	White	0.9

SPRING DATA

Size	Spring OD (in) (*mm*)	Free Ht. (in) (*mm*)	Ratio Kx/Ky	Ratio OD/OH
A	1 3/4 *44*	3-3 3/8 *76-86*	0.50-0.90	0.74-1.25

TYPE SLREBP DIMENSIONS (inches *mm*)

Size	H	L	T	W	CS	MBD	HCL
SLREBP-A	5 1/4 *133*	12 1/4 *311*	1/4 *6*	2 1/2 *64*	3/8"-16UNC x1 *3/8"-16UNC x 25*	1/2 *13*	10 3/4 *273*
SLREBP-2A	5 1/4 *133*	15 5/8 *397*	1/4 *6*	3 *76*	3/8"-16UNC x1 *3/8"-16UNC x 25*	5/8 *16*	13 7/8 *352*
SLREBP-4A	5 1/4 *133*	15 5/8 *397*	1/4 *6*	4 1/2 *114*	1/2"-13UNC x1 1/4 *1/2"-13UNC x 32*	3/4 *19*	13 5/8 *346*

‡Horizontal G Ratings are for quick reference only
Use OSHPD Rated Load Curves.

03/2020

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

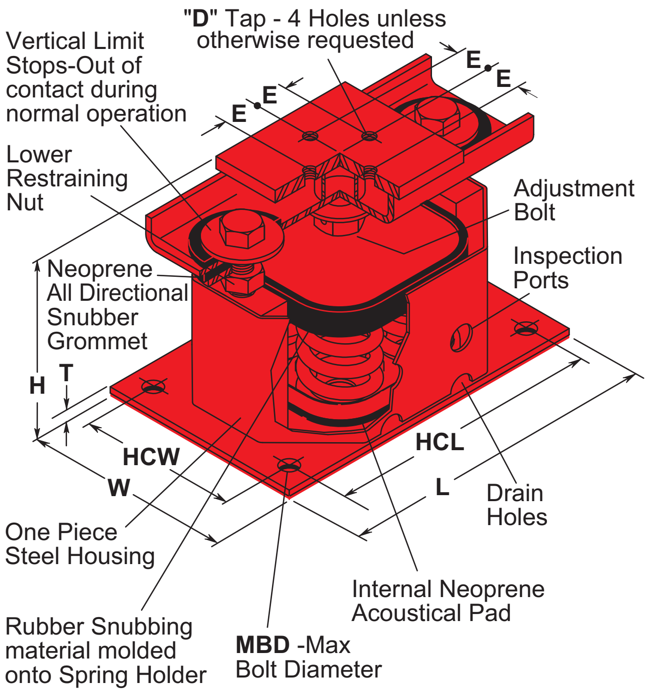
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRS 1”(*25mm*) Defl. B, 1 - 4 Springs



TYPE SLRS DIMENSIONS (inches and *mm*)

Size	H	T	D	E	L	HCL	W	HCW	MBD
B	8 5/8 *219*	1/4 *6*	1/2 *13*	1 1/8 *29*	8 1/2 *216*	7 *178*	4 1/4 *108*	2 3/4 *70*	5/8 *16*
1	8 5/8 *219*	1/4 *6*	5/8 *16*	1 3/8 *35*	9 1/2 *241*	7 1/2 *191*	5 1/4 *133*	3 1/2 *89*	5/8 *16*
2	8 5/8 *219*	1/4 *6*	5/8 *16*	1 3/8 *35*	14 *356*	12 1/4 *311*	5 1/4 *133*	3 1/2 *89*	5/8 *16*
4	8 5/8 *219*	1/4 *6*	7/8 *22*	1 3/8 *35*	13 *330*	11 *279*	8 3/8 *213*	6 1/4 *159*	3/4 *19*

TYPE SLRS RATINGS

SLRS Size	Rated Capacity (lbs) *(kg)*	Rated Defl (in) *(mm)*	Spring Constant (lbs/in)*(kg/mm)*	Max. G Rating	Spring Color
B-65	65 *29*	2.10 *53*	31 *0.55*	24.6	Brown
B-85	85 *39*	2.10 *53*	40 *0.74*	18.9	Wht/Blk
B-115	115 *52*	2.00 *51*	57 *1.02*	13.9	Silver
B-150	150 *68*	2.00 *51*	75 *1.33*	10.6	Orange
B-280	280 *127*	1.60 *41*	174 *3.10*	5.7	Green
B-450	450 *204*	1.31 *33*	344 *6.18*	3.5	Red
B-750	750 *340*	1.12 *28*	670 *12.14*	2.1	White
B-1000	1000 *454*	1.00 *25*	1000 *18.16*	1.6	Blue
1-1000	1000 *454*	1.00 *25*	1000 *18.16*	6.0	Black
1-1350	1350 *612*	1.00 *25*	1350 *24.48*	4.4	Yellow
1-1750	1750 *794*	1.00 *25*	1750 *31.76*	3.4	Black*
1-2100	2100 *953*	1.00 *25*	2100 *38.12*	2.8	Yellow
1-2385	2385 *1082*	1.00 *25*	2385 *43.28*	2.5	Yellow**
1-2650	2650 *1202*	1.00 *25*	2650 *48.08*	2.3	Red*
1-2935	2935 *1331*	1.00 *25*	2935 *53.24*	2.0	Red**
2-3500	3500 *1588*	1.00 *25*	3500 *63.52*	1.5	Black*
2-4200	4200 *1905*	1.00 *25*	4200 *76.20*	1.2	Yellow*
2-4770	4770 *2164*	1.00 *25*	4770 *86.56*	1.1	Yellow**
4-5400	5400 *2449*	1.00 *25*	5400 *97.96*	2.0	Yellow
4-7000	7000 *3175*	1.00 *25*	7000 *127.00*	1.6	Black*
4-8400	8400 *3810*	1.00 *25*	8400 *152.40*	1.3	Yellow*
4-9540	9540 *4327*	1.00 *25*	9540 *173.08*	1.2	Yellow**
4-10600	10600 *4808*	1.00 *25*	10600 *192.32*	1.1	Red*
4-11740	11740 *5325*	1.00 *25*	11740 *213.00*	0.9	Red**

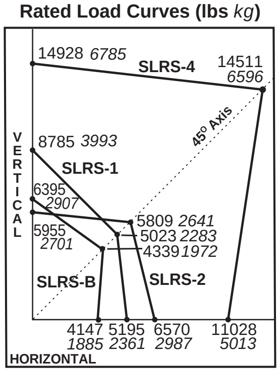
*with Red inner spring **with Green inner spring

Illustration above shows a SLRS-4 with four C springs. Not shown are SLRS-B, which has one B spring, SLRS-1 with one C spring, SLRS-2 with two C springs.

Housing load ratings expressed in G’s are based on tests with bolted connections to steel top and bottom. SLRS housings require uniform support under entire base plate.

SLRS mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4” maximum air gap.

OSHPD OPA-194
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0194. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD	Free Height	Ratio Kx/Ky	Ratio OD/OH
B	2 3/8 *60*	4 *102*	0.70-0.90	0.80-1.25
C	2 7/8 *73*	4 1/8 *105*	0.90-1.10	0.92

All springs have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection.

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

A P P R O V E D

California Office of Statewide Health Planning and Development

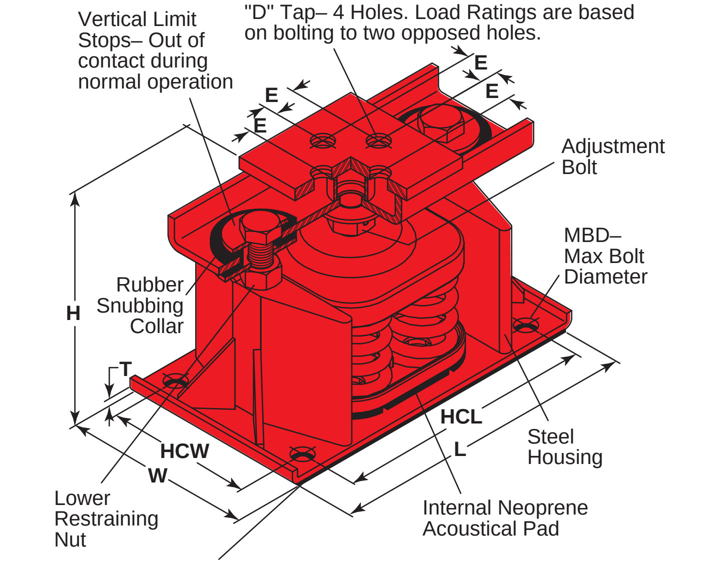
FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

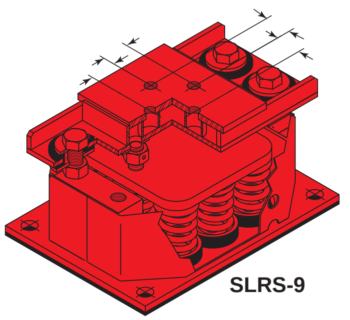
Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRSO 1"(*25mm*) Defl. B, 1 - 9 Springs



Non-Skid Pad is used in Non-Seismic zones only. Remove pad prior to bolting. Reduce published height by 1/8" if pad is removed.

Illustration above shows a SLRSO-4 housing with four C springs.

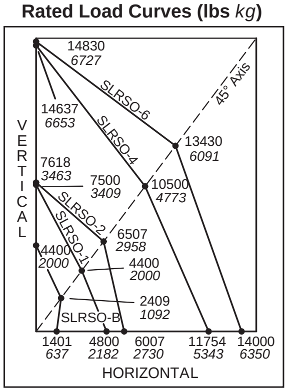


SLRS-9 has nine C springs and has closed sides. Not shown are SLRSO-B with one B spring and SLRSO-1, SLRSO-2 & SLRSO-6 with one, two and six C springs respectively.

All springs have an additional travel to solid equal to 50% of the rated deflection.

SLRSO mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

OSHPD
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD allowable loads based on testing and calculations performed to meet OSHPD criteria.

To use OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

TYPE SLRSO and SLRS DIMENSIONS (inches and *mm*)

Size	H	T	D	E	L	HCL	W	HCW	MBD
SLRSO-B	8 3/4 *222*	3/8 *10*	1/2 *13*	1 1/8 *29*	8 1/2 *216*	7 *178*	4 1/4 *108*	2 3/4 *70*	5/8 *16*
SLRSO-1	8 3/4 *222*	3/8 *10*	5/8 *16*	1 3/8 *35*	9 1/2 *241*	7 1/2 *191*	5 1/4 *133*	3 1/2 *89*	5/8 *16*
SLRSO-2	8 3/4 *222*	3/8 *10*	5/8 *16*	1 3/8 *35*	14 *356*	12 1/4 *311*	5 1/4 *133*	3 1/2 *89*	5/8 *16*
SLRSO-4	8 3/4 *222*	3/8 *10*	7/8 *22*	1 3/8 *35*	13 3/4 *350*	11 *279*	8 *203*	6 1/4 *159*	3/4 *19*
SLRSO-6	9 3/4 *248*	3/8 *10*	1 *25*	1 5/8 *41*	19 *483*	15 7/8 *403*	9 *229*	6 *152*	1 *25*
SLRS-9	9 3/4 *248*	5/8 *16*	1 *25*	2 *51*	18 *457*	15 3/4 *400*	13 *330*	10 3/4 *273*	1 *25*

TYPE SLRSO and SLRS RATINGS 1" *25mm* Deflection Series

SLRSO Size	Rated Capacity (lbs)	(*kg*)	Rated Defl (in)	(*mm*)	Spring Constant (lbs/in)	(*kg/mm*)	Max. Horiz. Housing G Rating†	Spring Color
B-65	65	*29*	2.10	*53*	31	*0.55*	21.6	Brown
B-85	85	*39*	2.10	*53*	40	*0.74*	16.5	Wht/Blk
B-115	115	*52*	2.00	*51*	57	*1.02*	12.2	Silver
B-150	150	*68*	2.00	*51*	75	*1.33*	9.3	Orange
B-280	280	*127*	1.60	*41*	174	*3.10*	5.0	Green
B-450	450	*204*	1.31	*33*	344	*6.18*	3.1	Red
B-750	750	*340*	1.12	*28*	670	*12.1*	1.9	White
B-1000	1000	*454*	1.00	*25*	1000	*18.2*	1.4	Blue
1-1000	1000	*454*	1.00	*25*	1000	*18.2*	4.8	Black
1-1350	1350	*612*	1.00	*25*	1350	*24.5*	3.6	Yellow
1-1750	1750	*794*	1.00	*25*	1750	*31.8*	2.7	Black*
1-2100	2100	*953*	1.00	*25*	2100	*38.1*	2.3	Yellow
1-2385	2385	*1082*	1.00	*25*	2385	*43.3*	2.0	Yellow**
1-2650	2650	*1202*	1.00	*25*	2650	*48.1*	1.8	Red*
1-2935	2935	*1331*	1.00	*25*	2935	*53.2*	1.6	Red**
2-3500	3500	*1588*	1.00	*25*	3500	*63.5*	1.7	Black*
2-4200	4200	*1905*	1.00	*25*	4200	*76.2*	1.4	Yellow*
2-4770	4770	*2164*	1.00	*25*	4770	*86.6*	1.3	Yellow**
4-5400	5400	*2449*	1.00	*25*	5400	*98.0*	2.2	Yellow
4-7000	7000	*3175*	1.00	*25*	7000	*127.0*	1.7	Black*
4-8400	8400	*3810*	1.00	*25*	8400	*152.4*	1.4	Yellow*
4-9540	9540	*4327*	1.00	*25*	9540	*173.1*	1.2	Yellow**
4-10600	10600	*4808*	1.00	*25*	10600	*192.3*	1.1	Red*
4-11740	11740	*5325*	1.00	*25*	11740	*213.0*	1.0	Red**
6-12600	12600	*5715*	1.00	*25*	12600	*228.6*	1.1	Yellow*
6-14310	14310	*6491*	1.00	*25*	14310	*259.6*	1.0	Yellow**
6-15900	15900	*7212*	1.00	*25*	15900	*288.5*	0.9	Red*
6-17610	17610	*7988*	1.00	*25*	17610	*319.5*	0.8	Red**
SLRS Size								
9-18900	18900	*8573*	1.00	*25*	18900	*342.9*	‡	Yellow*
9-21465	21465	*9736*	1.00	*25*	21465	*389.4*	‡	Yellow**
9-23850	23850	*10818*	1.00	*25*	23850	*432.7*	‡	Red*

*with Red inner spring **with Green inner spring ‡SLRS-9 under test

†Housing load ratings expressed in G's are based on tests with bolted connections to steel top and bottom. SLRSO & SLRS housings require uniform support under entire base plate.

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD	Free Height	Ratio Kx/Ky	Ratio OD/OH
B	2 3/8 *60*	4 0/0 *102*	0.70-0.80	0.80
C	2 7/8 *73*	4 1/8 *105*	0.90-1.10	0.92

All springs have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection.

03/2020

Tested per OPA Standards Developed by California Office of Statewide Health Planning and Development

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

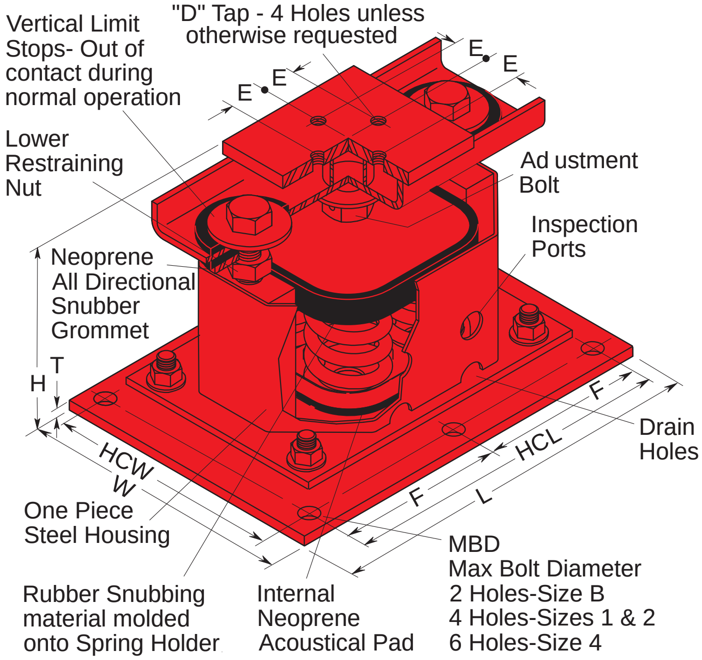
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

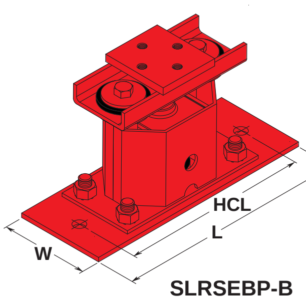
Info@Mason-Ind.com • www.Mason-Ind.com

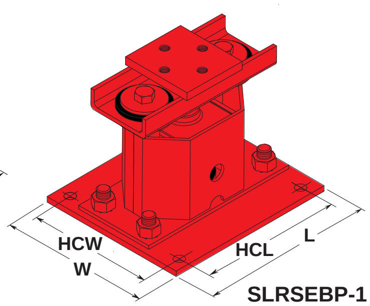
Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRSEBP (Extended Base Plate)

1"(*25mm*) Defl. B, 1 - 4 Springs







TYPE SLRSEBP DIMENSIONS (inches and *mm*)

Size	H	T	D	E	L	HCL	F	W	HCW	MBD
B	9 *229*	3/8 *10*	1/2 *13*	11/8 *29*	13 *330*	101/2 *267*	- -	5 *127*	- -	5/8 *16*
1	9 *229*	3/8 *10*	5/8 *16*	13/8 *35*	10 *254*	8 *203*	- -	10 *254*	8 *203*	5/8 *16*
2	9 *229*	3/8 *10*	5/8 *16*	13/8 *35*	141/2 *368*	11 *295*	- -	12 *305*	9 *229*	3/4 *19*
4	9 *229*	3/8 *10*	7/8 *22*	13/8 *35*	19 *483*	16 *406*	8 *203*	14 *356*	11 *279*	3/4 *19*

Illustration at right shows a SLRSEBP-4 with four C springs. SLRSEBP-B has one B spring, SLRSEBP-1 has one C spring, and SLRSEBP-2 (not shown) has two C springs.

Housing load ratings expressed in G's are based on tests with bolted connections to steel top and bottom. SLRSEBP housings require uniform support under entire base plate.

Approval applies to mount only. Baseplate not approved. Baseplate shown is satisfactory for most installations. Anchorage and baseplate calculations are provided for all installations. Baseplate modified when required.

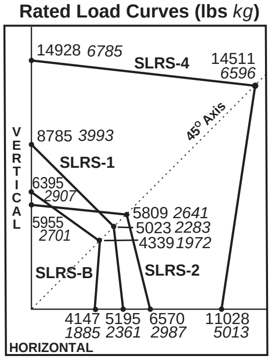
SLRS mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

TYPE SLRSEBP RATINGS

Size	Rated Capacity (lbs) *(kg)*	Rated Defl (in) *(mm)*	Spring Constant (lbs/in)*(kg/mm)*	Max. G Rating	Spring Color
B-65	65 *29*	2.10 *53*	31 *0.55*	24.6	Brown
B-85	85 *39*	2.10 *53*	40 *0.74*	18.9	Wht/Blk
B-115	115 *52*	2.00 *51*	57 *1.02*	13.9	Silver
B-150	150 *68*	2.00 *51*	75 *1.33*	10.6	Orange
B-280	280 *127*	1.60 *41*	174 *3.10*	5.7	Green
B-450	450 *204*	1.31 *33*	344 *6.18*	3.5	Red
B-750	750 *340*	1.12 *28*	670 *12.14*	2.1	White
B-1000	1000 *454*	1.00 *25*	1000 *18.16*	1.6	Blue
1-1000	1000 *454*	1.00 *25*	1000 *18.16*	6.0	Black
1-1350	1350 *612*	1.00 *25*	1350 *24.48*	4.4	Yellow
1-1750	1750 *794*	1.00 *25*	1750 *31.76*	3.4	Black*
1-2100	2100 *953*	1.00 *25*	2100 *38.12*	2.8	Yellow
1-2385	2385 *1082*	1.00 *25*	2385 *43.28*	2.5	Yellow**
1-2650	2650 *1202*	1.00 *25*	2650 *48.08*	2.3	Red*
1-2935	2935 *1331*	1.00 *25*	2935 *53.24*	2.0	Red**
2-3500	3500 *1588*	1.00 *25*	3500 *63.52*	1.5	Black*
2-4200	4200 *1905*	1.00 *25*	4200 *76.20*	1.2	Yellow*
2-4770	4770 *2164*	1.00 *25*	4770 *86.56*	1.1	Yellow**
4-5400	5400 *2449*	1.00 *25*	5400 *97.96*	2.0	Yellow
4-7000	7000 *3175*	1.00 *25*	7000 *127.00*	1.6	Black*
4-8400	8400 *3810*	1.00 *25*	8400 *152.40*	1.3	Yellow*
4-9540	9540 *4327*	1.00 *25*	9540 *173.08*	1.2	Yellow**
4-10600	10600 *4808*	1.00 *25*	10600 *192.32*	1.1	Red*
4-11740	11740 *5325*	1.00 *25*	11740 *213.00*	0.9	Red**

*with Red inner spring **with Green inner spring

OSHPD OPA-194
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0194. Testing and calculations performed to meet OSHPD criteria.

To use approved OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD	Free Height	Ratio Kx/Ky	Ratio OD/OH
B	23/8 *60*	4 *102*	0.70-0.90	0.80-1.25
C	27/8 *73*	41/8 *105*	0.90-1.10	0.92

All springs have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection.

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

Page

FM47

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRSOEBP (Extended Base Plate)

1"(*25mm*) Defl. B, 1 - 9 Springs

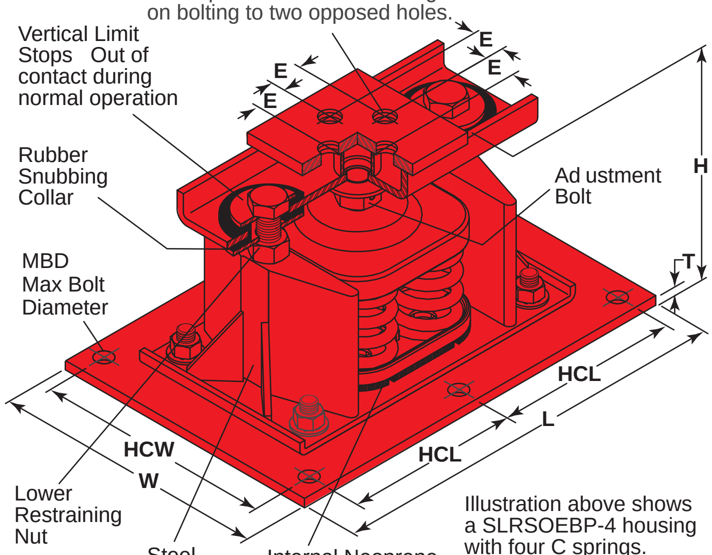
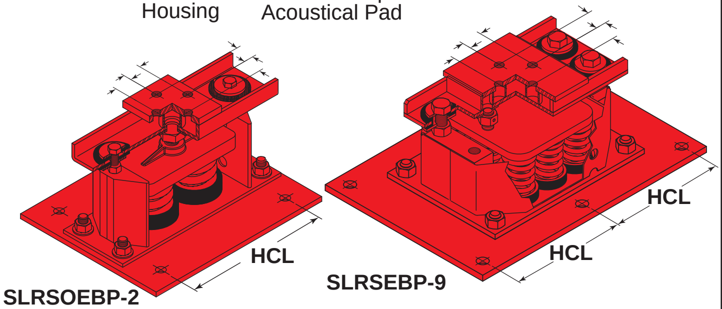


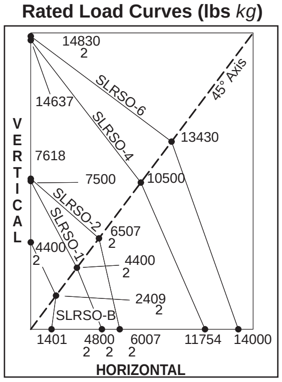
Illustration above shows a SLRSOEBP-4 housing with four C springs.



SLRSOEBP-2 SLRSEBP-9

SLRSOEBP-2 has two C springs and SLRSEBP-9 has nine C springs and has closed sides. Not shown are SLRSOEBP-B with one B spring, SLRSOEBP-1 with one C spring and SLRSOEBP-6 with six C springs.

OSHPD
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD allowable loads based on testing and calculations performed to meet OSHPD criteria.

To use OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

TYPE SLRSOEBP and SLRSEBP DIMENSIONS (inches and *mm*)

Type & Size	H	T	D	E	L	HCL	W	HCW	MBD
SLRSOEBP-B	9 *229*	3/8 *10*	1/2 *13*	1 1/8 *29*	13 *330*	10 1/2 *267*	5 *127*	– –	5/8 *16*
SLRSOEBP-1	9 *229*	3/8 *10*	5/8 *16*	1 3/8 *35*	10 *254*	8 *203*	10 *254*	8 *203*	5/8 *16*
SLRSOEBP-2	9 *229*	3/8 *10*	5/8 *16*	1 3/8 *35*	14 1/2 *368*	11 *280*	12 *305*	9 *229*	3/4 *19*
SLRSOEBP-4	9 *229*	3/8 *10*	7/8 *22*	1 3/8 *35*	19 *482*	8 *203*	14 *356*	11 *280*	3/4 *19*
SLRSOEBP-6	10 1/4 *260*	1/2 *13*	1 *25*	1 5/8 *41*	27 *686*	12 *305*	15 *381*	12 *305*	1 *25*
SLRSEBP-9	10 1/4 *260*	5/8 *16*	1 *25*	2 *51*	27 *686*	12 *305*	19 *483*	16 *406*	1 *25*

TYPE SLRSOEBP & SLRSEBP RATINGS 1" *25mm* Deflection Series

SLRSOEBP Size	Rated Capacity (lbs)	(*kg*)	Rated Defl (in)	(*mm*)	Spring Constant (lbs/in)	(*kg/mm*)	Max. Horiz. G Rating Bolted to Concrete†	Spring Color
B-65	65	*29*	2.10	*53*	31	*0.55*	21.6	Brown
B-85	85	*39*	2.10	*53*	40	*0.74*	16.5	Wht/Blk
B-115	115	*52*	2.00	*51*	57	*1.02*	12.2	Silver
B-150	150	*68*	2.00	*51*	75	*1.33*	9.3	Orange
B-280	280	*127*	1.60	*41*	174	*3.10*	5.0	Green
B-450	450	*204*	1.31	*33*	344	*6.18*	3.1	Red
B-750	750	*340*	1.12	*28*	670	*12.1*	1.9	White
B-1000	1000	*454*	1.00	*25*	1000	*18.2*	1.4	Blue
1-1000	1000	*454*	1.00	*25*	1000	*18.2*	4.4	Black
1-1350	1350	*612*	1.00	*25*	1350	*24.5*	3.3	Yellow
1-1750	1750	*794*	1.00	*25*	1750	*31.8*	2.5	Black*
1-2100	2100	*953*	1.00	*25*	2100	*38.1*	2.1	Yellow
1-2385	2385	*1082*	1.00	*25*	2385	*43.3*	1.9	Yellow**
1-2650	2650	*1202*	1.00	*25*	2650	*48.1*	1.7	Red*
1-2935	2935	*1331*	1.00	*25*	2935	*53.2*	1.5	Red**
2-3500	3500	*1588*	1.00	*25*	3500	*63.5*	1.7	Black*
2-4200	4200	*1905*	1.00	*25*	4200	*76.2*	1.4	Yellow*
2-4770	4770	*2164*	1.00	*25*	4770	*86.6*	1.3	Yellow**
4-5400	5400	*2449*	1.00	*25*	5400	*98.0*	1.7	Yellow
4-7000	7000	*3175*	1.00	*25*	7000	*127.0*	1.3	Black*
4-8400	8400	*3810*	1.00	*25*	8400	*152.4*	1.1	Yellow*
4-9540	9540	*4327*	1.00	*25*	9540	*173.1*	1.0	Yellow**
4-10600	10600	*4808*	1.00	*25*	10600	*192.3*	0.9	Red*
4-11740	11740	*5325*	1.00	*25*	11740	*213.0*	0.8	Red**
6-12600	12600	*5715*	1.00	*25*	12600	*228.6*	0.8	Yellow*
6-14310	14310	*6491*	1.00	*25*	14310	*259.6*	0.7	Yellow**
6-15900	15900	*7212*	1.00	*25*	15900	*288.5*	0.65	Red*
6-17610	17610	*7988*	1.00	*25*	17610	*319.5*	0.6	Red**
SLRSEBP Size								
9-18900	18900	*8573*	1.00	*25*	18900	*342.9*	‡	Yellow*
9-21465	21465	*9736*	1.00	*25*	21465	*389.4*	‡	Yellow**
9-23850	23850	*10818*	1.00	*25*	23850	*432.7*	‡	Red*

*with Red inner spring **with Green inner spring ‡SLRSEBP-9 under test

†Horizontal load ratings expressed in G's are based on calculations with bolted connections to steel on top and concrete inserts on bottom. SLRSOEBP housings require uniform support under entire base plate.

All springs have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection.

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD		Free Height		Ratio Kx/Ky	Ratio OD/OH
B	2 3/8	*60*	4	*102*	0.70-0.80	0.80
C	2 7/8	*73*	4 1/8	*105*	0.90-1.10	0.92

SLRSO mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

Tested per OPA Standards Developed by California Office of Statewide Health Planning and Development

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRS 2"(*50mm*) Defl. B, B2 & C2 Springs

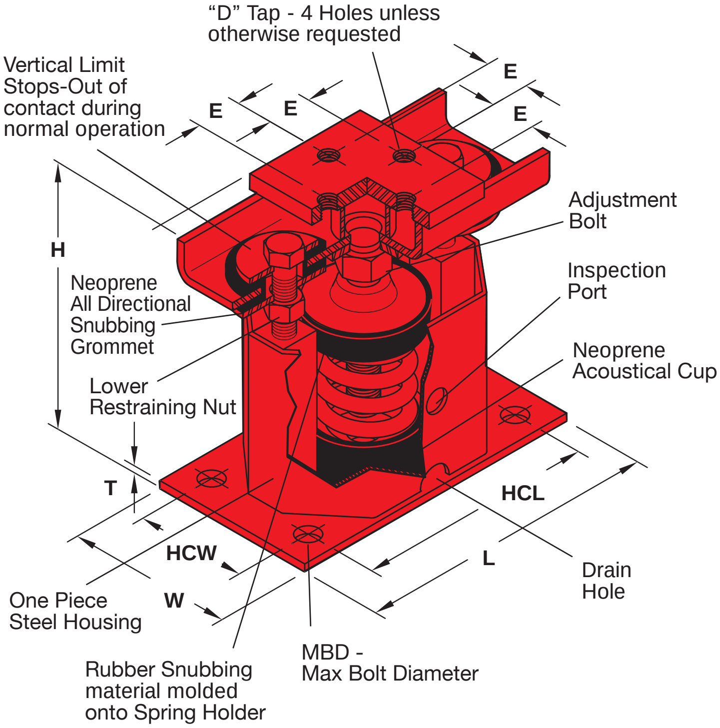
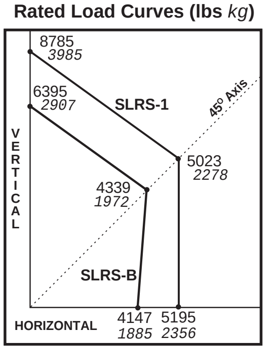


Illustration above shows a SLRS-B housing with one B or B2 spring. SLRS-1 housing has one C2 spring.

Housing load ratings expressed in G's are based on tests with bolted connections to steel top and bottom. SLRS housings require uniform support under entire base plate.

SLRS mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

OSHPD OPA-194
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0194. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

TYPE SLRS DIMENSIONS (inches and *mm*)

Size	H	T	D	E	L	HCL	W	HCW	MBD
B B2	8 5/8 *219*	1/4 *6*	1/2 *13*	1 1/8 *29*	8 1/2 *216*	7 *178*	4 1/4 *108*	2 3/4 *70*	5/8 *16*
C2	8 5/8 *219*	1/4 *6*	5/8 *16*	1 3/8 *35*	9 1/2 *241*	7 1/2 *191*	5 1/4 *133*	3 1/2 *89*	5/8 *16*

TYPE SLRS RATINGS *with Red inner spring

SLRS Size	Rated Capacity (lbs) *(kg)*	Rated Defl (in) *(mm)*	Spring Constant (lbs/in)*(kg/mm)*	Max. G Rating	Spring Color
B-20	20 *9*	2.40 *61*	8 *0.15*	80.0	Tan
B-26	26 *12*	2.18 *55*	12 *0.22*	61.5	Wht/Blue
B-35	35 *16*	2.20 *56*	16 *0.29*	45.7	Purple
B-50	50 *23*	2.20 *56*	24 *0.41*	32.0	Wht/Red
B-65	65 *29*	2.10 *53*	31 *0.55*	24.6	Brown
B-85	85 *39*	2.10 *53*	40 *0.74*	18.8	Wht/Blk
B-115	115 *52*	2.00 *51*	57 *1.02*	13.9	Silver
B-150	150 *68*	2.00 *51*	75 *1.33*	10.7	Orange
B2-210	210 *95*	2.12 *54*	99 *1.76*	7.6	Silver
B2-290	290 *132*	2.00 *51*	144 *2.59*	5.5	Blue
B2-450†	450 *204*	2.00 *51*	224 *4.00*	3.6	Tan
B2-680†	680 *308*	2.00 *51*	340 *6.04*	2.4	Gray
C2-125	125 *57*	2.50 *64*	50 *0.89*	48.0	Purple
C2-170	170 *77*	2.40 *61*	70 *1.26*	35.0	Brown
C2-210	210 *95*	2.30 *58*	90 *1.64*	28.3	Red
C2-260	260 *118*	2.20 *56*	120 *2.11*	23.0	White
C2-330	330 *150*	2.00 *51*	165 *2.94*	18.0	Black
C2-460	460 *209*	2.00 *51*	230 *4.10*	13.0	Blue
C2-610	610 *277*	2.00 *51*	305 *5.43*	9.8	Green
C2-880†	880 *399*	2.00 *51*	440 *7.82*	6.8	Gray
C2-1210†	1210 *549*	2.00 *51*	605 *10.76*	4.9	Silver
C2-1540†	1540 *699*	2.00 *51*	770 *13.71*	3.9	Gray*
C2-1870†	1870 *848*	2.00 *51*	935 *16.63*	3.2	Silver*

†Published ratings allow minimum 25% additional travel to solid. For a full 50% specified minimum use the following ratings:

Size	Derated Capacity (lbs)*(kg)*	Defl. (in)*(mm)*	Size	Derated Capacity (lbs) *(kg)*	Defl. (in)*(mm)*
B2-450	410 *186*	1.83 *46*	C2-1210	1010 *458*	1.67 *42*
B2-680	565 *256*	1.67 *42*	C2-1540	1285 *583*	1.67 *42*
C2-880	800 *363*	1.82 *46*	C2-1870	1560 *708*	1.67 *42*

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD	Free Height	Ratio Kx/Ky	Ratio OD/OH
B	2 3/8 *60*	4 *102*	0.55-0.65	0.95-1.00
B2	2 3/8 *60*	4 1/2 *114*	0.80-0.90	1.19-1.48
C2	2 7/8 *73*	5 *127*	0.63-0.85	0.96-1.15

All springs without "†" have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection except as noted.

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Page

FM48

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

APPROVED

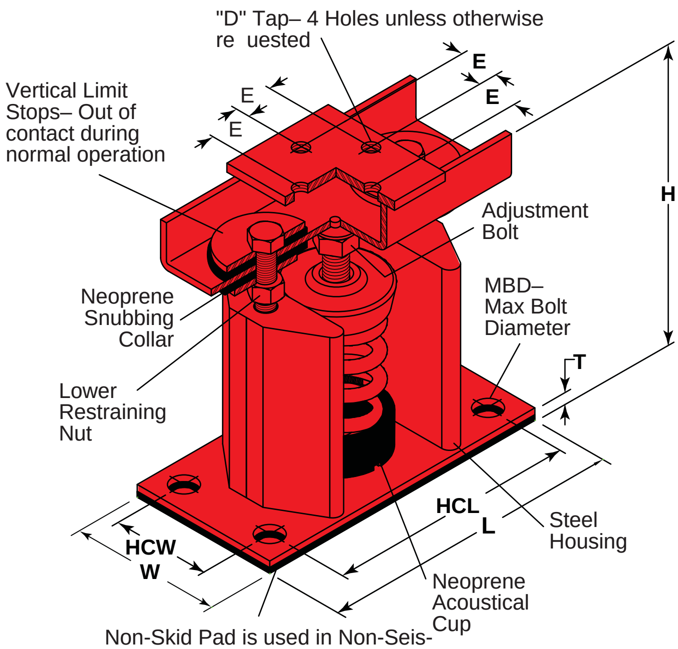
California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

SLRSO 2"(*50mm*) Defl. B, B2 & C2 Springs



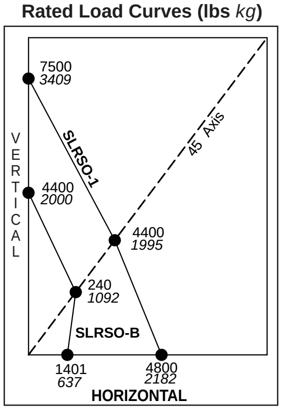
Non-Skid Pad is used in Non-Seismic zones only. Remove pad prior to installing in seismic zones. Reduce published height by 1/8" if pad is removed.

Illustration above shows a SLRSO-B housing with one B or B2 spring. SLRSO-1 housing contains one C2 spring.

SLRSO mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

†Housing load ratings expressed in G's are based on tests with bolted connections to steel top and bottom. SLRSO housings require uniform support under entire base plate.

OSHPD
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD allowable loads based on testing and calculations performed to meet OSHPD criteria.

To use OSHPD rated load curves:
1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

TYPE SLRSO and SLRS DIMENSIONS (inches and *mm*)

Type & Size	H	T	D	E	L	HCL	W	HCW	MBD
SLRSO-B	8 3/4 *222*	3/8 *10*	1/2 *13*	1 1/8 *29*	8 1/2 *216*	7 *178*	4 1/4 *108*	2 3/4 *70*	5/8 *16*
SLRSO-B2	8 3/4 *222*	3/8 *10*	5/8 *16*	1 3/8 *35*	9 1/2 *241*	7 1/2 *191*	5 1/4 *133*	3 1/2 *89*	5/8 *16*
SLRSO-C2	8 3/4 *222*	3/8 *10*	5/8 *16*	1 3/8 *35*	14 *356*	12 1/4 *311*	5 1/4 *133*	3 1/2 *89*	5/8 *16*

TYPE SLRSO and SLRS RATINGS 2" *50mm* Deflection Series

SLRSO Size	Rated Capacity (lbs)	(*kg*)	Rated Defl (in)	(*mm*)	Spring Constant (lbs/in)	(*kg/mm*)	Max. Horiz. Housing G Rating†	Spring Color
B-20	20	*9*	2.40	*61*	8	*0.15*	70.0	Tan
B-26	26	*12*	2.18	*55*	12	*0.22*	53.9	Wht/Blue
B-35	35	*16*	2.20	*56*	16	*0.29*	40.0	Purple
B-50	50	*23*	2.20	*56*	24	*0.41*	28.0	Wht/Red
B-65	65	*29*	2.10	*53*	31	*0.55*	21.6	Brown
B-85	85	*39*	2.10	*53*	40	*0.74*	16.5	Wht/Blk
B-115	115	*52*	2.00	*51*	57	*1.02*	12.2	Silver
B-150	150	*68*	2.00	*51*	75	*1.33*	9.3	Orange
B2-210	210	*95*	2.12	*54*	99	*1.76*	6.8	Silver
B2-290	290	*132*	2.00	*51*	144	*2.59*	4.9	Blue
B2-450††	450	*204*	2.00	*51*	224	*4.00*	3.2	Tan
B2-680††	680	*308*	2.00	*51*	340	*6.04*	2.1	Gray
C2-125	125	*57*	2.50	*64*	50	*0.89*	38.4	Purple
C2-170	170	*77*	2.40	*61*	70	*1.26*	28.2	Brown
C2-210	210	*95*	2.30	*58*	90	*1.64*	22.8	Red
C2-260	260	*118*	2.20	*56*	120	*2.11*	18.5	White
C2-330	330	*150*	2.00	*51*	165	*2.94*	14.5	Black
C2-460	460	*209*	2.00	*51*	230	*4.10*	10.4	Blue
C2-610	610	*277*	2.00	*51*	305	*5.43*	7.9	Green
C2-880††	880	*399*	2.00	*51*	440	*7.82*	5.5	Gray
C2-1210††	1210	*549*	2.00	*51*	605	*10.8*	4.0	Silver
C2-1540††	1540	*699*	2.00	*51*	770	*13.7*	3.1	Gray*
C2-1870††	1870	*848*	2.00	*51*	935	*16.6*	2.6	Silver*

*with Red inner spring

††Published ratings allow minimum 25% additional travel to solid. For a full 50% specified minimum use the following ratings:

Size	Derated Capacity (lbs)	(kg)	Defl. (in)	(mm)	Size	Derated Capacity (lbs)	(kg)	Defl. (in)	(mm)
B2-450	410	*186*	1.83	*46*	C2-1210	1010	*458*	1.67	*42*
B2-680	565	*256*	1.67	*42*	C2-1540	1285	*583*	1.67	*42*
C2-880	800	*363*	1.82	*46*	C2-1870	1560	*708*	1.67	*42*

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD		Free Height		Ratio Kx/Ky	Ratio OD/OH
B	2 3/8	*60*	4	*102*	0.55-0.65	0.95-1.00
B2	2 3/8	*60*	4 1/2	*114*	0.80-0.90	1.19-1.48
C2	2 7/8	*73*	5	*127*	0.63-0.85	0.96-1.15

All springs without "††" have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection.

