Piping Attachment Details

Pipes can be supported as independent units or grouped together and supported on a trapeze structure. Restraints can be installed in the same manner. When installing restraints, however, it is critical that (except for horizontally oriented restraint members) they be located in the immediate proximity of a vertical support member as the support is required to absorb vertical forces that are developed during the restraint process.

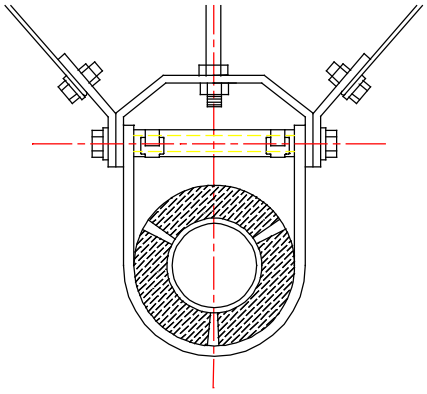
If the piping is isolated, cable restraints should be used in lieu of struts to prevent the transfer of vibration through the strut into the structure. Where cables are illustrated, they can be replaced with a single strut mounted in a similar fashion where appropriate.

Single Pipe Sections Supported on Hangers

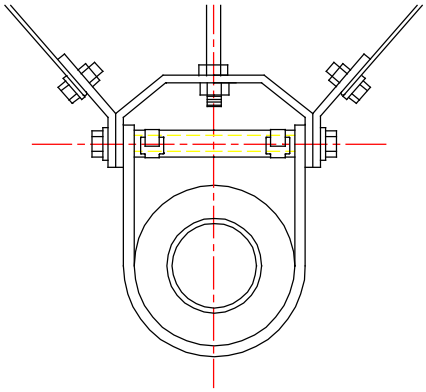
Lateral Restraints

The simplest piping restraint connection is a lateral restraint fit to a single pipe. Because the forces being restrained are at 90 degrees to the pipe axis, there is no requirement for a clamped or otherwise rigid connection between the pipe hanger and the pipe itself. Of concern is the durability of the hardware used, the durability of the pipe insulation (if insulated) and the capacity of the hanger rod to resist the reaction loads generated by the horizontal seismic forces.

Shown below are typical details for clevis hangers fitted with KCHB brace angles and straps (on the cross bolts) and hard insulation (on the pipe). If not insulated, the hardened insulation, blocks, or saddles would not be required.



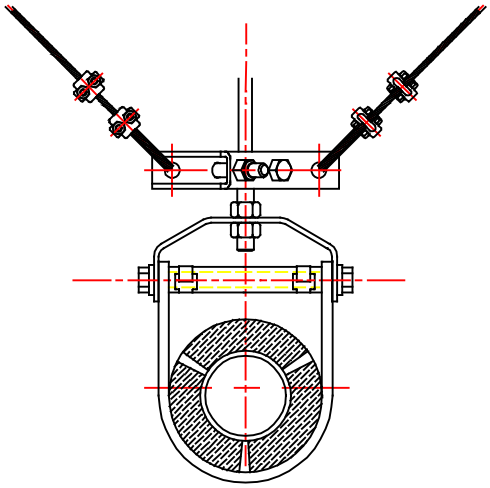
Side-Restrained Pipe with Wood Insulation Blocks



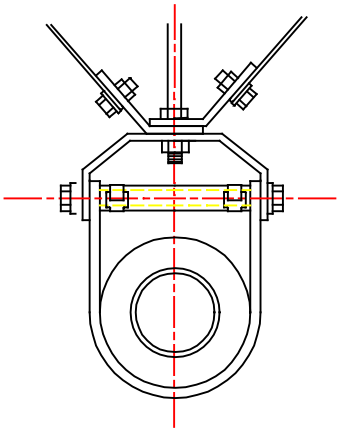
Side-Restrained Pipe with Hardened Insulation

KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA

Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com



Rod-Restrained Pipe with Wood Insulation Blocks



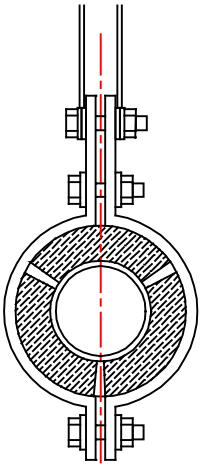
Top-Restrained Pipe with Hardened Insulation

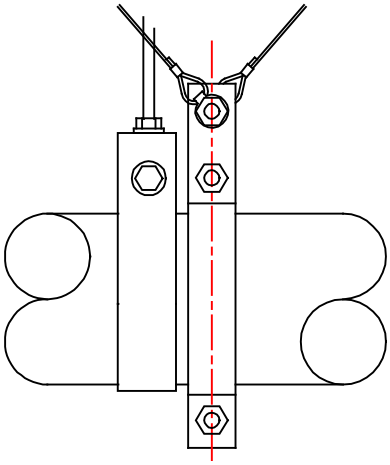
The above description represents the minimum treatment required at each restraint location, and is appropriate whether cable restraints or struts are used.

