

# Duct Attachment Details

Ducts 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 ductwork 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.

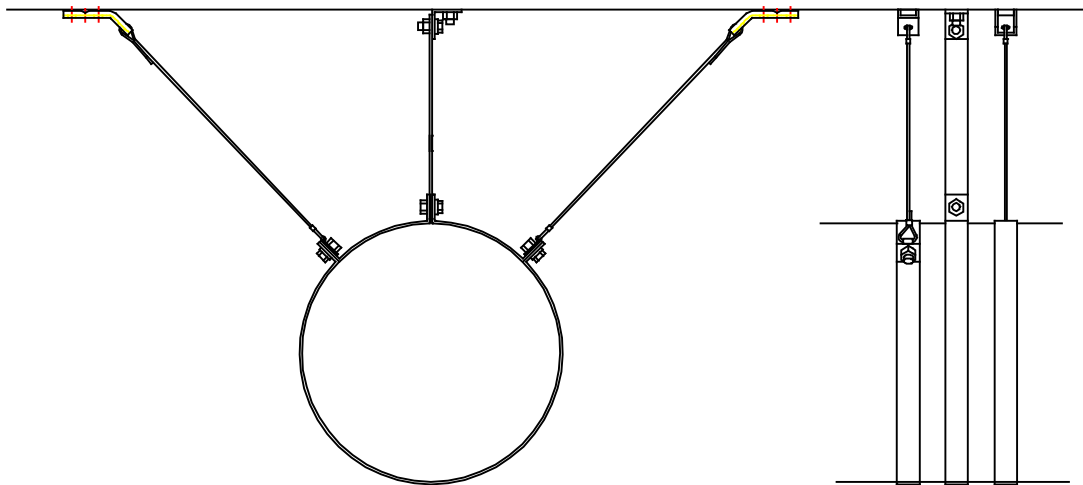
## Round Duct Sections Supported on Hangers

### Lateral Restraints

Single round ducts can be supported with 1 or 2 hanger rods. A single support will typically connect to a band clamp made of gauge material. A double support will typically connect to both sides of a split band clamp (2 semicircles) again made of gauge material.

The single hanger rod arrangement can normally be made of a steel strip or a structural shape rather than from threaded rod where the double support will normally be comprised of (2) pieces of threaded rod material.

When using the single rod arrangement, restraints should connect to the duct with (3) similar band clamps oriented as shown below.



Round Duct – Single Support – 3 Band Clamps and Cables

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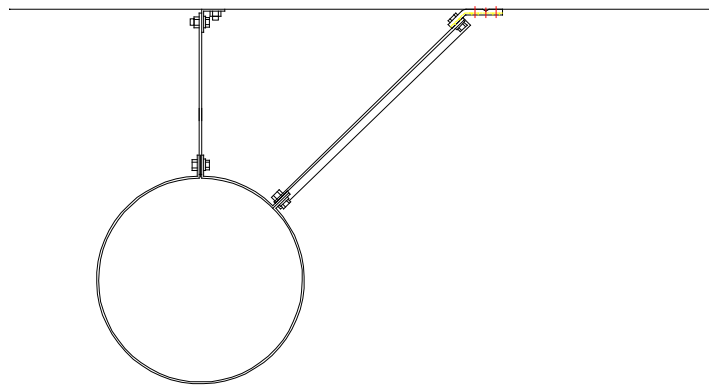