03/2020

Tested per OPA Standards Developed by California Office of Statewide Health Planning and Development

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

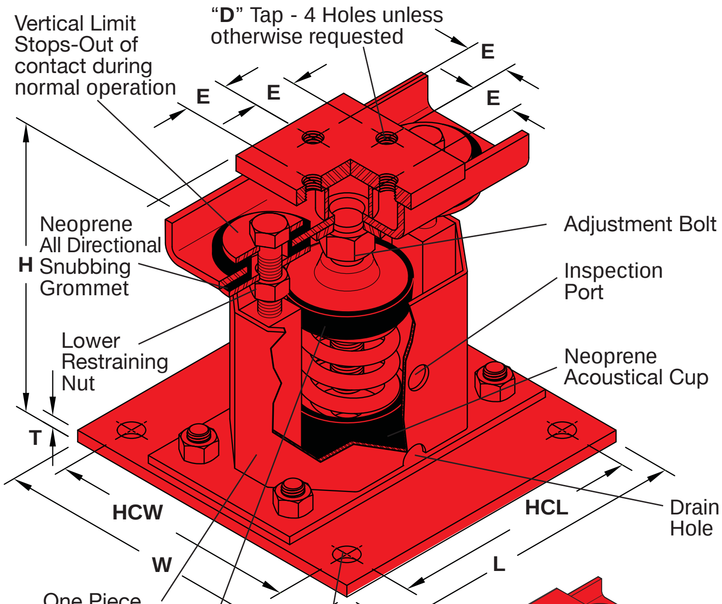
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

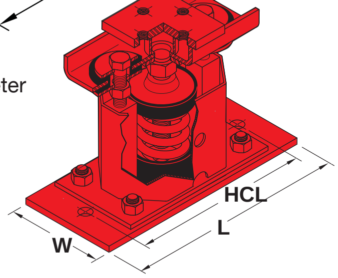
Info@Mason-Ind.com • www.Mason-Ind.com

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRSEBP (Extended Base Plate)

2"(*50mm*) Defl. B, B2 & C2 Springs

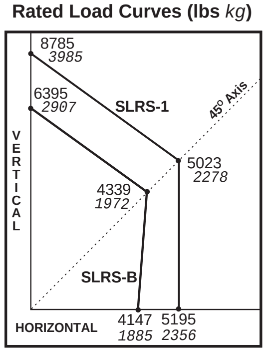




The Illustration above shows an SLRSEBP-1 housing with one C2 spring. To the right is an SLRSEBP-B housing with one B or B2 spring.

Approval applies to mount only. Baseplate not approved. Baseplate shown is satisfactory for most installations. Anchorage and baseplate calculations are provided for all installations. Baseplate modified when required.

OSHPD OPA-194
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0194. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

TYPE SLRSEBP DIMENSIONS (inches and *mm*)

Size	H	T	D	E	L	HCL	W	HCW	MBD
B & B2	9 *229*	3/8 *10*	1/2 *13*	1 1/8 *29*	13 *330*	10 1/2 *267*	5 *127*	- -	5/8 *16*
C2	9 *229*	3/8 *10*	5/8 *16*	1 3/8 *35*	10 *254*	8 *203*	10 *254*	8 *203*	5/8 *16*

Housing load ratings expressed in G's are based on tests with bolted connections to steel top and bottom. SLRSEBP housings require uniform support under entire base plate. Tests were run with one bolt in top plate.

SLRS mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

TYPE SLRSEBP RATINGS

*with Red inner spring

Size	Rated Capacity (lbs) *(kg)*	Rated Defl (in) *(mm)*	Spring Constant (lbs/in)*(kg/mm)*	Max. G Rating	Spring Color
B-20	20 *9*	2.40 *61*	8 *0.15*	80.0	Tan
B-26	26 *12*	2.18 *55*	12 *0.22*	61.5	Wht/Blue
B-35	35 *16*	2.20 *56*	16 *0.29*	45.7	Purple
B-50	50 *23*	2.20 *56*	24 *0.41*	32.0	Wht/Red
B-65	65 *29*	2.10 *53*	31 *0.55*	24.6	Brown
B-85	85 *39*	2.10 *53*	40 *0.74*	18.8	Wht/Blk
B-115	115 *52*	2.00 *51*	57 *1.02*	13.9	Silver
B-150	150 *68*	2.00 *51*	75 *1.33*	10.7	Orange
B2-210	210 *95*	2.12 *54*	99 *1.76*	7.6	Silver
B2-290	290 *132*	2.00 *51*	144 *2.59*	5.5	Blue
B2-450†	450 *204*	2.00 *51*	224 *4.00*	3.6	Tan
B2-680†	680 *308*	2.00 *51*	340 *6.04*	2.4	Gray
C2-125	125 *57*	2.50 *64*	50 *0.89*	48.0	Purple
C2-170	170 *77*	2.40 *61*	70 *1.26*	35.0	Brown
C2-210	210 *95*	2.30 *58*	90 *1.64*	28.3	Red
C2-260	260 *118*	2.20 *56*	120 *2.11*	23.0	White
C2-330	330 *150*	2.00 *51*	165 *2.94*	18.0	Black
C2-460	460 *209*	2.00 *51*	230 *4.10*	13.0	Blue
C2-610	610 *277*	2.00 *51*	305 *5.43*	9.8	Green
C2-880†	880 *399*	2.00 *51*	440 *7.82*	6.8	Gray
C2-1210†	1210 *549*	2.00 *51*	605 *10.76*	4.9	Silver
C2-1540†	1540 *699*	2.00 *51*	770 *13.71*	3.9	Gray*
C2-1870†	1870 *848*	2.00 *51*	935 *16.63*	3.2	Silver*

†Published ratings allow minimum 25% additional travel to solid. For a full 50% specified minimum use the following ratings:

Size	Derated Capacity (lbs)*(kg)*	Defl. (in)*(mm)*	Size	Derated Capacity (lbs) *(kg)*	Defl. (in)*(mm)*
B2-450	410 *186*	1.83 *46*	C2-1210	1010 *458*	1.67 *42*
B2-680	565 *256*	1.67 *42*	C2-1540	1285 *583*	1.67 *42*
C2-880	800 *363*	1.82 *46*	C2-1870	1560 *708*	1.67 *42*

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD	Free Height	Ratio Kx/Ky	Ratio OD/OH
B	2 3/8 *60*	4 *102*	0.55-0.65	0.95-1.00
B2	2 3/8 *60*	4 1/2 *114*	0.80-0.90	1.19-1.48
C2	2 7/8 *73*	5 *127*	0.63-0.85	0.96-1.15

All springs without "†" have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection except as noted.

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

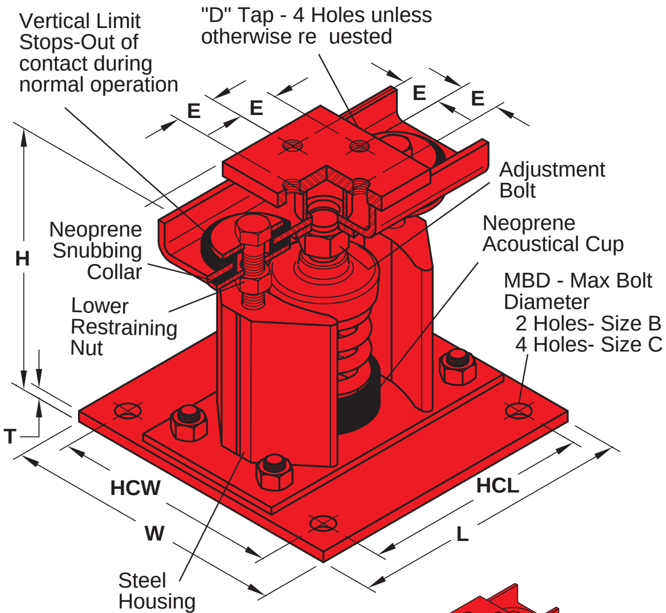
OPA-0349 January 6, 2003

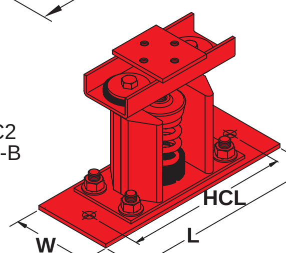
Bill Staehlin (916) 654-3362

Page

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRSOEBP (Extended Base Plate) 2"(*50mm*) Defl. B, B2 & C2 Springs





The Illustration above shows an SLRSOEBP-1 housing with one C2 spring. Below it is an SLRSOEBP-B housing with one B or B2 spring.

TYPE SLRSOEBP and SLRSEBP DIMENSIONS (inches and *mm*)

Type & Size	H	T	D	E	L	HCL	W	HCW	MBD
SLRSOEBP- B & B2	9 *229*	3/8 *10*	1/2 *13*	1 1/8 *29*	13 *330*	10 1/2 *267*	5 *127*	– –	5/8 *16*
SLRSOEBP- C2	9 *229*	3/8 *10*	5/8 *16*	1 3/8 *35*	10 *254*	8 *203*	10 *254*	8 *203*	5/8 *16*

TYPE SLRSOEBP and SLRSEBP RATINGS 2" *50mm* Deflection Series

SLRSOEBP Size	Rated Capacity (lbs)	Rated Capacity *(kg)*	Rated Defl (in)	Rated Defl *(mm)*	Spring Constant (lbs/in)	Spring Constant *(kg/mm)*	Max. Horiz. G Rating Bolted to Concrete†	Spring Color
B-20	20	*9*	2.40	*61*	8	*0.15*	70.0	Tan
B-26	26	*12*	2.18	*55*	12	*0.22*	53.9	Wht/Blue
B-35	35	*16*	2.20	*56*	16	*0.29*	40.0	Purple
B-50	50	*23*	2.20	*56*	24	*0.41*	28.0	Wht/Red
B-65	65	*29*	2.10	*53*	31	*0.55*	21.6	Brown
B-85	85	*39*	2.10	*53*	40	*0.74*	16.5	Wht/Blk
B-115	115	*52*	2.00	*51*	57	*1.02*	12.2	Silver
B-150	150	*68*	2.00	*51*	75	*1.33*	6.8	Orange
B2-210	210	*95*	2.12	*54*	99	*1.76*	9.3	Silver
B2-290	290	*132*	2.00	*51*	144	*2.59*	4.9	Blue
B2-450††	450	*204*	2.00	*51*	224	*4.00*	3.2	Tan
B2-680††	680	*308*	2.00	*51*	340	*6.04*	2.1	Gray
C2-125	125	*57*	2.50	*64*	50	*0.89*	35.5	Purple
C2-170	170	*77*	2.40	*61*	70	*1.26*	26.1	Brown
C2-210	210	*95*	2.30	*58*	90	*1.64*	21.1	Red
C2-260	260	*118*	2.20	*56*	120	*2.11*	17.1	White
C2-330	330	*150*	2.00	*51*	165	*2.94*	13.5	Black
C2-460	460	*209*	2.00	*51*	230	*4.10*	9.6	Blue
C2-610	610	*277*	2.00	*51*	305	*5.43*	7.3	Green
C2-880††	880	*399*	2.00	*51*	440	*7.82*	5.0	Gray
C2-1210††	1210	*549*	2.00	*51*	605	*10.8*	3.7	Silver
C2-1540††	1540	*699*	2.00	*51*	770	*13.7*	2.9	Gray*
C2-1870††	1870	*848*	2.00	*51*	935	*16.6*	2.4	Silver*

*with Red inner spring

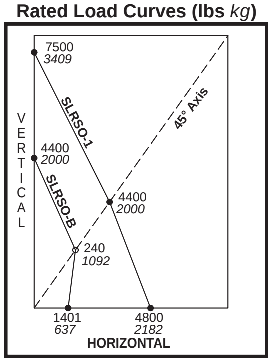
SLRSOEBP mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

†Horizontal load ratings expressed in G's are based on calculations with bolted connections to steel on top and concrete inserts on bottom. SLRSOEBP housings require uniform support under entire base plate.

††Published ratings allow minimum 25% additional travel to solid. For a full 50% specified minimum use the following ratings:

Size	Derated Capacity (lbs)	Derated Capacity *(kg)*	Defl. (in)	Defl. *(mm)*	Size	Derated Capacity (lbs)	Derated Capacity *(kg)*	Defl. (in)	Defl. *(mm)*
B2-450	410	*186*	1.83	*46*	C2-1210	1010	*458*	1.67	*42*
B2-680	565	*256*	1.67	*42*	C2-1540	1285	*583*	1.67	*42*
C2-880	800	*363*	1.82	*46*	C2-1870	1560	*708*	1.67	*42*

OSHPD
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD allowable loads based on testing and calculations performed to meet OSHPD criteria.

To use OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD		Free Height		Ratio Kx/Ky	Ratio OD/OH
B	2 3/8	*60*	4	*102*	0.55-0.65	0.95-1.00
B2	2 3/8	*60*	4 1/2	*114*	0.80-0.90	1.19-1.48
C2	2 7/8	*73*	5	*127*	0.63-0.85	0.96-1.15

All springs without "††" have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection.

03/2020

Tested per OPA Standards Developed by California Office of Statewide Health Planning and Development

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

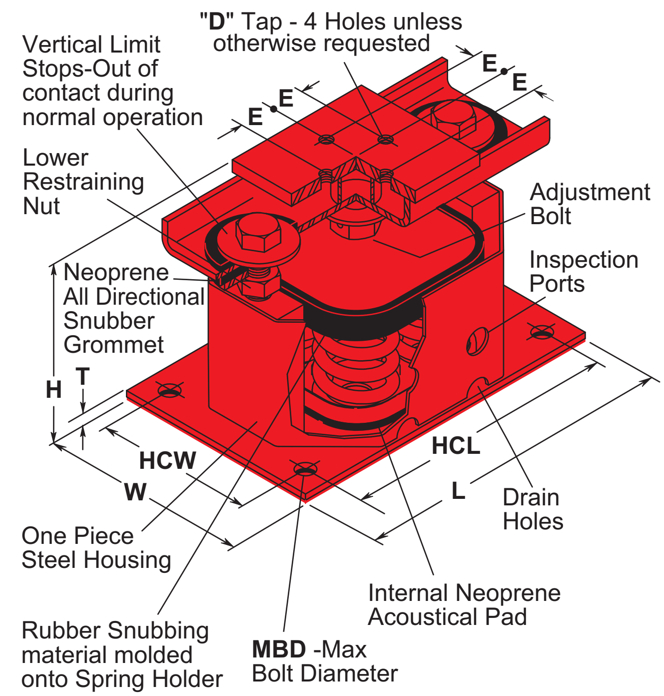
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRS 2"(*50mm*) Defl. 2-C2, 4-C2 Springs



TYPE SLRS DIMENSIONS (inches and *mm*)

Size	H	T	D	E	L	HCL	W	HCW	MBD
2-C2	8 5/8 *219*	1/4 *6*	5/8 *16*	1 3/8 *35*	14 *356*	12 1/4 *311*	5 1/4 *133*	3 1/2 *89*	5/8 *16*
4-C2	8 5/8 *219*	1/4 *6*	7/8 *22*	1 3/8 *35*	13 *330*	11 *279*	8 3/8 *213*	6 1/4 *159*	3/4 *19*

TYPE SLRS RATINGS

SLRS Size	Rated Capacity (lbs) *(kg)*	Rated Defl (in) *(mm)*	Spring Constant (lbs/in)*(kg/mm)*	Max. G Rating	Spring Color
2-C2-340	340 *154*	2.40 *61*	140 *2.52*	15.3	Brown
2-C2-420	420 *191*	2.30 *58*	180 *3.29*	12.4	Red
2-C2-520	520 *236*	2.20 *56*	240 *4.21*	10.0	White
2-C2-660	660 *299*	2.00 *51*	330 *5.86*	7.9	Black
2-C2-920	920 *417*	2.00 *51*	460 *8.18*	5.7	Blue
2-C2-1220	1220 *553*	2.00 *51*	610 *10.84*	4.3	Green
2-C2-1760†	1760 *798*	2.00 *51*	880 *15.65*	3.0	Gray
2-C2-2420†	2420 *1098*	2.00 *51*	1210 *21.53*	2.2	Silver
2-C2-3080†	3080 *1397*	2.00 *51*	1540 *27.39*	1.7	Gray*
2-C2-3740†	3740 *1696*	2.00 *51*	1870 *33.24*	1.4	Silver*
4-C2-4840†	4840 *2195*	2.00 *51*	2420 *43.04*	2.3	Silver
4-C2-6160†	6160 *2794*	2.00 *51*	3080 *54.78*	1.8	Gray*
4-C2-7480†	7480 *3393*	2.00 *51*	3740 *66.53*	1.5	Silver*

*with Red inner spring

Illustration above shows a SLRS-4-C2 housing with four C2 springs. Not shown are SLRS-2-C2 with two C2 springs.

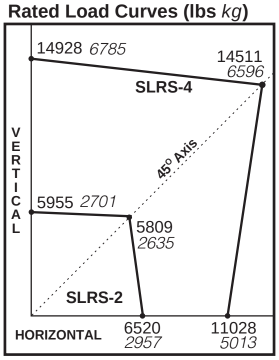
Housing load ratings expressed in G's are based on tests with bolted connections to steel top and bottom. SLRS housings require uniform support under entire base plate. Test were run with one bolt in top plate.

SLRS mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

†Published ratings allow minimum 25% additional travel to solid. For a full 50% specified minimum use the following ratings:

Size	Derated Capacity (lbs)	*(kg)*	Defl. (in)	*(mm)*
2-C2-1760	1600	*726*	1.67	*42*
2-C2-2420	2020	*916*	1.67	*42*
2-C2-3080	2570	*1166*	1.67	*42*
2-C2-3740	3120	*1415*	1.67	*42*
4-C2-4840	4040	*1833*	1.67	*42*
4-C2-6160	5145	*2334*	1.67	*42*
4-C2-7480	6245	*2833*	1.67	*42*

OSHPD OPA-194
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0194. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD	Free Height	Ratio Kx/Ky	Ratio OD/OH
C2	2 7/8 *73*	5 *127*	0.63-0.85	0.96-1.15

All springs without "†" have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection except as noted.

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRSO 2"(*50mm*) Defl. 2-C2, 4-C2, 6-C2 & 9-C2 Springs

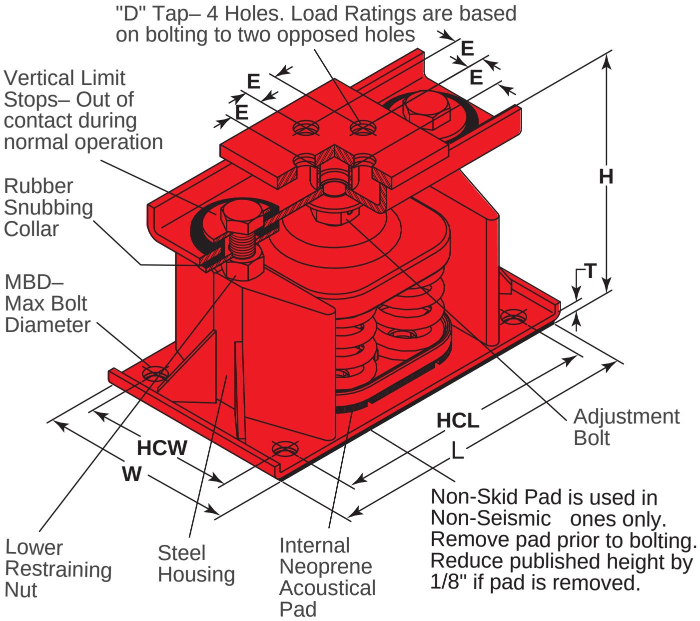
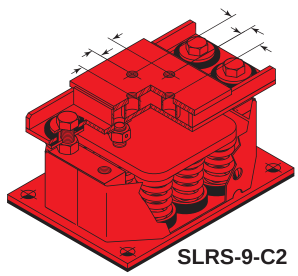


Illustration above shows a SLRSO-4-C2 housing with four C springs. SLRS-9-C2 has nine C2 springs and has closed sides. Not shown are SLRSO-2-C2 with two C2 springs and SLRSO-6-C2 with six C2 springs.

SLRSO mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.



SLRS-9-C2

TYPE SLRSO and SLRS DIMENSIONS (inches and *mm*)

Type & Size	H	T	D	E	L	HCL	W	HCW	MBD
SLRSO-2-C2	8 3/4 *222*	3/8 *10*	5/8 *16*	1 3/8 *35*	14 *356*	12 1/4 *311*	5 1/4 *133*	3 1/2 *89*	5/8 *16*
SLRSO-4-C2	8 3/4 *222*	3/8 *10*	7/8 *22*	1 3/8 *35*	13 3/4 *350*	11 *279*	8 *203*	6 1/4 *159*	3/4 *19*
SLRSO-6-C2	9 3/4 *248*	3/8 *10*	1 *25*	1 5/8 *41*	19 *483*	15 7/8 *403*	9 *229*	6 *152*	1 *25*
SLRS-9-C2	9 3/4 *248*	5/8 *16*	1 *25*	2 *51*	18 *457*	15 3/4 *400*	13 *330*	10 3/4 *273*	1 *25*

TYPE SLRSO and SLRS RATINGS 2" *50mm* Deflection Series

SLRSO Size	Rated Capacity (lbs) *(kg)*	Rated Defl (in) *(mm)*	Spring Constant (lbs/in)*(kg/mm)*	Max. Horiz. Housing G Rating†	Spring Color
2-C2-340	340 *154*	2.40 *61*	140 *2.52*	17.7	Brown
2-C2-420	420 *191*	2.30 *58*	180 *3.29*	14.3	Red
2-C2-520	520 *236*	2.20 *56*	240 *4.21*	11.6	White
2-C2-660	660 *299*	2.00 *51*	330 *5.86*	9.1	Black
2-C2-920	920 *417*	2.00 *51*	460 *8.18*	6.5	Blue
2-C2-1220	1220 *553*	2.00 *51*	610 *10.8*	4.9	Green
2-C2-1760††	1760 *798*	2.00 *51*	880 *15.7*	3.4	Gray
2-C2-2420††	2420 *1098*	2.00 *51*	1210 *21.5*	2.5	Silver
2-C2-3080††	3080 *1397*	2.00 *51*	1540 *27.4*	1.9	Gray*
2-C2-3740††	3740 *1696*	2.00 *51*	1870 *33.2*	1.6	Silver*
4-C2-4840††	4840 *2195*	2.00 *51*	2420 *43.0*	2.4	Silver
4-C2-6160††	6160 *2794*	2.00 *51*	3080 *54.8*	1.9	Gray*
4-C2 7480††	7480 *3393*	2.00 *51*	3740 *66.5*	1.6	Silver*
6-C2-7260††	7260 *3293*	2.00 *51*	3630 *64.6*	1.9	Silver
6-C2-9240††	9240 *4191*	2.00 *51*	4620 *82.2*	1.5	Gray*
6-C2-11220††	11220 *5089*	2.00 *51*	5610 *99.8*	1.3	Silver*
SLRS Size					
9-C2-13860††	13860 *6287*	2.00 *51*	6930 *123.2*	‡	Gray*
9-C2-16830††	16830 *7634*	2.00 *51*	8415 *149.7*	‡	Silver*

*with Red inner spring

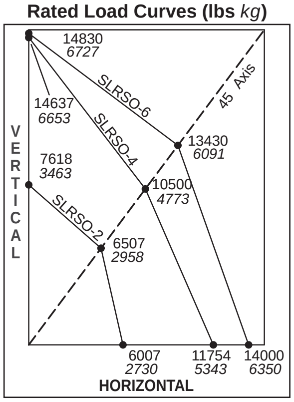
‡SLRS-9 under test

†Housing load ratings expressed in G's are based on tests with bolted connections to steel top and bottom. SLRSO & SLRS housings require uniform support under entire base plate.

††Published ratings allow minimum 25% additional travel to solid. For a full 50% specified minimum use the following ratings:

50% Travel to Solid SLRSO Size	Capacity (lbs) *(kg)*	Defl. (in)*(mm)*	50% Travel to Solid SLRSO Size	Capacity (lbs) *(kg)*	Defl. (in) *(mm)*
2-C2-1760	1600 *726*	1.67 *42*	4-C2-7480	6245 *2833*	1.67 *42*
2-C2-2420	2020 *916*	1.67 *42*	6-C2-7260	6060 *2749*	1.67 *42*
2-C2-3080	2570 *1166*	1.67 *42*	6-C2-9240	7715 *3500*	1.67 *42*
2-C2-3740	3120 *1415*	1.67 *42*	6-C2-11220	9370 *4250*	1.67 *42*
4-C2-4840	4040 *1833*	1.67 *42*	9-C2-13860	11570 *5248*	1.67 *42*
4-C2-6160	5145 *2334*	1.67 *42*	9-C2-16830	14050 *6373*	1.67 *42*

OSHPD
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD allowable loads based on testing and calculations performed to meet OSHPD criteria.

To use OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.

2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD	Free Height	Ratio Kx/Ky	Ratio OD/OH
C2	2 7/8 *73*	5 *127*	0.63-0.85	0.96-1.15

All springs without "††" have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection.

03/2020

Tested per OPA Standards Developed by California Office of Statewide Health Planning and Development

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

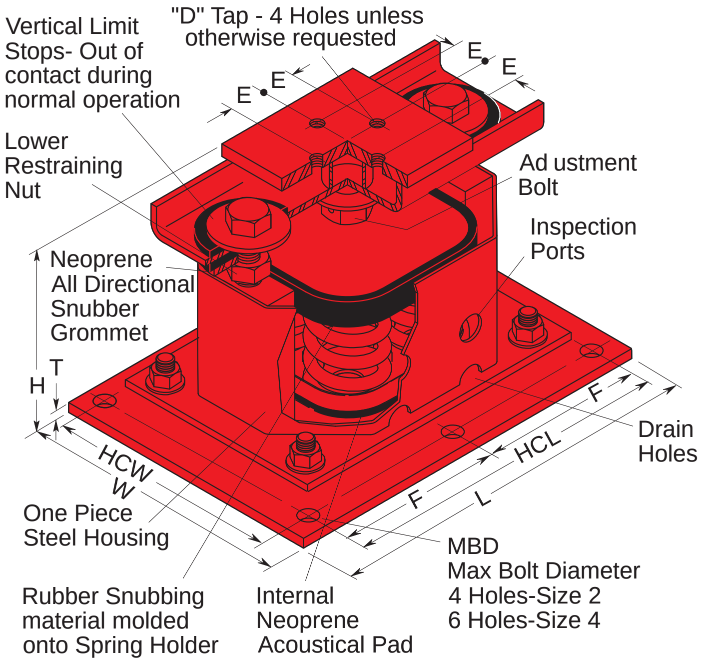
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRSEBP (Extended Base Plate)
2"(*50mm*) Defl. 2-C2 & 4-C2 Springs



TYPE SLRSEBP DIMENSIONS (inches and *mm*)

Size	H	T	D	E	L	HCL	F	W	HCW	MBD
2-C2	9 *229*	3/8 *10*	5/8 *16*	13/8 *35*	141/2 *368*	11 *295*	- -	12 *305*	9 *229*	3/4 *19*
4-C2	9 *229*	3/8 *10*	7/8 *22*	13/8 *35*	19 *483*	16 *406*	8 *203*	14 *356*	11 *279*	3/4 *19*

Illustration at left shows a SLRSEBP-4 with 4 C2 springs. Not shown is SLRSEBP-2 with two C2 springs.

Housing load ratings expressed in G's are based on tests with bolted connections to steel top and bottom. SLRSEBP housings require uniform support under entire base plate. Tests were run with one bolt in top plate.

SLRS mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

TYPE SLRSEBP RATINGS

Size	Rated Capacity (lbs) *(kg)*	Rated Defl (in) *(mm)*	Spring Constant (lbs/in)*(kg/mm)*	Max. G Rating	Spring Color
2-C2-340	340 *154*	2.40 *61*	140 *2.52*	15.3	Brown
2-C2-420	420 *191*	2.30 *58*	180 *3.29*	12.4	Red
2-C2-520	520 *236*	2.20 *56*	240 *4.21*	10.0	White
2-C2-660	660 *299*	2.00 *51*	330 *5.86*	7.9	Black
2-C2-920	920 *417*	2.00 *51*	460 *8.18*	5.7	Blue
2-C2-1220	1220 *553*	2.00 *51*	610 *10.84*	4.3	Green
2-C2-1760†	1760 *798*	2.00 *51*	880 *15.65*	3.0	Gray
2-C2-2420†	2420 *1098*	2.00 *51*	1210 *21.53*	2.2	Silver
2-C2-3080†	3080 *1397*	2.00 *51*	1540 *27.39*	1.7	Gray*
2-C2-3740†	3740 *1696*	2.00 *51*	1870 *33.24*	1.4	Silver*
4-C2-4840†	4840 *2195*	2.00 *51*	2420 *43.04*	2.3	Silver
4-C2-6160†	6160 *2794*	2.00 *51*	3080 *54.78*	1.8	Gray*
4-C2 7480†	7480 *3393*	2.00 *51*	3740 *66.53*	1.5	Silver*

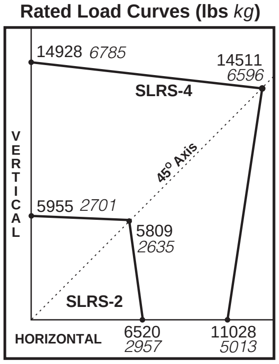
*with Red inner spring

Approval applies to mount only. Baseplate not approved. Baseplate shown is satisfactory for most installations. Anchorage and baseplate calculations are provided for all installations. Baseplate modified when required.

†Published ratings allow minimum 25% additional travel to solid. For a full 50% specified minimum use the following ratings:

Size	Derated Capacity (lbs) *(kg)*	Defl. (in)*(mm)*	Size	Derated Capacity (lbs) *(kg)*	Defl. (in) *(mm)*
2-C2-1760	1600 *726*	1.67 *42*	4-C2-4840	4040 *1833*	1.67 *42*
2-C2-2420	2020 *916*	1.67 *42*	4-C2-6160	5145 *2334*	1.67 *42*
2-C2-3080	2570 *1166*	1.67 *42*	4-C2-7480	6245 *2833*	1.67 *42*
2-C2-3740	3120 *1415*	1.67 *42*			

OSHPD OPA-194
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0194. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD	Free Height	Ratio Kx/Ky	Ratio OD/OH
C2	27/8 *73*	5 *127*	0.63-0.85	0.96-1.15

All springs without "†" have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection except as noted.

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SLRSOEBP (Extended Base Plate) 2"(*50mm*) Defl. 2-C2, 4-C2, 6-C2 & 9-C2 Springs

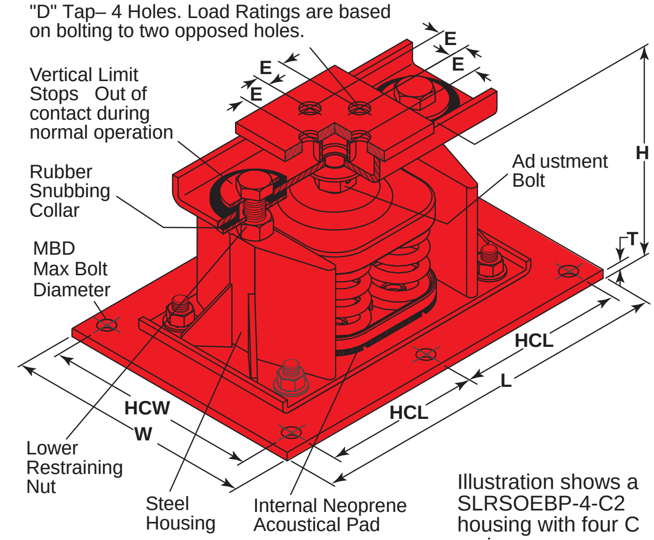
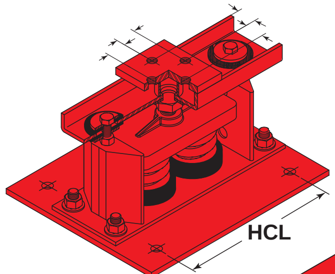
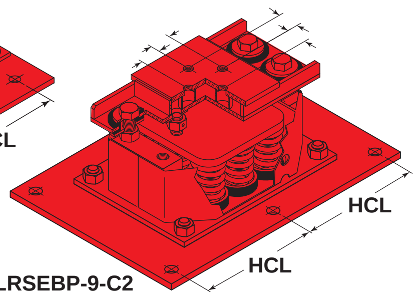


Illustration shows a SLRSOEBP-4-C2 housing with four C springs.



SLRSOEBP-2-C2



SLRSEBP-9-C2

SLRSOEBP-2-C2 has two C2 springs and SLRSEBP-9-C2 has nine C2 springs and has closed sides. Not shown is SLRSOEBP-6-C2 with six C2 springs.

TYPE SLRSOEBP and SLRSEBP DIMENSIONS (inches and *mm*)

Type & Size	H	T	D	E	L	HCL	W	HCW	MBD
SLRSOEBP-2-C2	9 *229*	3/8 *10*	5/8 *16*	1 3/8 *35*	14 1/2 *368*	11 *280*	11 *280*	9 *229*	3/4 *19*
SLRSOEBP-4-C2	9 *229*	3/8 *10*	7/8 *22*	1 3/8 *35*	19 *482*	8 *203*	14 *356*	11 *280*	3/4 *19*
SLRSOEBP-6-C2	10 1/4 *260*	1/2 *13*	1 *25*	1 5/8 *41*	27 *686*	12 *305*	15 *381*	12 *305*	1 *25*
SLRSEBP-9-C2	10 1/4 *260*	5/8 *16*	1 *25*	2 *51*	27 *686*	12 *305*	19 *483*	16 *406*	1 *25*

TYPE SLRSOEBP and SLRSEBP RATINGS 2" *50mm* Deflection Series

SLRSOEBP Size	Rated Capacity (lbs)	(*kg*)	Rated Defl (in)	(*mm*)	Spring Constant (lbs/in)	(*kg/mm*)	Max. Horiz. G Rating Bolted to Concrete†	Spring Color
2-C2-340	340	*154*	2.40	*61*	140	*2.52*	17.7	Brown
2-C2-420	420	*191*	2.30	*58*	180	*3.29*	14.3	Red
2-C2-520	520	*236*	2.20	*56*	240	*4.21*	11.6	White
2-C2-660	660	*299*	2.00	*51*	330	*5.86*	9.1	Black
2-C2-920	920	*417*	2.00	*51*	460	*8.18*	6.5	Blue
2-C2-1220	1220	*553*	2.00	*51*	610	*10.8*	4.9	Green
2-C2-1760††	1760	*798*	2.00	*51*	880	*15.7*	3.4	Gray
2-C2-2420††	2420	*1098*	2.00	*51*	1210	*21.5*	2.5	Silver
2-C2-3080††	3080	*1397*	2.00	*51*	1540	*27.4*	1.9	Gray*
2-C2-3740††	3740	*1696*	2.00	*51*	1870	*33.2*	1.6	Silver*
4-C2-4840††	4840	*2195*	2.00	*51*	2420	*43.0*	1.9	Silver
4-C2-6160††	6160	*2794*	2.00	*51*	3080	*54.8*	1.5	Gray*
4-C2 7480††	7480	*3393*	2.00	*51*	3740	*66.5*	1.2	Silver*
6-C2-7260††	7260	*3293*	2.00	*51*	3630	*64.6*	1.4	Silver
6-C2-9240††	9240	*4191*	2.00	*51*	4620	*82.2*	1.1	Gray*
6-C2-11220††	11220	*5089*	2.00	*51*	5610	*99.8*	0.9	Silver*
SLRSEBP Size								
9-C2-13860††	13860	*6287*	2.00	*51*	6930	*123.2*	‡	Gray*
9-C2-16830††	16830	*7634*	2.00	*51*	8415	*149.7*	‡	Silver*

*with Red inner spring

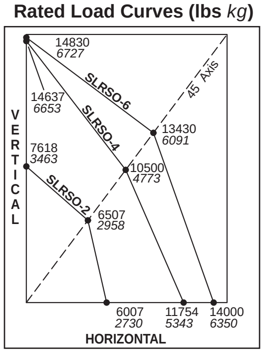
‡SLRSEBP-9 under test

†Horizontal load ratings expressed in G's are based on calculations with bolted connections to steel on top and concrete inserts on bottom. SLRSOEBP housings require uniform support under entire base plate.

††Published ratings allow minimum 25% additional travel to solid. For a full 50% specified minimum use the following ratings:

50% Travel to Solid SLRSO Size	Capacity (lbs)	(*kg*)	Defl. (in)	(*mm*)	50% Travel to Solid SLRSO Size	Capacity (lbs)	(*kg*)	Defl. (in)	(*mm*)
2-C2-1760	1600	*726*	1.67	*42*	4-C2-7480	6245	*2833*	1.67	*42*
2-C2-2420	2020	*916*	1.67	*42*	6-C2-7260	6060	*2749*	1.67	*42*
2-C2-3080	2570	*1166*	1.67	*42*	6-C2-9240	7715	*3500*	1.67	*42*
2-C2-3740	3120	*1415*	1.67	*42*	6-C2-11220	9370	*4250*	1.67	*42*
4-C2-4840	4040	*1833*	1.67	*42*	9-C2-13860	11570	*5248*	1.67	*42*
4-C2-6160	5145	*2334*	1.67	*42*	9-C2-16830	14050	*6373*	1.67	*42*

OSHPD
Rated Load Curves (lbs *kg*)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD allowable loads based on testing and calculations performed to meet OSHPD criteria.

To use OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.

2) Plot Horizontal and Vertical Loads. The intersection must fall within the area below the OSHPD curve.

SPRING CHARACTERISTICS (inches and *mm*)

Spring Size	OD		Free Height		Ratio Kx/Ky	Ratio OD/OH
C2	2 7/8	*73*	5	*127*	0.63-0.85	0.96-1.15

All springs without "††" have an additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times the Rated Deflection.

SLRSOEBP mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

03/2020

Tested per OPA Standards Developed by California Office of Statewide Health Planning and Development

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

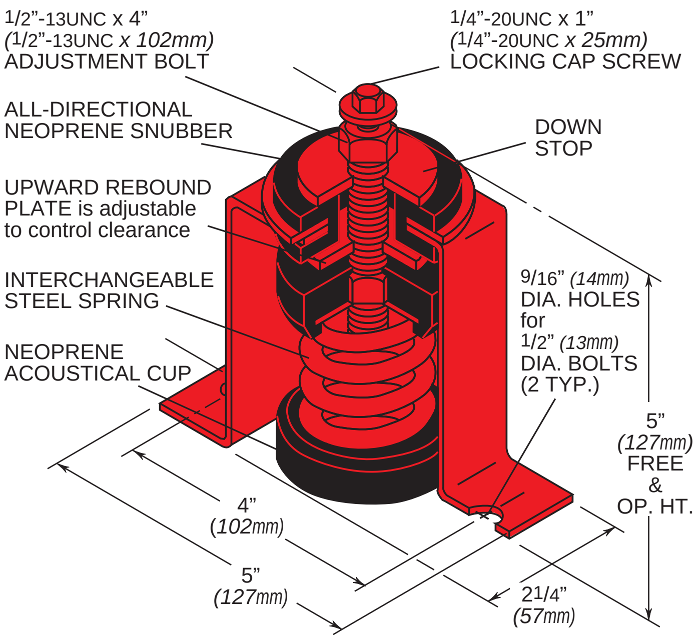
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

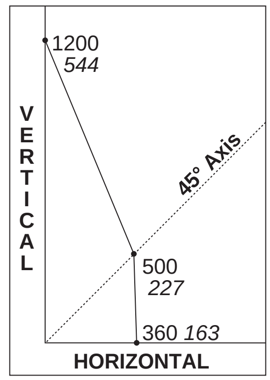
Info@Mason-Ind.com • www.Mason-Ind.com

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SSLFH-X 1" (*25mm*) Defl.



OSHPD OPA-0199 **Rated Load Curves (lbs *kg*)**†



†For kN divide kg by 102

Horizontal and Vertical plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0199. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal Load vs Vertical Load. The point must fall within the area below the OSHPD curve.

Mounts are galvanized.