Axial Restraints

Axial restraints pose more of a problem. Conventional pipe hangers, as shown above, do not have the ability to be clamped tightly enough to the pipe to prevent relative axial motion between the two. In order to ensure that the restraint is rigidly attached to the pipe, a heavy-duty pipe clamp is required, and the tie bolts must be tightened to spec. Three different acceptable types of clamps are shown below.

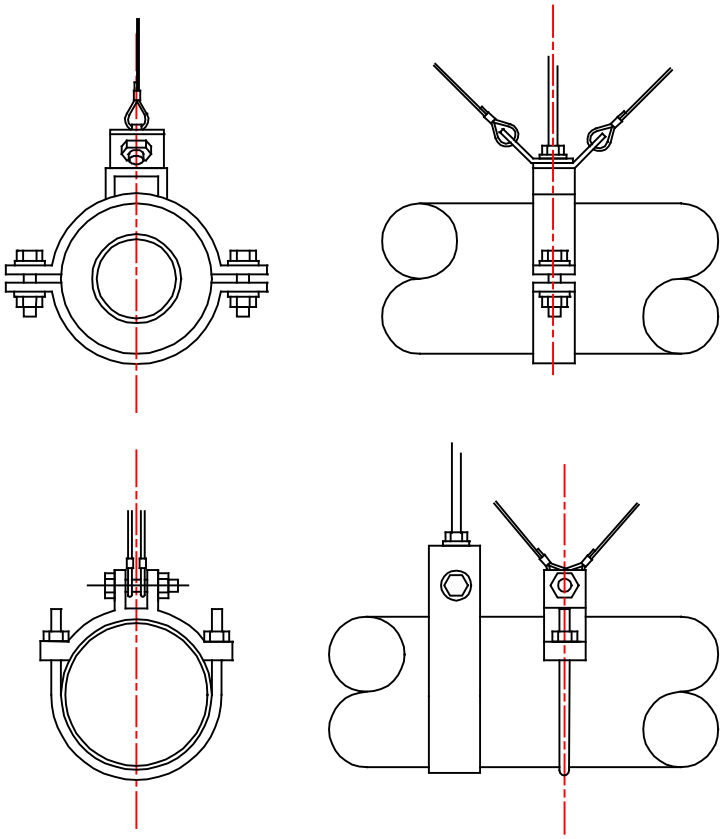
Again note that the restraints must be located in the immediate vicinity of a vertical support member.





KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA

Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com



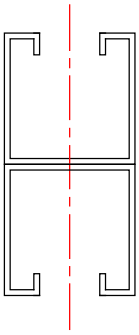
Pipes clamps must be clamped against hard spacers, hardened insulation or directly against the pipe as shown above

Restraint Arrangements for Multiple Pipe Sections Supported on a Trapeze

General Trapeze Design

When restraining multiple pipes of different sizes, the maximum spacing between restraints cannot exceed the worst-case condition for any of the individual pipes. In addition, the restraints must be sized based on the total weight of all of the pipes on the trapeze bar. Some caution should be exercised when selecting the bar to ensure that it has adequate capacity to transfer the load from the pipes to the restraint connections. This is particularly true for some strut arrangements that can be significantly stiffer in the vertical axis than they are in the horizontal (see illustration below.) Because the range of applications for trapeze bars is limitless, details will not be addressed here, but should be reviewed by a competent design professional.

KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA
Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com



Section that is Stiff Vertically
But Weak Horizontally

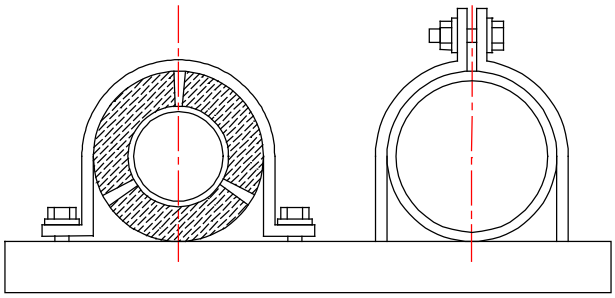
Pipe Connections to Trapeze Bars

When installing restraints, typically not all support points will require treatment. For those trapeze bars that are not restrained either axially or laterally no special pipe connection treatment is required. Where lateral restraint only is provided at a location, motion restraint between the pipes and the trapeze bar only is required in the lateral direction. Where axial restraint is required, the pipe needs to be clamped firmly to the trapeze bar so that it cannot slip through the clamp during a seismic event.

The axial clamps shown here are suitable for both axial and lateral loads, and can be used on all connections. The lateral restraint examples are only appropriate for lateral loads. Note that when controling the axial motion of the pipe, issues relating to expansion and contraction can arise. These issues need to be addressed in the design of the piping system either through the use of expansion loops, frequent doglegs, or expansion couplings.

Axial/Lateral Restraint Trapeze Connections

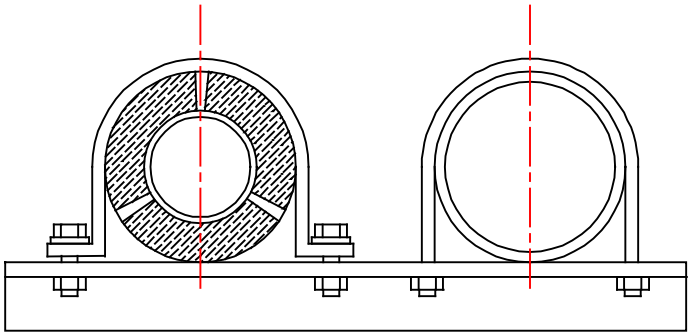
Below are examples of connections that would be suitable for either axial or lateral load conditions.



Piping Clamped to a Formed Channel-Based Trapeze Bar

KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA

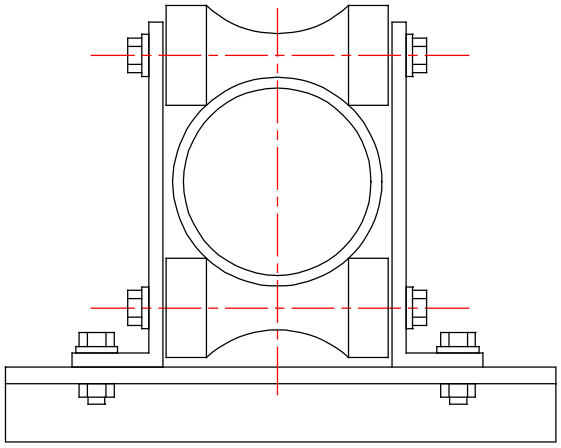
Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com



Piping Clamped to an Angle-Based Trapeze Bar

Trapeze Connections Suitable for Lateral Restraint Only

In cases where pipe expansion or contraction must be allowed but lateral restraint is needed, the connection between the pipe and the trapeze must allow motion along the pipe axis. This type of connection cannot transfer an axial restraint force and, as such, can only be used to prevent lateral motion of the piping.



Preferred Lateral Restraint
Trapezed Pipe Mounting Arrangement

Cable and Strut Hardware Attachment Options for use with Single Pipe Hanger Brackets

A typical piping installation begins with suspending the pipes, and then returning later and adding restraints. While this eliminates the need to deal with restraints when actually hanging the pipes, it normally results in more time expended, and possible rework, during the restraint installation phase. Increasing the diameter of hanger rods for strut-restrained systems, relocation or duplication of supports for more accessible restraint installation,

KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA

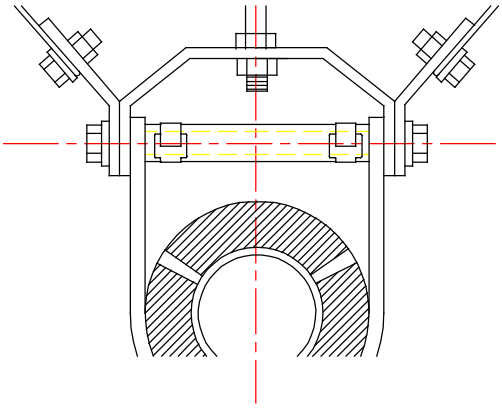
Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com

and dismantling and reassembling hanger components to make appropriate connections are the three primary examples of this.