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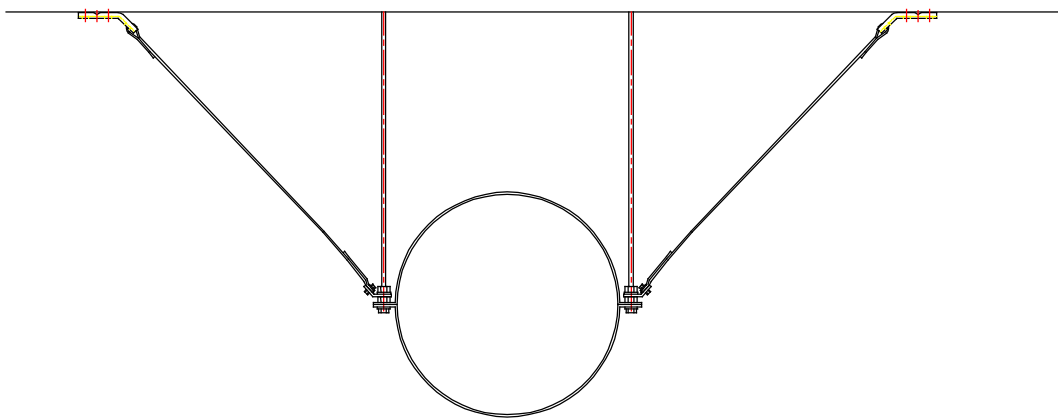
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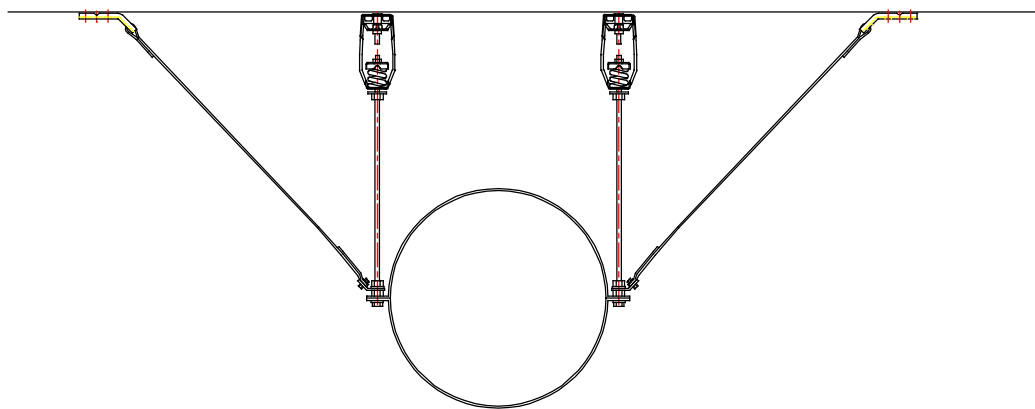


### Round Duct – Single Support – 2 Band Clamps and Strut

When using the double rod arrangement, restraints should connect to the duct at the support locations, again as shown below.



### Large Round Duct with Double Supports and Cable Restraints



### Isolated Round Duct with Double Supports

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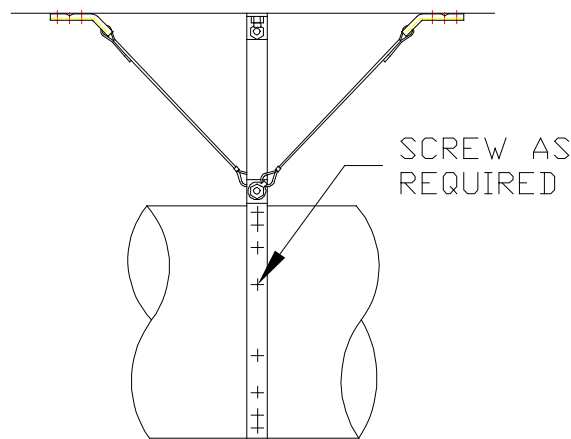
The above description represents the minimum treatment required at each restraint location and is appropriate whether cable restraints or struts are used.

Axial Restraints

When connecting ductwork to axially restrained supports, slippage between the duct and support is typically addressed by screwing the duct to the support bar or to an encircling band. The diameter and quantity of screws required are directly related to the force that they must resist.

Based on the Maximum Horizontal Force requirement and Force Class from Section D4, the appropriate size and quantity of fasteners to connect ducts to support/restraint members is as follows:

Force Class	I	II	III	IV	V	VI
Force (Lbs)	250	500	1000	2000	5000	10000
#10 Screw	3	5	10	20		
¼ Screw			3	6	20	40



**Single Support Duct Axially Restrained with Cable**

When firmly connecting restraints to ductwork there are a few general rules that should be followed:

- 1) Attachment screws should be spread evenly either around or along the top and bottom of the duct.
- 2) To minimize wind noise, short screws with minimal projection into the air stream should be selected.
- 3) Trapeze-mounted ductwork must be fully encompassed by a frame or screwed to the trapeze at each lateral restraint point.
- 4) Axially restrained duct connections must be positive and require screws as indicated above.