TYPE SSLFH RATINGS

Size	Rated Capacity (lbs) (kg)	Rated Defl (in) (mm)	Spring Constant (lbs/in) (kg/mm)	Spring Color/ Stripe	Max. G Rating‡
SSLFH-X-23	23 *10*	1.30 *33*	18 *0.33*	Brown	15.7
SSLFH-X-33	33 *15*	1.10 *28*	30 *0.55*	Red	10.9
SSLFH-X-54	54 *24*	1.20 *30*	45 *0.82*	White	6.7
SSLFH-X-76	76 *34*	1.02 *26*	73 *1.32*	Black	4.7
SSLFH-X-113	113 *51*	1.00 *25*	113 *2.06*	Yellow	3.2
SSLFH-X-130	130 *59*	1.00 *25*	130 *2.37*	Purple	2.8
SSLFH-X-175	175 *79*	1.00 *25*	175 *3.19*	Silver	2.1
SSLFH-X-210	210 *95*	1.00 *25*	210 *3.82*	Blue	1.7

‡Horizontal G Ratings are for quick reference only– Use OSHPD Rated Load Curves.

SPRING DATA

Size	Spring OD (in) (mm)	Free Ht. (in) (mm)	Ratio Kx/Ky	Ratio OD/OH
23-130	11/2 *38*	23/8 *60*	0.70-0.90	0.88-1.25
125-220	11/2 *38*	25/8 *67*	0.75	0.92-1.00

SSLFH-X mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

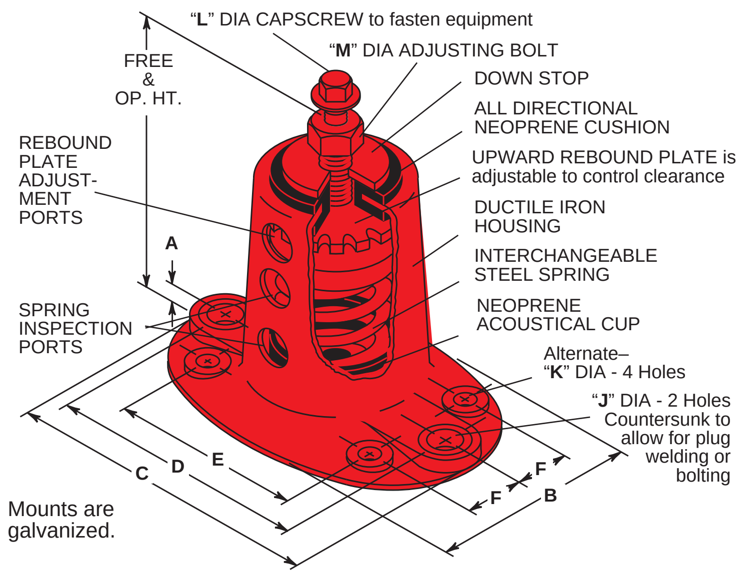
FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

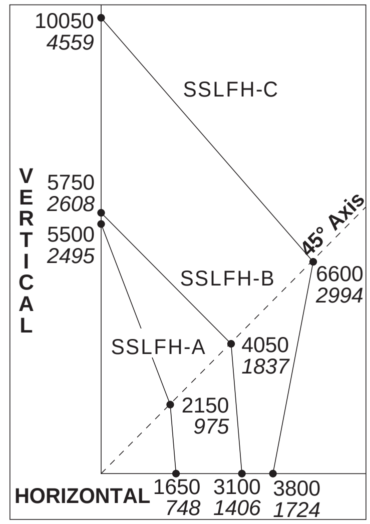
Bill Staehlin (916) 654-3362

Patrick J. Lama
Civil Engineer
California No. 25878

SSLFH 1" (*25mm*) Defl.



OSHPD OPA-0198
Rated Load Curves (lbs *kg*)†



Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0198. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments. 2) Plot Horizontal Load vs Vertical Load. The point must fall within the area below the OSHPD curve.

†For kN divide kg by 102

SSLFH mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

TYPE SSLFH RATINGS

Size	Rated Capacity (lbs)	(kg)	Rated Defl (in)	(mm)	Spring Constant (lbs/in)	(kg/mm)	Spring Color/ Stripe	Max. G Rating‡
SSLFH-A-45	45	*20*	1.60	*41*	28	*0.5*	Blue	37.8
SSLFH-A-75	75	*34*	1.50	*38*	50	*0.9*	Orange	22.7
SSLFH-A-125	125	*57*	1.33	*34*	94	*1.7*	Brown	13.6
SSLFH-A-200	200	*91*	1.15	*29*	174	*3.1*	Black	8.5
SSLFH-A-310	310	*141*	1.00	*25*	310	*5.6*	Yellow	5.5
SSLFH-A-400	400	*181*	1.00	*25*	400	*7.2*	Green	4.3
SSLFH-A-510	510	*231*	1.00	*25*	510	*9.2*	Red	3.3
SSLFH-A-625	625	*283*	1.00	*25*	625	*11.3*	White	2.7
SSLFH-B-65	65	*29*	2.10	*53*	31	*0.6*	Brown	47.7
SSLFH-B-85	85	*39*	2.10	*53*	40	*0.7*	White‡	36.5
SSLFH-B-115	115	*52*	2.00	*51*	57	*1.0*	Silver	27.0
SSLFH-B-150	150	*68*	2.00	*51*	75	*1.3*	Orange	20.7
SSLFH-B-280	280	*127*	1.60	*41*	174	*3.1*	Green	11.1
SSLFH-B-450	450	*204*	1.31	*33*	344	*6.2*	Red	6.9
SSLFH-B-750	750	*340*	1.12	*28*	670	*12.1*	White	4.1
SSLFH-B-1000	1000	*454*	1.00	*25*	1000	*18.2*	Blue	3.1
SSLFH-B-1250	1250	*567*	1.00	*25*	1250	*22.7*	Gray	2.5
SSLFH-B-1650	1650	*748*	1.00	*25*	1650	*30.0*	Black	1.9
SSLFH-C-1000	1000	*454*	1.00	*25*	1000	*18.2*	Black	3.8
SSLFH-C-1350	1350	*612*	1.00	*25*	1350	*24.5*	Yellow	2.8
SSLFH-C-1750	1750	*794*	1.00	*25*	1750	*31.8*	Black*	2.2
SSLFH-C-2100	2100	*953*	1.00	*25*	2100	*38.1*	Yellow*	1.8
SSLFH-C-2385	2385	*1082*	1.00	*25*	2385	*43.3*	Yellow**	1.6
SSLFH-C-2650	2650	*1202*	1.00	*25*	2650	*48.1*	Red*	1.4
SSLFH-C-2935	2935	*1331*	1.00	*25*	2935	*53.2*	Red**	1.3

‡with Black stripe *with Red inner spring **with Green inner spring

‡Horizontal G Ratings are for quick reference only - Use OSHPD Rated Load Curves.

TYPE SSLFH DIMENSIONS (inches *mm*)

Size	A	B	C	D	E	F	J	K	L	M	Free & Op Ht
SSLFH-A	1/4 *6*	4 *102*	6 1/4 *159*	4 3/4 *121*	4 *102*	1 1/8 *29*	3/4 *19*	1/2 *13*	3/8- 16UNC	3/4 *19*	6 *152*
SSLFH-B	1/2 *13*	6 *152*	9 1/4 *235*	7 1/2 *191*	5 1/2 *140*	1 5/8 *41*	3/4 *19*	5/8 *16*	1/2- 13UNC	7/8 *22*	7 1/2 *191*
SSLFH-C	1/2 *13*	7 *178*	11 *279*	9 *229*	6 *152*	2 *51*	7/8 *22*	3/4 *19*	5/8- 11UNC	1 *25*	8 *203*

SPRING DATA

Size	Spring OD (in)	*(mm)*	Free Ht. (in)	*(mm)*	Ratio Kx/Ky	Ratio OD/OH
A-45-400	1 3/4	*44*	3	*76*	0.70-0.90	0.88-1.25
A-510-625	1 3/4	*44*	3 1/8-3 3/8	*79-86*	0.50-0.60	0.74-0.82
B	2 3/8	*60*	4	*102*	0.65-0.90	0.76-1.25
C	2 7/8	*73*	4 1/8	*105*	0.90-1.00	0.92

03/2020

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

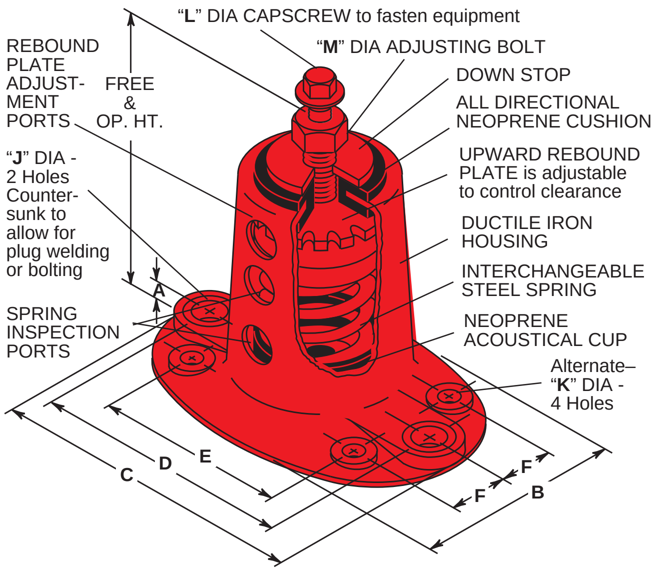
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

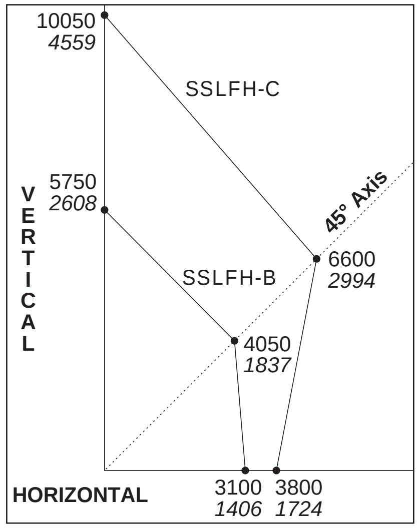
Info@Mason-Ind.com • www.Mason-Ind.com

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SSLFH 2" (*51mm*) Defl.



OSHPD OPA-0198
Rated Load Curves (lbs *kg*)†



Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0198. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves:

1) Calculate Vertical and Horizontal Forces on mountings including translations and overturning moments.
2) Plot Horizontal Load vs Vertical Load. The point must fall within the area below the OSHPD curve.

†For kN divide kg by 102

SSLFH mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

SPRING DATA

Size	Spring OD (in) *(mm)*	Free Ht. (in) *(mm)*	Ratio Kx/Ky	Ratio OD/OH
B & B2	2 3/8 *60*	4 *102*	0.65-0.90	0.76-1.25
C	2 7/8 *73*	4 1/8 *105*	0.90-1.00	0.92

TYPE SSLFH RATINGS

Size	Rated Capacity (lbs) *(kg)*	Rated Defl (in) *(mm)*	Spring Constant (lbs/in) *(kg/mm)*	Spring Color/ Stripe	Max. G Rating‡
SSLFH-B-20	20 *9*	2.40 *61*	8 *0.1*	Tan	155.0
SSLFH-B-26	26 *12*	2.18 *55*	12 *0.2*	White/Blue	119.2
SSLFH-B-35	35 *16*	2.20 *56*	16 *0.3*	Purple	88.6
SSLFH-B-50	50 *23*	2.20 *56*	24 *0.4*	White/Red	62.0
SSLFH-B-65	65 *30*	2.10 *53*	31 *0.6*	Brown	47.7
SSLFH-B-85	85 *39*	2.10 *53*	40 *0.7*	White/Black	36.5
SSLFH-B-115	115 *52*	2.00 *51*	57 *1.0*	Silver	27.0
SSLFH-B-150	150 *68*	2.00 *51*	75 *1.3*	Orange	20.7
SSLFH-B2-210	210 *95*	2.12 *54*	99 *1.8*	Silver	14.8
SSLFH-B2-290	290 *131*	2.00 *51*	144 *2.6*	Blue	10.7
SSLFH-B2-450‡‡	450 *204*	2.00 *51*	224 *4.0*	Tan	6.9
SSLFH-B2-680‡‡	680 *308*	2.00 *51*	340 *6.0*	Gray	4.6
SSLFH-C2-125	125 *57*	2.50 *64*	50 *0.9*	Purple	30.4
SSLFH-C2-170	170 *77*	2.40 *61*	70 *1.3*	Brown	22.4
SSLFH-C2-210	210 *95*	2.30 *58*	90 *1.6*	Red	18.1
SSLFH-C2-260	260 *118*	2.20 *56*	120 *2.1*	White	14.6
SSLFH-C2-330	330 *150*	2.00 *51*	165 *2.9*	Black	11.5
SSLFH-C2-460	460 *209*	2.00 *51*	230 *4.1*	Blue	8.3
SSLFH-C2-610	610 *277*	2.00 *51*	305 *5.4*	Green	6.2
SSLFH-C2-880‡‡	880 *399*	2.00 *51*	440 *7.8*	Gray	4.3
SSLFH-C2-1210‡‡	1210 *549*	2.00 *51*	605 *10.8*	Silver	3.1
SSLFH-C2-1540‡‡	1540 *699*	2.00 *51*	770 *13.7*	Gray*	2.5
SSLFH-C2-1870‡‡	1870 *848*	2.00 *51*	935 *16.6*	Silver*	2.0

‡Horizontal G Ratings are for quick reference only– Use OSHPD Rated Load Curves.

*with RED inner spring

TYPE SSLFH DIMENSIONS (inches *mm*)

Size	A	B	C	D	E	F	J	K	L	M	Free & Op Ht
SSLFH-B&B2	1/2 *13*	6 *152*	9 1/4 *235*	7 1/2 *191*	5 1/2 *140*	1 5/8 *41*	3/4 *19*	5/8 *16*	1/2-13UNC	7/8 *22*	7 1/2 *191*
SSLFH-C2	1/2 *13*	7 *178*	11 *279*	9 *229*	6 *152*	2 *51*	7/8 *22*	3/4 *19*	5/8-11UNC	1 *25*	8 *203*

‡‡Published ratings allow minimum 25% additional travel to solid. For a full 50% specified minimum use the following ratings:

Size	Derated Capacity (lbs) *(kg)*	Defl (in) *(mm)*	Size	Derated Capacity (lbs) *(kg)*	Defl (in) *(mm)*
B2-450	410 *186*	1.83 *46.5*	C2-1210	1010 *458*	1.67 *42.4*
B2-680	565 *256*	1.66 *42.2*	C2-1540	1285 *583*	1.67 *42.4*
C2-880	800 *363*	1.82 *46.2*	C2-1870	1560 *708*	1.67 *42.4*

All springs without "‡‡" have additional travel to solid equal to 50% of the rated deflection.

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

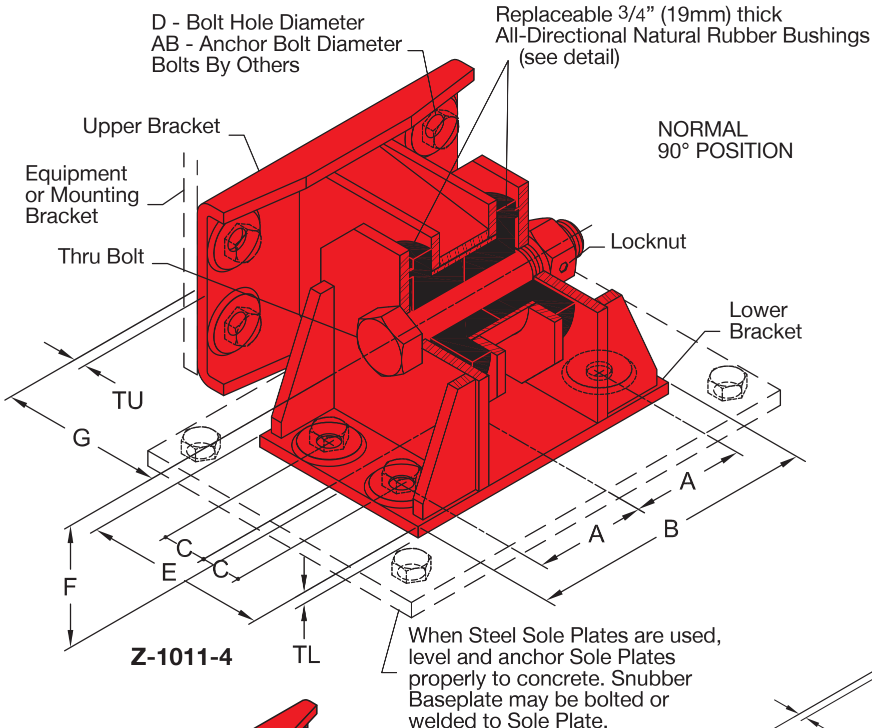
FIXED EQUIPMENT ANCHORAGE

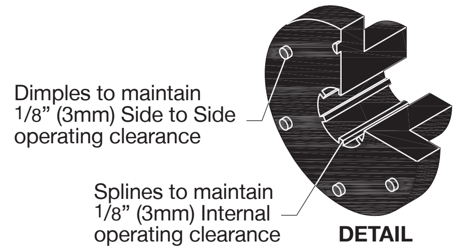
OPA-0349 January 6, 2003

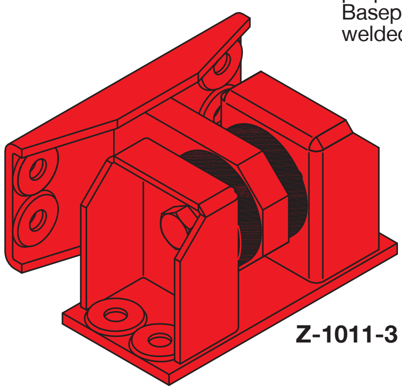
Bill Staehlin (916) 654-3362

Patrick J. Lama
Civil Engineer
California No. 25878

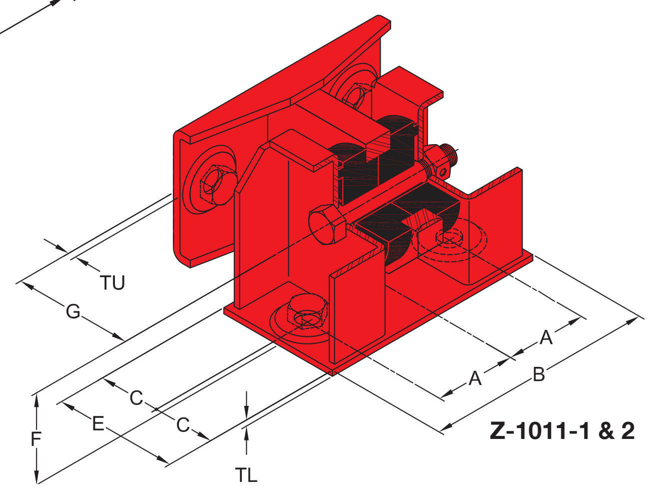
Z-1011 Seismic Snubbers







Z-1011-3



Z-1011-1 & 2

Z-1011 mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

TYPE Z-1011 1G ALL DIRECTIONAL LOAD RATINGS AND DIMENSIONS

	Type & Size	All Directional Load Ratings[1]	A	AB	B	C	D	E	F	G	TL	TU
American Units (lbs & inches)	Z-1011-1	625	2 1/8	1/2	6	1 7/16	9/16	2 7/8	2 1/4	2 3/4	1/8	1/8
	Z-1011-2	1300	2 1/8	1/2	6	1 11/16	9/16	3 3/8	2 3/8	3 1/8	5/32	3/16
	Z-1011-3	1925	3 1/8	1/2	7 3/4	3/4	9/16	3 5/8	2 5/8	3 3/4	5/16	3/4
	Z-1011-4	3190	3 1/2	5/8	9	1 1/4	11/16	5 1/2	3 3/4	5	3/8	5/16
Metric *(KN & mm)*	Z-1011-1	*2.8*	*54*	*13*	*152*	*37*	*14*	*73*	*57*	*70*	*3*	*3*
	Z-1011-2	*5.8*	*54*	*13*	*152*	*43*	*14*	*86*	*60*	*79*	*4*	*5*
	Z-1011-3	*8.5*	*79*	*13*	*197*	*19*	*14*	*92*	*67*	*95*	*8*	*6*
	Z-1011-4	*14.1*	*89*	*16*	*229*	*32*	*17*	*140*	*95*	*127*	*10*	*8*

1. SEE PAGES FM55B & FM55C FOR INDIVIDUAL DIRECTION LOADS AND FORMULATION FOR COMBINING LOADS.

03/2020

REVIEWED FOR CODE COMPLIANCE
oshpd
OPM-0043-13
BY: Jeffrey Y. Kikumoto
DATE: 08/16/2019
CALIFORNIA BUILDING CODE, 2013

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

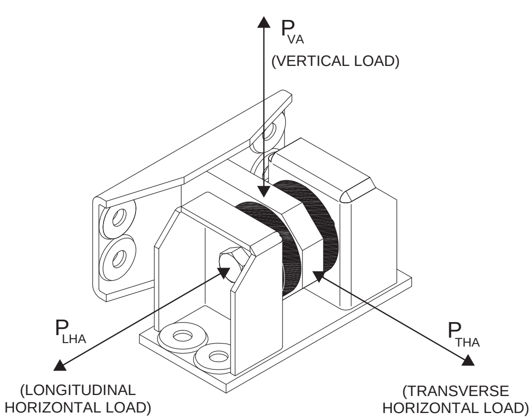
MASON IND. Z-1011 SEISMIC SNUBBER
MAXIMUM ALLOWABLE LOADS & STIFFNESS DATA

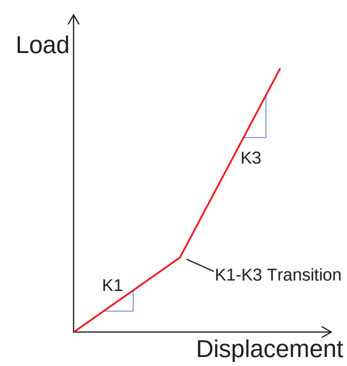
Z-1011 Size	***LRFD** - Allowable Design Loads (lbs)* [1]		***ASD** - Allowable Design Loads (lbs)* [1]		*Avg. K1 Stiffness (lbs/in)*	*Avg. K3 Stiffness (lbs/in)*	*Avg. K1-K3 Transition Load (lbs)*	*Avg. K1-K3 Transition Displacement (in)*
Z-1011-1	P_{VA}	2144	P_{VA}	1429	1379	4196	690	0.50
	P_{THA}	3139	P_{THA}	2092	1708	8123	854	0.50
	P_{LHA}	4047	P_{LHA}	2698	2958	5650	740	0.25
Z-1011-2	P_{VA}	5274	P_{VA}	3516	1192	12357	596	0.50
	P_{THA}	6420	P_{THA}	4280	1042	14625	521	0.50
	P_{LHA}	6523	P_{LHA}	4348	3783	9781	946	0.25
Z-1011-3	P_{VA}	6806	P_{VA}	4537	1350	16207	675	0.50
	P_{THA}	10480	P_{THA}	6986	1300	25367	650	0.50
	P_{LHA}	10082	P_{LHA}	6721	3650	15888	913	0.25
Z-1011-4	P_{VA}	10406	P_{VA}	6937	3967	20325	1984	0.50
	P_{THA}	15267	P_{THA}	10178	3733	33901	1867	0.50
	P_{LHA}	22282	P_{LHA}	14854	6533	33294	1633	0.25
Z-1011-5	P_{VA}	13971	P_{VA}	9314	5642	24365	2821	0.50
	P_{THA}	21135	P_{THA}	14090	6767	36574	3384	0.50
	P_{LHA}	27838	P_{LHA}	18559	13533	37231	3383	0.25

1 - The combined vertical and horizontal loads on each snubber must satisfy the following condition:

$(P_V/P_{VA}) + (P_{TH}/P_{THA}) + (P_{LH}/P_{LHA}) < 1.00$

P_V, P_{TH}, and P_{LH} are calculated vertical, transverse horizontal, and longitudinal horizontal load





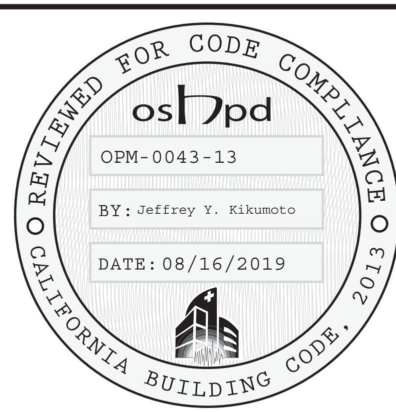
03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com



Page

FM55B

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

Z-1011 SEISMIC SNUBBER INSTALLATION INSTRUCTIONS

1) Snubbers are inactive during normal operation and clearance must be maintained.

2) If Snubbers are installed on equipment or system with flexible connections that move and remain in a different position during operation, final positioning and ad ustment of Snubbers must be made with equipment in operation.

3) Use one piece, full size shim (1/4" maximum thickness) at Upper or Lower Brackets of the Snubbers as required so that no pressure from the equipment dead and live load will be applied on the Rubber Bushings.

4) Use the Upper and Lower Bracket bolt holes to layout then drill attachment holes on equipment or frame and on supporting structure if bolting attachment is preferred.

5) Bolt or weld the Snubber onto the equipment or frame and to the supporting structure. Follow design example provided in this section by Mason Industries.

6) A steel Sole Plate may be bolted or welded to Snubber Baseplate when anchoring into concrete. Consult the Registered Design Professional for design of Sole Plate.

7) Snubbers are to be used in con unction with spring isolators without restraints. Snubbers shall not be used to support gravity loads.

03/2020

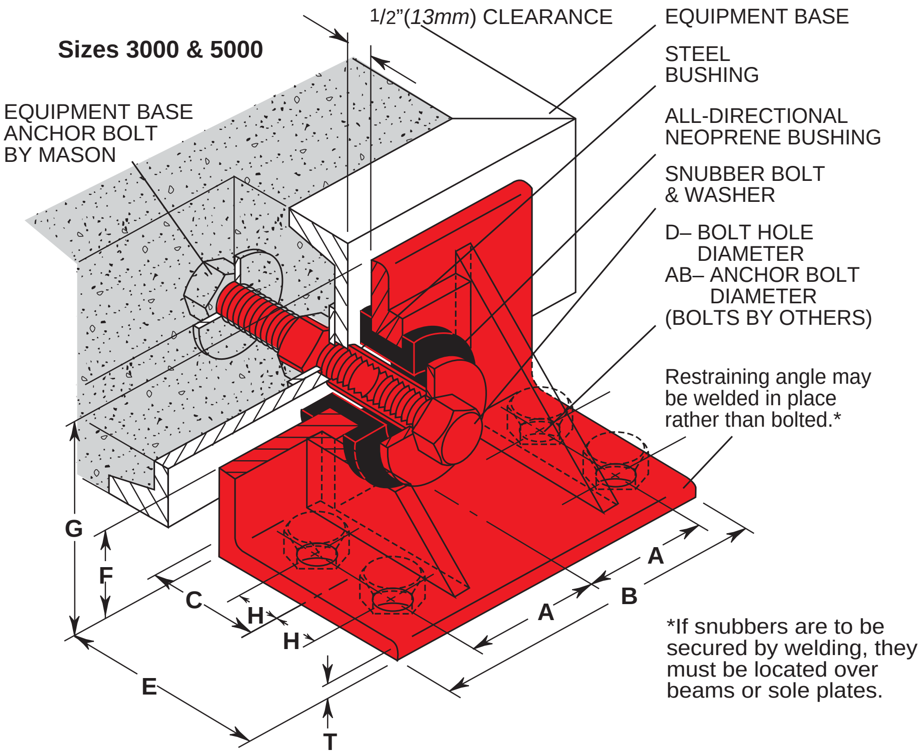
REVIEWED FOR CODE COMPLIANCE
oshpd
OPM-0043-13
BY: Jeffrey Y. Kikumoto
DATE: 08/16/2019
CALIFORNIA BUILDING CODE, 2013

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

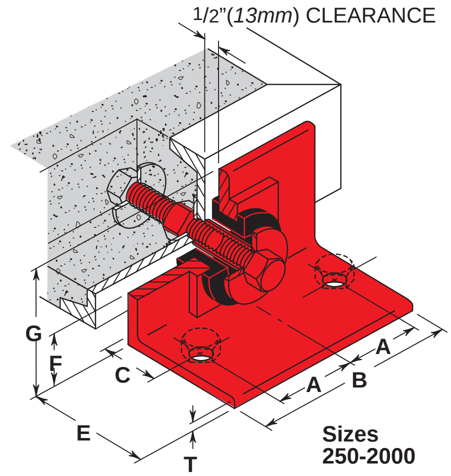
Gummadi Dharma Reddy
Civil Engineer
California No. 29627

Z-1225 Seismic Snubbers

Sizes 3000 & 5000

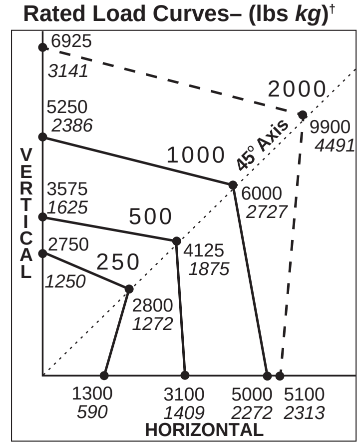


*If snubbers are to be secured by welding, they must be located over beams or sole plates.



Sizes 250-2000

OSHPD OPA-0196
Rated Load Curves– (lbs *kg*)†



†For kN divide kg by 102

Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0196. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves: 1) Calculate Vertical and Horizontal Forces on mounting including translations and overturning moments. 2) Plot Horizontal Load vs Vertical Load. The point must fall within the area below the OSHPD curve.

Z-1225 mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4” maximum air gap.

TYPE Z-1225 1G ALL DIRECTIONAL LOAD RATINGS AND DIMENSIONS

	Type & Size	1G All Directional Load Ratings	A	AB	B	C	D	E	F	G	H	T	Equipment Base Anchor Bolt Size & Length
U.S.A. or British (lbs & inches)	Z-1225-250	250 lbs	2	1/2	5	1 3/4	5/8	3	2 1/8	3 1/2	—	1/4	1/2”-13 UNC-4
	Z-1225-500	500 lbs	2 3/4	1/2	7	1 3/4	5/8	4	2 3/8	4	—	1/4	5/8”-11 UNC-6
	Z-1225-1000	1000 lbs	3	5/8	8	2 1/2	3/4	5	2 1/2	5	—	3/8	3/4”-10 UNC-6
	Z-1225-2000	2000 lbs	5	3/4	12	3	7/8	6	3	6	—	1/2	3/4”-10 UNC-6
	Z-1225-3000	3000 lbs	4 3/4	3/4	12	5	7/8	10	3 1/4	6 3/8	3 3/4	3/8	7/8”-9 UNC-6
	Z-1225-5000	5000 lbs	6	1	15	6	1 1/8	12	3 1/2	6 3/8	4 3/4	3/8	1”-8 UNC-6
Metric (kgs & mm)	*Z-1225-250*	*113 kg*	*51*	*13*	*127*	*44*	*16*	*76*	*54*	*89*	—	*6*	1/2”-13 UNC-*102*
	Z-1225-500	*227 kg*	*70*	*13*	*178*	*44*	*16*	*102*	*60*	*102*	—	*6*	5/8”-11 UNC-*152*
	Z-1225-1000	*455 kg*	*76*	*16*	*203*	*64*	*19*	*127*	*64*	*127*	—	*10*	3/4”-10 UNC-*152*
	Z-1225-2000	*909 kg*	*127*	*19*	*305*	*76*	*22*	*152*	*76*	*152*	—	*13*	3/4”-10 UNC-*152*
	Z-1225-3000	*1364 kg*	*121*	*19*	*305*	*127*	*22*	*254*	*83*	*162*	*95*	*10*	7/8”-9 UNC-*152*
	Z-1225-5000	*2273 kg*	*152*	*25*	*381*	*152*	*29*	*305*	*89*	*162*	*121*	*10*	1”-8 UNC-*152*

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

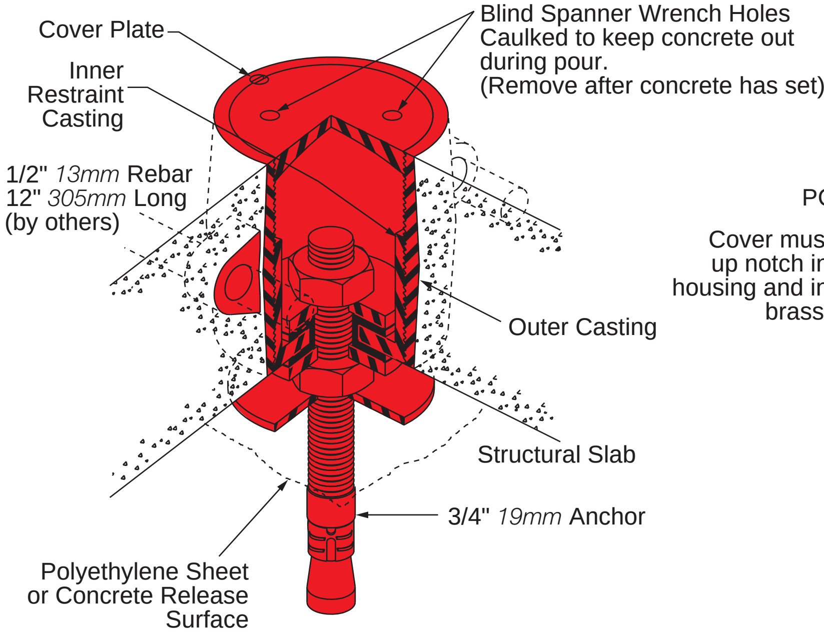
OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

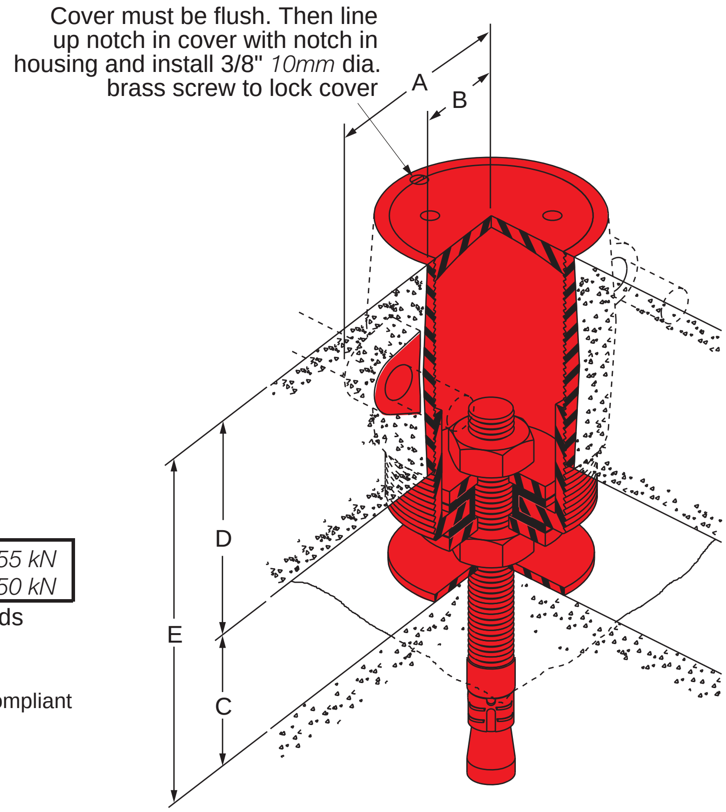
Patrick J. Lama
Civil Engineer
California No. 25878

SFFS Seismic Floating Floor Snubber

POSITION (FLOOR IN POURED POSITION)



POSITION 2 (FLOOR IN RAISED POSITION)



TYPE SFFS RATINGS

Allowable Vertical Loading of Housing	5520 lbs. *24.55 kN*
Allowable Horizontal Loading of Housing	7750 lbs. *34.50 kN*

NOTE Capacity of Snubber is dictated by allowable loads on the Anchor Bolt.

SFFS mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

TYPE SFFS DIMENSIONS

Housing Dimensions A	Housing Dimensions B	Air Gap C	Floor Thickness D	Overall Height E
3 1/8" *79 mm*	1 15/16" *49 mm*	Most Common 1" or 2" *25 or 50 mm* Occasionally 3" or 4" *75 or 100 mm*	Minimum 3" - *75 mm* Most Common 4" - *100 mm* Occasionally 6" thru 12" *150 - 300 mm*	Air Gap plus Floor Thickness

Illustrated housing is for 4" *100mm* thick floating floors. Other configurations are availiable for 3" *75mm*, 5" *125mm* and 6" *150mm* thick floating floors as required.