While there is little that can be done from a hardware standpoint to deal with relocation issues, the proper selection of restraint hardware can reduce or eliminate the need to dismantle and reassemble previously installed pipe supports.

Hanger Bracket Reinforcement

When using conventional hangers, the first item required is a spacer bar at the hanger clevis. This serves two functions. The first is to keep the sides of the support from collapsing during a seismic event and the second is to offer a hard surface to work against when attaching and tightening side-mounted restraint brackets and hardware.



Hanger Clevis Showing KSHB Clevis
Hanger Brace Fitted on Tie Bolt

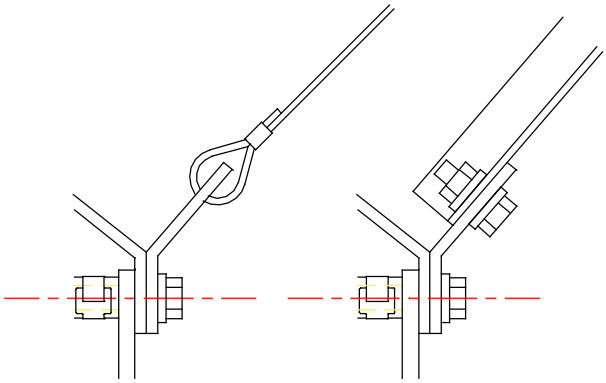
The brace shown here can be installed without disassembling any previously installed support hardware.

Cable/Strut Restraint Connection Hardware for Hanger Brackets

Also shown in the above drawing are side-mounted cable attachment brackets. Installation requires the removal and replacement of the tie bolt, which for larger or spring supported pipes can be awkward and time consuming. This is the preferred installation arrangement for CCA mounting clips when used on pipes in excess of 12 inches in diameter.

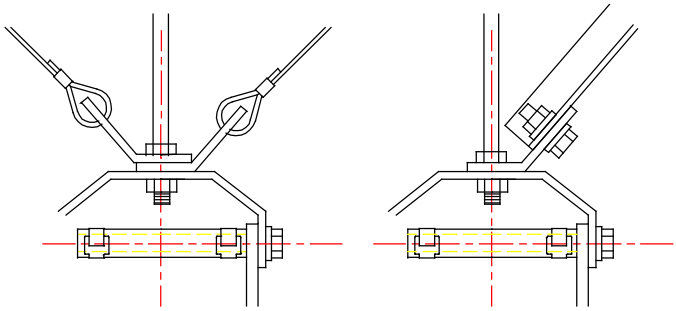
The CCA mounting clip can be used with either cables or struts, but for struts, the angle between the strut and the ground is limited to 45 degrees. See also the sketches below.

KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA
Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com



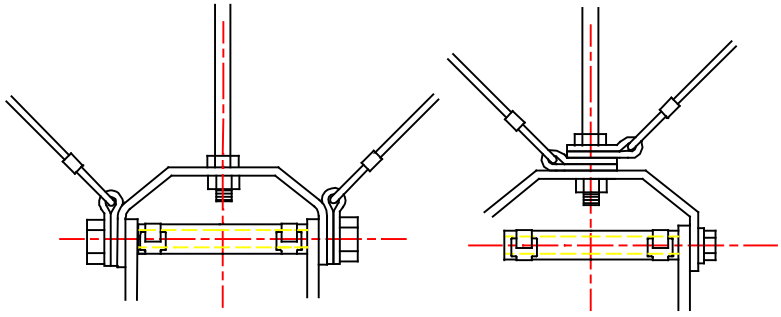
Side-Mounted CCA Clip with Cable and Strut Connections

For piping that is 12 inches in diameter and less, the CCA clip can be top mounted. Unless installed during the initial hanger bracket installation process, this will require the hanger clevis to be disconnected and reinstalled. This installation is virtually the same as the side-mounted arrangement with the exception that the CCA clip attaches to the hanger clevis at the hanger rod location.



Top-Mounted CCA Clip with Cable and Strut Connections

As an option to the CCA clip, a KSCU clip can be used for side- and top-mounted cable restraint applications as shown below.