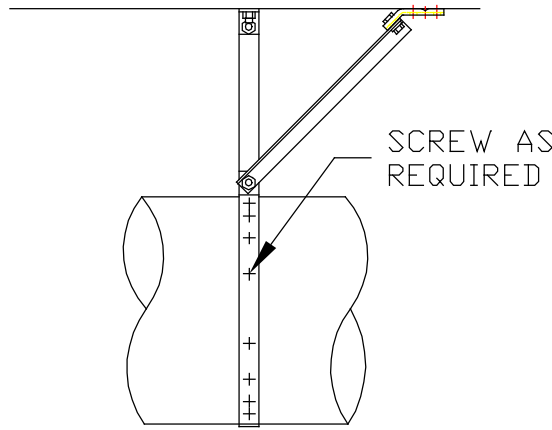
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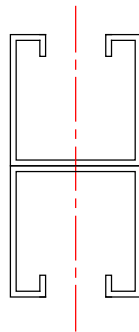


### Single Support Duct Axially Restrained with a Strut

## Restraint Arrangements for Duct Sections Supported on a Trapeze

### General Trapeze Design

Ducts can be supported singly or in multiples on trapeze bars. When restraining multiple ducts of different sizes, the maximum spacing between restraints cannot exceed the worst-case condition for any of the individual ducts. In addition, the restraints must be sized based on the total weight of all of the ducts 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 ducts 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.



**Section that is Stiff Vertically  
But Weak Horizontally**

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## Duct Connections to Trapeze Bars

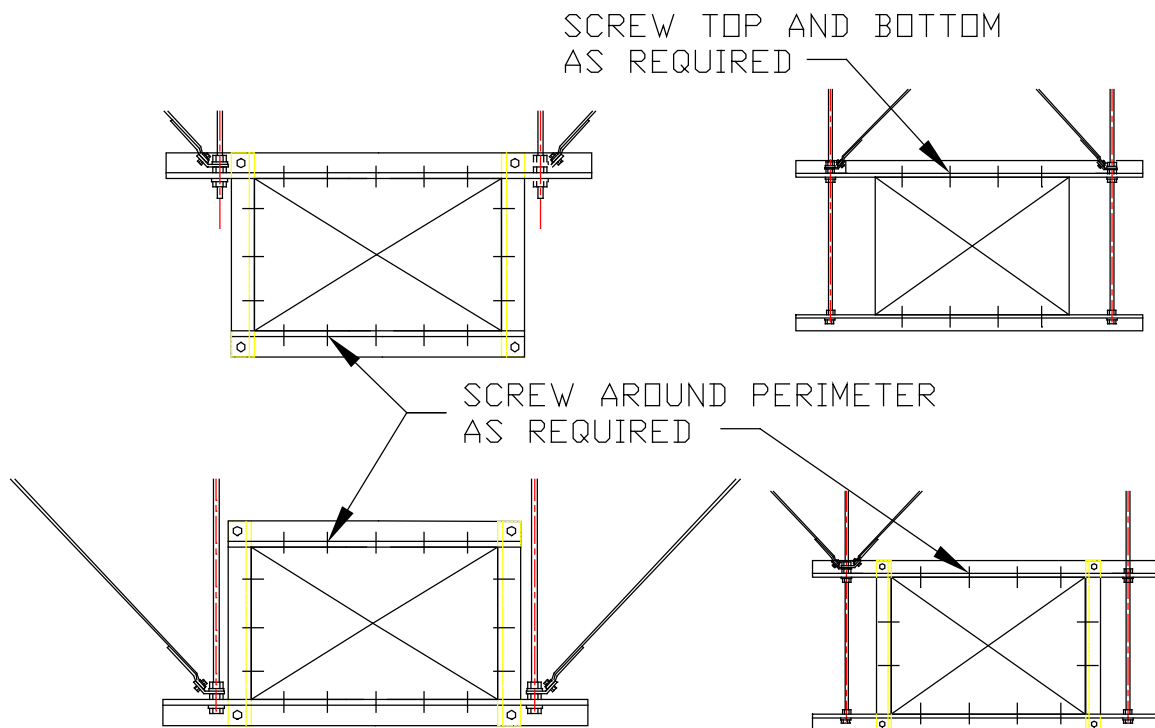
When installing restraints, typically not all support points will require treatment. For those trapeze bars that are not restrained either axially or laterally, no special connection treatment is required. Where lateral restraint only is provided at a location, motion restraint between the duct and the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

Connections should not be made to duct flanges without the prior consent of the flange manufacturer. In general, these are not designed to withstand seismic loads, so without confirmation that they are adequate, should be ignored when arranging restraints.