03/2020

Tested per OPA Standards Developed by California Office of Statewide Health Planning and Development

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

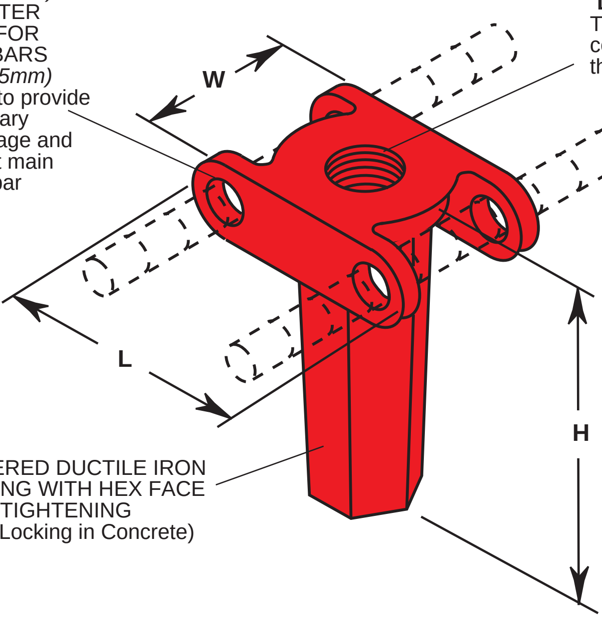
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

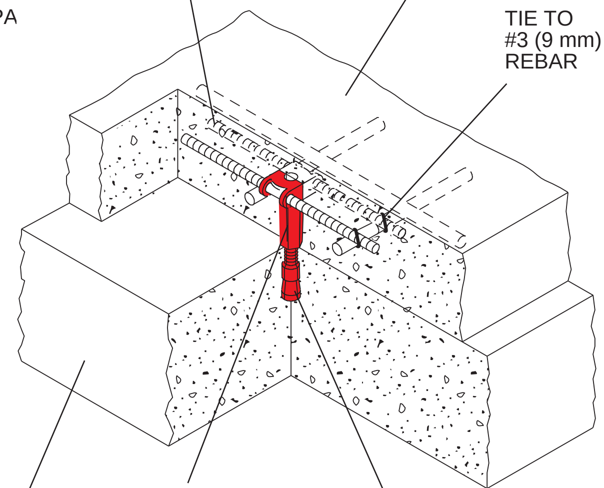
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Richard Rustorino
Civil Engineer
California CE No. 30112

HPA SEISMIC HOUSEKEEPING PAD ANCHOR





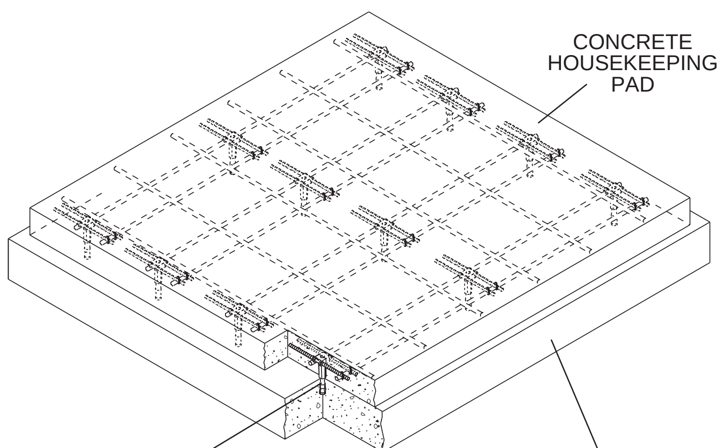
TYPE HPA DIMENSIONS (inches)

Size	L	W	H	D	SAS Stud Anchor Capacity in 3000 psi Concrete Tension (lbs)	Shear (lbs)
HPA-1/2	2 1/8	1 1/4	3	1/2"UNC	820	1540
HPA-5/8	2 3/8	1 1/2	3	5/8"UNC	1210	2260
HPA-3/4	2 3/4	1 3/4	3	3/4"UNC	1545	3675

TYPE HPA DIMENSIONS *(mm)*

Size	L	W	H	D	SAS Stud Anchor Capacity in 20 Mpa Concrete Tension *(kg)*†	Shear *(kg)*†
HPA-1/2	*54*	*32*	*75*	*1/2"UNC*	*372*	*699*
HPA-5/8	*60*	*38*	*75*	*5/8"UNC*	*549*	*1025*
HPA-3/4	*70*	*44*	*75*	*3/4"UNC*	*701*	*1667*

†For kN divide kg by 102

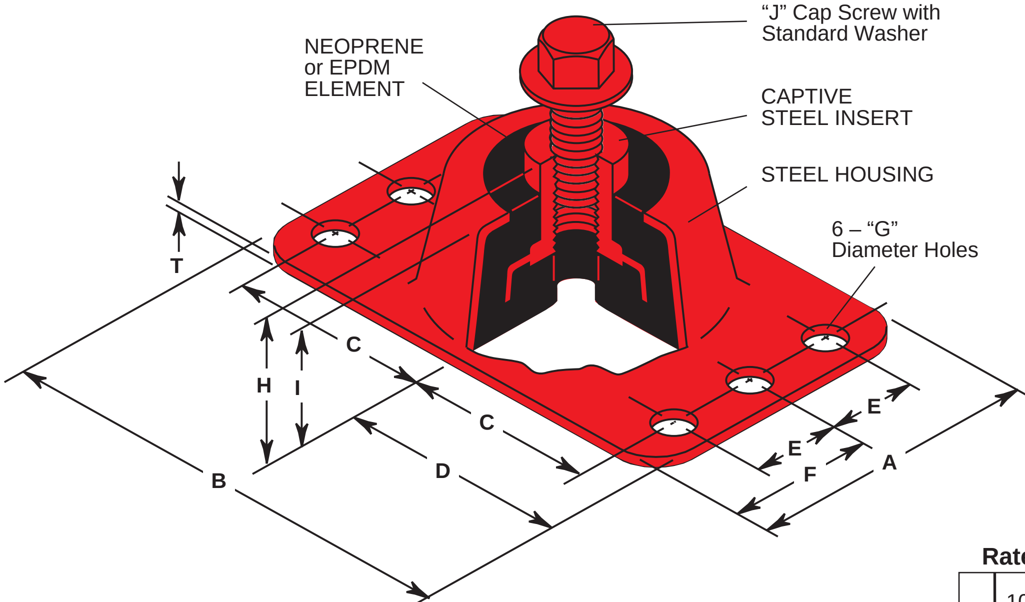


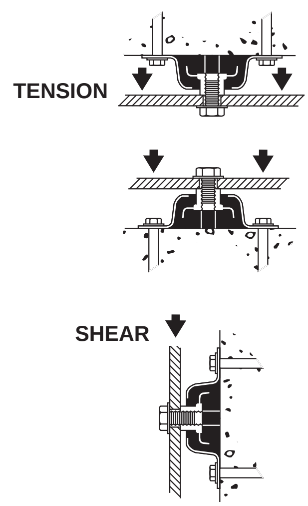
03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 92801 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

RAA, RBA, RCA & RDA

NEOPRENE SEISMIC MOUNTINGS





TYPE RAA, RBA, RCA and RDA DIMENSIONS (inches *millimeters*)

Type	A	B	C	D	E	F	G	H	I	J	T
RAA	2 5/8 *67*	4 1/4 *108*	1 11/16 *43*	2 1/8 *54*	7/8 *22*	1 5/16 *33*	7/16 *11*	1 1/2 *38*	1 1/8 *29*	3/8-16UNC x 1	3/32 *2*
RBA	3 *76*	4 3/4 *121*	1 15/16 *49*	2 3/8 *60*	1 *25*	1 1/2 *38*	7/16 *11*	1 7/8 *48*	1 1/2 *38*	1/2-13UNC x 1 1/4	3/32 *2*
RCA	3 3/4 *95*	6 1/4 *159*	2 1/2 *64*	3 1/8 *79*	1 1/4 *32*	1 7/8 *48*	9/16 *14*	1 7/8 *48*	1 1/2 *38*	5/8 -11UNC x 1 1/4	3/32 *2*
RDA	5 *127*	8 *203*	3 1/4 *83*	4 *108*	1 3/4 *44*	2 1/2 *64*	3/4 *19*	2 3/8 *60*	1 7/8 *48*	7/8 -9UNC x 1 1/4	1/8 *3*

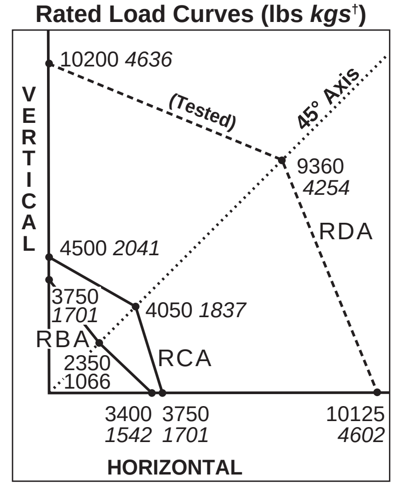
TYPE RAA, RBA, RCA and RDA RATINGS

Type	Size (Color Mark)	Duro-meter	COMPRESSION Rated Capacity (lbs) *(kgs)*	COMPRESSION Rated Defl (in)*(mm)*	TENSION Rated Capacity (lbs) *(kgs)*	TENSION Rated Defl (in)*(mm)*	SHEAR Rated Capacity (lbs) *(kgs)*	SHEAR Rated Defl (in)*(mm)*	Maximum Horizontal Static G Rating‡
RAA-	Black	30	200 *91*	0.10 *3*	150 *68*	0.08 *2*	150 *68*	0.08 *2*	7.0
	Green	45	300 *136*		200 *91*		200 *91*		5.0
	White	60	500 *227*		400 *181*		400 *181*		2.5
RBA-	Black	30	250 *113*	0.15 *4*	200 *91*	0.12 *3*	200 *90*	0.09 *2*	13.6
	Green	45	525 *238*		420 *191*		420 *191*		6.5
	White	60	1000 *454*		800 *363*		800 *363*		3.4
RCA-	Green	40	1400 *635*	0.15 *4*	1000 *454*	0.12 *3*	400 *181*	0.09 *2*	2.7
	Red	50	2100 *953*		1500 *680*		600 *272*		1.8
	White	60	3500 *1588*		2500 *1134*		1000 *454*		1.1
RDA-	Green	40	2800 *1270*	0.18 *5*	2000 *910*	0.15 *4*	900 *410*	0.12 *3*	3.3
	Red	50	4200 *1910*		2900 *1320*		1300 *590*		2.2
	White	60	7100 *3230*		4200 *1910*		1800 *820*		1.3

All Rated Capacities are based on proper neoprene loadings without metal to metal contact. Seismic Max. G Ratings are based on metal failure under static seismic loadings as defined in the building codes.

‡Horizontal G Ratings are for quick reference only– Use OSHPD Rated Load Curves.

OSHPD OPA-0200
Rated Load Curves (lbs *kgs*†)



Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0200. Testing and calculations were performed to meet OSHPD criteria.

To use approved OSHPD rated load curves: 1) Calculate Vertical and Horizontal Forces on mounting including translations and overturning moments. 2) Plot Horizontal Load vs Vertical Load. The point must fall within the area below the OSHPD curve.

†For kN divide kg by 102

RAA, RBA, RCA and RDA mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

03/2020

A P P R O V E D

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

OPA-0349 January 6, 2003

Bill Staehlin (916) 654-3362

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

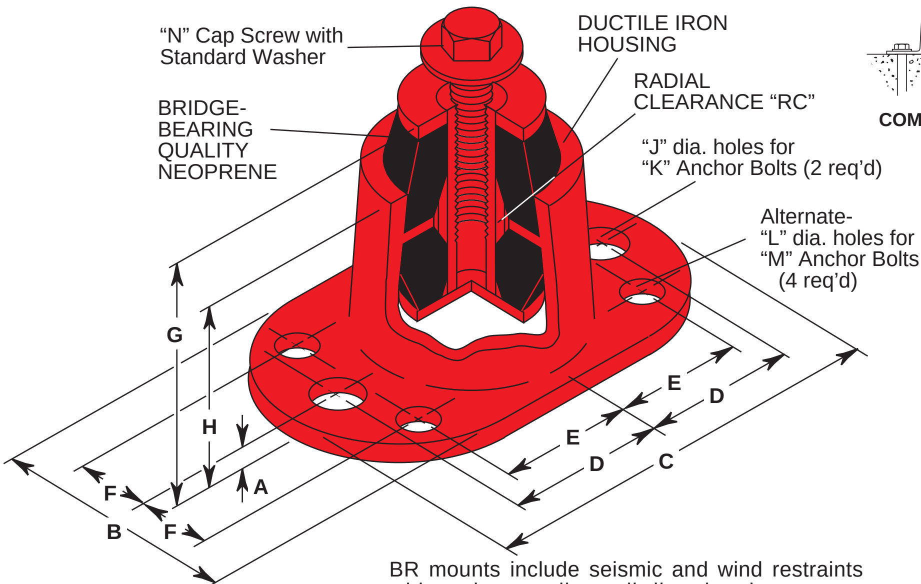
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

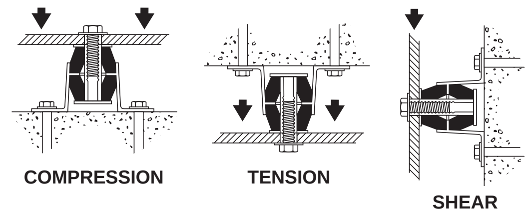
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Patrick J. Lama
Civil Engineer
California No. 25878

BR CAPTIVE NEOPRENE MOUNTINGS

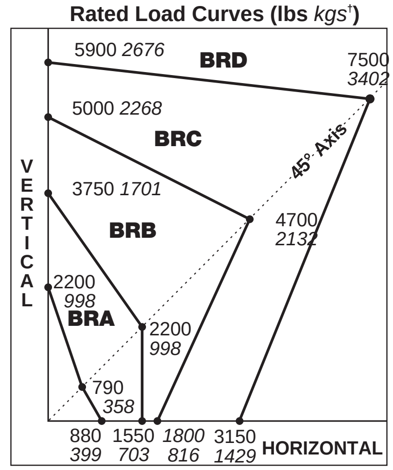




NOTE:
All Hardware Plated

BR mounts include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

OSHPD OPA-0201
Rated Load Curves (lbs *kgs*†)



TYPE BR DIMENSIONS (inches *millimeters*)

Type	A	B	C	D	E	F	G	H	J	K	L	M	N	RC
BRX	3/16 *5*	2 *50*	3 3/4 *95*	1 3/8 *35*	1 *25*	5/8 *16*	2 1/2 *64*	1 5/8 *41*	7/16 *11*	3/8 *10*	5/16 *8*	1/4 *6*	1/4 x 3/4 *6 x 19*	1/8 *3*
BRA	3/16 *5*	2 1/2 *64*	4 1/4 *108*	1 5/8 *41*	1 3/8 *35*	3/4 *19*	3 *76*	2 *51*	1/2 *13*	3/8 *10*	3/8 *10*	1/4 *6*	5/16 x 1 *8 x 25*	3/16 *5*
BRB	3/16 *5*	3 1/4 *83*	5 3/4 *146*	2 1/4 *57*	1 7/8 *48*	7/8 *22*	3 *76*	2 *51*	5/8 *16*	1/2 *13*	1/2 *13*	3/8 *10*	7/16 x 1 *11 x 25*	1/4 *6*
BRC	1/4 *6*	5 1/4 *133*	9 *229*	3 5/8 *92*	3 *76*	1 1/2 *38*	6 1/2 *165*	4 1/2 *114*	7/8 *22*	3/4 *19*	3/4 *19*	5/8 *16*	5/8 x 1 1/2 *16 x 38*	5/8 *16*
BRD	1/4 *6*	6 *152*	10 1/2 *267*	4 3/8 *111*	3 5/8 *92*	1 5/8 *41*	6 1/2 *165*	4 1/2 *114*	7/8 *22*	3/4 *19*	3/4 *19*	5/8 *16*	5/8 x 1 1/2 *16 x 38*	5/8 *16*

TYPE BR RATINGS

Type	Size (Color Mark)	Durometer	COMPRESSION Rated Capacity (lbs)	*(kgs)*	COMPRESSION Rated Defl (in)	*(mm)*	TENSION Rated Capacity (lbs)	*(kgs)*	TENSION Rated Defl (in)	*(mm)*	SHEAR Rated Capacity (lbs)	*(kgs)*	SHEAR Rated Defl (in)	*(mm)*	Maximum Horizontal Static G Rating*
BR-	X-Green	40	30	*14*	0.12	*3*	30	*14*	0.10	*3*	20	*9*	0.08	*2*	12.0
	X-Red	50	45	*20*			45	*20*			35	*16*			8.0
	X-White	60	70	*32*			70	*32*			45	*20*			6.0
	A-Green	40	85	*39*	0.2	*5*	85	*39*	0.18	*5*	20	*9*	0.13	*3*	10.4
	A-Red	50	125	*57*			125	*57*			30	*14*			7.0
	A-White	60	205	*93*			205	*95*			50	*23*			4.3
	A-Yellow	70	290	*132*			290	*132*			70	*32*			3.0
	B-Red	50	450	*204*	0.2	*5*	500	*227*	0.18	*5*	100	*45*	0.15	*4*	3.4
	B-White	60	740	*336*			750	*340*			170	*77*			2.1
	B-Yellow	70	1040	*472*			1050	*476*			240	*109*			1.5
	C-Red	50	650	*295*	0.3	*8*	750	*340*	0.25	*6*	380	*172*	0.50	*13*	2.8
	C-White	60	1100	*499*			1150	*522*			500	*227*			1.6
	C-Yellow	70	1540	*699*			1610	*730*			700	*318*			1.2
	D-White	60	2390	*1084*	0.3	*8*	2450	*1111*	0.25	*6*	750	*340*	0.50	*13*	1.3
	D-Yellow	70	3150	*1429*			3430	*1556*			1050	*476*			1.0

Horizontal, Vertical and 45° plotted Ratings are California OSHPD approved values having the OSHPD Anchorage Preapproval Number OPA-0201. Testing and calculations were performed to meet OSHPD criteria. BRX's have not been submitted to OSHPD.

To use approved OSHPD rated load curves:
1) Calculate Vertical and Horizontal Forces on mounting including translations and overturning moments.
2) Plot Horizontal Load vs Vertical Load. The point must fall within the area below the OSHPD curve.

BRIDGE-BEARING NEOPRENE SPECIFICATIONS

ORIGINAL PHYSICAL PROPERTIES (a) Durometer	(b) Tensile Strength (min)	(b) Elongat. at Break (min)	TESTED FOR AGING (c) OVEN AGING(70h/212°F) Hardness (max)	Tensile Strength (max)	Elongat. at Break (max)	(d) OZONE 1 ppm in air by Vol.20% Strain 100F°	COMPRESSION SET (e) 22hrs 150F° Method B
40±5	2000 psi	450%	+15%	±15%	-40%	No Cracks	30%(max)
50±5	2500 psi	400%	+15%	±15%	-40%	No Cracks	25%(max)
60±5	2500 psi	350%	+15%	±15%	-40%	No Cracks	25%(max)

(a)ASTM D-676 (b)ASTM D-412 (c)ASTM D-573 (d)ASTM D-1149 (e)ASTM D-395

All Rated Capacities are based on proper neoprene loadings without metal to metal contact. Seismic Max. G Ratings are based on metal failure under static seismic loadings as defined in the building codes.

*Horizontal G Ratings are for quick reference only– Use OSHPD Rated Load Curves.

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

APPROVED

California Office of Statewide Health Planning and Development

FIXED EQUIPMENT ANCHORAGE

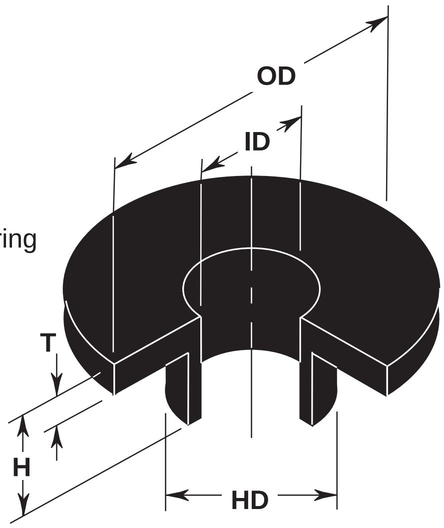
OPA-0349 January 6, 2003

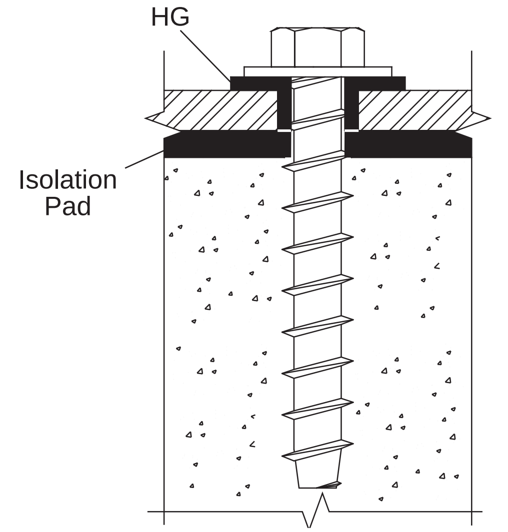
Bill Staehlin (916) 654-3362

Richard E. Pustorino
Civil Engineer
California No. 30112

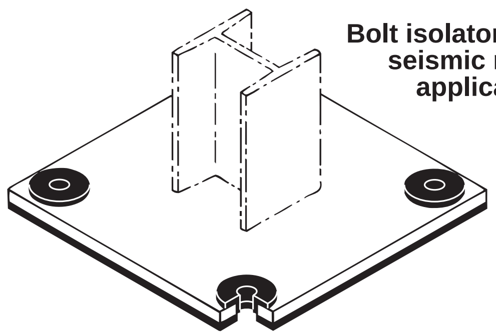
HG WASHER-BUSHINGS

Material:
Bridge-Bearing Neoprene

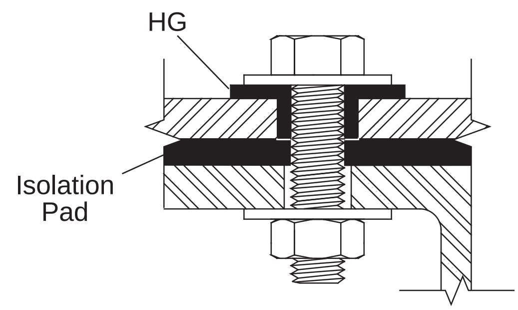




Steel to Concrete Detail



Bolt isolator and seismic relief application



Steel to Steel Detail

HG Washer Bushings may be used without isolation pads to limit bolt shear from impact.

BRIDGE-BEARING NEOPRENE SPECIFICATIONS

ORIGINAL PHYSICAL PROPERTIES			TESTED FOR AGING				COMPRES-SION SET
			(c) OVEN AGING(70h/212°F)			(d) OZONE	(e)
(a) Duro-meter	(b) Tensile Strength (min)	(b) Elongat. at Break (min)	Hard-ness (max)	Tensile Strength (max)	Elongat. at Break (max)	1 ppm in air by Vol.20% Strain 100F°	22hrs 150F° Method B
40±5	2000 psi	450%	+15%	±15%	-40%	No Cracks	30%(max)
50±5	2500 psi	400%	+15%	±15%	-40%	No Cracks	25%(max)
60±5	2500 psi	350%	+15%	±15%	-40%	No Cracks	25%(max)

(a)ASTM D-676 (b)ASTM D-412 (c)ASTM D-573 (d)ASTM D-1149 (e)ASTM D-395

TYPE HG DIMENSIONS

Size	Bolt Dia.* (in)	(mm)	Allowable Shear Load in a Steel to Steel Connection (lbs)	(kN)	Allowable Tension Load in a Steel to Steel Connection (lbs)	(kN)	ID (in)	(mm)	HD (in)	(mm)	OD (in)	(mm)	T (in)	(mm)	H (in)	(mm)
HG-25	1/4	*6*	490	*2.2*	980	*4.4*	1/4	*6*	1/2	*13*	1	*25*	1/8	*3*	3/8	*10*
HG-38	3/8	*10*	1100	*4.9*	2200	*9.8*	3/8	*10*	5/8	*16*	1 1/4	*32*	1/8	*3*	1/2	*13*
HG-50	1/2	*13*	1960	*8.7*	3920	*17.4*	1/2	*13*	3/4	*19*	1 5/8	*41*	1/8	*3*	1/2	*13*
HG-63	5/8	*16*	3070	*13.6*	6140	*27.2*	5/8	*16*	7/8	*22*	2	*51*	3/16	*5*	5/8	*16*
HG-75	3/4	*19*	4420	*19.7*	8840	*39.4*	3/4	*19*	1	*25*	2 1/4	*57*	3/16	*5*	5/8	*16*
HG-100	1	*25*	7850	*34.9*	15700	*69.8*	1	*25*	1 1/4	*32*	2 3/4	*70*	1/4	*6*	7/8	*22*
HG-125	1 1/4	*32*	12270	*54.6*	24540	*109.2*	1 1/4	*32*	1 1/2	*38*	3 1/4	*83*	1/4	*6*	7/8	*22*
HG-150	1 1/2	*38*	17670	*78.6*	35340	*157.2*	1 1/2	*38*	1 3/4	*45*	3 3/4	*95*	1/4	*6*	1	*25*

* Retention strength based on diameter of anchor bolt and anchoring method.

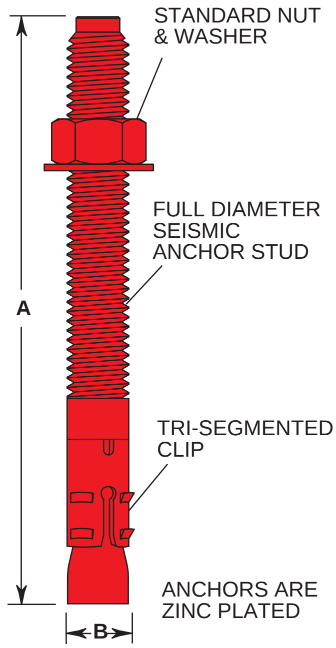
HG washer-bushings include seismic and wind restraints with code compliant all-directional neoprene bushings and 1/4" maximum air gap.

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 92801 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

SAS & SASE SEISMIC ANCHOR STUDS

SAS and SASE



TYPE SAS STANDARD LENGTH ANCHOR STUD RATINGS BASED ON ALLOWABLE STRESS DESIGN (ASD) installed into 2500 psi (17.2 Mpa) Normal Weight or Sand-Lightweight Concrete

Type and Size	Embedment Depth (Nominal) (in)	(mm)	Normal Weight Concrete Tension† (lbs)	(kg)	Normal Weight Concrete Shear (lbs)	(kg)	Sand-Lightweight Concrete Tension† (lbs)	(kg)	Sand-Lightweight Concrete Shear (lbs)	(kg)
SAS-3/8	1 7/8	*50*	440	*199*	760	*345*	300	*136*	515	*233*
SAS-1/2	2 3/4	*70*	975	*442*	1400	*635*	665	*301*	955	*433*
SAS-5/8	3 3/8	*85*	1320	*599*	3065	*1391*	895	*406*	2580	*1171*
SAS-3/4	4 1/8	*105*	1795	*814*	5155	*2340*	1220	553	3505	*1591*
SAS-1	5 1/4	*135*	2220	*1007*	6300	*2860*	1510	*685*	5400	*2451*

TYPE SASE EXTENDED LENGTH ANCHOR STUD RATINGS BASED ON ALLOWABLE STRESS DESIGN (ASD) installed into 2500 psi (17.2 Mpa) Normal Weight or Sand-Lightweight Concrete

Type and Size	Embedment Depth (Nominal) (in)	(mm)	Normal Weight Concrete Tension† (lbs)	(kg)	Normal Weight Concrete Shear (lbs)	(kg)	Sand-Lightweight Concrete Tension† (lbs)	(kg)	Sand-Lightweight Concrete Shear (lbs)	(kg)
SASE-3/8	2 7/8	*75*	945	*429*	815	*370*	640	*290*	815	*370*
SASE-1/2	3 7/8	*100*	1270	*576*	2955	*1341*	865	*392*	2955	*1341*
SASE-5/8	5 1/8	*130*	2350	*1066*	4510	*2047*	1595	*724*	4510	*2047*
SASE-3/4	5 3/4	*145*	2895	*1314*	5350	*2428*	1970	*894*	5350	*2428*

TYPE SAS & SASE ANCHOR STUD RATINGS BASED ON ALLOWABLE STRESS DESIGN (ASD) installed in the Soffit of 3000 psi (20.7 Mpa) Normal Weight or Sand-Lightweight Concrete-filled Profile Steel Deck Assemblies (minimum 20 gauge 3” *76mm* profile). Anchors must be installed in either the lower or upper flutes of the profile deck no more than 1” *25mm* from flute centerline.

Type and Size	Embedment Depth (Nominal) (in)	(mm)	Tension† (lbs)	(kg)	Shear (lbs)	(kg)
SAS-3/8	2	*50*	350	*158*	725	*329*
SASE-3/8	3 3/8	*85*	890	*404*	1585	*719*
SAS-1/2	2 3/4	*70*	695	*315*	870	*395*
SASE-1/2	4 1/2	*115*	930	*422*	1870	*848*
SAS-5/8	3 3/8	*85*	1825	*828*	1075	*488*
SASE-5/8	5 5/8	*145*	1700	*771*	2860	*1298*

For combined allowable stress design tension and shear forces on anchors, use the following equation:

$$\frac{T_{Applied}}{T_{Allowable\ (ASD)}} + \frac{V_{Applied}}{V_{Allowable\ (ASD)}} \leq 1.2$$

TYPE SAS & SASE ANCHOR STUD DIMENSIONS

Type and Size	A (in)	(mm)	B (in)	(mm)	Maximum Tightening Torque (Ft-lbs)	(N-m)
SAS-3/8	3 1/2	*90*	3/8	*10*	30	*41*
SAS-1/2	4 3/4	*120*	1/2	*13*	60	*81*
SAS-5/8	5	*125*	5/8	*16*	90	*122*
SAS-3/4	6 1/4	*170*	3/4	*19*	150	*203*
SAS-1	7	*180*	1	*25*	230	*312*
SASE-3/8	5	*125*	3/8	*10*	30	*41*
SASE-1/2	5 1/2	*140*	1/2	*13*	60	*81*
SASE-5/8	7	*180*	5/8	*16*	90	*122*
SASE-3/4	8 1/2	*215*	3/4	*19*	150	*203*

Anchors have the following Code Reports:
- ICC-ES-ESR-3037 and City of Los Angeles RR25891 for cracked & uncracked concrete
- Florida Statewide Product Approval FL15731
- IAPMO ES ER 240 & City of Los Angeles RR25936 for CMU Walls
- Underwriter Laboratories file EX3605
- Factory Mutual #3043442

* These values are applicable when the anchors are installed with periodic special inspection as set forth in Section 1704.13 of the 2006 IBC, Section 1704.15 of the 2009 IBC or Section 1705.1.1 and Table 1705.3 of the 2012 or 2015 IBC.

† The Tension values may be increased for greater compressive strength, up to 8000 psi (55.2 MPa), by multiplying the value by $(F'_c/2500)^{0.5}$, where F'_c is the specified strength of concrete in psi.
For example: SAS-1/2 in 4000 psi normal weight concrete

$$T = \left(\frac{4000}{2500}\right)^{0.5} \text{ x } 980 \text{ lbs} = 1240 \text{ lbs}$$

NOTES:
1. All values are for single anchors with no edge distance or spacing reduction and assume supplementary reinforcement condition B.
2. Anchorage must be designed in accordance with ACI 318-11 Appendix D.
3. Allowable loads are for the attachment of non-structural components.
4. Allowable loads are based on 100% seismic loading in seismic design categories C-F.

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279
2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

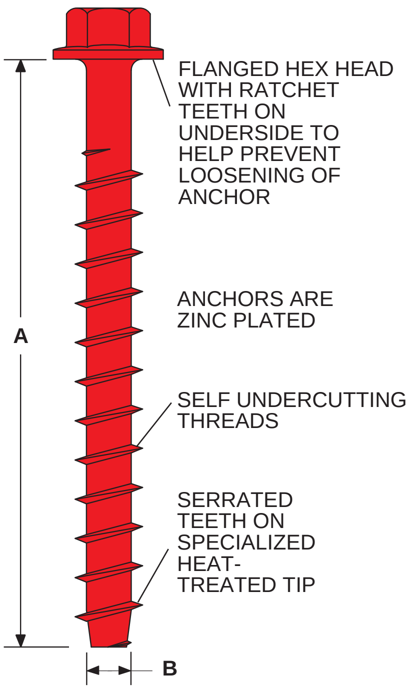
Tension and Shear Values as verified by ICC Report ICC-ES-ESR-3037.

ICC EVALUATION SERVICE

ICC Report ICC-ES-ESR-3037

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SAST SEISMIC ANCHOR SELF-TAPPING



TYPE SAST ANCHOR BOLT RATINGS BASED ON ALLOWABLE STRESS DESIGN (ASD)

Type and Size	Embedment Depth (in)	*(mm)*	Installed into 2500psi (17.2Mpa) Normal Weight Concrete: Tension† (lbs)	*(kg)*	Normal Weight Shear (lbs)	*(kg)*	Installed into 2500psi (17.2Mpa) Lightweight Concrete: Tension† (lbs)	*(kg)*	Lightweight Shear (lbs)	*(kg)*	Maximum Tightening Torque (Ft-lbs)	*(N-m)*
SAST-3/8	3 1/4	*83*	920	*410*	1160	*525*	555	*250*	695	*315*	50	*68*
SAST-1/2	4	*102*	1500	*680*	2010	*910*	900	*405*	1205	*545*	65	*88*
SAST-5/8	4 1/2	*114*	1810	*820*	3870	*1755*	1085	*490*	2325	*1055*	140	*190*
SAST-3/4	5 1/2	*140*	2070	*940*	3925	*1780*	1245	*565*	2355	*1065*	150	*205*

For combined allowable stress design tension and shear forces on anchors, use the following equation:

$$\frac{T_{Applied}}{T_{Allowable\ (ASD)}} + \frac{V_{Applied}}{V_{Allowable\ (ASD)}} \le 1.2$$

* These values are applicable when the anchors are installed with periodic special inspection as set forth in Section 1704.13 of the 2006 IBC, Section 1704.15 of the 2009 IBC or Section 1705.1.1 and Table 1705.3 of the 2012 or 2015 IBC.

† The Tension values may be increased for greater compressive strength, up to 8500 psi (58.6 MPa), by multiplying the value by $(F'_c/2500)^{0.5}$, where F'_c is the specified strength of concrete in psi.
For example: SAST-1/2 in 4000 psi normal weight concrete

$$T = \left(\frac{4000}{2500}\right)^{0.5} \times 1500 \text{ lbs} = 1895 \text{ lbs}$$

TYPE SAST ANCHOR BOLT DIMENSIONS

Type and Size	A (in)	*(mm)*	B (in)	*(mm)*
SAST-3/8	4	*102*	3/8	*10*
SAST-1/2	5	*127*	1/2	*13*
SAST-5/8	6	*152*	5/8	*16*
SAST-3/4	7	*178*	3/4	*19*

Anchors have the following Code Reports:
- ICC-ES-ESR-2713 and City of Los Angeles Report RR25741 for cracked & uncracked concrete
- ICC-ES-ESR-1056 and City of Los Angeles Report RR25560 for CMU (Concrete Masonry Units)
- Florida Statewide Approval FL11506.7
- Factory Mutual 3017082

NOTES:
1. All values are for single anchors with no edge distance or spacing reduction.
2. Anchorage must be designed in accordance with ACI 318-11 Appendix D.
3. Allowable loads are for the attachment of non-structural components.
4. Allowable loads are based on 100% seismic loading in seismic design categories C-F.

03/2020

Tension and Shear Values as verified by ICC Report ICC-ES-ESR-2713.

ES ICC EVALUATION SERVICE

ICC Report ICC-ES-ESR-2713

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

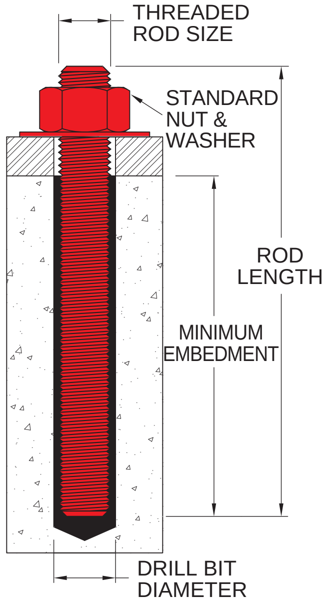
350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

SRA SEISMIC ROD ANCHOR (ADHESIVE)



TYPE SRA ANCHOR DATA

Type and Size	Threaded Rod Size	Rod Length (in)	Rod Length *(mm)*	Embedment Depth (in)	Embedment Depth *(mm)*	Drill Bit Dia (in)	Minimum Concrete Thickness (in)	Minimum Concrete Thickness *(mm)*	Maximum Tightening Torque After curing (Ft-lbs)	Maximum Tightening Torque After curing *(N-m)*	Number of Anchors that can be installed per 22oz of adhesive
SRA-3/8	3/8-16 UNC	6	*152*	4	*102*	1/2	5 7/8	*149*	10	*14*	40
SRA-1/2	1/2-13 UNC	7	*178*	5	*127*	5/8	7 1/2	*190*	20	*27*	30
SRA-5/8	5/8-11 UNC	8	*203*	6	*152*	3/4	9 1/4	*235*	30	*41*	20
SRA-3/4	3/4-10 UNC	9	*229*	7	*178*	7/8	10 3/4	*273*	45	*61*	14
SRA-1	1-8 UNC	11	*280*	9	*229*	1 1/8	14	*355*	80	*108*	7

CURE SCHEDULE†

Concrete Temperature °F	Concrete Temperature *°C*	Cure Time (Hrs.)
50	*10*	72
70	*21*	24
90	*32*	24
110	*43*	24

†For water saturated concrete, these times should be doubled.

For combined allowable stress design tension and shear forces on anchors, use the following equation:

$$\frac{T_{Applied}}{T_{Allowable\ (ASD)}} + \frac{V_{Applied}}{V_{Allowable\ (ASD)}} \leq 1.2$$

* These values are applicable when the anchors are installed with periodic special inspection as set forth in Section 1704.13 of the 2006 IBC, Section 1704.15 of the 2009 IBC or Section 1705.1.1 and Table 1705.3 of the 2012 or 2015 IBC.

NOTES:
1. All values are for single anchors with no edge distance or spacing reduction and assume supplementary reinforcement condition B.
2. Anchorage must be designed in accordance with ACI 318-11 Appendix D.
3. Allowable loads are for the attachment of non-structural components.
4. Allowable loads are based on 100% seismic loading in seismic design categories C-F.
5. All values assume installations in dry concrete substrates and service temperature below the following maximums: 75°F *24°C* maximum long term temperature and 110°F *43°C* maximum short term temperature.

Anchors have the following Code Reports:
- ICC-ES-ESR-2508 and City of Los Angeles Report RR25744 for cracked & uncracked concrete
- NSF/ANSI Standard 61 (216in^2 / 1000 gal)

TYPE SRA ANCHOR RATINGS BASED ON ALLOWABLE STRESS DESIGN (ASD)
installed into 2500 psi (17.2 Mpa) Normal Weight Concrete

Type and Size	A307 Grade C Threaded Rod Tension (in)	*(mm)*	A307 Grade C Shear (lbs)	*(kg)*	A193 Grade B7 Threaded Rod Tension (lbs)	*(kg)*	A193 Grade B7 Shear (lbs)	*(kg)*	A193 Grade B6 Stainless Steel (Type 410) Threaded Rod Tension (lbs)	*(kg)*	A193 Grade B6 Shear (lbs)	*(kg)*	A193 Grade B8 Stainless Steel (Type 18-8, 304) Threaded Rod Tension (lbs)	*(kg)*	A193 Grade B8 Shear (lbs)	*(kg)*
SRA-3/8	1640	*744*	890	*404*	1640	*744*	1225	*556*	1640	*744*	1345	*610*	1640	*744*	695	*315*
SRA-1/2	2345	*1064*	1750	*794*	2345	*1064*	3775	*1713*	2345	*1064*	3490	*1584*	2345	*1064*	1805	*819*
SRA-5/8	3000	*1362*	2430	*1103*	3000	*1362*	5235	*2376*	3000	*1362*	5080	*2306*	3000	*1362*	2630	*1194*
SRA-3/4	3720	*1688*	3590	*1629*	3720	*1688*	7740	*3513*	3720	*1688*	7510	*3409*	3720	*1688*	3895	*1768*
SRA-1	5260	*2388*	6515	*2957*	5260	*2388*	14045	*6376*	5260	*2388*	15090	*6850*	5260	*2388*	7815	*3548*

03/2020

MASON INDUSTRIES, Inc.
Manufacturers of Vibration Control Products

350 Rabro Drive
Hauppauge, NY 11788
631/348-0282
FAX 631/348-0279

2101 W. Crescent Ave., Suite D
Anaheim, CA 92801
714/535-2727
FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Tension and Shear Values as verified by ICC Report ICC-ES-ESR-2508.

ICC EVALUATION SERVICE

ICC Report ICC-ES-ESR-2508

Gummadi Dharma Reddy
Civil Engineer
California No. 29627

DYNAMIC ANALYSIS OF FLOOR MOUNTED EQUIPMENT

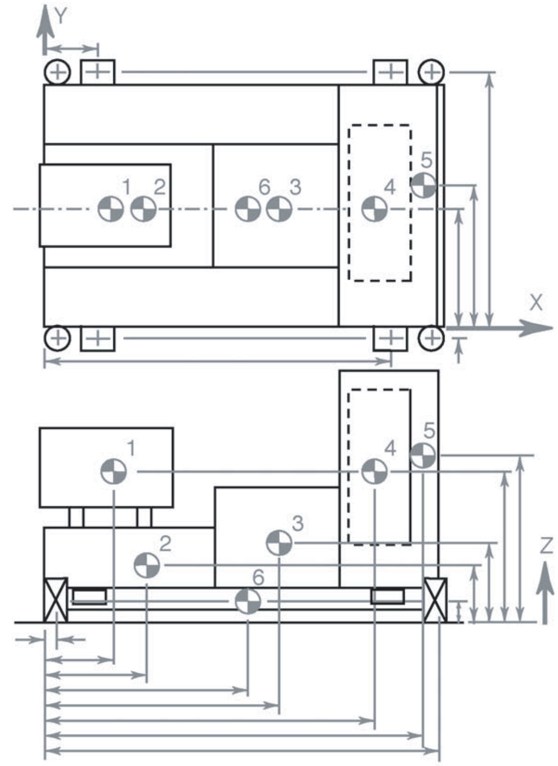
Static calculation methods are used to verify the equipment anchorage is adequate to resist the lateral forces determined by the appropriate design code. These static determinations do not consider the effects of support resonance, restraint resonance or restraint design. Airgaps of over 1/4” (6mm), and no or inadequate cushioning can amplify statically calculated forces by factors as high as 20.

Proper restraint, with maximum airgaps of 1/4” (6mm), and thick, resilient cushioning keep amplification to a minimum and protect equipment from high accelerations that could cause severe damage.

The Z-1011 [FM55] snubber system was designed to minimize amplification and protect equipment components and connections. The design and certification of the snubber system can be used in one of two ways. First, as the basis of design for static code compliant calculations, as shown in previous sections of this manual. The small airgaps and 3/4” (20mm) cushioning will limit forces to the equipment and anchor bolts although it is not calculated.

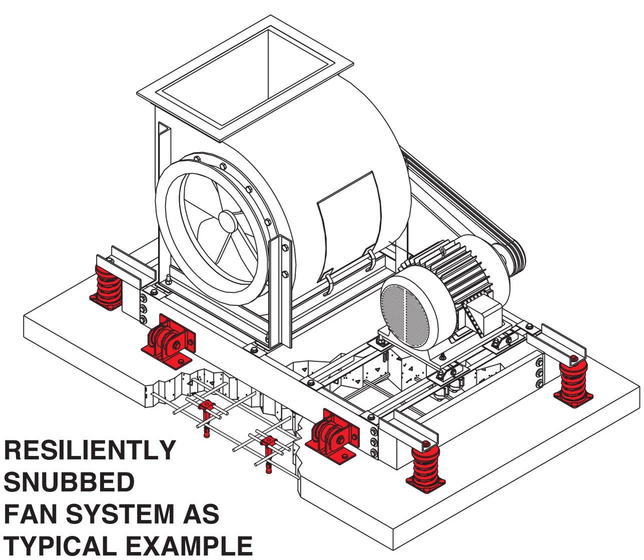
Second, as a more advanced method, in a dynamic analysis to determine snubber forces, equipment displacements, and maximum acceleration of the equipment components in as many as 26 locations. These analyses are run with site and structure-specific response spectra to accurately model the system’s response to the earthquake.

FM66 is a summary of this program.



1 - CG MOTOR
2 - CG MOTOR PEDESTAL
3 - CG BEARING PEDESTAL
4 - CG FAN WHEEL
5 - CG FAN HOUSING
6 - CG BASE

MATHEMATICAL MODEL OF SNUBBED FAN SYSTEM



RESILIENTLY SNUBBED FAN SYSTEM AS TYPICAL EXAMPLE

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

TECHNICAL DESCRIPTION of Z-1011
COMPUTER DYNAMIC ANALYSIS PROGRAM

Modeling Assumptions

Equipment is modeled as a single, three-dimensional rigid body composed of several rigidly attached lumped masses. Each support is modeled as a combination of linear springs and air gaps as shown in Sketch A. With these assumptions, the system is conservative and has six natural modes and frequencies.

Method of Analysis

An approximate solution is obtained employing a response spectrum technique. The final solution is obtained as a combination of modal responses in the form of a "most probable" value (rms of six modes) and an "upperbound" value (sum of absolute values of six modes).

The solution technique is motivated by the following three properties of linear systems:

1. Rayleigh's principle, which for conservative systems states that in any mode, maximum kinetic energy equals maximum potential energy.
2. The earthquake response spectrum which yields the maximum kinetic energy as a function of natural frequency.