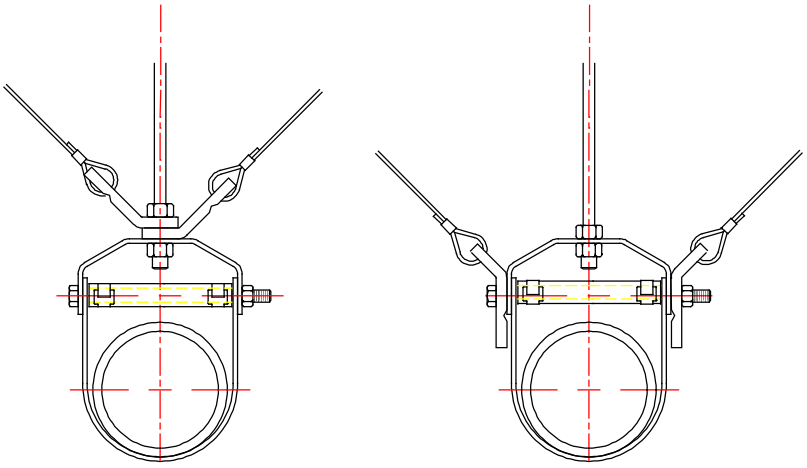
Top- and Side-Mounted KSUA Clips with Cable Connections

KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA

Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com

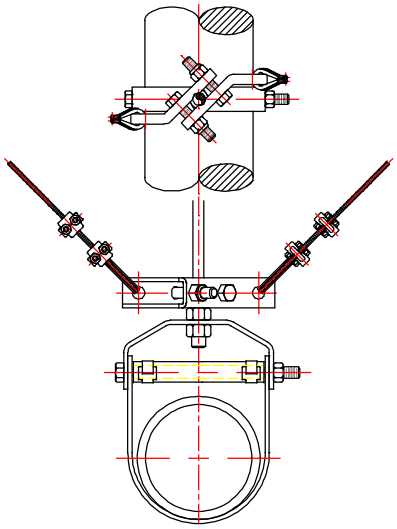
The KSCA is the most versatile clip manufactured by Kinetics Noise Control. It can be mounted in a number of fashions, including both of the above, as well as hanger rod mounted. In the hanger rod-mounted arrangement, no previously installed hardware need be disassembled. This frequently makes it the most time-efficient bracket to install in the field.

While the KSCA is not suitable for extremely heavy-duty applications, it is appropriate for most applications, even up to relatively high "G" load conditions. See the tables in Chapter D4 in this manual for sizing components.



Top Mounted **Side Mounted**

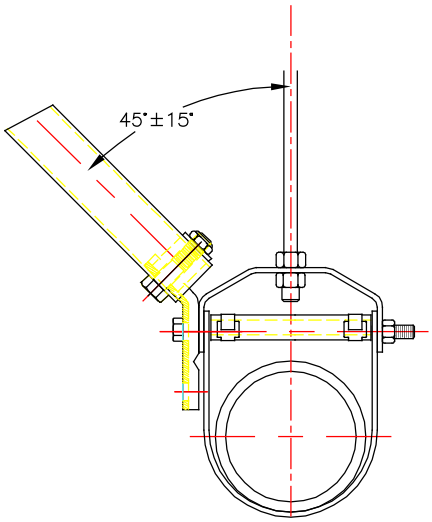
Conventional KSCA Cable Restraint Clip Mounting Arrangements



Hanger Rod-Mounted KSCA Cable Restraint Clip

KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA

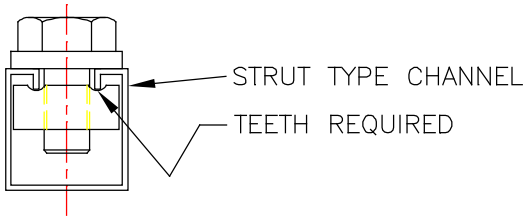
Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com