### Axial/Lateral Restraint Trapeze Connections

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



**Various Screwed Duct to Trapeze Arrangements**

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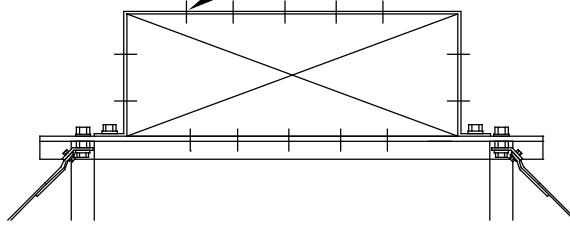
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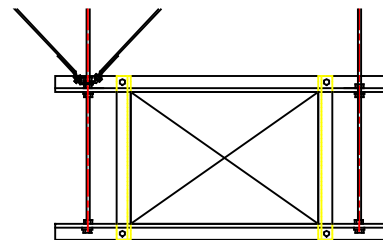
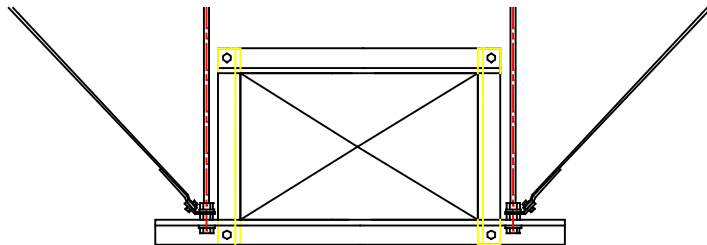
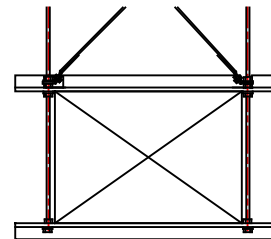
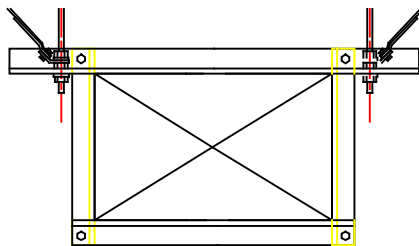
SCREW AROUND PERIMETER STRAP AS REQUIRED



**Duct Restrained using a Full Perimeter Strap (3" x 12 Ga Min)**

Trapeze Connections Suitable for Lateral Restraint Only

In cases where only lateral restraint is needed, it is possible to encase or "trap" the duct. The result is a connection similar to those shown above with the inter-connecting screws omitted.



**Trapeze Connections Suitable for Lateral Restraint Only**

**Cable and Strut Hardware Attachment Options for use with Single Round Duct Attachment Bands**

A typical duct installation begins with suspending the ductwork, and then returning later and adding restraints. While this eliminates the need to deal with restraints when actually

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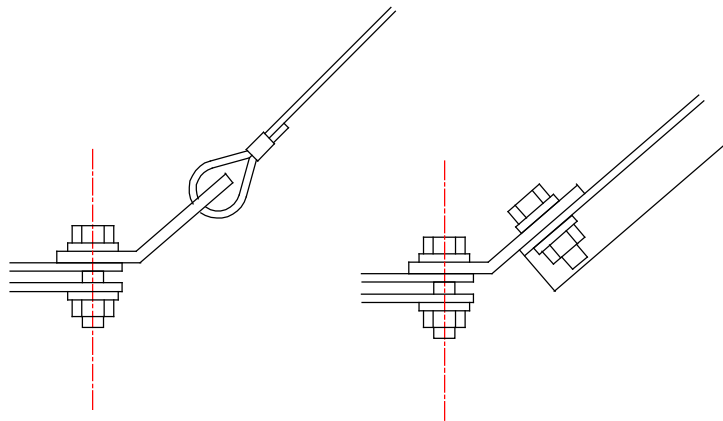


hanging the duct, it normally results in more time expended, and possible rework, during the restraint installation phase. Increasing the diameter of hanger rods for strut-restrained systems, relocation or duplication of supports for more accessible restraint installation, and dismantling and reassembling 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 duct supports.

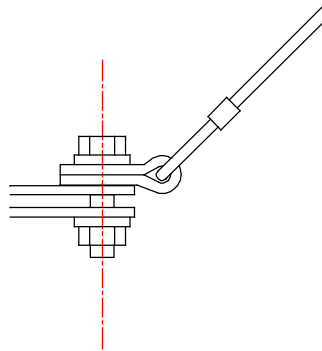
### Cable/Strut Restraint Connection Hardware for Hanger Brackets

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 the sketches below.