These principles are applied to the nonlinear snubber-isolator system by the assumption that:

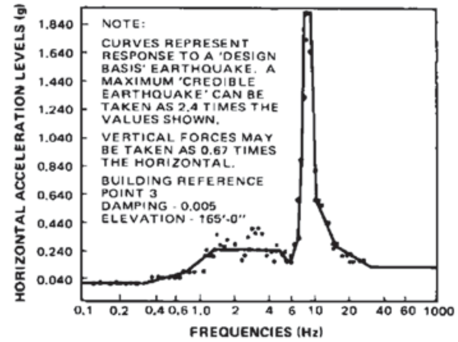
3. At each support, the nonlinear snubber-isolator spring combi-nation may be replaced by a single equivalent linear spring which is dependent on the displacement amplitudes, as depicted in Sketch B.

Thus, (1) and (2) yield displacement amplitude as a function of natural frequencies, and (3) yields natural frequencies as a function of displacement amplitude.

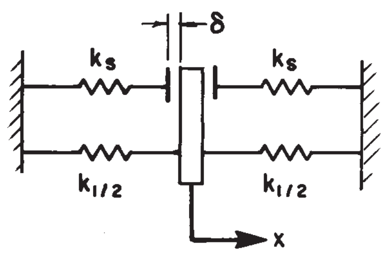
This transcendental relationship is solved by an iterative procedure as follows: from the non-snubbed natural frequencies, the modal kinetic energies are determined using the response spectrum. By equating kinetic and potential energies, the non-linear displacement amplitudes are obtained numerically. From these displacements, a new estimate of effective natural frequency is obtained using the equivalent linear support stiffnesses. The procedure is continued until the natural frequencies converge.

Our interactive computer program utilizing the above solution technique runs on a PDP-10 time-sharing system. The program provides estimates of maximum response, displacement and acceleration at any location of the system. In particular, the program provides direct read-out of maximum displacement and force load at each equipment component as well as any remote connection. The program can simultaneously accept three different sets of response data (one for each mode) if required.

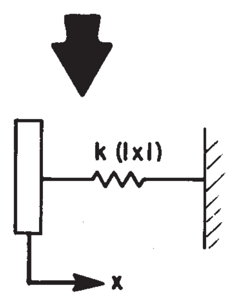
ACCELERATION RESPONSE SPECTRUM



COMPUTER MODELING DIAGRAMS



SKETCH A



SKETCH B

δ .. SNUBBER AIR GAP
k_S .. SNUBBER STIFFNESS
k_I .. ISOLATOR STIFFNESS
X .. SUPPORT DISPLACEMENT
k(|x|).. EQUIVALENT LINEAR STIFFNESS

TYPICAL IN x, y AND z DIRECTIONS

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

FM Tested or Approved Seismic Brace Brackets

Mason Industries has submitted several new seismic bracing brackets and current seismic bracing brackets to Factory Mutual Approvals for testing to meet the demanding requirements of their FM-1950 standard for seismic braces.

FM Approval allows these products to be used on all fire sprinkler systems.

The FM-1950 test standard is listed in IBC 2012 and products that are FM Tested or Approved are accepted by OSHPD for use on California hospitals subject to CBC 2013 and all previous code cycles.

These products are included in our pre-approved seismic bracing manual OPM 0043-13 for suspended piping, ductwork and electrical systems. The approved bracing brackets can also be used for suspended equipment bracing with additional overturning calculations and anchorage calculations provided on each project.

The bracing details and installation requirements included in OSHPD OPM 0043-13 are very specialized and recommended for use on California OSHPD hospitals and DSA public schools.

Please refer to the OSHPD approved details from our OPM-0043-13 which have been included on the following pages:

FM68 - The Mason SCB Seismic Cable Bracket which include our cable locking bolts, eliminating the need for thimbles and cable clamps or press fittings. The SCB is designed to limit prying for bolted attachments to the structure. The SCB is FM Tested.

FM69 – The Mason SCBH Seismic Cable Bracket Hook which can be stacked and installed without disconnecting the support rod on trapeze pipe, duct or conduit racks. The SCBH is FM Tested.

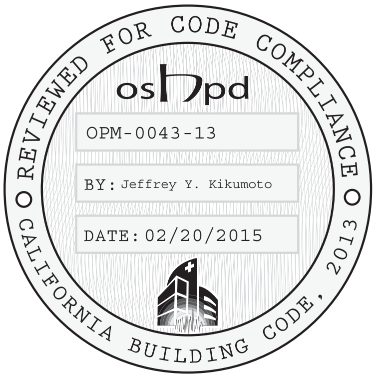
FM70 - The Mason SSBS Solid Seismic Brace that can be stacked for multiple braces installed on one rod and used for attachment to the structure. The SSBS is FM Tested and Approved.

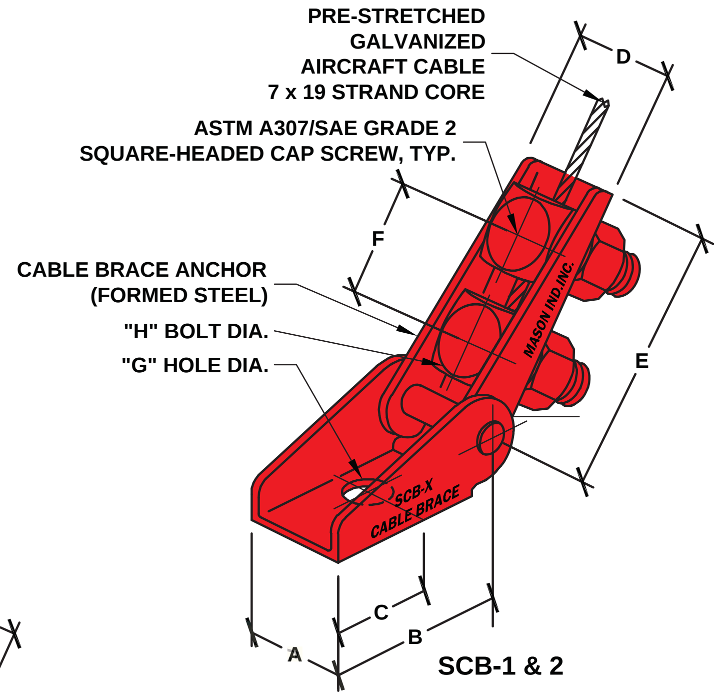
FM71 - The Mason SSB Seismic Solid Brace for steel strut or steel angle braces attached to large pipe, duct or conduit racks and used for attachment to the structure. The SSB is FM Tested and Approved.

FM72 - The new Mason SBH Solid Brace Hook, which can be installed without disconnecting the support rod on clevis supported pipe or conduit and trapeze pipe, duct or conduit racks. The SBH is FM Tested and Approved.

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

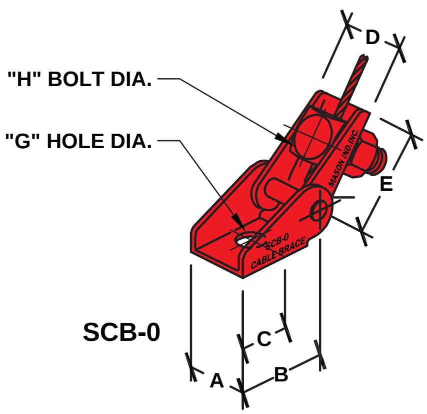
MASON IND. N.Y. SCB - SEISMIC CABLE BRACE





SCB-1 & 2

FINISH:
ALL PARTS ARE
ZINC ELECTROPLATED



SCB-0

NOTE: NOT TO BE USED AS A HANGER FOR EQUIPMENT, DUCTWORK OR PIPING.
TO BE USED AS A SEISMIC RESTRAINT ONLY.

ATTACHMENT TO STEEL OR OTHER SUBSTRATES (e.g., CONCRETE, WOOD) MAY GOVERN THE DESIGN OF THE OVERALL BRACE ASSEMBLY AND SHALL BE EVALUATED ON A PROJECT BY PROJECT BASIS.

TYPE SCB DIMENSIONS (inches **mm**)

SIZE	A		B		C		D		E		F		G		H	
SCB-0	1 5/16	**33**	1 1/2	**38**	3/4	**19**	15/16	**24**	1 3/4	**44**	-	**-**	7/16	**11**	5/8	**16**
SCB-1	1 3/8	**35**	2	**51**	1	**25**	1	**25**	3 3/8	**86**	1 1/2	**38**	9/16	**14**	5/8	**16**
SCB-2	1 5/8	**41**	2 3/4	**70**	1 3/8	**35**	1 1/4	**32**	4 3/8	**111**	1 3/4	**44**	11/16	**17**	3/4	**19**

TYPE SCB ASSEMBLY RATINGS (ASD)

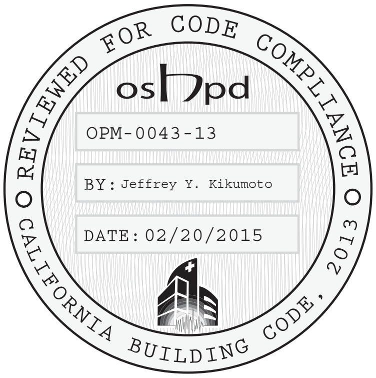
SIZE	CABLE DIA.[1]		LATERAL LOAD RATINGS [3]						TORQUE ON BOLTS		
			30° - 44° [2]			45° - 59° [2]					
	(in)	(mm)	lbs	kN	kg	lbs	kN	kg	Ft-lbs	N-m	Kg-m
SCB-0	3/32	2.4	283	1.3	128	200	0.9	91	30	41	4.2
SCB-1	1/8	3	565	2.5	256	400	1.8	181	25	34	3.5
SCB-2	3/16	5	1188	5.3	539	840	3.7	381	45	61	6.2

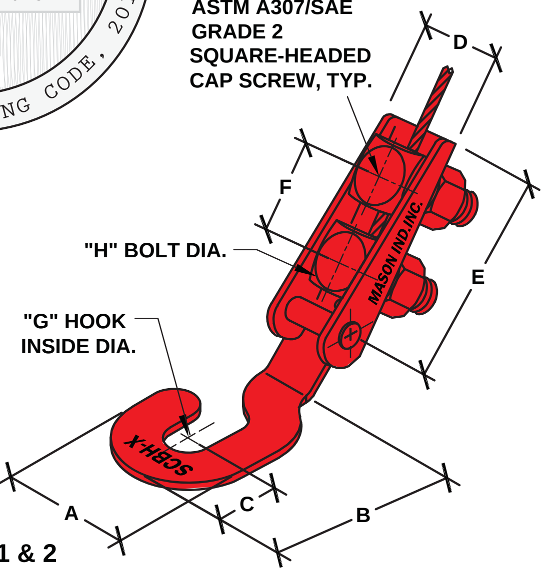
1. CABLES SHALL MEET THE FOLLOWING SPECIFICATIONS: MIL-DTL-83420M WITH AMENDMENT 2 AND RR-W-410F.
2. BRACE ANGLE MEASURED FROM HORIZONTAL.
3. LATERAL LOADS ARE FROM TESTING PERFORMED BY FACTORY MUTUAL APPROVALS IN ACCORDANCE WITH TEST PROTOCOL 1950 TITLED, "STANDARD FOR SEISMIC SWAY BRACES FOR AUTOMATIC SPRINKLER SYSTEMS".

03/2020

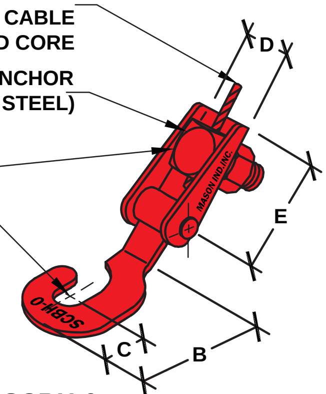
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

MASON IND. N.Y. SCBH - SEISMIC CABLE BRACE WITH HOOK ATTACHMENT





SCBH-1 & 2

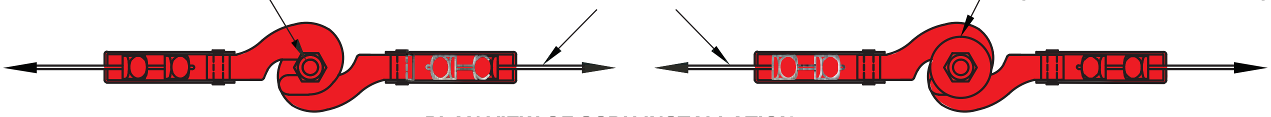


SCBH-0

FINISH:
ALL PARTS ARE
ZINC ELECTROPLATED

NOTE: NOT TO BE USED AS A HANGER FOR EQUIPMENT, DUCTWORK OR PIPING.
TO BE USED AS A SEISMIC RESTRAINT ONLY.

ATTACHMENT TO STEEL OR OTHER SUBSTRATES (e.g., CONCRETE, WOOD) MAY GOVERN THE DESIGN OF THE OVERALL BRACE ASSEMBLY AND SHALL BE EVALUATED ON A PROJECT BY PROJECT BASIS.



PLAN VIEW OF SCBH INSTALLATION

TYPE SCBH DIMENSIONS (inches **mm**)

SIZE	FOR USE WITH ROD SIZES		A		B		C		D		E		F		G		H	
SCBH-0	3/8	10	1 3/8	35	2 1/16	52	11/16	17	15/16	24	1 3/4	44	-	-	3/8	10	5/8	16
SCBH-1	1/2, 5/8	13, 16	1 7/8	48	2 3/8	60	1	25	1	25	3 3/8	86	1 1/2	38	5/8	16	5/8	16
SCBH-2	3/4, 7/8	19, 22	2 7/8	73	3 3/4	95	1 1/4	35	1 1/4	32	4 3/8	111	1 3/4	44	7/8	22	3/4	19

TYPE SCBH ASSEMBLY RATINGS (ASD)

SIZE	CABLE DIA.[1]		LATERAL LOAD RATINGS [4]						TORQUE ON BOLTS		
			30° - 44° [2]			45° - 59° [2]					
	(in)	(mm)	lbs	kN	kg	lbs	kN	kg	Ft-lbs	N-m	Kg-m
SCBH-0	3/32	2.4	283	1.3	128	200	0.9	91	30	41	4.2
SCBH-1	1/8	3	565	2.5	256	400	1.8	181	25	34	3.5
SCBH-2	3/16	5	1030	4.6	467	480	2.2	218	45	61	6.2

1. CABLES SHALL MEET THE FOLLOWING SPECIFICATIONS: MIL-DTL-83420M WITH AMENDMENT 2 AND RR-W-410F.
2. BRACE ANGLE MEASURED FROM HORIZONTAL.
3. STANDARD WASHER REQUIRED FOR ROD SIZES SMALLER THAN THE HOOK INSIDE DIAMETER 'G'.
4. LATERAL LOADS ARE FROM TESTING PERFORMED BY FACTORY MUTUAL APPROVALS IN ACCORDANCE WITH TEST PROTOCOL 1950 TITLED, "STANDARD FOR SEISMIC SWAY BRACES FOR AUTOMATIC SPRINKLER SYSTEMS".

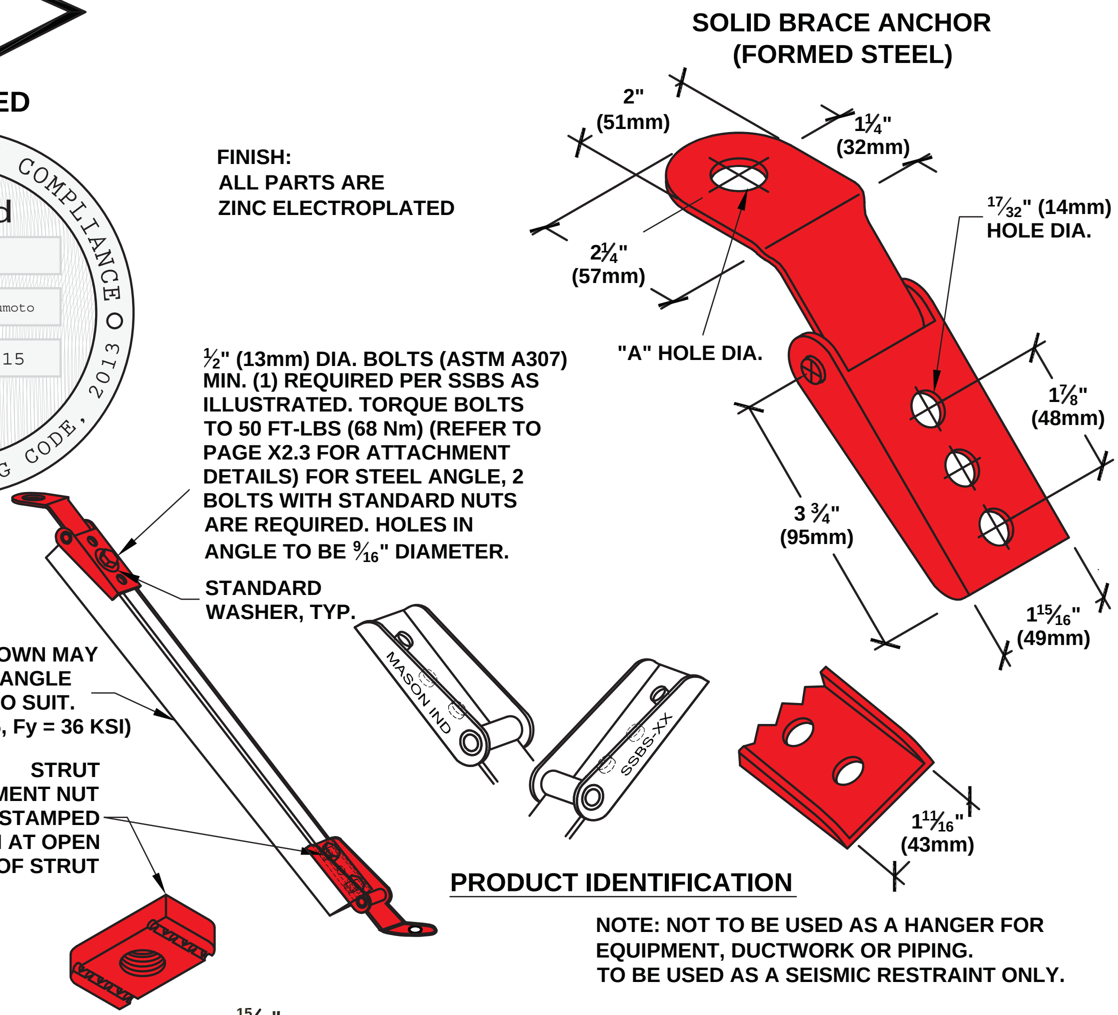
03/2020

MASON IND. N.Y. SSBS - SEISMIC SOLID BRACE

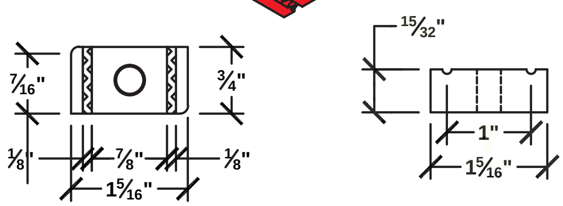
FM APPROVED

REVIEWED FOR CODE COMPLIANCE
oshpd
OPM-0043-13
BY: Jeffrey Y. Kikumoto
DATE: 02/20/2015
CALIFORNIA BUILDING CODE, 2013

FINISH:
ALL PARTS ARE
ZINC ELECTROPLATED



NOTE: NOT TO BE USED AS A HANGER FOR EQUIPMENT, DUCTWORK OR PIPING.
TO BE USED AS A SEISMIC RESTRAINT ONLY.



STRUT NUT DIMENSIONS[2]

STRUT ATTACHMENT NUT (ASTM A36) MUST HAVE STAMPED TEETH TO ACHIEVE THESE VALUES.

BRACE MEMBER AXIAL RATING (ASD) (LBS)

AXIAL MEMBER	MAX LENGTH (FT)		
	5'-0"	9'-6"	14'-6"
1⅝x1⅝x12GA SINGLE STRUT	1600	850	475
1⅝x1⅝x12GA DOUBLE STRUT	3950	2200	1200
L2x2x¼	5790	1970	920
L3x3x¼	14400	6200	3000

NOTE: STRUT MUST BE ASTM A1011SS GR 33 COLD ROLLED MILD STEEL, SLOTTED, PUNCHED OR SOLID (REF X7.0 & X7.1). DOUBLE STRUT MUST BE MINIMUM 2'-0" LONG. ANGLE MUST BE A36 STEEL.

TYPE SSBS DIMENSIONS & RATINGS (ASD)

SIZE	A		ROD/BOLT SIZE		LATERAL LOAD RATINGS					
					30° - 44° [1]			45° - 59° [1]		
	(in)	(mm)	(in)	(mm)	lbs	kN	kg	lbs	kN	kg
SSBS-12	17⁄32	13	⅜	10	660	2.90	299	970	4.30	440
SSBS-12	17⁄32	13	½	13	660	2.90	299	970	4.30	440
SSBS-20	25⁄32	20	⅝	16	660	2.90	299	970	4.30	440
SSBS-20	25⁄32	20	¾	19	660	2.90	299	970	4.30	440
SSBS-25	1 1⁄32	26	⅞	22	660	2.90	299	970	4.30	440
SSBS-25	1 1⁄32	26	1	25	660	2.90	299	970	4.30	440

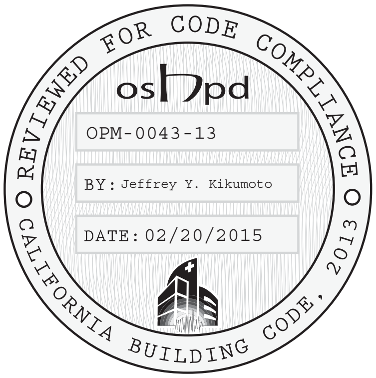
1. BRACE ANGLE MEASURED FROM HORIZONTAL.
2. ATTACHMENT TO STEEL OR OTHER SUBSTRATES (e.g., CONCRETE, WOOD) MAY GOVERN THE DESIGN OF THE OVERALL BRACE ASSEMBLY AND SHALL BE EVALUATED ON A PROJECT BY PROJECT BASIS.

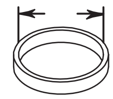
03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

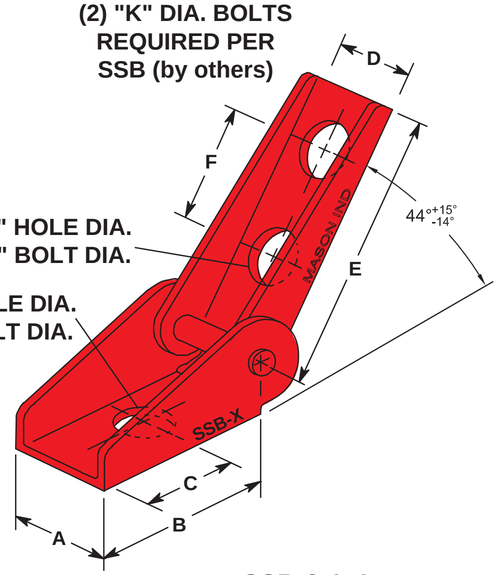
MASON IND. N.Y. SSB - SEISMIC SOLID BRACE

FM APPROVED

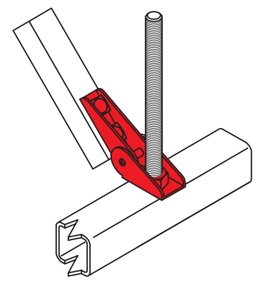




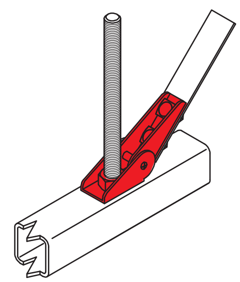
1 1/16" ID SSB-4 STEEL INSERT WASHER



SSB-3 & 4



LONGITUDINAL BRACING



TRANSVERSE BRACING

FINISH:
ALL PARTS ARE
ZINC ELECTROPLATED

NOTE: NOT TO BE USED AS A HANGER FOR EQUIPMENT, DUCTWORK OR PIPING.
TO BE USED AS A SEISMIC RESTRAINT ONLY.

BRACE MEMBER AXIAL RATING (ASD) (lbs kg)

AXIAL MEMBER	MAX LENGTH (ft m)		
	5'-0" **1.5m**	9'-6" **2.9m**	14'-6" **4.4m**
L3x3x1/4	14400 **6534**	6200 **2813**	3000 **1360**
L4x4x1/4	20600 **9347**	13600 **6170**	6800 **3085**

NOTE: ANGLE MUST BE A36 STEEL.

TYPE SSB DIMENSIONS (inches mm)

SIZE	A		B		C		D		E		F		G		H		J		K	
SSB-3	2	**51**	3 1/2	**89**	1 3/4	**44**	1 7/16	**37**	4 3/4	**121**	2	**51**	13/16	**21**	9/16	**14**	3/4	**19**	1/2	**13**
SSB-4	3 1/8	**79**	5	**127**	2 1/2	**64**	1 15/16	**49**	5 3/4	**146**	2 1/4	**57**	1 5/16	**33**	11/16	**17**	1 1/4	**32**	5/8	**16**

TYPE SSB ASSEMBLY RATINGS (ASD)

SIZE[3]	ROD/BOLT SIZE		LATERAL LOAD RATINGS[2]					
			30° - 44° [1]			45° - 59° [1]		
	(in)	**(mm)**	(lbs)	**(kN)**	**(kg)**	(lbs)	**(kN)**	**(kg)**
SSB-3	3/4	**19**	5640	**25.0**	**2557**	3360	**14.9**	**1523**
SSB-4	1	**25**	6410	**28.5**	**2906**	4280	**19.0**	**1940**
SSB-4	1 1/4	**32**	6410	**28.5**	**2906**	4280	**19.0**	**1940**

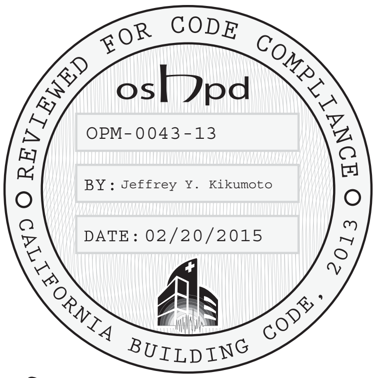
1. BRACE ANGLE MEASURED FROM HORIZONTAL.
2. ATTACHMENT TO STEEL OR OTHER SUBSTRATES (e.g., CONCRETE, WOOD) MAY GOVERN THE DESIGN OF THE OVERALL BRACE ASSEMBLY AND SHALL BE EVALUATED ON A PROJECT BY PROJECT BASIS.
3. WHEN USING SSB-4 WITH 1" ROD/BOLT, 1 1/16" ID RING IS REQUIRED.

03/2020

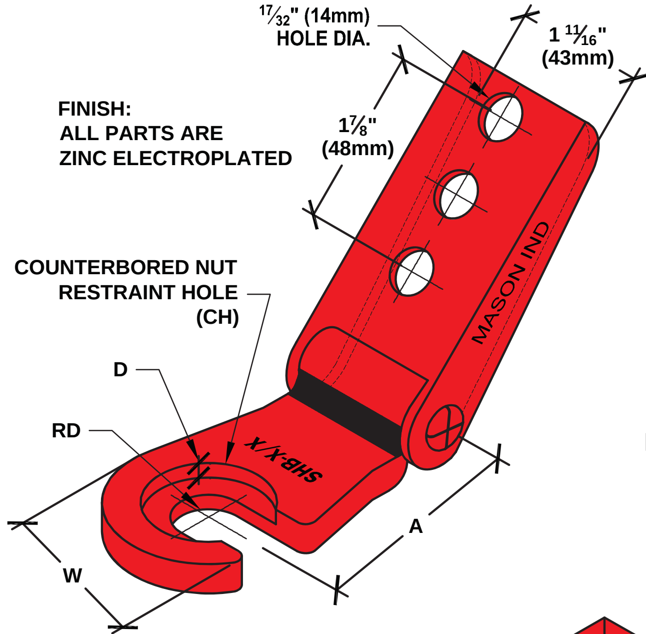
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

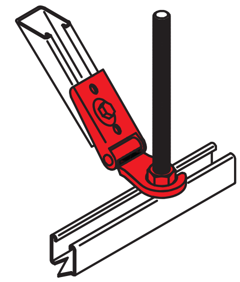
MASON IND. N.Y. SHB - SEISMIC HOOK BRACE

APPROVED

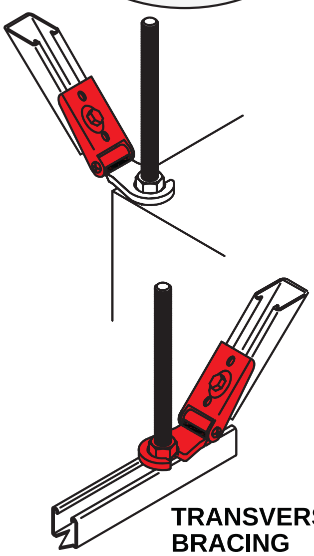


FINISH:
ALL PARTS ARE
ZINC ELECTROPLATED

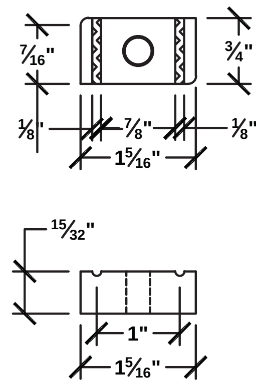




LONGITUDINAL BRACING

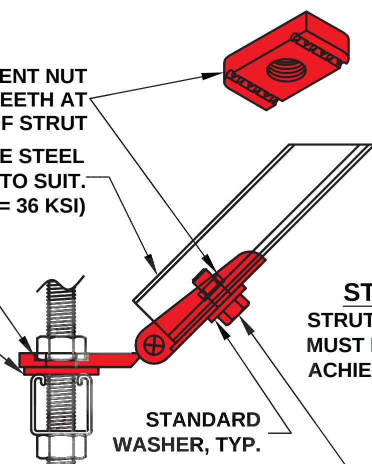


TRANSVERSE BRACING



STRUT NUT DIMENSIONS[2]

STRUT ATTACHMENT NUT (ASTM A36) MUST HAVE STAMPED TEETH TO ACHIEVE THESE VALUES.



$\frac{1}{2}$" (13mm) DIA. BOLTS (ASTM A307) MIN. (1) REQUIRED PER SHB.
TORQUE BOLTS TO 50 FT-LBS (68 Nm)
(REFER TO PAGE X2.3 FOR ATTACHMENT DETAILS) FOR STEEL ANGLE, 2 BOLTS WITH STANDARD NUTS ARE REQUIRED.
HOLES IN ANGLE TO BE $\frac{9}{16}$" DIAMETER.

NOTE: NOT TO BE USED AS A HANGER FOR EQUIPMENT, DUCTWORK OR PIPING. TO BE USED AS A SEISMIC RESTRAINT ONLY.

BRACE MEMBER AXIAL RATING (ASD) (LBS)

AXIAL MEMBER	MAX LENGTH (FT)		
	5'-0"	9'-6"	14'-6"
$1\frac{5}{8}$x$1\frac{5}{8}$x12GA SINGLE STRUT	1600	850	475
$1\frac{5}{8}$x$1\frac{5}{8}$x12GA DOUBLE STRUT	3950	2200	1200
L2x2x$\frac{1}{4}$	5790	1970	920
L3x3x$\frac{1}{4}$	14400	6200	3000

NOTE: STRUT MUST BE ASTM A1011SS GR 33 COLD ROLLED MILD STEEL, SLOTTED, PUNCHED OR SOLID (REF X7.0 & X7.1). DOUBLE STRUT MUST BE MINIMUM 2'-0" LONG. ANGLE MUST BE A36 STEEL.

TYPE SHB DIMENSIONS & RATINGS (ASD)

SIZE	ROD DIA. (RD)		COUNTERBORED HOLE DIA. (CH) x DEPTH (D)		W		A		LATERAL LOAD RATINGS					
									30° - 44° [1]			45° - 59° [1]		
	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	lbs	kN	kg	lbs	kN	kg
SHB-3/8	$\frac{3}{8}$	10	$\frac{3}{4}$ x $\frac{3}{32}$	19 x 24	2	51	2	51	1420	6.3	644	1000	4.5	454
SHB-1/2	$\frac{1}{2}$	13	1 x $\frac{5}{32}$	25 x 4	2	51	2	51	1710	7.6	775	1280	5.7	581
SHB-5/8	$\frac{5}{8}$	16	$1\frac{3}{16}$ x $\frac{5}{32}$	30 x 4	$2\frac{1}{8}$	54	$1\frac{15}{16}$	49	1520	6.8	690	1100	4.9	499
SHB-3/4	$\frac{3}{4}$	19	$1\frac{7}{16}$ x $\frac{5}{32}$	37 x 4	$2\frac{1}{4}$	57	$1\frac{7}{8}$	48	1660	7.4	753	1040	4.6	471

1. BRACE ANGLE MEASURED FROM HORIZONTAL.
2. ATTACHMENT TO STEEL OR OTHER SUBSTRATES (e.g., CONCRETE, WOOD) MAY GOVERN THE DESIGN OF THE OVERALL BRACE ASSEMBLY AND SHALL BE EVALUATED ON A PROJECT BY PROJECT BASIS.

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

FLEXIBLE CONNECTORS FOR EQUIPMENT CONNECTIONS

There are (10) different requirements in the IBC building code that address differential piping motion due to seismic motion of the building. Of all the requirements piping connections to equipment may be the most critical. Piping very seldom breaks in an earthquake, but broken equipment piping nozzles contributed to a large number of equipment failures.

While required by code, there is very little guidance regarding the actual piping design or type of flexible connector to be used at equipment connections. The design engineer can look at the overall system flexibility and design the piping to accept the motion without overloading the equipment connection. This may require pipe vees, flexible supports and anchors that must be installed exactly as designed. Or movement requirements can be addressed directly with flexible connectors at the piping connections to simplify the solution and limit dependence on overall system flexibility.

Mason Safeflex connectors can be used for vibration isolation and seismic protection at equipment connections where temperature, fluid type, system pressure and movements are acceptable. They are intended for installation in mechanical rooms where access is readily available for monitoring and service. They are not intended for installation in ceiling spaces or other concealed spaces. Safeflex connectors are designed to extend to a pressure balance length and can restrain the piping pressure thrust without adding control rods. On vibration isolated systems Safeflex connectors can be pre-extended to their pressure balance length during installation to avoid short circuiting the seismic snubbers. The Safeflex angular movement capability and low angular stiffness can be utilized to limit piping loads and moments on equipment connections.

Please refer to Figure 1 which illustrates a solid pipe drop to equipment, a pipe drop with a Safeflex flexible connector, a pipe drop with an FFL Flexible Braided Hose and a pipe drop with a VFL Flexible Braided Vee. Since the piping header is braced to the deck overhead and the equipment is anchored to the floor, the building sway and interstory drift causes differential displacement to occur between the piping header and the equipment.

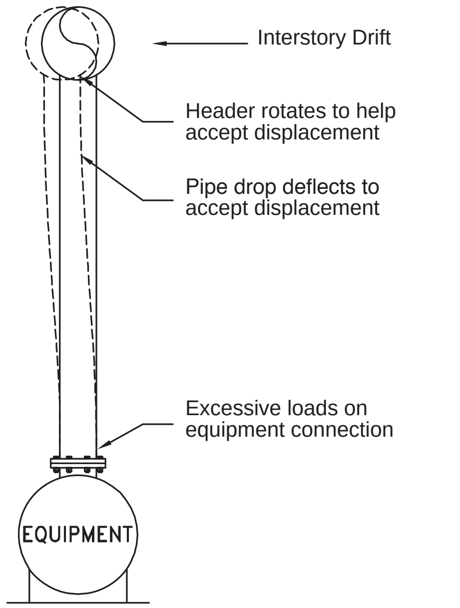
The solid pipe drop will bend to accommodate the displacement but will develop the highest loads on the pipe, pipe braces and equipment connections. The solid pipe drop also transfers a moment to the equipment that can lead to equipment connection failure.

The Safeflex connector can accept some differential displacement but will also reduce the moment on the equipment connection and reduce the bending loads from the pipe. Please refer to FM75 for more information on the Safeflex connector.

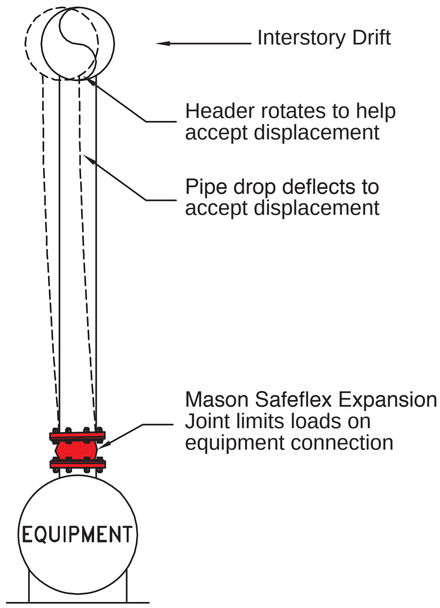
A Mason FFL Flexible Braided Hose, selected to accommodate the full displacement, can also reduce the force on the equipment connection, with flexible support on the piping to allow the braided hose to move laterally without axial restraint. Please refer to FM76 for more information on the Mason FFL Flexible Braided Hose.

A Mason VFL Flexible Braided Vee installed at the equipment connection may be the best selection of all. It will allow large amounts of differential displacement in any direction and virtually eliminate loads on the equipment connections. Please refer to FM82 for more information on the Mason VFL Flexible Braided Vee.

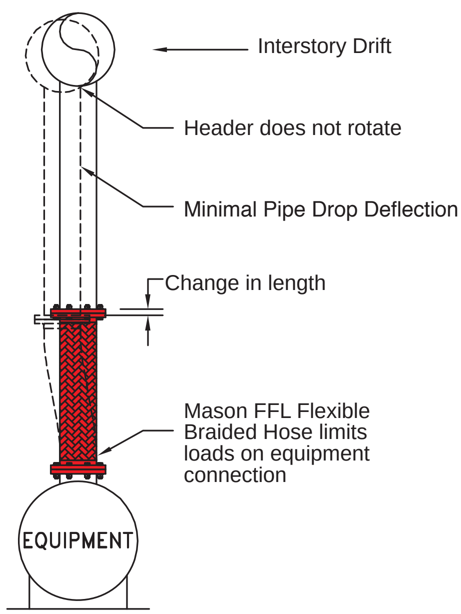
Solid equipment connection, **Mason Safeflex SFEJ** equipment connection, **Mason FFL Flexible Braided Hose** equipment connection and **Mason VFL Flexible Braided Vee** equipment connection



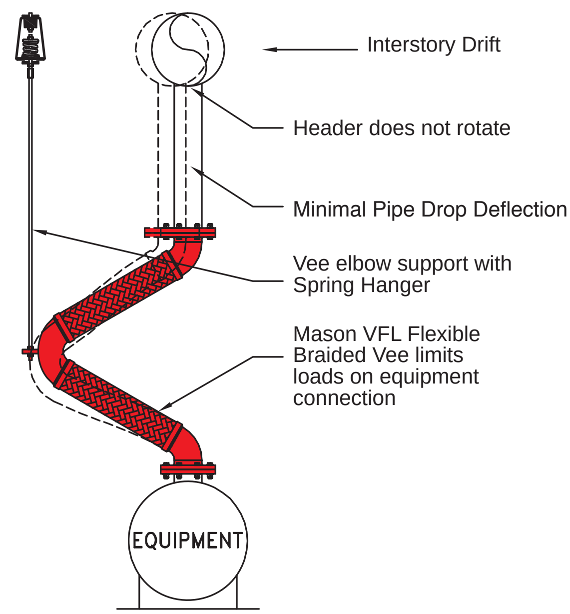
SOLID PIPING EQUIPMENT ATTACHMENT CONNECTION



MASON SAFEFLEX EXPANSION JOINT EQUIPMENT CONNECTION



MASON FFL FLEXIBLE BRAIDED HOSE EQUIPMENT CONNECTION



MASON VFL FLEXIBLE BRAIDED VEE EQUIPMENT CONNECTION

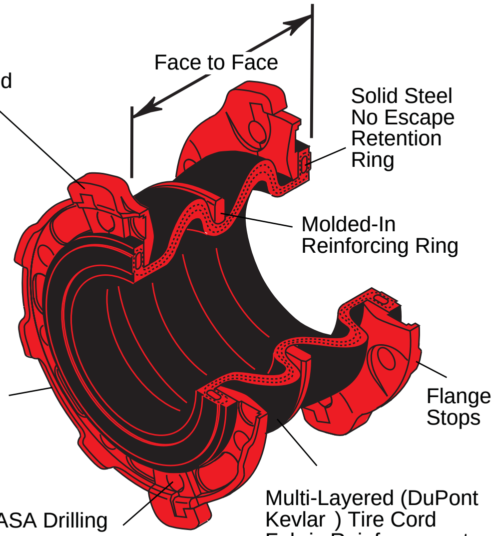
Figure 1

03/2020

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

SFDEJ SAFEFLEX DOUBLE SPHERE EPDM CONNECTOR & EXPANSION JOINT

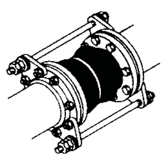


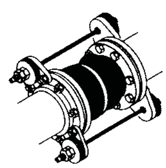
❏ 150 lb ASA Drilling
❏ 300 lb ASA Drilling
❏ BRITISH Series E Drilling
❏ BRITISH Series F Drilling
❏ DIN or PIN-10
❏ DIN or PIN-16
❏ DIN or PIN-25

❏ CR Control Rods
❏ ACC Control Cables

If not all Peroxide Cured EPDM, Materials are

Cover Liner
❏ ❏ Neoprene
❏ ❏ Natural Rubber
❏ ❏ Hypalon
❏ ❏ Nitrile (Buna N)
❏ ❏ EPDM


CR CONTROL RODS


ACC CONTROL CABLES

SAFEFLEX SFDEJ DIMENSIONS AND ALLOWABLE MOVEMENTS

Pipe Size (in)	Face to Face (in)	Pipe Size *(mm)*	Face to Face *(mm)*	Allowable Movements Angular (degrees)	Compression (in)	Compression *(mm)*	Elongation (in)	Elongation *(mm)*	Transverse ± (in)	Transverse ±*(mm)*
1 1/2 2 2 1/2 3 4 5 6	7	*40* *50* *65* *75* *100* *125* *150*	*175*	36 34 32 30 28 24 22	1 1/4	*32*	3/4	*19*	3/4	*19*
8 10 12	8	*200* *250* *300*	*200*	20 18 16	1 1/2	*38*	7/8	*22*	7/8	*22*
14	10	*350*	*250*	14	1 5/8	*41*	1	*25*	1	*25*
16 18	11 11	*400* *450*	*275* *275*	13 12	1 3/4	*44*	1	*25*	1	*25*
20 24	12 12	*500* *600*	*300* *300*	11 10	1 7/8	*47*	1 1/8	*28*	1 1/8	*28*

SAFEFLEX SFDEJ
Standard and High Pressure Construction-
Pressure Reduction at Higher Temperatures

Construction Types & Sizes (in) *(mm)*	Nominal Rating In PSI *Bar* at: 170°F *77°C*	190°F *88°C*	210°F *99°C*	230°F *110°C*	250°F *121°C*	Max. Vacuum (in Hg) *(Minus Bar)*
SFDEJ Standard 1 1/2" - 16" *40 - 400mm*	250 *17*	245 *16.5*	235 *16*	225 *15*	215 *14*	14" *0.5*
SFDEJ Standard 18" - 24" *450 - 600mm*	180 *12*	175 *11.5*	170 *11*	165 *10.5*	155 *10*	14" *0.5*
SFDEJ High Pressure 1 1/2" - 16" *40 - 400mm*	335 *23*	325 *22*	315 *21*	300 *20*	285 *19*	22" *0.7*
SFDEJ High Pressure 18" - 24" *450 - 600mm*	225 *15*	220 *14.5*	210 *14*	200 *13.5*	190 *13*	22" *0.7*

Burst pressures are a minimum of three times Operating Pressures.