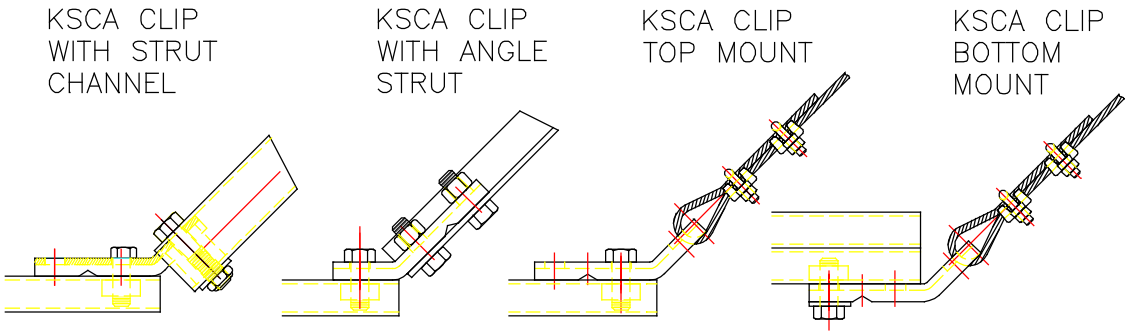
KSCA with Strut Attachment Hardware

Cable/Strut Restraint Connection Hardware for Trapeze Bars

One of the most common materials for trapezed support of piping is formed strut-type channel (ex. Unitstrut). Connections to these materials, if using strut nuts, require the use of toothed nuts. Smooth nuts do not provide adequate resistance against friction and as such are not acceptable. All nuts must be tightened to their full-rated torque.

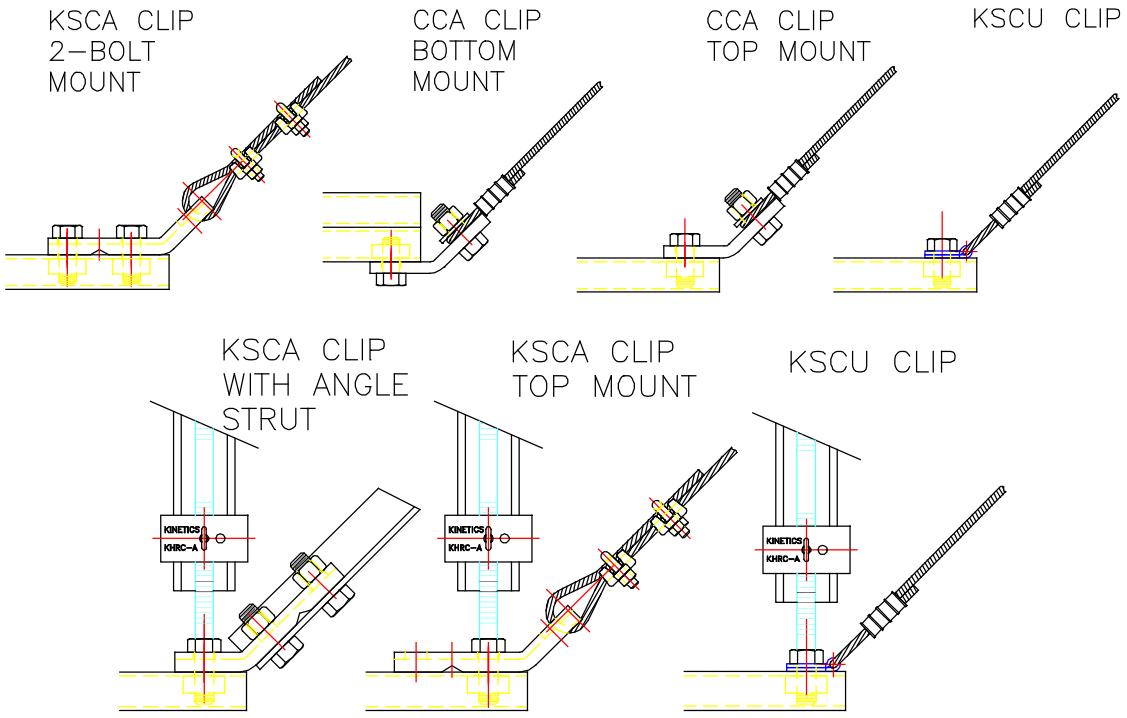


Shown below are various acceptable methods of mounting restraint hardware to struts.