### **Side-Mounted CCA Clip with Cable and Strut Connections**

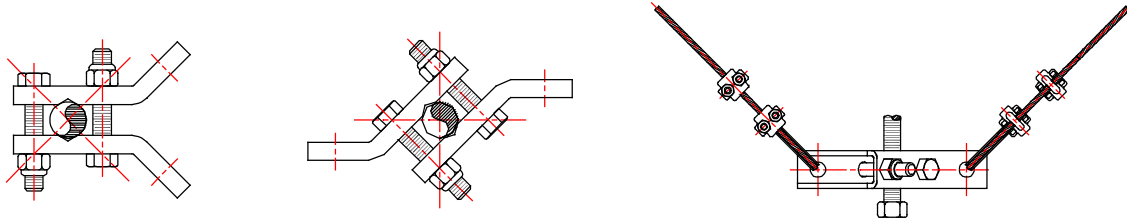
As an option to the CCA clip, a KSCU clip can be used for side-mounted cable restraint applications as shown below.



### **Side-Mounted KSCU Clips with Cable Connections**

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While the KSCA is the most versatile clip manufactured by Kinetics Noise Control, it is not well suited for direct attachment to band-type duct brackets. However, in applications involving hanger rods (like side-supported duct), it offers the ability to directly connect to the hanger rod, offering a significant savings in installation time and cost. Shown here is both an "inline" arrangement for single axis restraint and a "V" arrangement where biaxial restraint is needed.

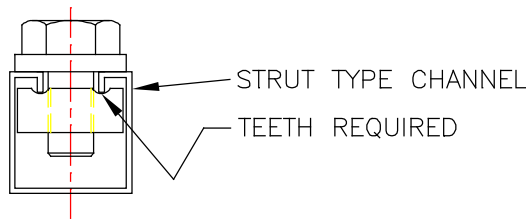


### Hanger Rod-Mounted KSCA Cable Restraint Clip

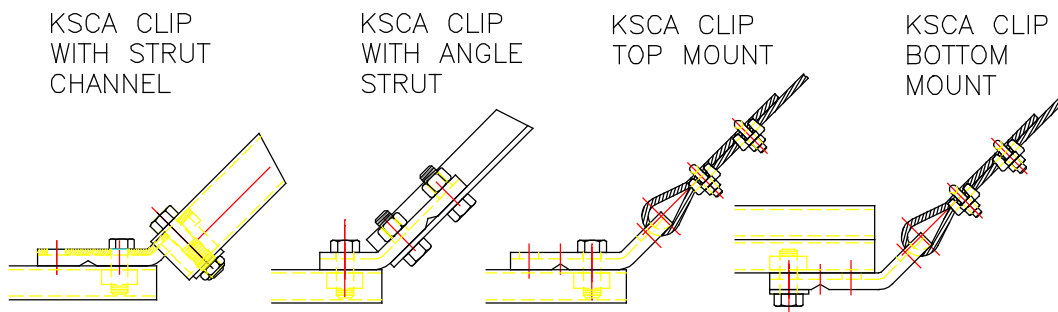
The KSCA is not suitable for extremely heavy-duty applications. This would encompass very large ducts in high seismic areas. However, it is appropriate for most applications. See the tables in Chapter D4 in this manual for sizing components.