When Expansion Joints are used for piping expansion or contraction, anchors must be provided on both sides of the expansion joint at the extreme ends of the protected run or the joints will not function properly.

Standard Pressure Safeflex Connectors do not require control rods or cables in anti-vibration applications when pre-extended during installation in accordance with installation instructions.

High Pressure Connectors should be installed with control rods or cables over 275 psi/*19 Bar.*

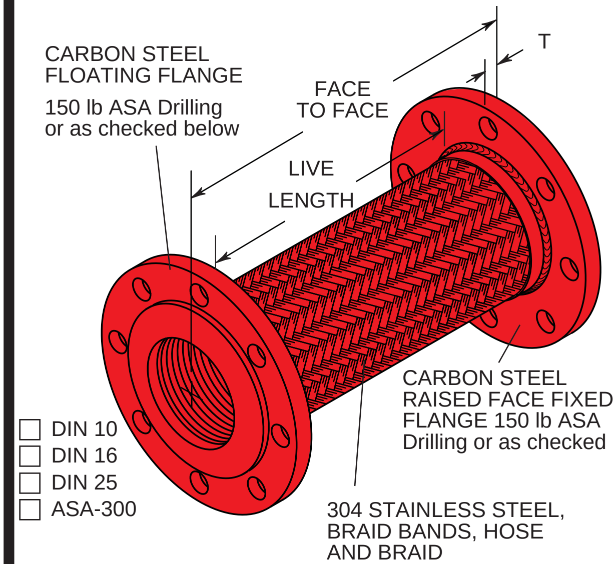
Pressure Ratings—

Nominal 250 psi *17 Bar* Standard Up to 16"
Nominal 335 psi *23 Bar* High Pressure Up to 16"

Nominal 180 psi *12 Bar* Standard 18" - 24"
Nominal 225 psi *15 Bar* High Pressure 18" - 24"

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

FFL SS BRAIDED HOSE WITH CARBON STEEL FIXED & FLOATING FLANGES



RATED PRESSURES @ ELEVATED TEMPERATURES (psi) (*kg/cm²*)

Hose Size (in) (*mm*)	250°F *121°C* Factor 0.92	350°F *176°C* Factor 0.86	450°F *232°C* Factor 0.81
1 1/2 *40*	400 *28*	370 *26*	350 *24*
2 *50*	330 *23*	310 *21*	290 *20*
2 1/2 *65*	270 *19*	250 *17*	235 *16*
3 *80*	260 *18*	240 *16*	230 *16*
4 *100*	210 *15*	200 *14*	190 *13*
5 *125*	190 *13*	180 *12*	170 *11*
6 *150*	190 *13*	180 *12*	170 *11*
8 *200*	190 *13*	180 *12*	170 *11*
10 *250*	160 *11*	150 *10*	140 *9*
12 *300*	160 *11*	150 *10*	140 *9*
14 *350*	160 *11*	150 *10*	140 *9*
16 *400*	160 *11*	150 *10*	140 *9*

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

Size (in) (*mm*)	Max Gauge (psi)(*kg/cm²*)	Temp Reference (F) (*°C*)
1 1/2 *40*	150 *11*	362 *183*
2 *50*	150 *11*	362 *183*
2 1/2 *65*	125 *9*	355 *179*
3 *80*	125 *9*	355 *179*
4 *100*	125 *9*	355 *179*
5 *125*	100 *7*	337 *169*
6 *150*	100 *7*	337 *169*
8 *200*	75 *5*	320 *160*
10 *250*	60 *4*	307 *153*
12 *300*	60 *4*	307 *153*
14 *350*	60 *4*	307 *153*
16 *400*	60 *4*	307 *153*

**Vacuum rating varies with size and application.
Consult factory on all vacuum applications.**

Our steam service ratings are very low in the interest of safety although our 70°F (*21°C*) pressure ratings are as high or higher then our competitors. All locations where failure could lead to personal injury or suffocation must be avoided. In dangerous locations we suggest housed expansion joints, solid loops, ball joints, packed devices etc. rather than thin walled flexible products regardless of manufacturer.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

304 SS can be used up to 850°F (*454°C*) in applications such as engine exhaust.

When using FFL products in copper or brass water or steam systems, dielectric flanges must be used on each end to prevent leakage from galvanic action.

CARBON STEEL PLATE FLANGE THICKNESS

Pipe Size (in)	(*mm*)	Flange Thickness T (in)	(*mm*)
1 1/2 thru 4	*40 thru 100*	5/8	*16*
5 thru 6	*125 thru 150*	3/4	*19*
8 thru 16	*200 thru 400*	1	*25*

Face to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.

Lateral Offset one side of centerline and normal machinery vibration. If intermittent in both directions, reduce by 50%.

Sizes 12" - 16" *(300-400mm)* have double braid.

FFL DIMENSIÇ AND PRESSURE RATINGS (American Units)

Type	Pipe Size & Face to Face (in)	Live Length (in)	Corru-gations per foot	Maximum Permanent Lateral Offset (in)	Rated Pressure @70°F (psi)
FFL	1 1/2 X 12	9 3/4	63	1 1/4	450
FFL	1 1/2 X 18	15 3/4	63	3 1/2	450
FFL	1 1/2 X 24	21 3/4	63	6 1/2	450
FFL	2 X 12	9 3/4	58	1 1/8	360
FFL	2 X 18	15 3/4	58	2 1/2	360
FFL	2 X 24	21 3/4	58	5	360
FFL	2 1/2 X 12	9	48	1	290
FFL	2 1/2 X 18	15	48	2 1/4	290
FFL	2 1/2 X 24	21	48	4 3/4	290
FFL	3 X 12	9 3/4	46	7/8	280
FFL	3 X 18	15 3/4	46	2	280
FFL	3 X 24	21 3/4	46	4	280
FFL	3 X 36	33 3/4	46	8	280
FFL	4 X 12	9 3/4	32	3/4	225
FFL	4 X 18	15 3/4	32	1 1/2	225
FFL	4 X 24	21 3/4	32	3 1/2	225
FFL	4 X 36	33 3/4	32	7	225
FFL	5 X 18	14 3/4	29	1 1/4	200
FFL	5 X 24	20 3/4	29	2 1/4	200
FFL	5 X 36	32 3/4	29	5 1/2	200
FFL	6 X 18	14 3/4	25	1	200
FFL	6 X 24	20 3/4	25	2	200
FFL	6 X 36	32 3/4	25	5	200
FFL	8 X 18	14 1/2	23	7/8	200
FFL	8 X 24	20 1/2	23	1 1/2	200
FFL	8 X 36	32 1/2	23	4	200
FFL	10 X 18	14 1/2	21	3/4	170
FFL	10 X 24	20 1/2	21	1 1/4	170
FFL	10 X 36	32 1/2	21	3	170
FFL	12 X 24	20 1/2	20	1	170
FFL	12 X 36	32 1/2	20	2 1/2	170
FFL	14 X 36	32 1/2	18	1 1/4	170
FFL	16 X 36	32 1/2	16	1	170

FFL DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Type	Pipe Size & Face to Face *(mm)*	Live Length *(mm)*	Corru-gations per meter	Maximum Permanent Lateral Offset *(mm)*	Rated Pressure @21°C *(kg/cm²)*
FFL	*40 X 305*	*248*	*207*	*32*	*31*
FFL	*40 X 457*	*400*	*207*	*89*	*31*
FFL	*40 X 610*	*552*	*207*	*165*	*31*
FFL	*50 X 305*	*248*	*190*	*29*	*25*
FFL	*50 X 457*	*400*	*190*	*64*	*25*
FFL	*50 X 610*	*552*	*190*	*127*	*25*
FFL	*65 X 305*	*248*	*157*	*25*	*20*
FFL	*65 X 457*	*400*	*157*	*57*	*20*
FFL	*65 X 610*	*552*	*157*	*121*	*20*
FFL	*80 X 305*	*248*	*151*	*22*	*19*
FFL	*80 X 457*	*400*	*151*	*51*	*19*
FFL	*80 X 610*	*552*	*151*	*102*	*19*
FFL	*80 X 914*	*857*	*151*	*203*	*19*
FFL	*100 X 305*	*248*	*105*	*19*	*15*
FFL	*100 X 457*	*400*	*105*	*38*	*15*
FFL	*100 X 610*	*552*	*105*	*89*	*15*
FFL	*100 X 914*	*857*	*105*	*178*	*15*
FFL	*125 X 457*	*375*	*95*	*32*	*14*
FFL	*125 X 610*	*527*	*95*	*57*	*14*
FFL	*125 X 914*	*832*	*95*	*140*	*14*
FFL	*150 X 457*	*375*	*82*	*25*	*14*
FFL	*150 X 610*	*527*	*82*	*51*	*14*
FFL	*150 X 914*	*832*	*82*	*127*	*14*
FFL	*200 X 457*	*368*	*75*	*22*	*14*
FFL	*200 X 610*	*521*	*75*	*32*	*14*
FFL	*200 X 914*	*826*	*75*	*102*	*14*
FFL	*250 X 457*	*368*	*69*	*19*	*11*
FFL	*250 X 610*	*521*	*69*	*32*	*11*
FFL	*250 X 914*	*826*	*69*	*76*	*11*
FFL	*300 X 610*	*521*	*66*	*25*	*11*
FFL	*300 X 914*	*826*	*66*	*64*	*11*
FFL	*350 X 914*	*826*	*59*	*32*	*11*
FFL	*400 X 914*	*826*	*52*	*25*	*11*

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

PIPING CROSSING BUILDING JOINTS

Buildings or portions of buildings that will move differently in an earthquake are separated by building joints to prevent catastrophic structural damage. For very small amounts of relative displacement it is possible for piping systems crossing building joints to operate without damage or special design.

For larger amounts of differential motion the piping system can be designed to accept the motion. A typical pipe run is shown in Figure 1. The entire pipe run must be analyzed for possible excessive motion problems and potential failure of pipe supports. Failure of rigid piping connections to equipment is a real possibility, especially if the equipment is attached to very short pipe branches. Installation of flex connectors on the equipment piping connections may be necessary to insure these very vulnerable connections are protected.

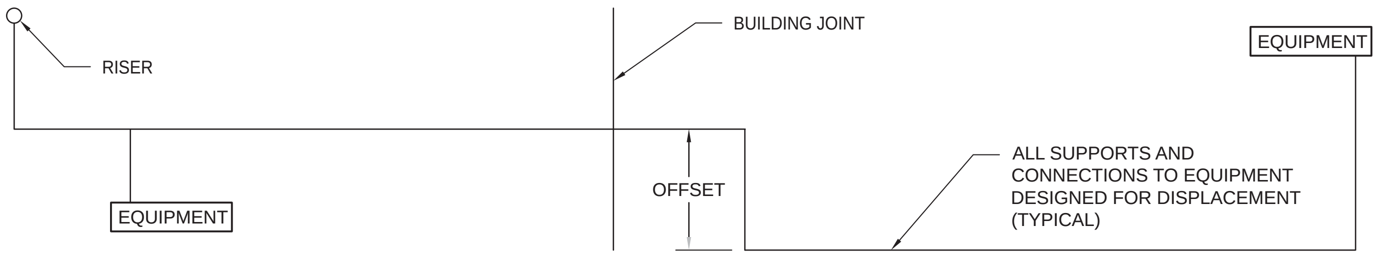


Figure 1

This intensive system design and precise installation can be eliminated, and piping can be installed normally throughout the building if the differential motion is addressed at the building joint. It may be possible to use a pipe offset and anchors to take the motion as illustrated in Figure 2.

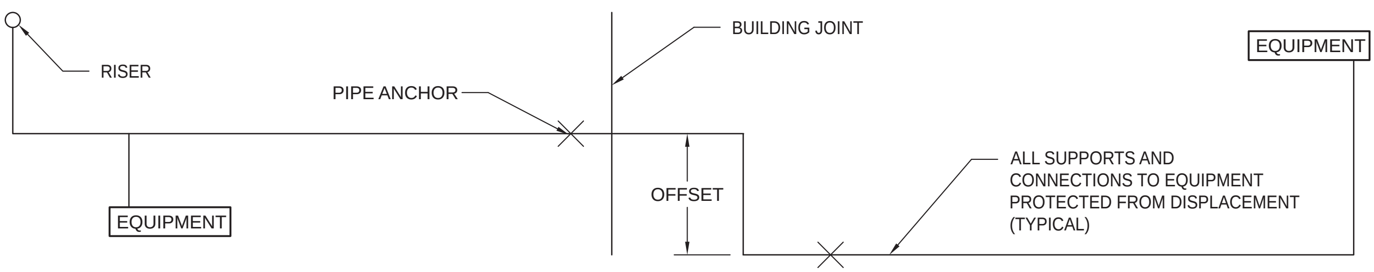


Figure 2

Pipe lengths and anchor loads can be quite large, and installing flexible connectors at the building joint to take the differential motion may be a better solution. Flexible braided hoses, Safeflex connectors or expansion compensators are not recommended. Instead we recommend Mason Flexible Braided Vees. The Vees can be installed on one side of the building joint with supports and anchors designed to limit the building joint motion at the vee. See Figure 3.

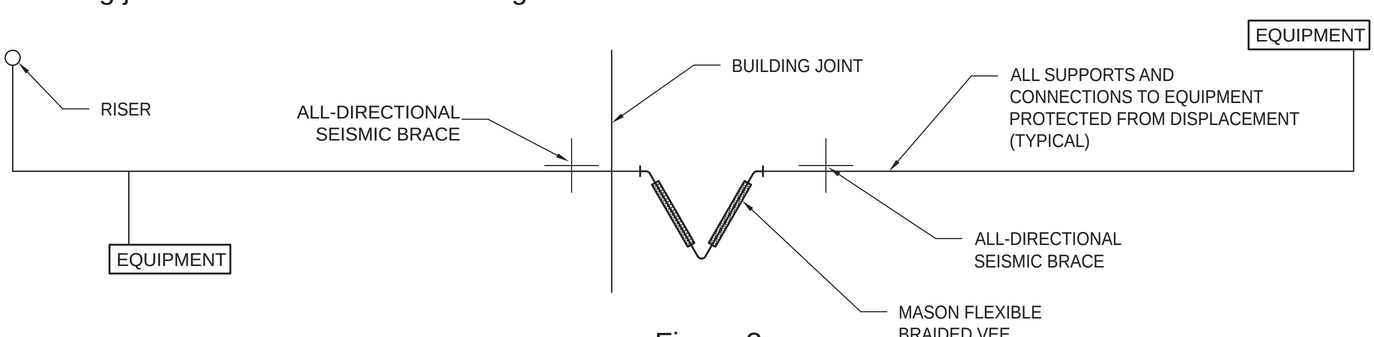


Figure 3

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

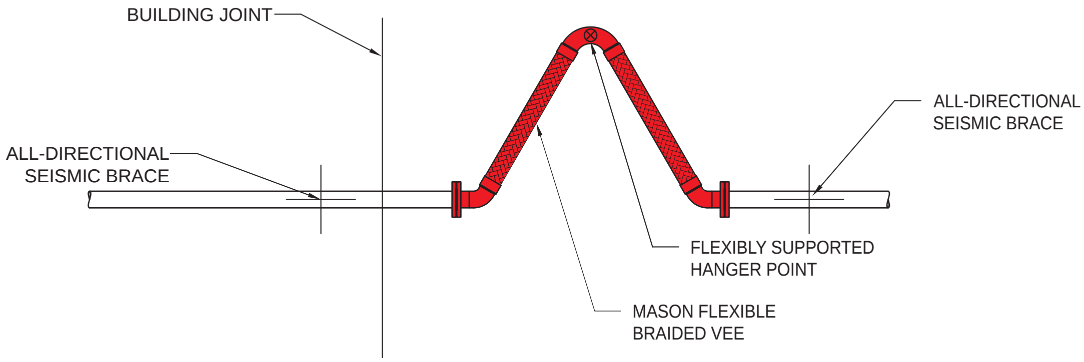


Figure 4

There are several advantages when using Flexible Braided Vees over traditional flexible connectors.

Advantage #1: Flexible Braided Vees do not require anchorage for piping pressure thrust. This is a huge advantage. All inline expansion devices must be installed in anchored systems. The forces on the anchors are a function of the pressure x the effective area. In some cases the anchors must be designed for the test pressures. This requires welded steel members to attach the piping to the building. And the building must be designed for this continuous operating load. Flexible Braided Vees are pressure balanced and applies zero pressure thrust on the building. Welded anchor members are not required. In most cases the standard seismic braces can be used to act as anchors. The small forces allow the piping to be vibration isolated without serious short-circuits.

Advantage #2: Floating flanges on both ends of the flanged Vee allow the Vee to be rotated in any direction, to minimize space requirements and fit into ceilings and other confined spaces.

Advantage #3: The Vee design allows standard Vees to be nested to minimize space and simplify support.

Advantage #4: Vees have a very low spring rate. Mason Flexible Braided Vees consist of (2) very flexible braided hose sections connected by hard elbows. The hoses are designed to offer maximum flexibility with close pitched corrugations. This reduces the spring rate of the hose, further reducing loads on the structure. The low forces and subsequent lack of required anchors and guides represent a huge advantage in installation and long term operation of piping systems. We have been able to use Vees instead of more traditional expansion compensators on many projects. They are becoming the new standard for both thermal and seismic movement allowance.

Flexible Braided Vee installation details are shown on the following pages:

FM79 - Mason VFL Vee on a single pipe restrained with Mason SSBS seismic braces.

FM80 - Mason VFL Vee on multiple pipes support by a trapeze and restrained with Mason SSBS seismic braces.

FM81 - Mason VFL Vee on a single pipe, supported by Mason 30N spring hangers and restrained with Mason SCB/SCBH cable braces.

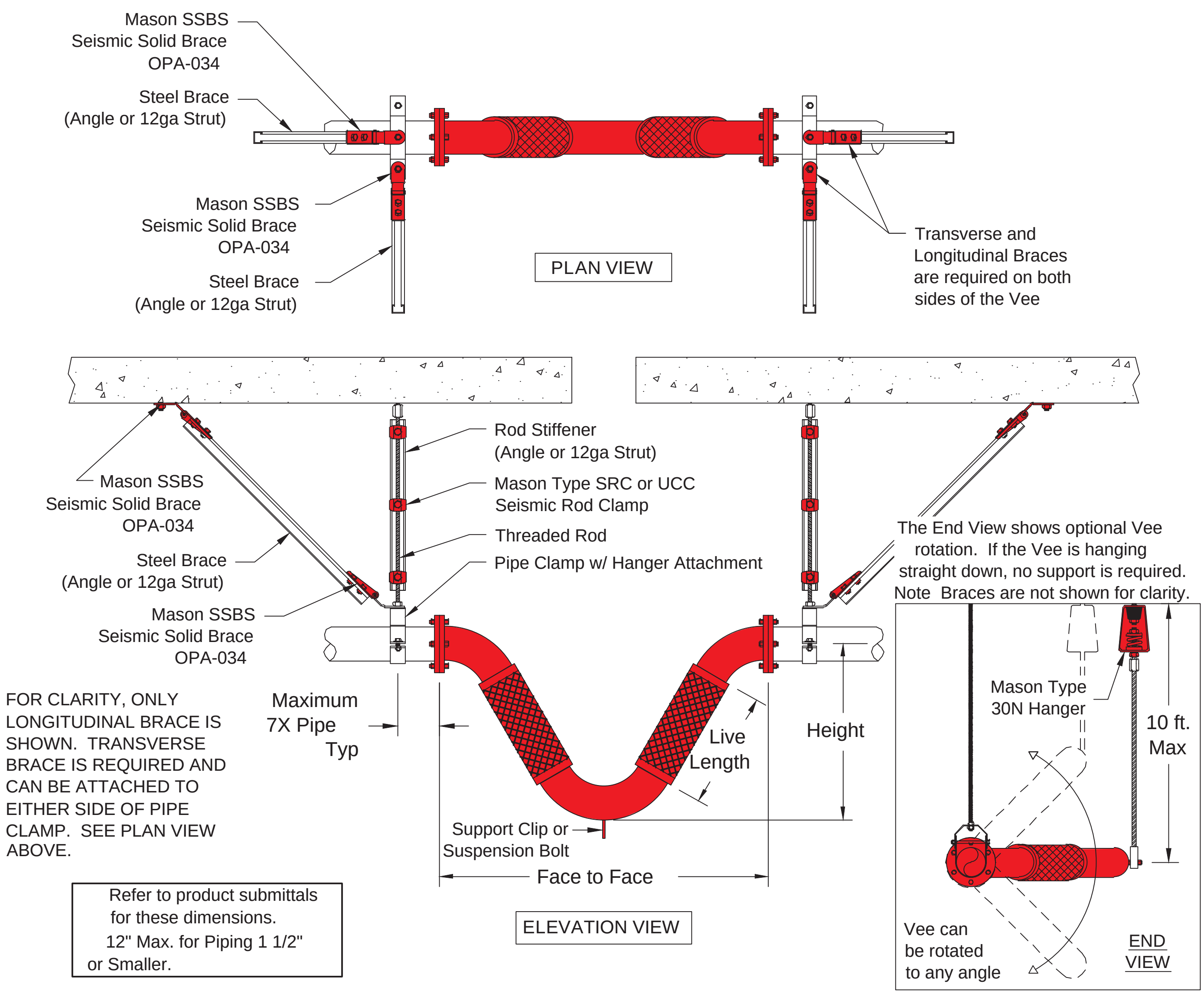
Refer to FM82 for more information on the Mason VFL Vee.

Refer to FM86 for the specification for the Mason VFL Vee.

For very large pipe sizes it may be necessary to utilize Mason ASG Sliding Guides at Vee locations. Refer to FM87 for more information.

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Mason Flexible Braided Vee Installation
On Single Pipes at Building Seismic Joints with
SSBS Seismic Solid Braces and **SRC** or **UCC Seismic Rod Clamps**



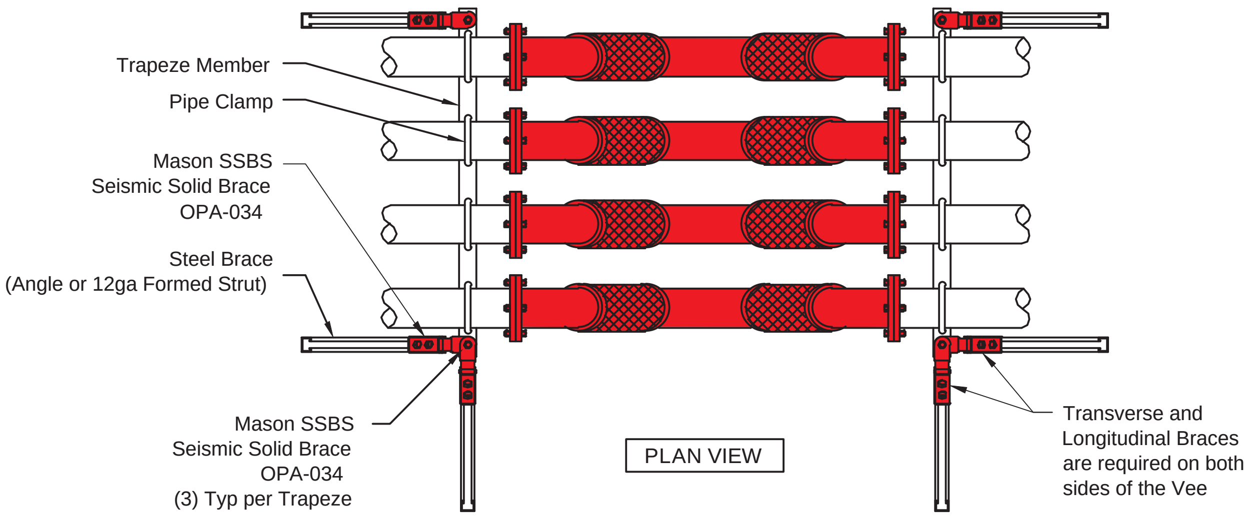
NOTES:

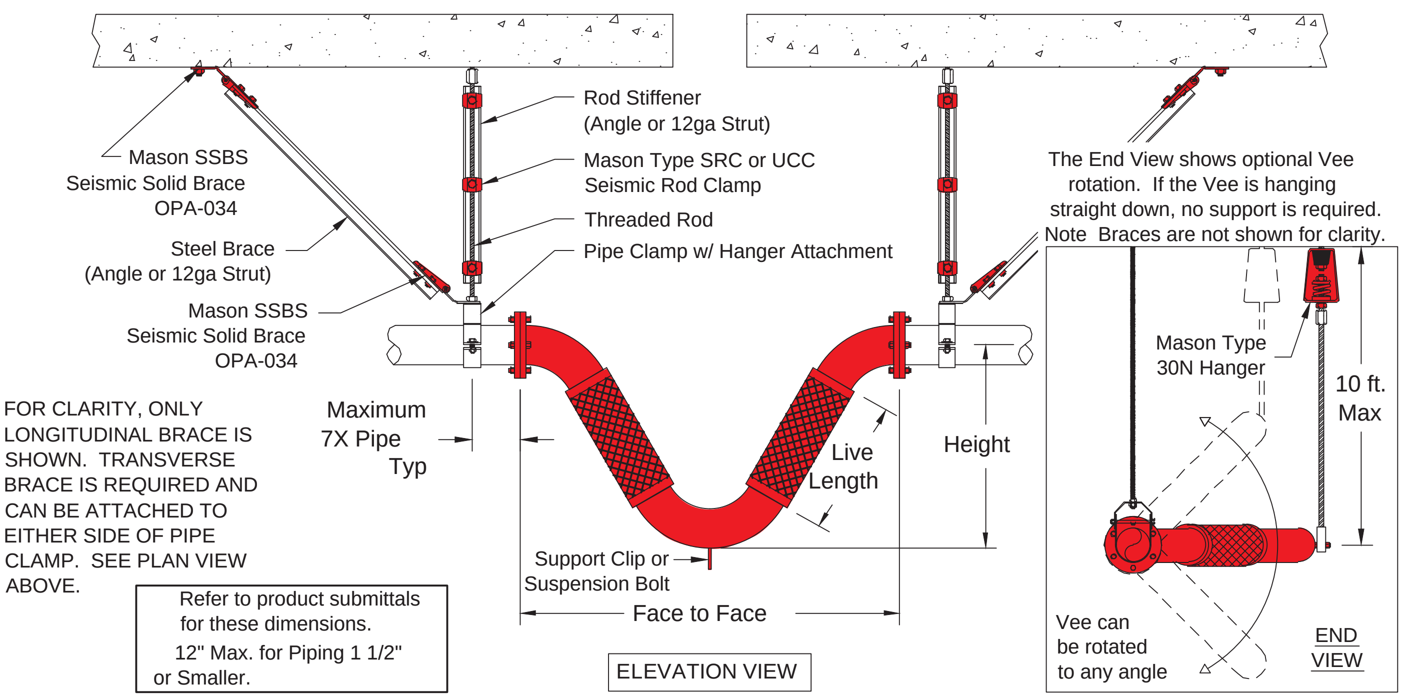
1) Insulation shall be installed to maintain proper vapor barrier without inhibiting, restricting or preventing movement of the flexible vee.
2) Flexible vees are designed and usable for expansion and contraction applications, provided each individual application has been engineered.
3) Seismic bracing shall not pass through building seismic and/or expansion and contraction oints. Seismic bracing shall not connect or tie together different sides or parts of the building structure.
4) Flexible vees installed in any orientation other than hanging straight down, shall require the installation of a support at the support clip to prevent Flexible vee from sagging. This additional support shall include a spring hanger so as to not inhibit, restrict or prevent movement of the flexible vee.

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Mason Flexible Braided Vee Installation
On Trapezed Pipes at Building Seismic Joints with
SSBS Seismic Solid Braces and SRC or UCC Seismic Rod Clamps



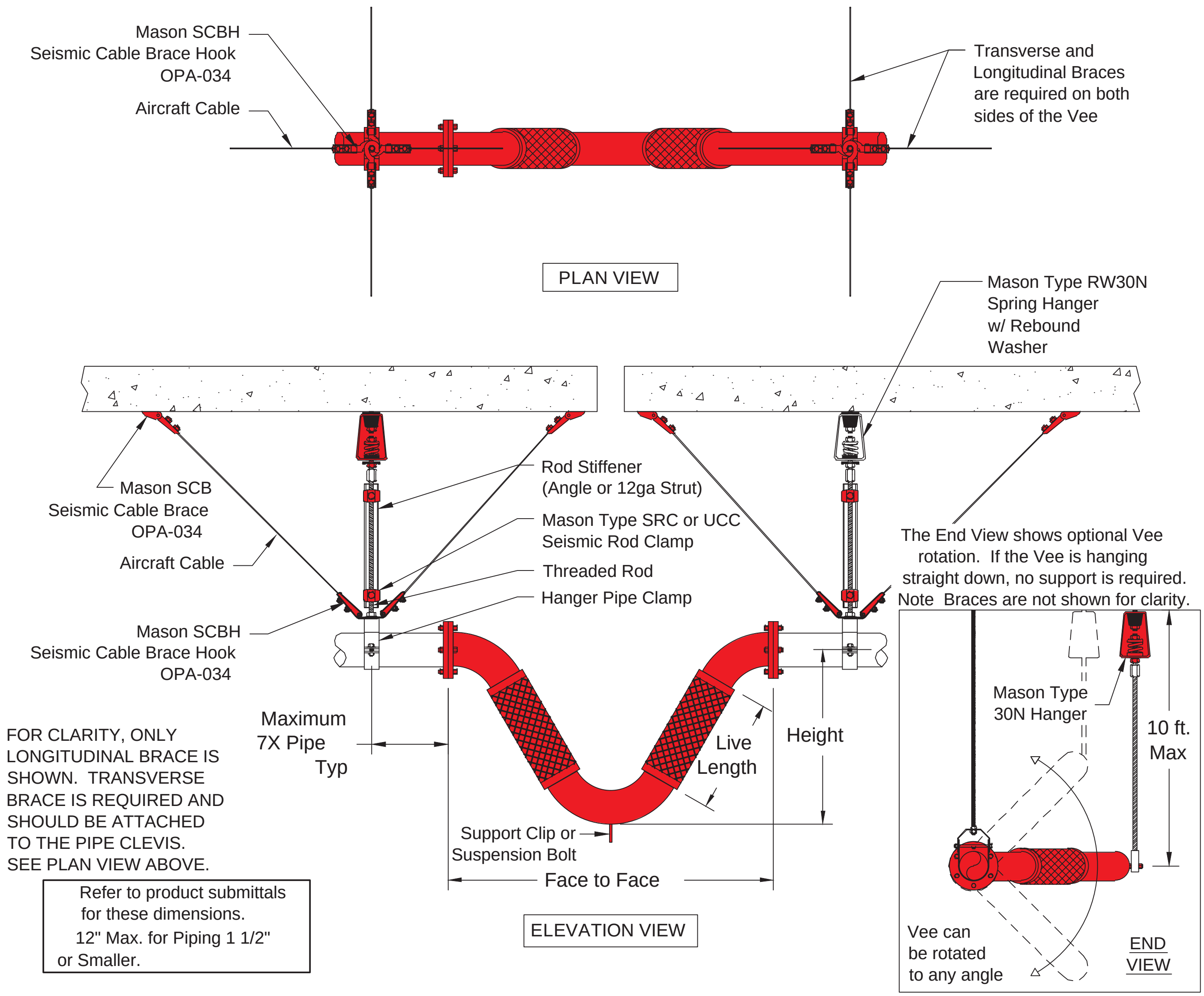


NOTES:
1) Insulation shall be installed to maintain proper vapor barrier without inhibiting, restricting or preventing movement of the flexible vee.
2) Flexible vees are designed and usable for expansion and contraction applications, provided each individual application has been engineered.
3) Seismic bracing shall not pass through building seismic and/or expansion and contraction oints. Seismic bracing shall not connect or tie together different sides or parts of the building structure.
4) Flexible vees installed in any orientation other than hanging straight down, shall require the installation of a support at the support clip to prevent flexible vee from sagging. This additional support shall include a spring hanger so as to not inhibit, restrict or prevent movement of the flexible vee.

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Mason Flexible Braided Vee Installation
On Single Pipes at Building Seismic Joints with
RW30 Spring Hangers, SCB/SCBH Seismic Braces
and **SRC** or **UCC Seismic Rod Clamps**



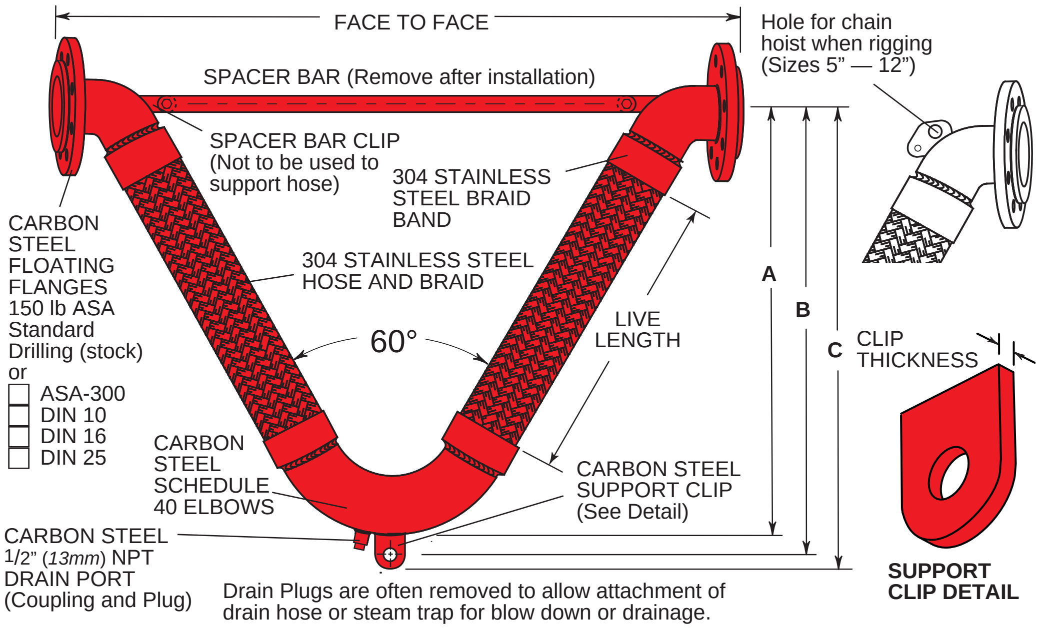
NOTES:

1) Insulation shall be installed to maintain proper vapor barrier without inhibiting, restricting or preventing movement of the flexible vee.
2) Flexible vees are designed and usable for expansion and contraction applications, provided each individual application has been engineered.
3) Seismic bracing shall not pass through building seismic and/or expansion and contraction oints. Seismic bracing shall not connect or tie together different sides or parts of the building structure.
4) Flexible vees installed in any orientation other than hanging straight down, shall require the installation of a support at the support clip to prevent flexible vee from sagging. This additional support shall include a spring hanger so as to not inhibit, restrict or prevent movement of the flexible vee.

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

VFL 60VEE SS BRAIDED HOSE WITH CARBON STEEL FLOATING FLANGES



CARBON STEEL PLATE FLANGES

Pipe Size (in)	Pipe Size *(mm)*	Flange Thickness (in)	Flange Thickness *(mm)*
2 thru 4	*50 thru 100*	5/8	*16*
5 thru 6	*125 thru 150*	3/4	*19*
8 thru 12	*200 thru 300*	1	*25*

CARBON STEEL SUPPORT CLIP

Pipe Size (in)	Pipe Size *(mm)*	Support Clip Hole Diameter (in)	Hole Diameter *(mm)*	Thickness (in)	Thickness *(mm)*
2	*50*	5/8	*16*	1/8	*3*
21/2	*65*	5/8	*16*	1/8	*3*
3	*80*	3/4	*16*	1/8	*3*
4	*100*	3/4	*19*	1/8	*3*
5	*125*	3/4	*19*	1/4	*6*
6	*150*	7/8	*22*	3/8	*9*
8	*200*	7/8	*22*	1/2	*13*
10	*250*	1	*25*	1/2	*13*
12	*300*	1	*25*	1/2	*13*

Vacuum rating varies with size and application. Consult factory on all vacuum applications.

RATED PRESSURES @ ELEVATED TEMPERATURES (psi) *(kg/cm²)*

Hose Size (in)	*(mm)*	250°F *121°C* Factor 0.92 (psi)	*(kg/cm²)*	350°F *176°C* Factor 0.86 (psi)	*(kg/cm²)*	450°F *232°C* Factor 0.81 (psi)	*(kg/cm²)*
2	*50*	330	*23*	310	*21*	290	*20*
21/2	*65*	270	*19*	250	*17*	235	*16*
3	*80*	260	*18*	240	*16*	230	*16*
4	*100*	210	*15*	200	*14*	190	*13*
5	*125*	190	*13*	180	*12*	170	*11*
6	*150*	190	*13*	180	*12*	170	*11*
8	*200*	190	*13*	180	*12*	170	*11*
10	*250*	160	*11*	150	*10*	140	*9*
12	*300*	160	*11*	150	*10*	140	*9*

SATURATED STEAM RECOMMENDED PRESSURE LIMITS

Size (in)	*(mm)*	Max Gauge (psi)	*(kg/cm²)*	Temp Reference (F)	*(°C)*
2	*50*	150	*11*	362	*183*
21/2	*65*	125	*9*	355	*179*
3	*80*	125	*9*	355	*179*
4	*100*	125	*9*	355	*179*
5	*125*	100	*7*	337	*169*
6	*150*	100	*7*	337	*169*
8	*200*	75	*5*	320	*160*
10	*250*	60	*4*	307	*153*
12	*300*	60	*4*	307	*153*

Our steam service ratings are very low in the interest of safety although our 70°F (*21°C*) pressure ratings are as high or higher then our competitors. All locations where failure could lead to personal injury or suffocation must be avoided. In dangerous locations we suggest housed expansion joints, solid loops, ball joints, packed devices etc. rather than thin walled flexible products regardless of manufacturer.

Consult factory with full location description as well as service conditions for higher pressure or temperature applications.

304 SS can be used up to 850°F (*454°C*) in applications such as engine exhaust.

When using VFL products in copper or brass water or steam systems, dielectric flanges must be used on each end to prevent leakage from galvanic action.