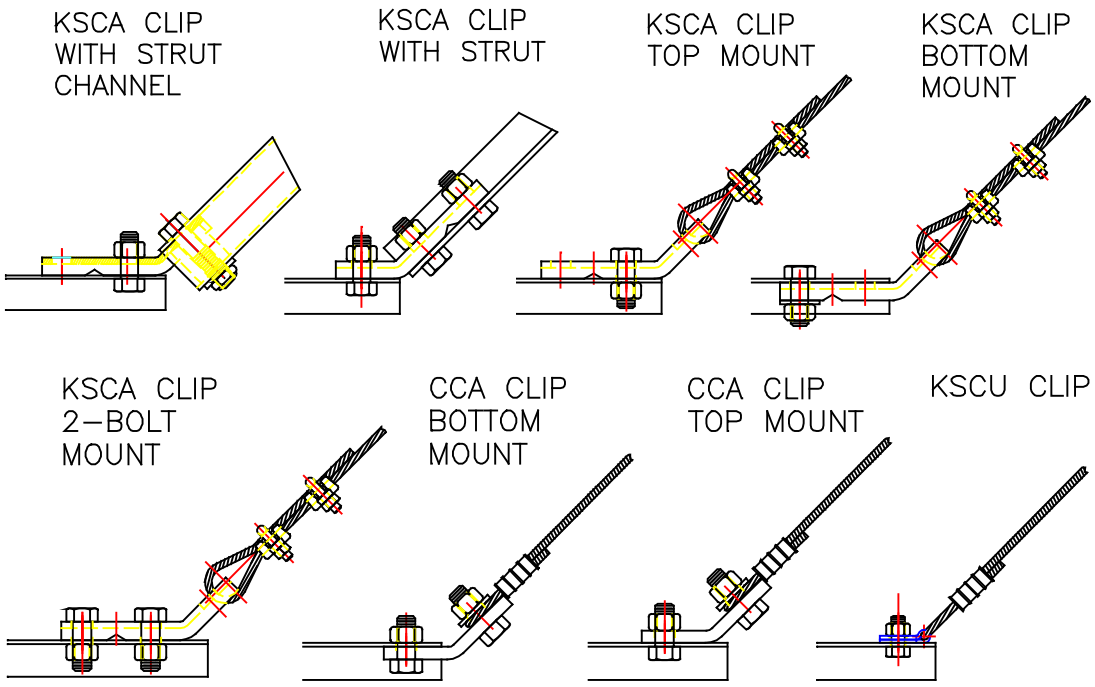
KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA

Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com



Cable Restraint Bracket to Strut Trapeze Bar Connections (Typical)

Similar types of mounting arrangements can be used with trapeze bars made out of angle or other structural shapes as illustrated below.



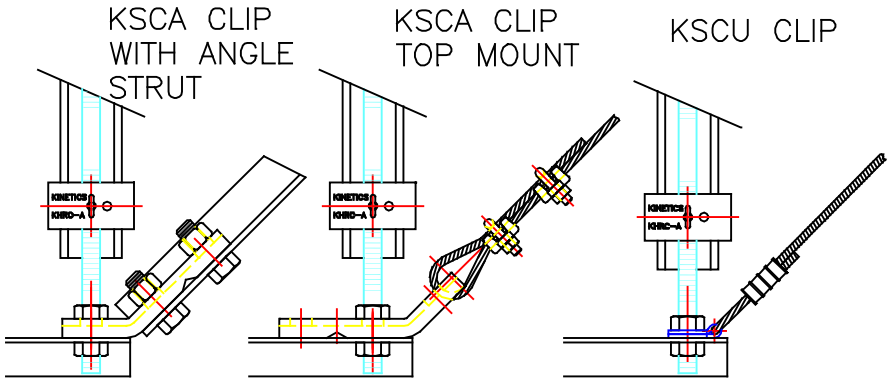
PIPING ATTACHMENT DETAILS

RELEASE DATE: 03/08/04

KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA

Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com

DOCUMENT:
D7.5.3
VISCMA MEMBER

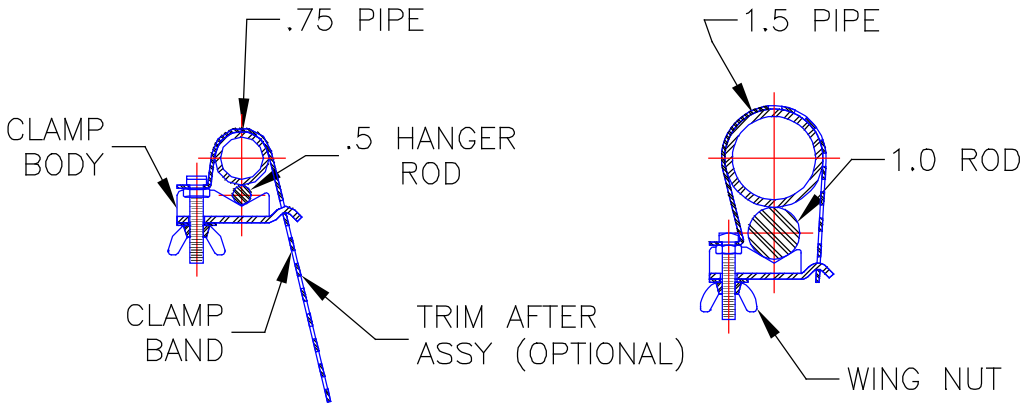


Cable Restraint Bracket to Structural Steel Trapeze Bar Connections (Typical)