### Cable/Strut Restraint Connection Hardware for Trapeze Bars

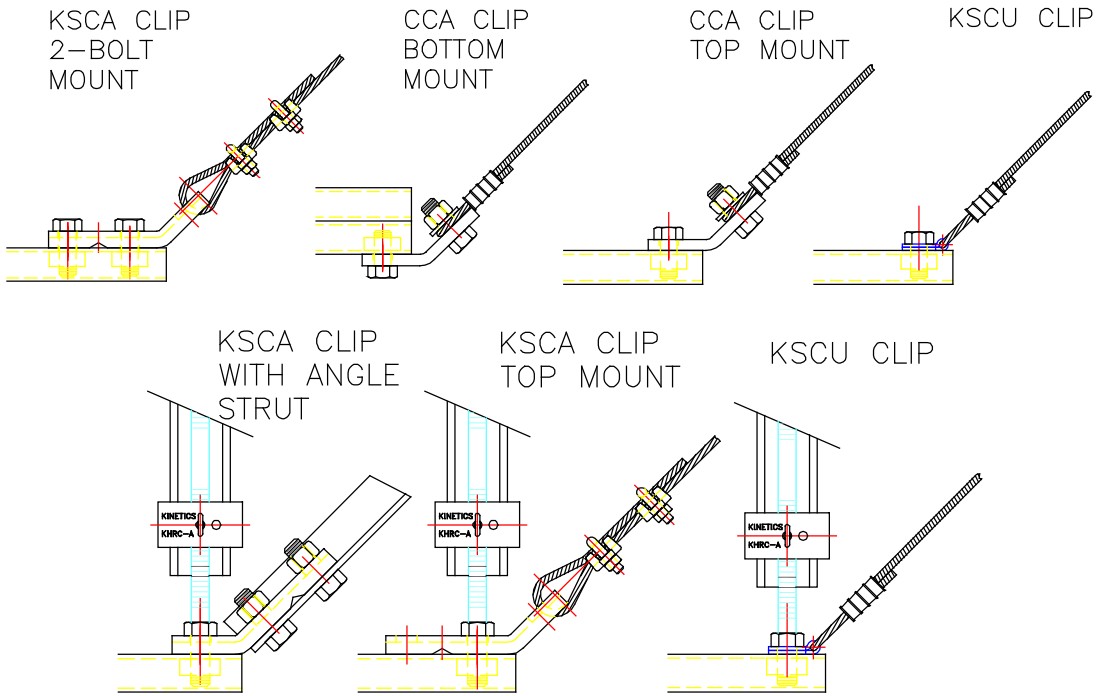
One of the most common materials for trapezoid support of ductwork is formed strut-type channel (ex. Unitstrut). Connections to these materials, if using strut nuts, require the use of toothed nuts. Smooth nuts do not provide adequate resistance against friction and as such are not acceptable. All nuts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



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

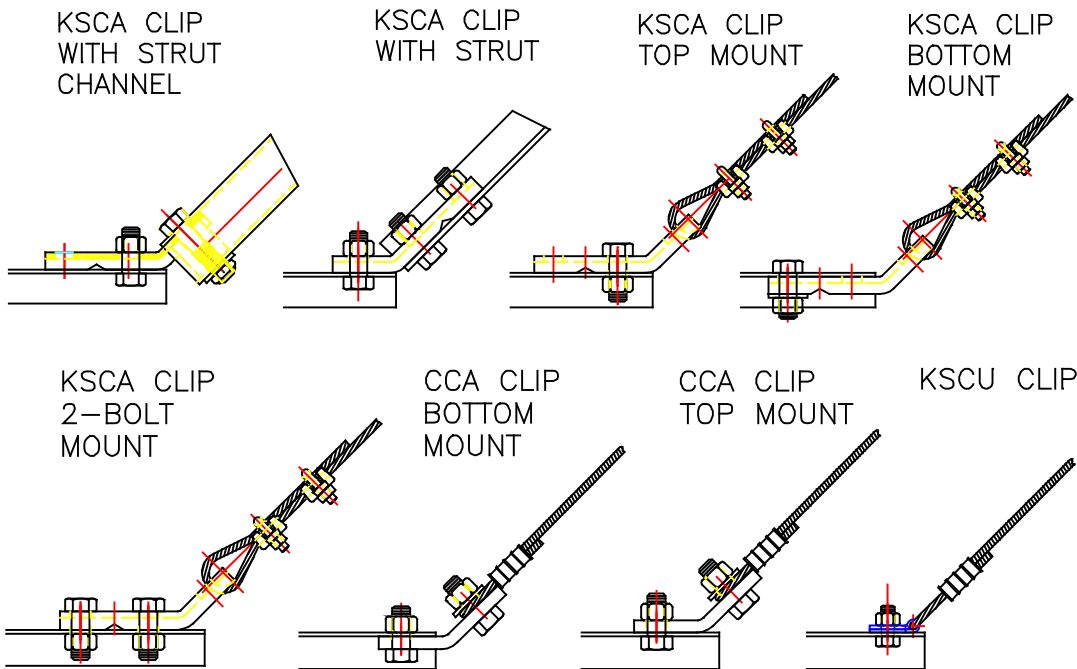


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**Cable Restraint Bracket to Strut Trapeze Bar Connections (Typical)**