RATED MOVEMENTS

±4"(*100mm*) All Directional Seismic Movement
±6"(*150mm*) Guided Thermal Movement Only

VFL DIMENSIONS AND PRESSURE RATINGS (American Units)

Type	Pipe Size & Face to Face (in)	Live Length (in)	Corrugations per foot	A (in)	B (in)	C (in)	Rated Pressure @70°F (psi)
VFL	2 X 33	20	58	231/4	241/4	25	360
VFL	21/2 X 37	22	48	26	27	273/4	290
VFL	3 X 42	24	46	287/8	301/8	311/8	280
VFL	4 X 49	26	32	321/2	333/4	343/4	225
VFL	5 X 58	30	29	38	391/2	401/2	200
VFL	6 X 66	33	25	425/8	441/8	453/8	200
VFL	8 X 80	36	23	491/4	503/4	52	200
VFL	10 X 96	42	21	581/2	601/4	613/4	170
VFL	12 X 112	48	20	673/4	691/2	71	170

VFL DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Type	Pipe Size & Face to Face *(mm)*	Live Length *(mm)*	Corrugations per meter	A *(mm)*	B *(mm)*	C *(mm)*	Rated Pressure @21°C *(kg/cm²)*
VFL	*50 X 838*	*508*	*190*	*591*	*616*	*635*	*25*
VFL	*65 X 940*	*559*	*157*	*660*	*686*	*705*	*20*
VFL	*80 X 1067*	*610*	*151*	*733*	*765*	*791*	*19*
VFL	*100 X 1245*	*660*	*105*	*826*	*857*	*883*	*16*
VFL	*125 X 1473*	*762*	*95*	*965*	*1003*	*1029*	*14*
VFL	*150 X 1676*	*838*	*82*	*1083*	*1121*	*1153*	*14*
VFL	*200 X 2032*	*914*	*75*	*1251*	*1289*	*1321*	*14*
VFL	*250 X 2438*	*1067*	*69*	*1486*	*1530*	*1568*	*12*
VFL	*300 X 2849*	*1219*	*66*	*1721*	*1765*	*1803*	*12*

Face to Face Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4. Size 12" *(300mm)* has double braid.

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

FLEXIBLE CONNECTIONS FOR INLINE COIL PIPING CONNECTIONS

Broken piping connections on inline coils installed in ceiling spaces have caused a great deal of damage in earthquakes. The small piping is typically unbraced. The duct may be braced or unbraced. In either case the differential motion of the piping and coil section has caused problems. The piping itself does not break; instead it is the smaller copper tubes connecting to the coils that have failed. This problem has been generally addressed in several places in ASCE 7 and specifically in a bracing exception for inline coils in section 13.6.7:

> Components that are installed in-line with the duct system and have an operating weight greater than 75 lb. (334 N), such as fans, heat exchangers, and humidifiers, shall be supported and laterally braced independent of the duct system and such braces shall meet the force requirements of Section 13.3.1. Appurtenances such as dampers, louvers, and diffusers shall be positively attached with mechanical fasteners. *Unbraced piping attached to in-line equipment shall be provided with adequate flexibility to accommodate differential displacements.*

The "adequate flexibility" requirement can be explained:

1. Unbraced piping must have adequate flexibility to accommodate differential displacements of the piping and component. This is usually achieved by using flexible connectors on the piping connections. *This applies to piping attached to all inline components, seismically braced or unbraced, regardless of weight.*
2. Braced piping attached to seismically braced or unbraced components require flexible connectors per the code.
3. For components with an Ip=1.5 the design engineer should require the coil manufacturer to supply "acceptable nozzle loads" so a flexible connector can be selected to accept the differential displacement without breaking the piping nozzle. For components with an Ip=1.0 the design engineer should verify that the connections will remain intact since a broken piping connection is a life safety hazard.

Installing straight braided hoses at the piping connection can provide adequate flexibility for side to side motions, but for all directional motion Mason Flexible Braided Vees should be installed. Figure 1 shows an unbraced inline coil with Flexible Braided Vees installed on the piping at the coil piping connections.

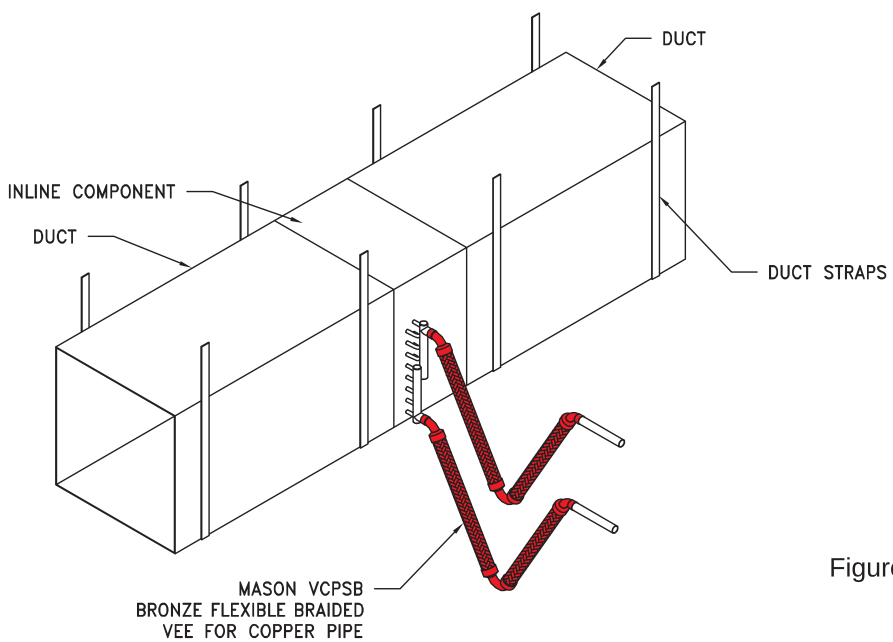


Figure 1

03/2020

The installation of Flexible Braided Vees is also required on inline coils that are seismically braced. Figure 2 shows the installation with Mason SCB/SCBH Seismic Cable Braces attached to a threaded rod and horizontal strut assembly. The struts must be attached to the coil section housing carefully with sheet metal screws.

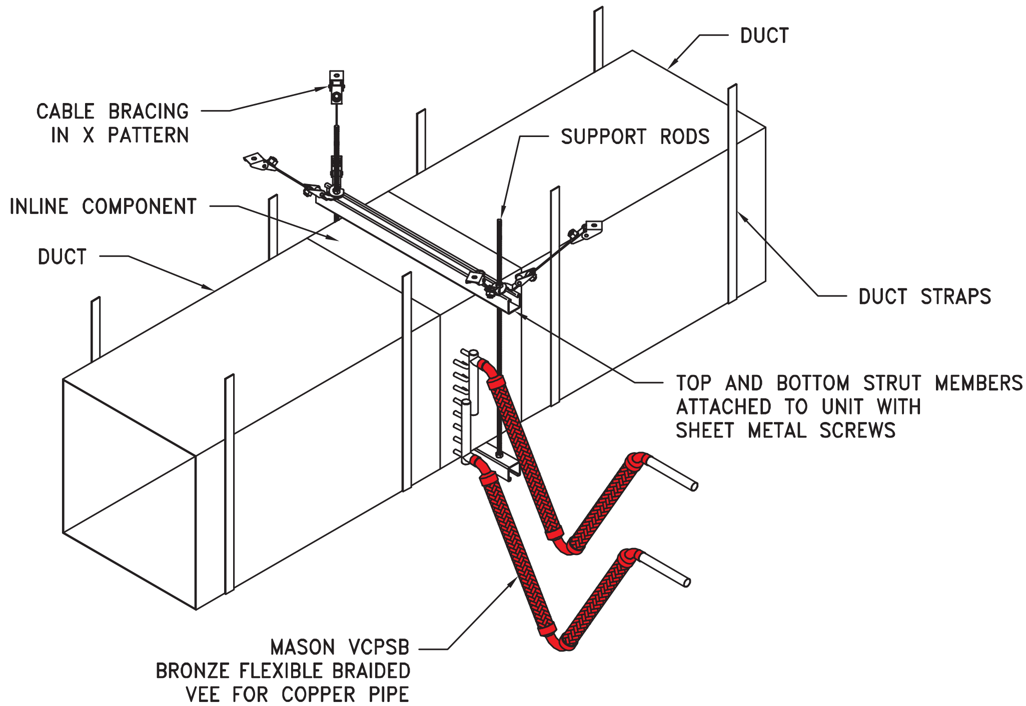


Figure 2

Mason Industries has tested Flexible Braided Vees under a range of operating pressures and has published the forces developed by the vee at 2" and 4" of differential displacement in all directions. See Figure 3. Equipment coil connections should be designed to accept these forces to insure that the piping connection will remain intact in an earthquake.

Refer to page FM85 for more information.

TEST DATA VCPSB Bronze Braided Vee with Copper Sweat Ends

SEISMIC TRAVEL
Force Required to Move Standard Length VCPSB

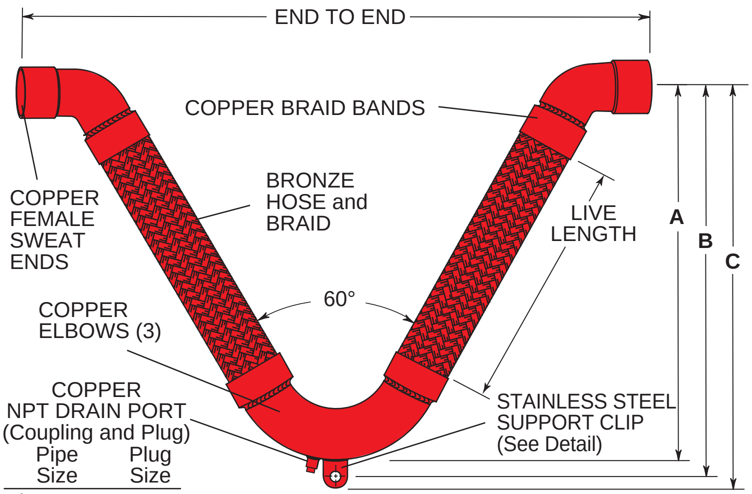
Type & Size	Pressure (psi)	*(kg/cm²)*	2" *50mm* Movement (lbs) *(kg)* Axial		Vertical		Trans-Verse		4" *100mm* Max Seismic Movement (lbs) *(kg)* Axial		Vertical		Trans-Verse	
1/2" *15mm* **VCPSB**	0	*0*	1	*0.5*	1	*0.5*	1	*0.5*	2	*0.9*	1	*0.5*	2	*0.9*
	50	*3.5*	1	*0.5*	1	*0.5*	2	*0.5*	3	*1.4*	1	*0.5*	3	*1.4*
	100	*7.0*	2	*0.5*	1	*0.5*	2	*0.5*	3	*1.4*	1	*0.5*	3	*1.4*
	175	*12.3*	2	*0.5*	1	*0.5*	2	*0.5*	3	*1.4*	2	*0.5*	4	*1.8*
3/4" *20mm* **VCPSB**	0	*0*	2	*0.5*	1	*0.5*	2	*0.9*	3	*1.4*	3	*1.4*	4	*1.8*
	50	*3.5*	2	*0.5*	2	*0.5*	2	*0.9*	4	*1.8*	4	*1.8*	4	*1.8*
	100	*7.0*	2	*0.5*	2	*0.5*	4	*1.8*	5	*2.3*	5	*2.3*	6	*2.7*
	175	*12.3*	3	*1.4*	2	*0.5*	5	*2.3*	6	*2.7*	7	*3.2*	8	*3.6*
1" *25mm* **VCPSB**	0	*0*	2	*0.5*	3	*1.4*	3	*1.4*	3	*1.4*	4	*1.8*	5	*2.3*
	50	*3.5*	2	*0.5*	3	*1.4*	3	*1.4*	3	*1.4*	5	*2.3*	7	*3.2*
	100	*7.0*	2	*0.5*	4	*1.8*	4	*1.8*	4	*1.8*	7	*3.2*	8	*3.6*
	175	*12.3*	3	*1.4*	6	*2.7*	5	*2.3*	7	*3.2*	8	*3.6*	10	*4.5*

Figure 3

Refer to page FM85 for more information on the Mason VCPSB Flexible Braided Vee.

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

VCPSB BRONZE BRAIDED 60VEE HOSE WITH COPPER FEMALE SWEAT ENDS



Pipe Size	Plug Size
1/2" - 1"	None
1 1/4" - 1 1/2"	1/4"
2" - 4"	1/2"

Drain Plugs are often removed to allow attachment of drain hose or steam trap for blow down or drainage.

STAINLESS STEEL SUPPORT CLIP

Pipe Size (in) *(mm)*		SUPPORT CLIP Hole Diameter (in) *(mm)*		Thickness (in) *(mm)*	
1/2	*13*	1/2	*13*	1/8	*3*
3/4	*20*	1/2	*13*	1/8	*3*
1	*25*	1/2	*13*	1/8	*3*
1 1/4	*32*	1/2	*13*	1/8	*3*
1 1/2	*40*	1/2	*13*	1/8	*3*
2	*50*	5/8	*16*	1/8	*3*
2 1/2	*65*	5/8	*16*	1/8	*3*
3	*80*	3/4	*19*	1/8	*3*
4	*100*	3/4	*19*	1/8	*3*

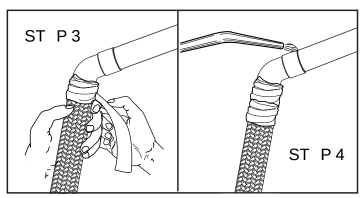
RATED PRESSURES @ ELEVATED TEMPERATURES (psi) *(kg/cm²)*

Hose Size (in) *(mm)*		150°F *66°C* *Factor 0.92*		300°F *149°C* *Factor 0.83*		400°F *204°C* *Factor 0.78*	
1/2	*15*	460	*32*	415	*29*	390	*27*
3/4	*20*	432	*30*	390	*27*	367	*25*
1	*25*	414	*29*	373	*26*	351	*24*
1 1/4	*32*	368	*25*	332	*23*	312	*22*
1 1/2	*40*	308	*21*	278	*19*	261	*18*
2	*50*	216	*15*	195	*13*	183	*13*
2 1/2	*65*	212	*15*	191	*13*	179	*12*
3	*80*	207	*14*	187	*12*	175	*12*
4	*100*	202	*14*	183	*12*	172	*12*

When using VCPSB products in stainless steel water systems, dielectric unions must be used on each end to prevent leakage from galvanic action.

INSTALLATION:

1. Thoroughly clean male and female ends using steel wool and steel brushes.
2. Apply flux.
3. Wrap base of copper fitting on connector and 2" (*50mm*) of the braid with a wet cloth to prevent overheating during soldering.
4. Direct the torch away from the base of the copper fitting and braided section. Avoid contact of the flame with the base of the copper fitting and braid. Heat end of copper fitting for proper flow of silver solder. Silver solder flows at approximately 430°F (*221°C*).
5. Use caution with brazing rod or other higher temperature techniques. Overheating will cause leaks.
6. Remove wet cloth and remove all soldering flux immediately after installation. Flux chlorides will cause premature failure of joint.



RATED MOVEMENTS

±4"(*100mm*) All Directional Seismic Movement
±6"(*150mm*) Guided Thermal Movement Only

Vacuum rating varies with size and application. Consult factory on all vacuum applications.

VCPSB DIMENSIONS AND PRESSURE RATINGS (American Units)

Type	Tubing Size & End to End (in)	Live Length (in)	Corru-gations per foot	A (in)	B (in)	C (in)	Rated Pressure @70°F (psi)
VCPSB	1/2 x 21 1/2	14	73	15	15 7/8	16 3/8	500
VCPSB	3/4 x 21 5/8	15	67	15 3/4	16 1/2	17	470
VCPSB	1 x 24 3/8	16	58	17	17 7/8	18 3/8	450
VCPSB	1 1/4 x 26 3/4	17	55	18 3/8	19 1/8	19 5/8	400
VCPSB	1 1/2 x 30 1/8	19	53	20 5/8	21 3/8	21 7/8	335
VCPSB	2 x 34 3/8	20	51	22 1/2	23 1/2	24 1/8	235
VCPSB	2 1/2 x 40	22	34	25 7/8	26 3/4	27 3/8	230
VCPSB	3 x 45	24	30	28 5/8	29 7/8	30 3/4	225
VCPSB	4 x 53 1/8	26	28	32 3/8	33 5/8	34 1/2	220

VCPSB DIMENSIONS AND PRESSURE RATINGS (Metric Units)

Type	Tubing Size & End to End *(mm)*	Live Length *(mm)*	Corru-gations per meter	A *(mm)*	B *(mm)*	C *(mm)*	Rated Pressure *@21°C* *(kg/cm²)*
VCPSB	*15 x 546*	*356*	*240*	*381*	*403*	*416*	*34*
VCPSB	*20 x 549*	*381*	*220*	*400*	*419*	*432*	*32*
VCPSB	*25 x 594*	*406*	*190*	*432*	*454*	*468*	*31*
VCPSB	*32 x 679*	*432*	*180*	*467*	*486*	*498*	*28*
VCPSB	*40 x 765*	*483*	*174*	*524*	*543*	*556*	*23*
VCPSB	*50 x 873*	*508*	*167*	*572*	*597*	*613*	*16*
VCPSB	*65 x 1016*	*559*	*112*	*657*	*679*	*695*	*16*
VCPSB	*80 x 1143*	*610*	*98*	*727*	*759*	*781*	*15*
VCPSB	*100 x 1349*	*660*	*92*	*822*	*854*	*876*	*15*

End to End Tolerance: minus 1% plus 3%. Minimum Burst is four times the Rated Pressure. Safety factor of 4.
Female end fits over copper tubing, e.g. 1/2 x 21 1/2" (*15 x 546mm*) fits over 1/2" (*15mm*) tubing.

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Mason Flexible Braided Vees - Specification

Flexible Braided Vees shall consist of two braided hoses joined by a 60° Vee fitting at the base and 120° return elbows. Flexible vees for steel pipe shall be manufactured using type 304 stainless steel hose and braid. Raised-face free-floating carbon steel flanges may be used on each end in sizes 2" through 12" (50mm through 300mm) to allow for misalignment of piping flange holes and to allow for 360° rotation during installation. Fixed flanges are not acceptable. Carbon steel grooved ends may be used in sizes 2" through 12" (50mm through 200mm). Welding is not acceptable. Carbon steel threaded male ends may be used in sizes 1/2" through 4" (13mm through 100mm). Flexible vees for copper pipe shall be manufactured using bronze hose and braid with copper sweat ends. Size 4" (100mm) or smaller, with copper sweat ends, may have stainless steel hose and braid for gas service or bronze hose and braid for water service. All flexible braided stainless steel hoses used in the flexible vees shall have close pitch with the following minimum number of corrugations per foot (CPF) of hose length:

Size (in)	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6	8	10	12
Size (mm)	15	20	25	32	40	50	65	80	100	125	150	200	250	300
CPF	92	80	72	67	63	58	48	46	32	29	25	23	21	20

All flexible braided bronze hoses used in the flexible vees shall have close pitch with the following minimum number of corrugations per foot (CPF) of hose length:

Size (in)	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4
Size (mm)	15	20	25	32	40	50	65	80	100
CPF	73	67	58	55	53	51	34	30	28

All flexible braided hoses used in the flexible vees shall have the minimum hose live length (MLL) as follows:

Size (in)	1/2	3/4	1	2-1/2	1-1/2	2	2-1/2	3	4	5	6	8	10	12
MLL (in)	14	15	16	17	19	20	22	24	26	30	33	36	42	48
Size (mm)	15	20	25	32	40	50	65	80	100	125	150	200	250	300
MLL (mm)	350	375	400	425	475	500	550	600	650	750	825	900	1050	1200

Flexible vees shall be capable of plus or minus 4" (100mm) seismic motion in all planes and 6" (150mm) axial piping expansion and contraction. Flexible vees shall have a minimum burst pressure of four times their rated pressure at 70° F (21° C). Forces required to displace flexible vees under operating pressure shall be determined by testing, and certified by a professional engineer. Submittals shall include original test data showing force/displacement, fittings, material, live lengths, number of corrugations per foot and safety factor at pressure ratings. Flexible vees shall be type **VMN, VGWN, VCPSB, or VFL** as manufactured by Mason Industries, Inc.

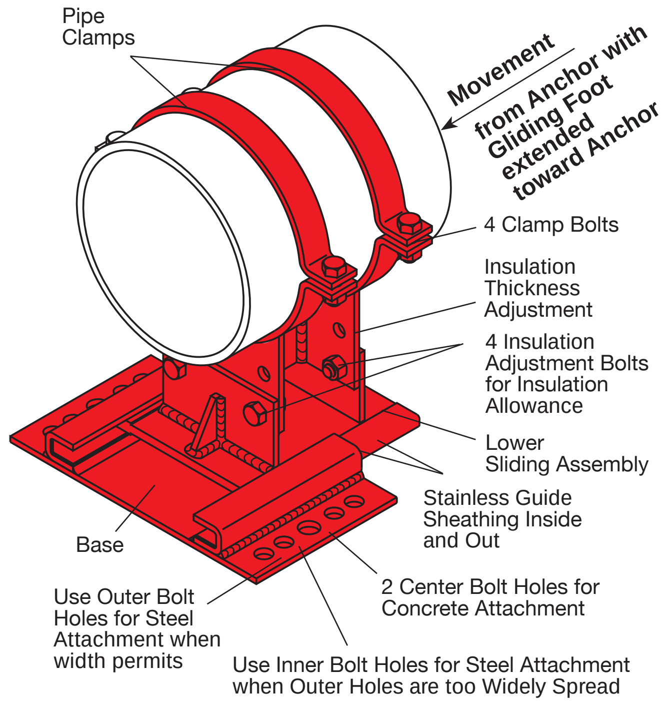
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

MASON ASG ADJUSTABLE SLIDING GUIDES FOR PIPING

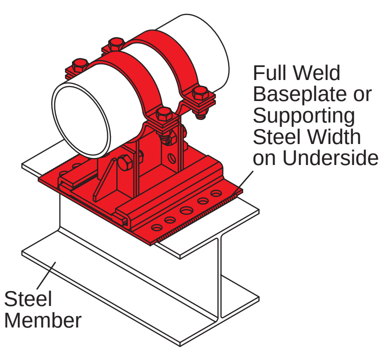
Mason ASG pipe guides have many advantages over standard spider guides including:

1. ASG pipe guides are adjustable to handle different insulation thickness.
2. ASG pipe guides are fabricated with stainless steel sliding surfaces to reduce friction and avoid corrosion issues that can lead to failure.
3. ASG pipe guides are supplied with multiple holes to facilitate easy bolting to different steel beams and concrete walls and slabs.
4. ASG pipe guides have published load ratings and can be installed in various positions including base mounted, overhead, or on walls.

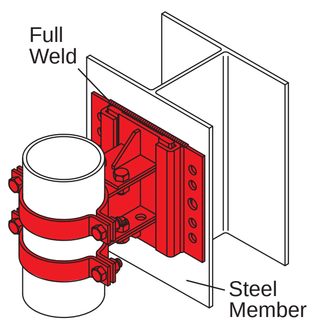
ASG ASSEMBLY



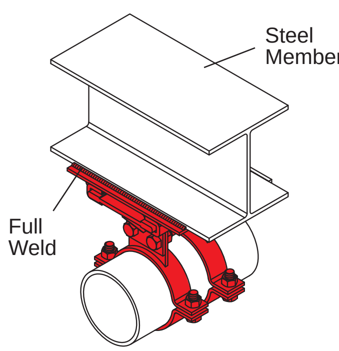
ASG WELDED POSITIONS and WELD LOCATIONS



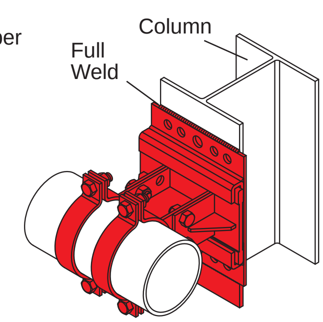
On Top of Beam or Plate



Vertical



ASG Overhead



Column

Refer to page FM88 for ASG dimensions and details.
Refer to FM90 for the ASG specification.

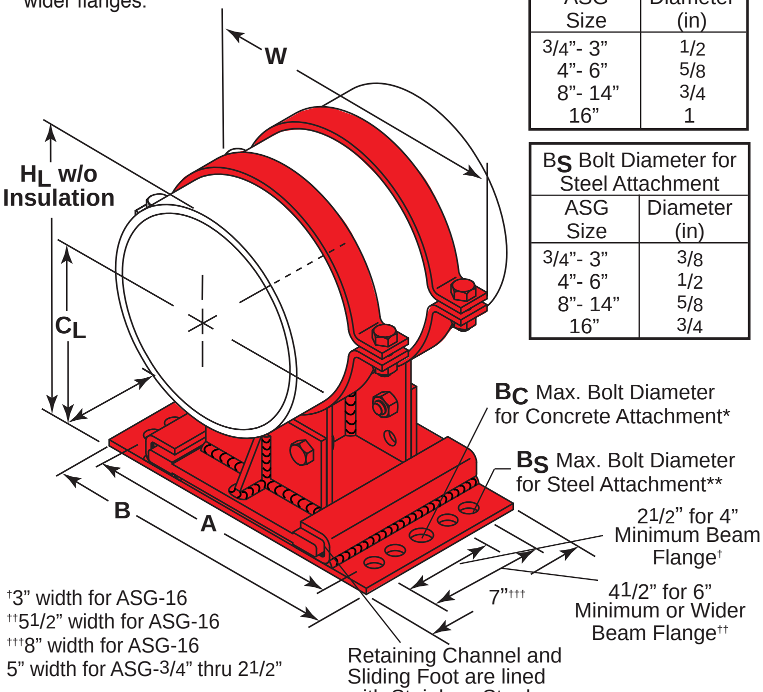
ASG ADJUSTABLE PIPE SLIDING GUIDE (American Units)

*Use two bolts for concrete attachment.
**Use four bolts for steel attachment. Use inner holes for narrow steel flange widths or outer holes for wider flanges.

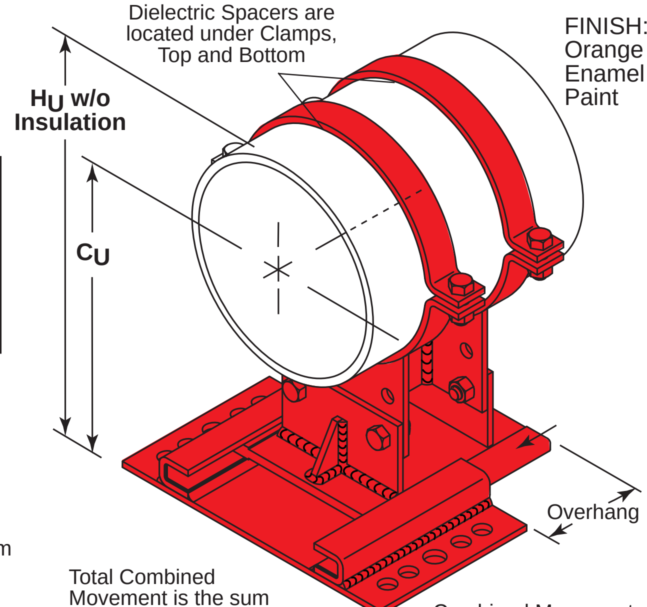
B_C Bolt Diameter for Concrete Attachment	
ASG Size	Diameter (in)
3/4"- 3"	1/2
4"- 6"	5/8
8"- 14"	3/4
16"	1

B_S Bolt Diameter for Steel Attachment	
ASG Size	Diameter (in)
3/4"- 3"	3/8
4"- 6"	1/2
8"- 14"	5/8
16"	3/4

All Material is Carbon Steel except where noted.



†3" width for ASG-16
††5 1/2" width for ASG-16
†††8" width for ASG-16
5" width for ASG-3/4" thru 2 1/2"



Total Combined Movement is the sum of Expansion and Contraction. e.g., 6" Movement may comprise 4" Expansion and 2" Contraction.

Combined Movement
Sizes 3/4"- 2 1/2" – 4"
Sizes 3" thru 16" – 6"

ASG LOWER POSITION C_L & H_L
Sizes 3/4" to 16" 2 1/2" Insulation Max.

Pipe Size (in)	℄ Pipe Height C_L (in)	Overall Height without Insulation H_L (in)	Maximum Insulation Thickness Lower Position (in)
3/4	3 3/4	4 1/2	2
1	4 1/8	5	2
1 1/4	4 3/8	5 3/8	2
1 1/2	4 1/2	5 5/8	2
2	4 3/4	6 1/8	2
2 1/2	5	6 5/8	2
3	5 3/8	7 1/4	2 1/2
4	6 5/8	9	2 1/2
5	7 1/8	10 1/16	2 1/2
6	7 5/8	11 1/8	2 1/2
8	9	13 1/2	2 1/2
10	10 3/4	16 1/4	2 1/2
12	11 7/8	18 3/4	2 1/2
14	12 5/8	20	2 1/2
16	13 7/8	22 1/4	2 1/2

A (in)	B (in)	W (in)
5 1/2	6 3/4	3 1/4
6	7 1/4	3 5/8
6	7 1/4	4
6	7 1/4	4 1/4
6	7 1/4	4 3/4
6	7 1/4	5 1/4
6 1/2	7 3/4	6
7 1/4	8 1/2	7 1/4
8	9 1/4	8 1/2
8 3/4	10	9 1/2
10 1/2	12 1/4	11 3/4
11 1/2	13 1/4	14 5/8
13	14 3/4	16 3/4
16	17 3/4	18 1/8
18 1/2	20 1/2	20 1/2

ASG UPPER POSITION C_U & H_U
Sizes 1" to 16" for 3" to 4" Insulation
Note: 3/4" size cannot be raised

Pipe Size (in)	℄ Pipe Height C_U (in)	Overall Height without Insulation H_U (in)	Maximum Insulation Thickness Upper Position (in)
3/4	3 3/4	4 1/2	2
1	5 1/8	6	3
1 1/4	5 3/8	6 3/8	3
1 1/2	5 1/2	6 5/8	3
2	5 3/4	7 1/2	3
2 1/2	6	7 5/8	3
3	6 3/8	8 1/4	3
4	8 1/8	10 1/2	4
5	8 5/8	11 9/16	4
6	9 1/8	12 5/8	4
8	10 1/2	15	4
10	12 1/4	17 3/4	4
12	13 3/8	20 1/4	4
14	14 1/8	21 1/2	4
16	15 3/8	23 3/4	4

ASG LOAD RATINGS

ASG Pipe Size (in)	Rated Base Mounted Pipe Load (lbs)	Rated Hanging Pipe Load (lbs)	Rated Transverse Pipe Load (lbs)
3/4	1200	1200	750
1	1200	1200	750
1 1/4	1200	1200	750
1 1/2	1200	1200	750
2	1200	1200	750
2 1/2	1200	1200	750
3	1850	1700	1000
4	1900	1800	1050
5	1925	1830	1100
6	1950	1950	1300
8	3050	2775	1850
10	5550	4350	2750
12	5600	5600	3950
14	7000	7000	5500
16	8800	8800	7300

Copper pipe will require Dielectric Spacers supplied by Mason. Safety Factor of 5.

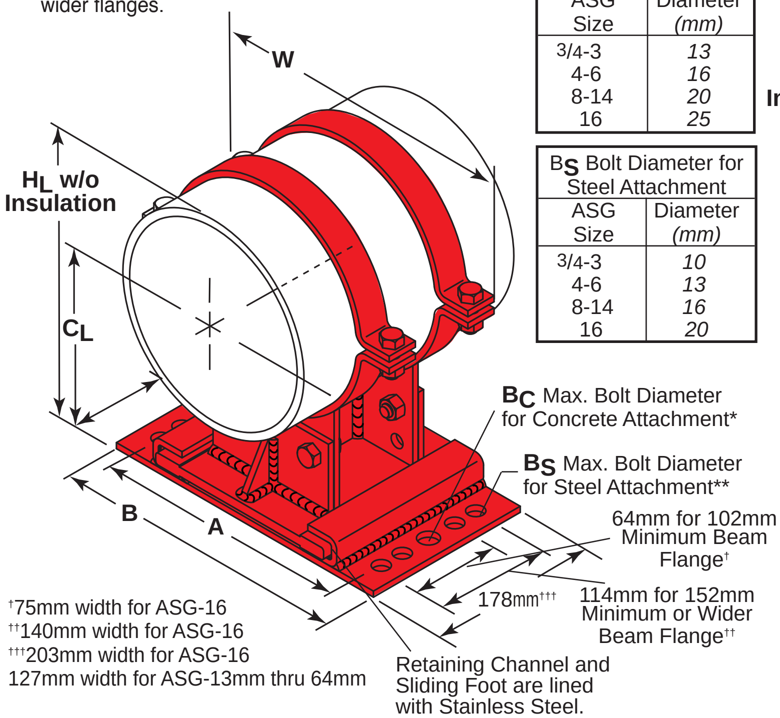
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

ASG ADJUSTABLE PIPE SLIDING GUIDE (Metric Units)

*Use two bolts for concrete attachment.
**Use four bolts for steel attachment. Use inner holes for narrow steel flange widths or outer holes for wider flanges.

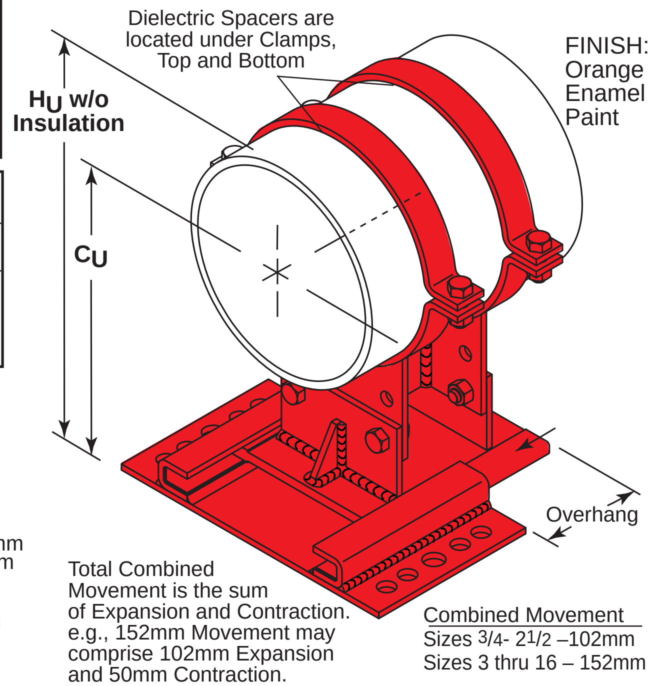
B_C Bolt Diameter for Concrete Attachment	
ASG Size	Diameter (mm)
3/4-3	13
4-6	16
8-14	20
16	25

B_S Bolt Diameter for Steel Attachment	
ASG Size	Diameter (mm)
3/4-3	10
4-6	13
8-14	16
16	20



†75mm width for ASG-16
††140mm width for ASG-16
†††203mm width for ASG-16
127mm width for ASG-13mm thru 64mm

All Material is Carbon Steel except where noted.



ASG LOWER POSITION C_L & H_L
Sizes 3/4 to 16 64mm Insulation Max.

Type & Size	Pipe Size (mm)	℄ Pipe Height C_L (mm)	Overall Height without Insulation H_L (mm)	Maximum Insulation Thickness Lower Position (mm)
ASG-3/4	20	95	114	51
ASG-1	25	105	127	51
ASG-11/4	32	111	137	51
ASG-11/2	40	114	143	51
ASG-2	50	121	156	51
ASG-21/2	65	127	168	51
ASG-3	80	137	184	64
ASG-4	100	168	229	64
ASG-5	125	181	255	64
ASG-6	150	194	283	64
ASG-8	200	229	343	64
ASG-10	250	273	413	64
ASG-12	300	302	476	64
ASG-14	350	321	508	64
ASG-16	400	352	565	64

A (mm)	B (mm)	W (mm)
140	172	83
152	184	92
152	184	102
152	184	108
152	184	121
152	184	133
164	196	152
184	216	184
204	235	216
222	254	240
267	311	298
292	337	372
330	375	426
406	451	460
470	521	521

ASG UPPER POSITION C_U & H_U
Sizes 1 to 16 76 to 102mm Insulation
Note: ASG-3/4 cannot be raised

℄ Pipe Height C_U (mm)	Overall Height without Insulation H_U (mm)	Maximum Insulation Thickness Upper Position (mm)
95	114	51
130	152	76
137	162	76
140	168	76
146	181	76
152	194	76
162	210	76
206	267	102
219	294	102
232	321	102
267	381	102
311	451	102
340	514	102
359	546	102
391	603	102

ASG LOAD RATINGS

Rated Base Mounted Pipe Load (kgs)	Rated Hanging Pipe Load (kgs)	Rated Transverse Pipe Load (kgs)
544	544	340
544	544	340
544	544	340
544	544	340
544	544	340
544	544	340
839	771	454
862	816	476
873	830	499
885	885	590
1383	1259	839
2517	1973	1247
2540	2540	1792
3175	3175	2495
3992	3992	3311

Copper pipe will require Dielectric Spacers supplied by Mason. Safety Factor of 5.

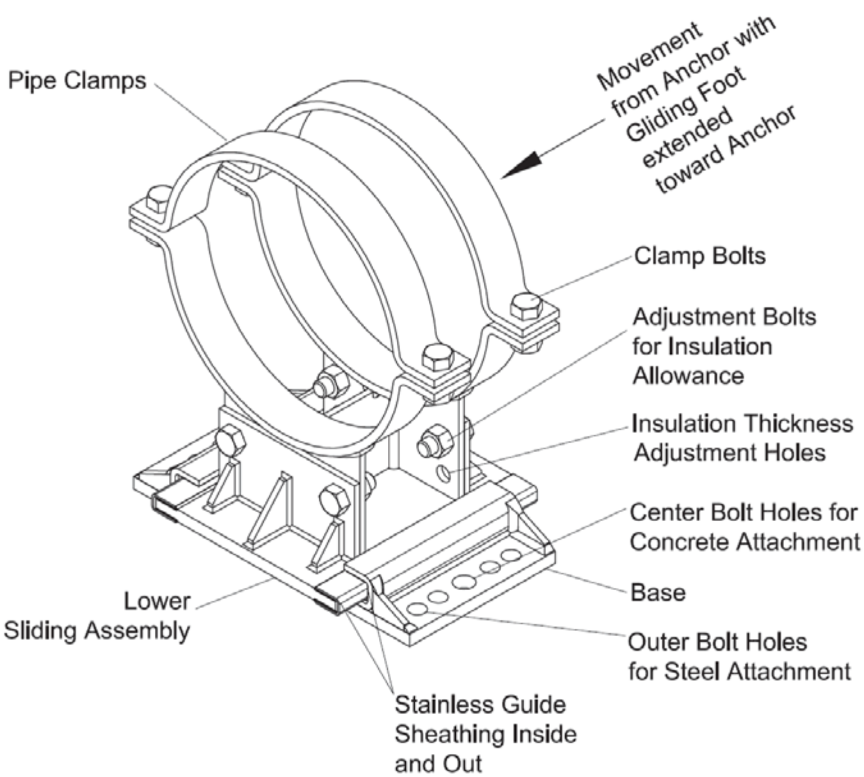
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

Mason Adjustable Sliding Guide Specification

Pipe guides shall be manufactured with stainless steel wrapping the carbon steel sliding foot where it passes through horizontal U guides similarly lined to prevent corrosion. Sliding guides must allow 4” (100mm) axial movements for pipe sizes 3/4“ through 2-1/2” (19 through 63mm), and 6” (150mm) axial movement for pipe sizes 3” through 12” (75 through 300mm). Should motion exceed these numbers, guides must be built to order.

Height must be adjustable to accept different thicknesses of insulation up to 4” (100mm). The base plate shall have multiple holes for bolting to beam flanges or flat surfaces. Bases may be welded into position in lieu of bolting.

Load ratings shall be determined by testing, and certified by a professional engineer. Load ratings shall include both pipe support and guide loads for all guide orientations including bottom mounted, overhead, side mounted or riser positioning. Sliding Guide shall be type ASG as manufactured by Mason Industries, Inc.



03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

PIPING RISER SUPPORTS AND SEISMIC RESTRAINT

Piping risers for most HVAC systems should be designed with welded steel or soldered copper pipe. If standard grooved pipe couplings are used they must be pre-extended during construction to avoid excessive expansion of riser when pressurized. This is a difficult process, so rigid type grooved couplings should be considered. Riser clamps should be welded to steel pipe. Riser clamps can be clamped to copper risers but a split coupling should be soldered above the clamp to eliminate slippage.

The water column load can be carried up the riser and shared by multiple supports to distribute piping loads out to many floors. Since most risers undergo significant thermal change during operation flexible SLF spring supports or 30N hangers must be used. In general springs with higher deflections are used at locations with higher pipe growth to minimize the change in floor loads. Branch piping and horizontal mains must be flexibly supported and designed to allow riser motion without excessive stress. Pipe expansion/contraction will occur around a point of zero motion as defined by support stiffness considerations (including riser supports, branch piping supports and main piping supports).

Risers may be free-floating or anchored. Mason ADA anchors can be used but they must be designed for a theoretical no support load and to resist upward motion when water is drained from riser. Mason VSG guides must be pre-extended to design clearances and held with a shear pin to facilitate proper installation. VSG guides also allows angular offset of the riser to compensate for floor drift in an earthquake. Guides support no dead load during installation or normal operation but will act as emergency support in a catastrophic situation.

Riser installation details are included on pages FM92-95.