Hanger Rod Stiffening Arrangements

In some cases, depending on hanger rod length and the applied seismic force, it may be necessary to protect the hanger rod from the buckling forces that can occur during a seismic event. Chapter D4 includes a section on determining the need for and sizing of the stiffener. When required, either a pipe or an angle can be used as a stiffener and must be clamped tightly to the hanger rod using rod clamps.

Kinetics Noise Control makes clamps for both pipe and angle stiffeners. These are designated the KSRC-P (for pipe) and KSRC-A (for angle). Both are adjustable and can be used over a wide range of hanger rod and stiffener sizes.

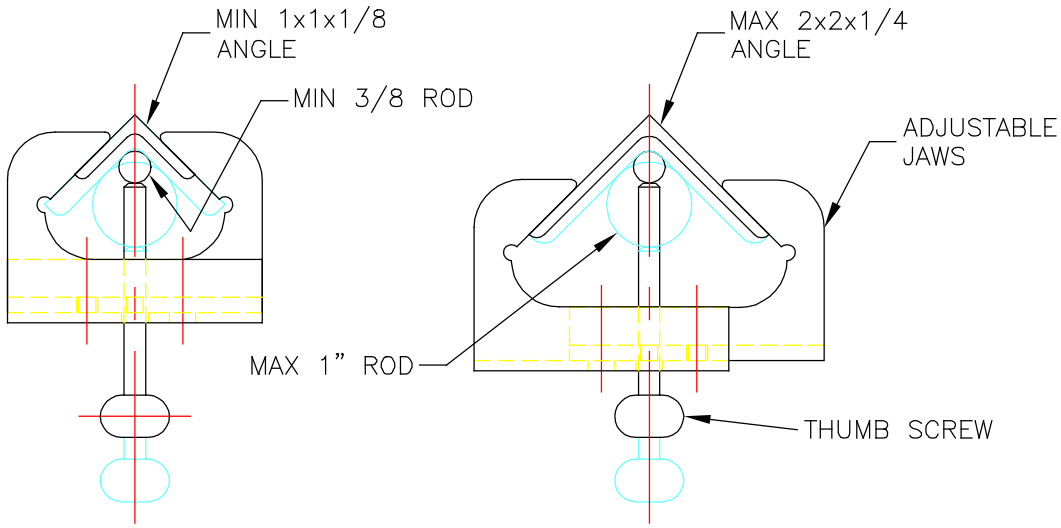


KSRC-P Hanger Rod Stiffener Clamp can be used to clamp Rods from .5" to 1.0" Diameter to Pipes from .75" to 1.5" Diameter

Both clamps feature two-part construction and "no tool required" installation. The KSRC-P is comprised of a flexible band punched with a number of slots that is fitted to a clamp body with an integral seat for the hanger rod. Based on the size of the pipe stiffener and the hanger rod, the appropriate slot in the clamp band can be used for preliminary

KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA
Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com

adjustment, with final tightening by means of a wing nut.



KSRC-A Hanger Rod Stiffener Clamp can be used to clamp Rods from .5" to 1.0" Diameter to Angles with Leg lengths from 1 to 2 inches

Shown above is the KSRC-A Clamp. It is made up of two telescoping jaws and a thumbscrew. Preliminary adjustment is made by aligning the appropriate holes in the jaws for the thumb screw, and final tightening is made by tightening the screw.

For both of the above clamps the clamping screws are to be tightened so that they will not come loose in service through vibration. If significant vibration is expected, the use of Loctite or other thread binder is recommended.

KINETICS Noise Control
DUBLIN, OHIO, USA • MISSISSAUGA, ONTARIO, CANADA

Toll Free (USA only): 800-959-1229
International: 614-889-0480
Fax: 614-889-0540
World Wide Web: www.kineticsnoise.com
Email: sales@kineticsnoise.com