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



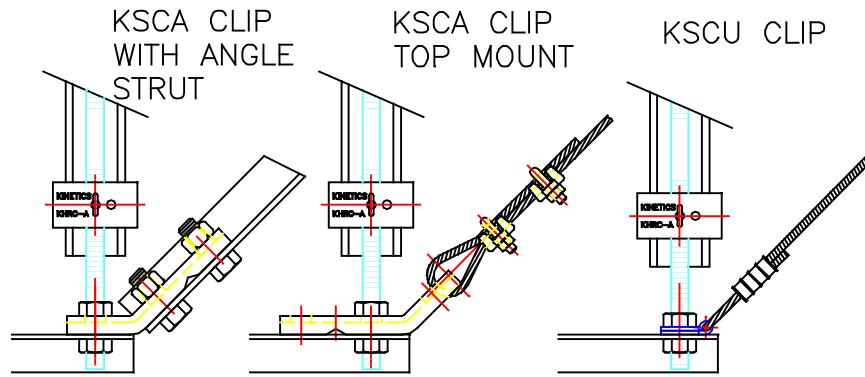
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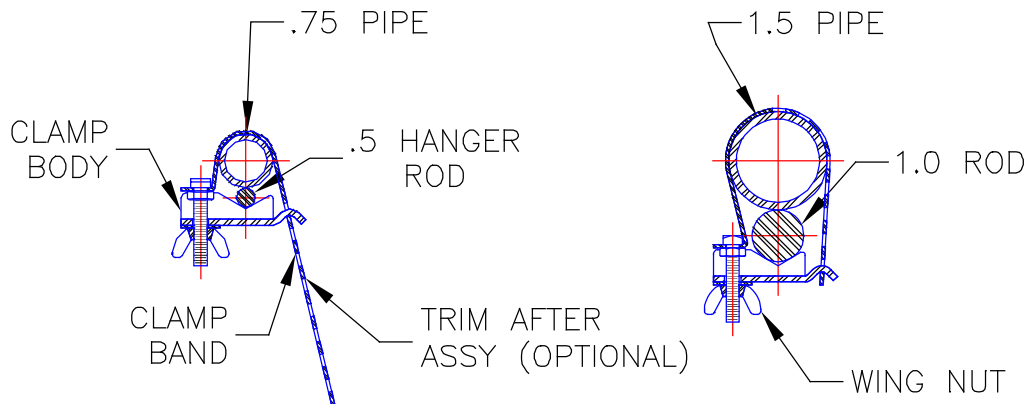


## Cable Restraint Bracket to Structural Steel Trapeze Bar Connections (Typical)

### 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 fit 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

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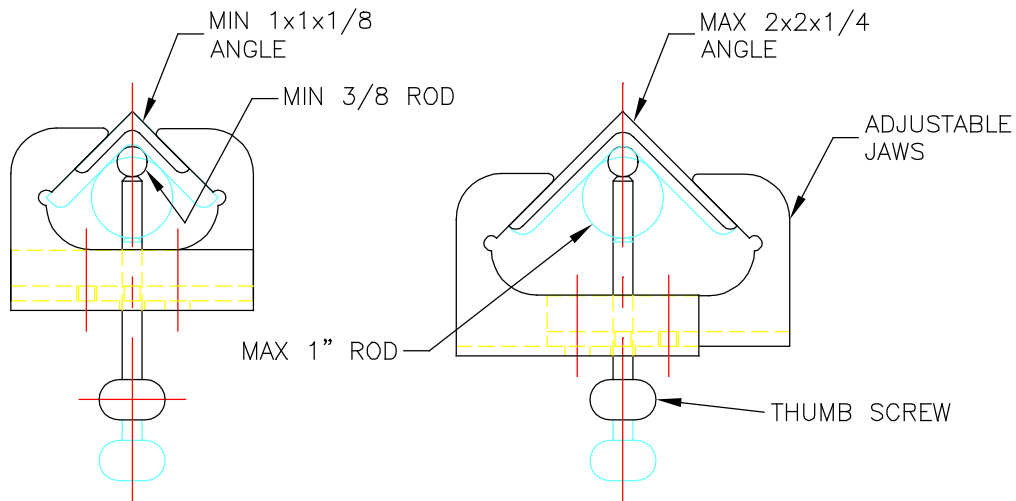


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adjustment, with final tightening by means of a wing nut.



**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.

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