Mason 2” deflection SLF spring mounts are included on FM96. These are one example of the many spring sizes and rated deflection that can be used as riser supports.

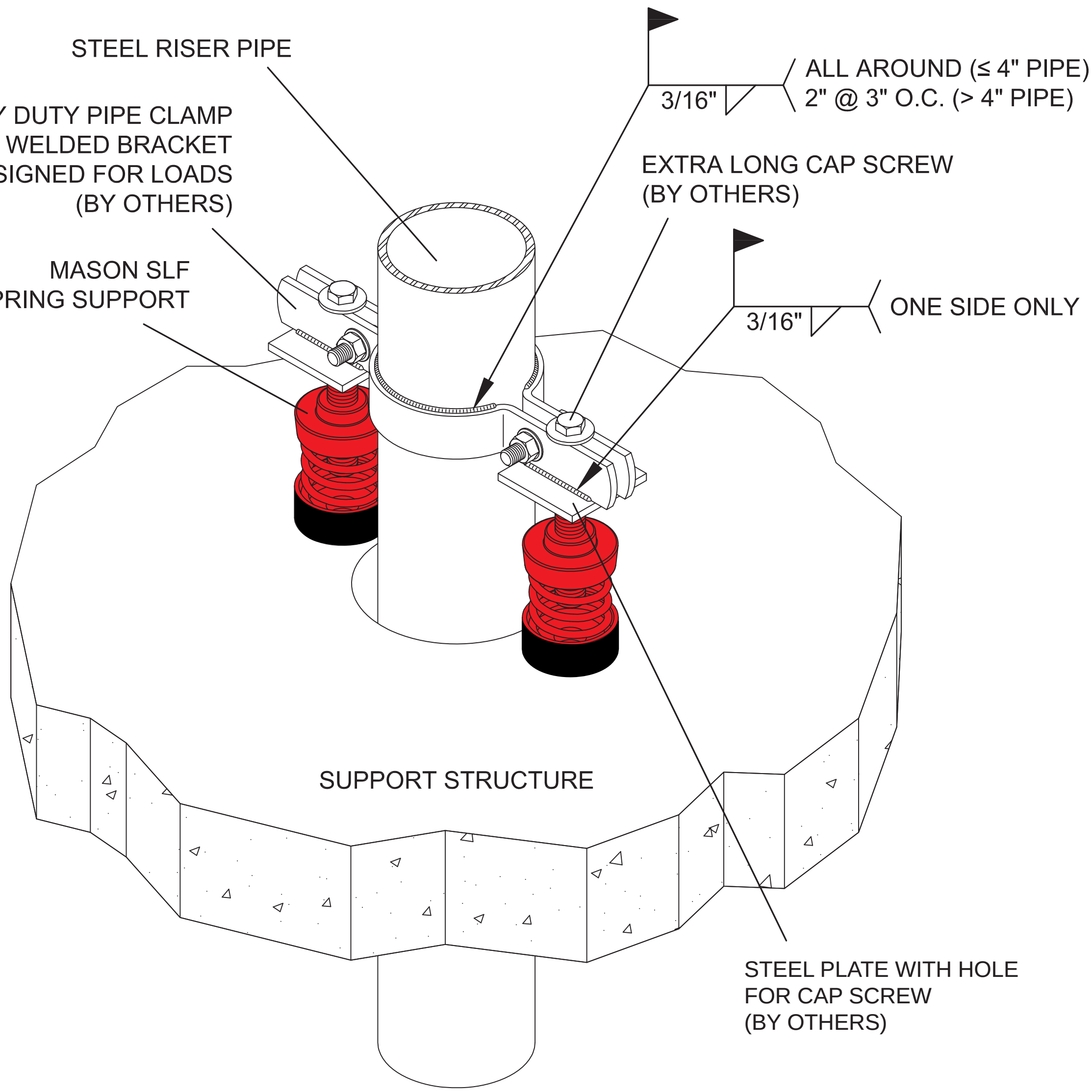
Mason 2” deflection 30N Spring Hanger an included on FM97.

Mason VSG Vertical Sliding Guide product information is included on page FM98.

Mason ADA All Directional Anchor product information is included on page FM99.

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

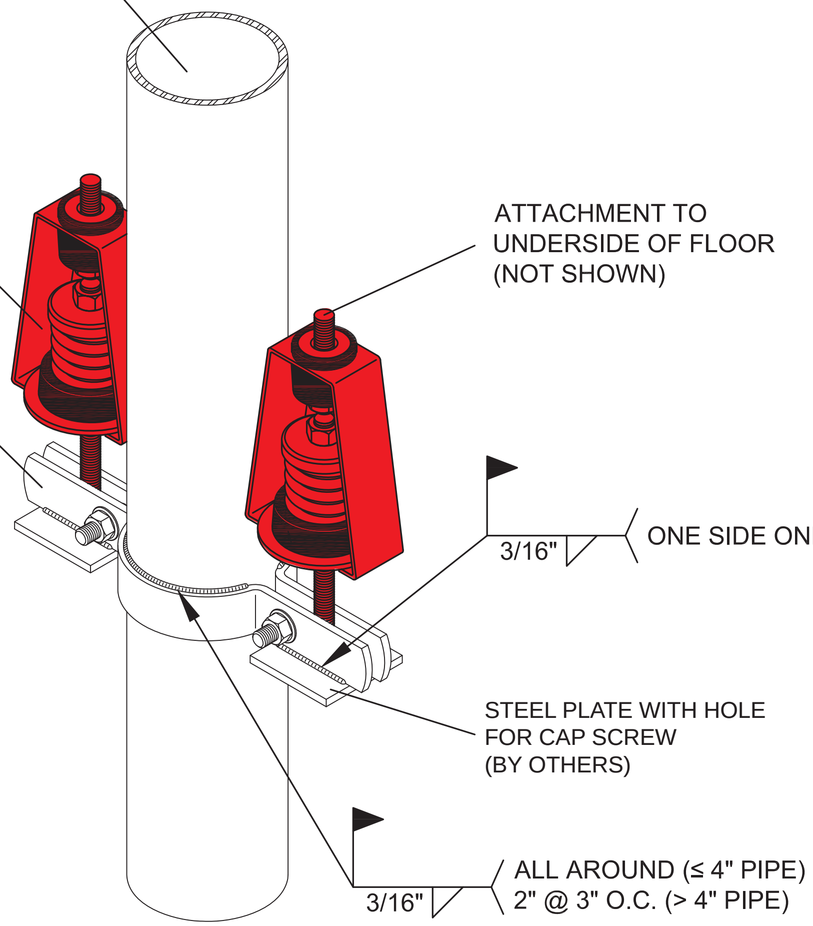
SLF Spring Isolators

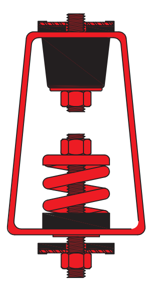


03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

RW30N Spring Isolation Hangers

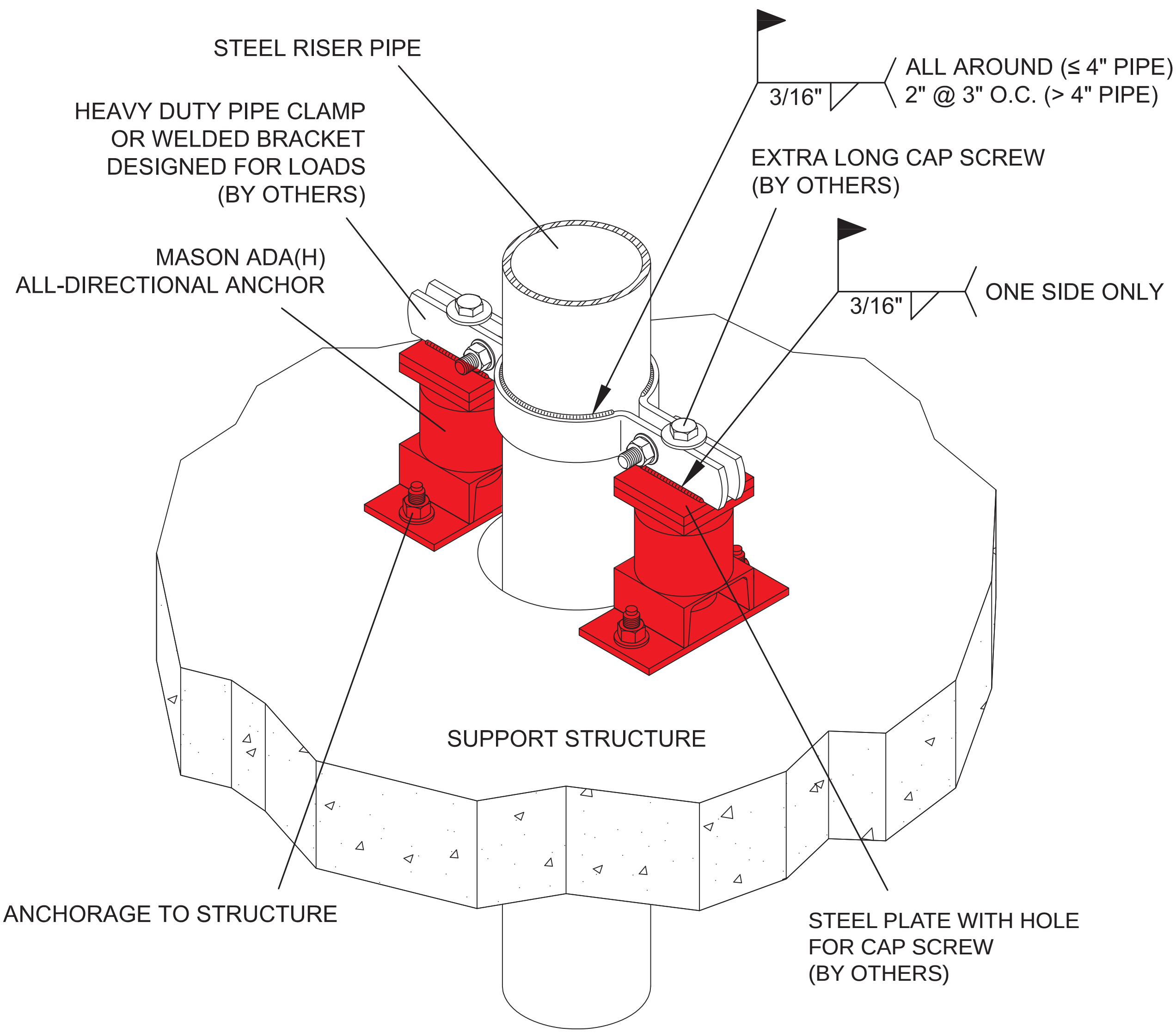




DETAIL: MASON RW30N
WITH REBOUND WASHERS
TOP AND BOTTOM

03/2020

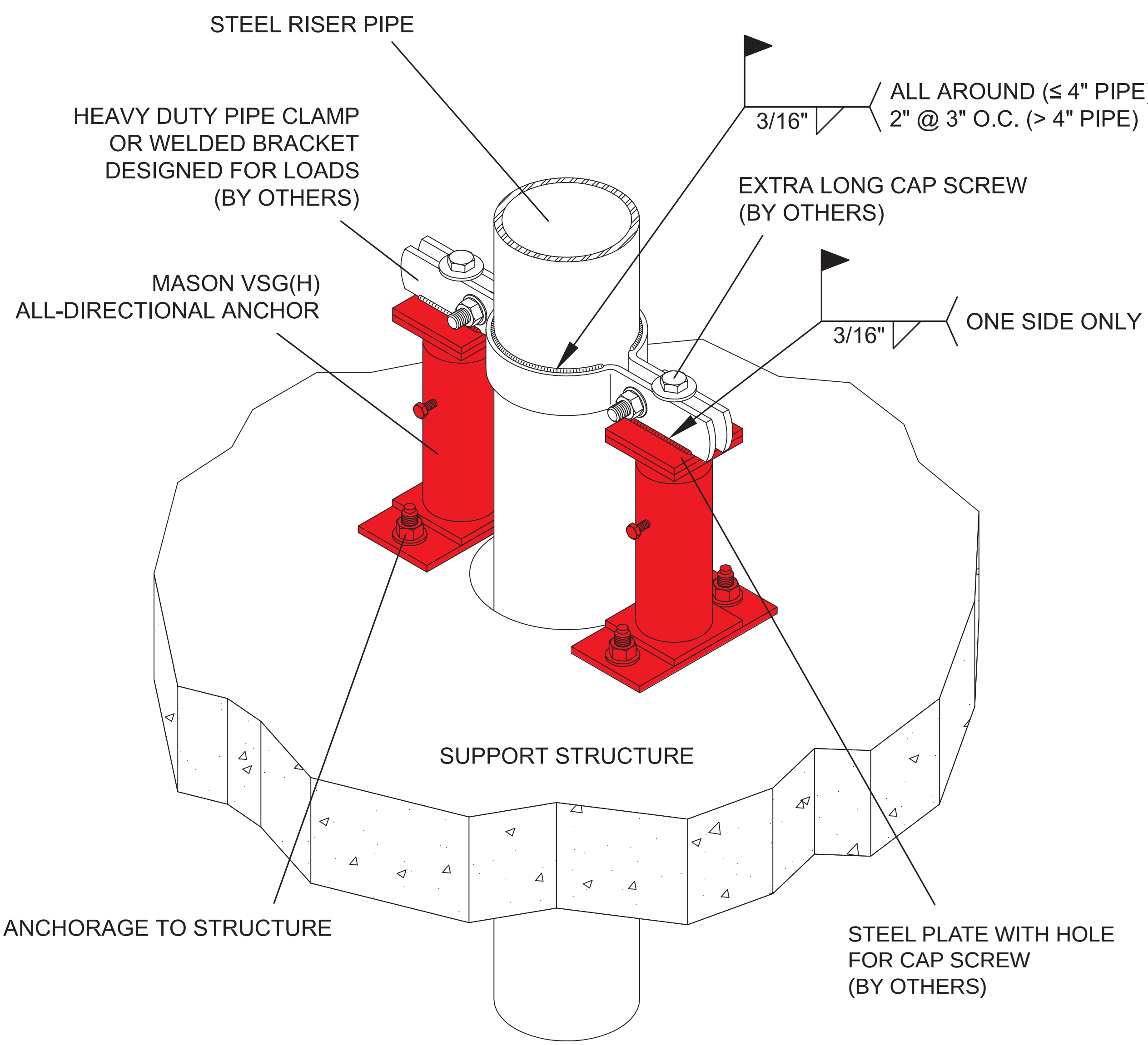
ADA(H) All Directional Anchor for Pipe Clamps or Guides



03/2020

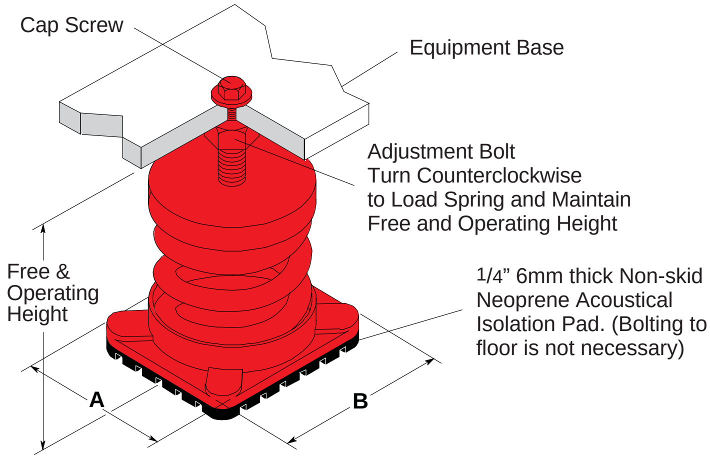
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

VSG(H) Vertical Sliding Pipe Guides



03/2020

SLF 2” 51mm DEFLECTION 100 SERIES SPRING MOUNTS



Cap Screw secures Height Saving Bracket (or Equipment Base) to Tapped Concentric Hole in Mounting Adjustment Bolt.

All springs have additional travel to solid equal to 50% of the rated deflection.

Solid Spring Height = Free Height minus 1.5 times Rated Deflection.

OD/OH = Ration of Spring Outside Diameter to Operating Height =0.82 - 1.15

Holders for mounts SLF-101 thru SLF-117 are castings. Holders for mounts SLF-118 are steel.

Type SLF Load Ratings and Dimensions

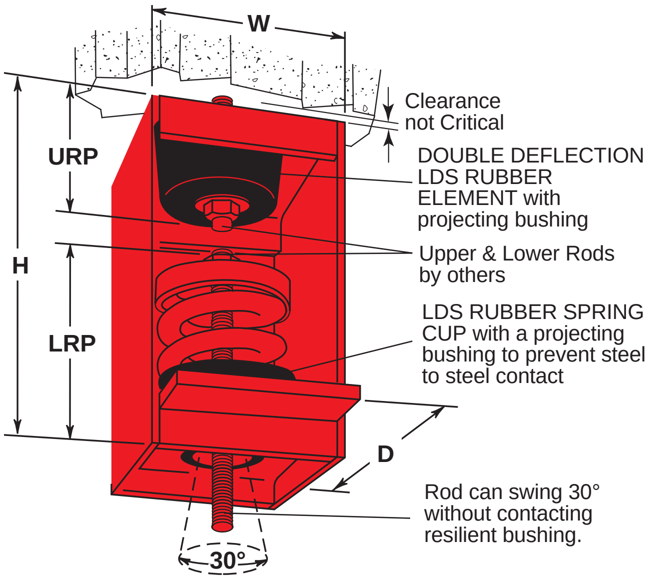
Type and Size	Rated Capacity (lbs)	*(kg)*	Rated Defl. (in)	*(mm)*	Spring Constant (lbs/in)	*(kg/mm)*	Spring Color/ Stripe	Spring Only: Spring OD		Spring Only: Free Height		Free & Oper Ht		A		B		Adjust-ment Bolt AB	Locking Cap Screw CS
SLF-101	125	*57*	2.50	*64*	50	*0.89*	Purple	3 3/4	*95*	5 3/4	*146*								
SLF-102	200	*91*	2.50	*64*	80	*1.42*	Brown	3 3/4	*95*	5 3/4	*146*								
SLF-103	310	*141*	2.50	*64*	125	*2.20*	Pink	3 3/4	*95*	5 3/4	*146*								
SLF-104	500	*227*	2.50	*64*	200	*3.55*	Green	3 3/4	*95*	5 3/4	*146*	7 1/4	*184*	4 1/4	*108*	4 3/4	*120*	7/8x5 3/4	1/2x1 1/4
SLF-105	740	*336*	2.40	*61*	310	*5.51*	Red	3 3/4	*95*	5 3/4	*146*							x 146	x 34
SLF-106	1050	*476*	2.10	*53*	500	*8.98*	White	3 3/4	*95*	5 7/8	*149*								
SLF-107	1400	*635*	2.00	*51*	700	*12.45*	Blue	3 3/4	*95*	5 7/8	*149*								
SLF-108	1660	*753*	2.05	*52*	810	*14.48*	Silver	4 1/2	*114*	6 3/4	*171*	8 3/8	*213*	5	*127*	5 1/4	*133*		
SLF-109	2250	*1021*	2.00	*51*	1125	*20.02*	Orange	4 1/2	*114*	7 1/2	*191*	9	*229*	5	*127*	5 1/4	*133*	7/8x5 3/4	1/2x1 1/4
SLF-110	3000	*1361*	2.00	*51*	1500	*26.69*	Gray	5	*127*	7 1/2	*191*	9	*229*	5 1/2	*140*	6 1/2	*165*	x 146	x 34
SLF-111	4000	*1814*	2.00	*51*	2000	*35.57*	Tan	5	*127*	7 1/2	*191*	9	*229*	5 1/2	*140*	6 1/2	*165*		
SLF-112	5300	*2404*	2.00	*51*	2665	*47.14*	Black	5 1/2	*140*	8 1/2	*216*	10 1/8	*257*	6	*152*	7	*178*		
SLF-113	7100	*3221*	2.00	*51*	3550	*63.16*	Yellow	6	*152*	8 3/4	*222*	10 1/2	*267*	6 5/8	*168*	7 1/2	*191*	1 x 6	1/2x1 1/4
SLF-114	9300	*4218*	2.00	*51*	4650	*82.71*	Blue/Orng	6 3/4	*171*	10	*254*	12	*305*	7 1/2	*191*	7 1/2	*191*	x 152	x 34
SLF-115	12600	*5715*	2.00	*51*	6300	*112.06*	Blue/Red	6 3/4	*171*	10	*254*	12	*305*	7 1/2	*191*	7 1/2	*191*	1 1/4x6	5/8x1 1/2x38
SLF-116	16800	*7620*	2.00	*51*	8400	*149.41*	Blue/White	7 3/4	*197*	10 1/8	*257*	13	*330*	8 1/2	*216*	8 1/2	*216*	1 1/2 x 8	3/4x2
SLF-117	28500	*12927*	2.55	*65*	11175	*198.88*	Blue/Silver	8 3/4	*222*	13 1/8	*333*	16	*406*	9 1/2	*241*	9 1/2	*241*	x 203	x 51
SLF-118	40000	*18144*	2.10	*53*	19000	*342.34*	Blue/Gray	9 3/8	*238*	13 1/8	*333*	16	*406*	10 1/2	*267*	10 1/2	*267*	2 x 8	1x2 1/2 x64

03/2020

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

30N 2” 51mm DEFLECTION 100 SERIES SPRING HANGERS

NOTE: Illustration shows typical construction.
Components vary depending on capacity.



TYPE 30N RATINGS

Type and Size	Rated Capacity (lbs)	Rated Capacity *(kg)*	Rated Deflection† (in)	Rated Deflection† *(mm)*	Spring Constant†† (lbs/in)	Spring Constant†† *(kg/mm)*	Avg LDS Deflection (in)	Avg LDS Deflection *(mm)*	Spring Color/ Stripe
30N-101	125	*57*	2.90	*74*	50	*0.77*			Purple
30N-102	200	*91*	2.90	*74*	80	*1.23*			Brown
30N-103	310	*141*	2.90	*74*	125	*1.91*			Pink
30N-104	500	*227*	2.90	*74*	200	*3.07*			Green
30N-105	740	*336*	2.80	*71*	310	*4.73*			Red
30N-106	1050	*476*	2.50	*64*	500	*7.44*			White
30N-107	1400	*635*	2.40	*61*	700	*10.41*			Blue
30N-108	1660	*753*	2.45	*62*	810	*12.15*	0.4	*10*	Silver
30N-109	2250	*1021*	2.40	*61*	1125	*16.74*			Orange
30N-110	3000	*1361*	2.40	*61*	1500	*22.31*			Gray
30N-111	4000	*1814*	2.40	*61*	2000	*29.74*			Tan
30N-112	5300	*2404*	2.40	*61*	2665	*39.41*			Black
30N-113	7100	*3221*	2.40	*61*	3550	*52.80*			Yellow
30N-114	9300	*4218*	2.40	*61*	4650	*69.15*			Blue/Or
30N-115	12600	*5715*	2.40	*61*	6300	*93.69*			Blue/Rd

† includes double deflection LDS Rubber element.
††applies to spring only.

TYPE 30N DIMENSIONS

Size Range	D – Depth (in)	D – Depth *(mm)*	H – Height (in)	H – Height *(mm)*	W – Width (in)	W – Width *(mm)*	LRP (in)	LRP *(mm)*	URP (in)	URP *(mm)*	MRD (in)	MRD *(mm)*	SRD (in)	SRD *(mm)*
30N-101	5	*127*	13 1/2	*343*	6	*152*	7 1/2	*191*	3 1/4	*83*	7/8	*22*	5/8	*16*
30N-102	5	*127*	13 1/2	*343*	6	*152*	7 1/2	*191*	3 1/4	*83*	7/8	*22*	5/8	*16*
30N-103	5	*127*	13 1/2	*343*	6	*152*	7 1/2	*191*	3 1/4	*83*	7/8	*22*	5/8	*16*
30N-104	5	*127*	13 1/2	*343*	6	*152*	7 1/2	*191*	3 1/4	*83*	7/8	*22*	5/8	*16*
30N-105	5	*127*	13 1/2	*343*	6	*152*	7 1/2	*191*	3 1/4	*83*	7/8	*22*	5/8	*16*
30N-106	5	*127*	13 1/2	*343*	6	*152*	7 1/2	*191*	3 1/4	*83*	7/8	*22*	5/8	*16*
30N-107	5	*127*	13 1/2	*343*	6	*152*	7 1/2	*191*	3 1/4	*83*	7/8	*22*	5/8	*16*
30N-108	6	*152*	15 3/8	*391*	7 1/4	*184*	11	*279*	3 1/4	*83*	7/8	*22*	5/8	*16*
30N-109	6	*152*	15 3/8	*391*	7 1/4	*184*	11	*279*	3 1/4	*83*	7/8	*22*	5/8	*16*
30N-110	6	*152*	16	*406*	7 1/4	*184*	11 1/2	*292*	3 1/4	*83*	7/8	*22*	3/4	*19*
30N-111	6	*152*	16	*406*	7 1/4	*184*	11 1/2	*292*	3 1/4	*83*	7/8	*22*	3/4	*19*
30N-112	7	*178*	17	*432*	9 1/4	*235*	12 1/4	*311*	3 1/4	*83*	1 1/8	*29*	7/8	*22*
30N-113	7	*178*	17	*432*	9 1/4	*235*	12 1/4	*311*	3 1/4	*83*	1 1/8	*29*	7/8	*22*
30N-114	8	*203*	22	*559*	10	*254*	15 1/2	*394*	6 1/2	*165*	1 1/8	*29*	1	*25*
30N-115	8	*203*	22	*559*	10	*254*	15 1/2	*394*	6 1/2	*165*	1 1/8	*29*	1	*25*

LDS stands for **L**ow **D**ynamic **S**tiffness AASHTO Bridge Bearing Natural Rubber to minimize noise and vibration transmission. Maximum Dynamic Stiffness is 1.4.

LRP - Lower Rod Penetration
URP - Upper Rod Penetration
MRD - Maximum Rod Diameter
SRD - Minimum Rod Diameter (to maintain spring stability)

All springs have additional travel to solid equal to 50% of the Rated Deflection. Hanger elements have straight line deflection curves.

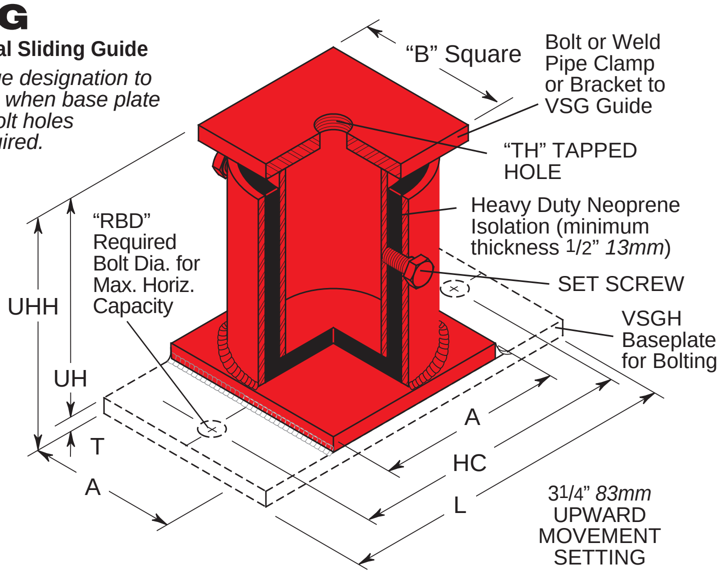
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

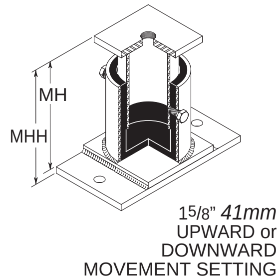
VSG VERTICAL SLIDING PIPE GUIDES

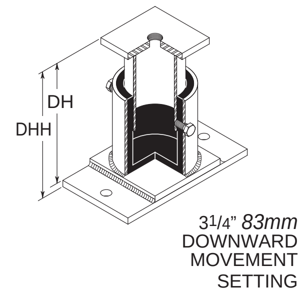
VSG

Vertical Sliding Guide

Change designation to VSGH when base plate with bolt holes is required.







Each pair of VSG guides provides high frequency noise and vibration isolation for those locations where movement must be guided in the axial direction.

Standard VSG Guides can be set to accommodate:

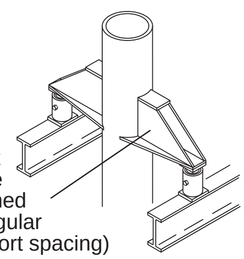
a) 0 Upward Movement and 3 1/4" *83mm* Downward Movement.
b) 3 1/4" *83mm* Upward Movement and 0 Downward Movement.
c) 1 5/8" *41mm* Upward or Downward Movement.
d) Special settings as required and certified.

Guides are always used in pairs.

When pairs of VSG Guides are used as shown in the illustrations below right, radial motion is controlled while axial motion is guided.

TYPE VSG and VSGH RATINGS

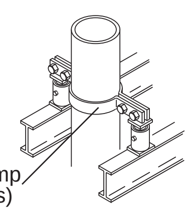
Type	Size	Horizontal Capacity per Pair (lbs)	(*kg*)	Possible Horizontal Deflection (in)	(*mm*)	For use with Pipe Sizes (in) (*mm*)
VSG- VSGH-	75	1,000	*453*	0.1	*2.5*	thru 5 *125*
	200	8,000	*3629*	0.1	*2.5*	6 *150* thru 12 *300*
	350	11,300	*5126*	0.1	*2.5*	14 *350* thru 24 *600*



Mason Bracket Welded to Pipe (custom designed for wide or irregular structural support spacing)

TYPE VSG and VSGH DIMENSIONS (inches and mm)

Type	Size	A	B	L	T	HC	RBD	TH	3 1/4" *83mm* Downward Movement DH	DHH	3 1/4" *83mm* Upward Movement UH	UHH	1 5/8" *41mm* Up or Down Movement MH	MHH
VSG- VSGH-	75	3	3	6 1/4	1/4	5	3/8	1/2-13UNC	10 1/4	10 1/2	7	7 1/4	8 5/8	8 7/8
		76	*76*	*159*	*6*	*127*	*10*		*260*	*267*	*178*	*184*	*219*	*225*
	200	4 1/2	4	9 3/4	3/8	8	5/8	7/8-9UNC	10 1/2	10 7/8	7 1/4	7 5/8	8 7/8	9 1/4
		114	*102*	*248*	*6*	*203*	*16*		*267*	*276*	*184*	*194*	*225*	*235*
	350	6	5	11	1/2	9	3/4	1-8UNC	10 3/4	11 1/4	7 1/2	8	9 1/8	9 5/8
		152	*127*	*280*	*13*	*229*	*19*		*273*	*286*	*191*	*203*	*232*	*244*



Pipe Clamp (by others) Welded to Pipe

03/2020

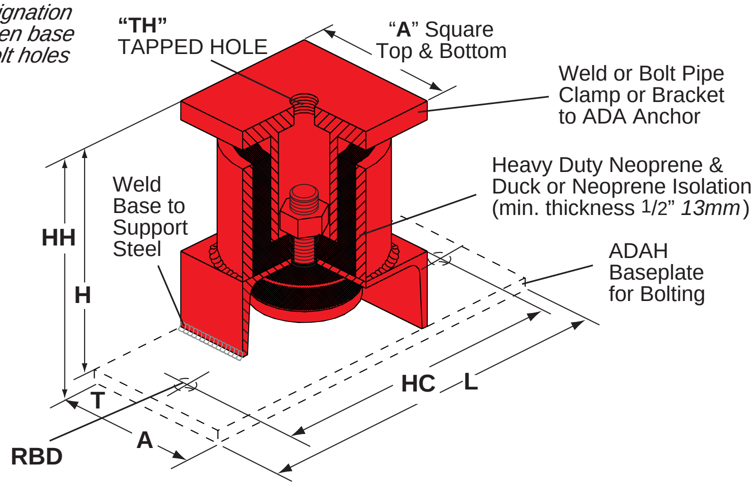
MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

ADA(H) ALL DIRECTIONAL ANCHORS FOR PIPE CLAMPS OR GUIDES

ADA

All Directional Anchors

Change designation to ADAH when base plate with bolt holes is required.



TYPE ADA and ADAH RATINGS

Type	Size	Anchoring Capacity per Pair (lbs)	*(kg)*	Rated Defl (in)	*(mm)*
ADA-	75	1,000	*453*	0.1	*2.5*
	200	6,000	*2722*	0.1	*2.5*
	350	24,000	*10886*	0.1	*2.5*
ADAH-	600	60,000	*27216*	0.1	*2.5*
	800	100,000	*45359*	0.1	*2.5*

Each pair of ADA(H) all directional anchors provides high frequency noise and vibration isolation for those locations where movement must be controlled.

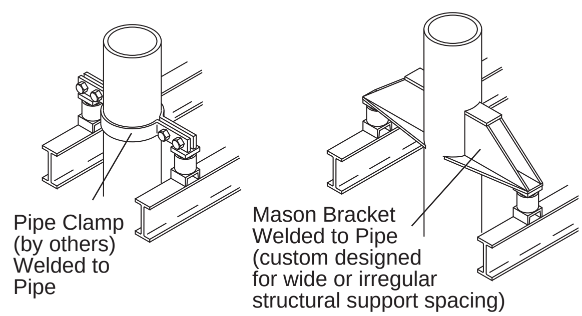
When the anchors are attached to piping as shown in the illustrations below, all expansion will be directed from this point.

Anchors are always used in pairs.

TYPE ADA and ADAH DIMENSIONS (inches and mm)

RBD-Required Bolt Dia. for Max. Loading

Type	Size	A	H	L	T	HC	HH	RBD	TH
ADA-	75	3 *76*	4 1/2 *114*	6 *152*	1/4 *6*	5 *127*	4 3/4 *121*	3/8 *10*	1/2-13UNC
	200	4 *102*	7 *178*	11 *279*	3/8 *10*	8 1/2 *216*	7 3/8 *187*	5/8 *16*	5/8-11UNC
	350	*	7 1/4 *184*	12 *305*	1/2 *13*	9 1/2 *241*	7 3/4 *197*	3/4 *19*	None
ADAH-	600	9 *229*	11 *279*	14 1/2 *368*	3/4 *19*	12 *305*	11 3/4 *298*	1 1/4 *32*	None
	800	11 *279*	13 1/2 *343*	17 1/2 *445*	1 *25*	14 1/2 *368*	14 1/2 *368*	1 1/2 *38*	None



*Size 350 –
Top is 5" *127mm* x 5" *127mm*, Bottom is 6" *152mm* x 6" *152mm*.

03/2020

RISER DESIGN EXAMPLE

The 4" CWS & R riser system shown on FM101 is designed per our recommendations.

Please refer to the riser diagram as the system is discussed below.

These condenser water piping risers are designed to be installed at 50°F and operate at 90°F, so the maximum temperature change is 40°F. The risers are a total of 95 feet in overall length. The change in overall length due to thermal growth is small; less than 3/8". But this small amount of expansion would result in a potentially dangerous support condition in a non-engineered riser with pipe clamps on each floor. As the riser expands the supports on the upper floors would lift off the floors, transferring the riser loads to the lower floor supports, assuming the floors and pipe clamps could handle the load. The relative stiffness of the clamps and floors are unknown. The resulting loads are completely unpredictable.

Neoprene pads are not a solution. They are non-adjustable and there is no way to guarantee their deflection at installation or operation. A 1/16" elevation change could double the floor load.

In this case Mason SLF-105 springs are the solution. They are installed at Level 2 and 6. The diagram shows that they are to be initially adjusted to 1.4 inches spring deflection for a total support load of 869 lbs. per pair of springs. Then as the riser expands the springs located on Level 2 will deflect another approximately 1/8 of an inch and support 931 lbs. The springs on Level 6 will unload approximately 1/8 of an inch and support 807 lbs. Mason ADA-75 Anchors are installed on Level 4 to resist any inadvertent pipe motion. Under normal conditions there is no load change on the ADA-75 anchors which is at the zero point of the riser. The initial loads on the springs are set by adjustment bolts and the final load is completely predictable. The flexibility of the spring will easily correct for any variation in floor stiffness or pipe clamp stiffness.

Mason VSG-75 Guides are installed on Levels 1, 3, 5 and PH. Along with the ADA-75 Anchors they will resist pipe sway during normal operation and provide lateral seismic restraint in an earthquake. Maximum horizontal seismic load will occur at the PH due to the increased floor elevation at PH and greater assigned load.

The notes indicate important design considerations and installation requirements including temperature change, load definition, pipe clamp requirements, and branch piping and main horizontal piping support requirements. In general, spring hangers are required to allow connected horizontal piping to move with the riser.

This is a fully engineered riser system that will provide years of trouble free service. The support and guide system is virtually maintenance free. Loads on the building are predictable and will remain consistent throughout the life of the building.

MASON INDUSTRIES, INC.

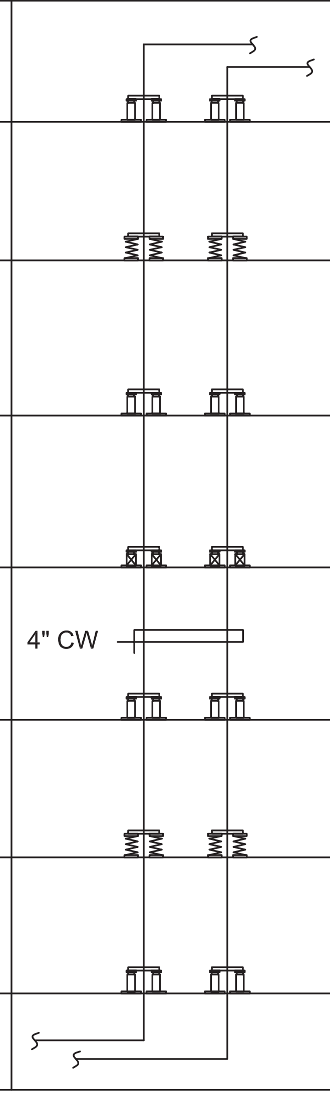
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279

2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738

Info@Mason-Ind.com • www.Mason-Ind.com

Riser Design Example

Maximum Horizontal Seismic Load @1.0g	Anchor, Spring Support or Guide Size	Initial Load @ Initial Spring Deflection	Final Load @ Final Spring Deflection	Thermal Movement	Riser Diagram	Floor Level (Elevation)
410 LBS	(4) VSG-75			0.15" ↑		PH (+92'-3")
	(4) SLF-105	869 LBS @ 1.4"	807 LBS @ 1.3"	0.10" ↑		L6 (+77'-3")
393 LBS	(4) VSG-75			0.02" ↑		L5 (+63'-3")
256 LBS	(4) ADA-75	0"	0"	0.00"		L4 (+49'-3")
423 LBS	(4) VSG-75			0.05" ↓		L3 (+35'-3")
	(4) SLF-105	869 LBS @ 1.4"	931 LBS @ 1.5"	0.10" ↓		L2 (+17'-0")
301 LBS	(4) VSG-75			0.15" ↓		L1 (+2'-6")
						G



NOTES:

1. Maximum temperature change = +40° F
2. Loads shown are per pair of supports, guides or anchors.
3. Pipe clamps must be capable of accepting vertical loads from riser supports
4. Branch piping and main horizontal piping must be supported on spring hangers for the first (3) supports from the riser.

GUIDES

SPRINGS

ANCHORS

MASON INDUSTRIES, INC.
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com

RISER DESIGN AND PRODUCT SPECIFICATIONS

Riser Design Specification:

Risers shall be suspended from 30N spring hangers or supported by SLF spring mounts, anchored with ADA isolated anchors, and guided with VSG sliding guides. Steel springs shall be a minimum of 0.75" deflection except in those expansion locations where additional deflection is required to limit load changes to 25% of the initial load. Suspend branch piping and main piping runs from spring hangers or support on springs mounts for the first (3) locations from the riser. Submittals must include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on the building structure, spring deflection changes and seismic loads. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the proposed design.

Supports, Guides and Anchors Specifications:

Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4" neoprene acoustical friction pad between the base plate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height. Mountings shall be type **SLF** as manufactured by Mason Industries, Inc.

Springs hangers shall consist of rigid steel frames containing minimum 1-1/4" thick rubber elements at the top and a steel spring with type **SLF** general characteristics seated in a steel washer reinforced rubber cup on the bottom. The rubber element and the cup shall have rubber bushings projecting through the steel box. To maintain stability the boxes shall not be articulated as clevis hangers nor the rubber element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc from side to side before contacting the rod bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30 degree capability. Hangers shall be type **30N** as manufactured by Mason Industries, Inc.

All-directional acoustical pipe anchor shall consist of two sizes of steel tubing separated by a minimum 1/2" thick 60 durometer neoprene. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction. Allowable loads on the isolation material should not exceed 500 psi and the design shall be balanced for equal resistance in any direction. All-directional anchors shall be type **ADA** as manufactured by Mason Industries, Inc.

Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2" thickness of 60 durometer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Shear pin shall be removable to allow for selection of pipe movement. Guides shall be capable of 1-5/8" motion, or to meet location requirements. Pipe guides shall be type **VSG** as manufactured by Mason Industries.

MASON INDUSTRIES, INC.

350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 928017 • 714/535-2727 • FAX 714/535-5738
Info@Mason-Ind.com • www.Mason-Ind.com