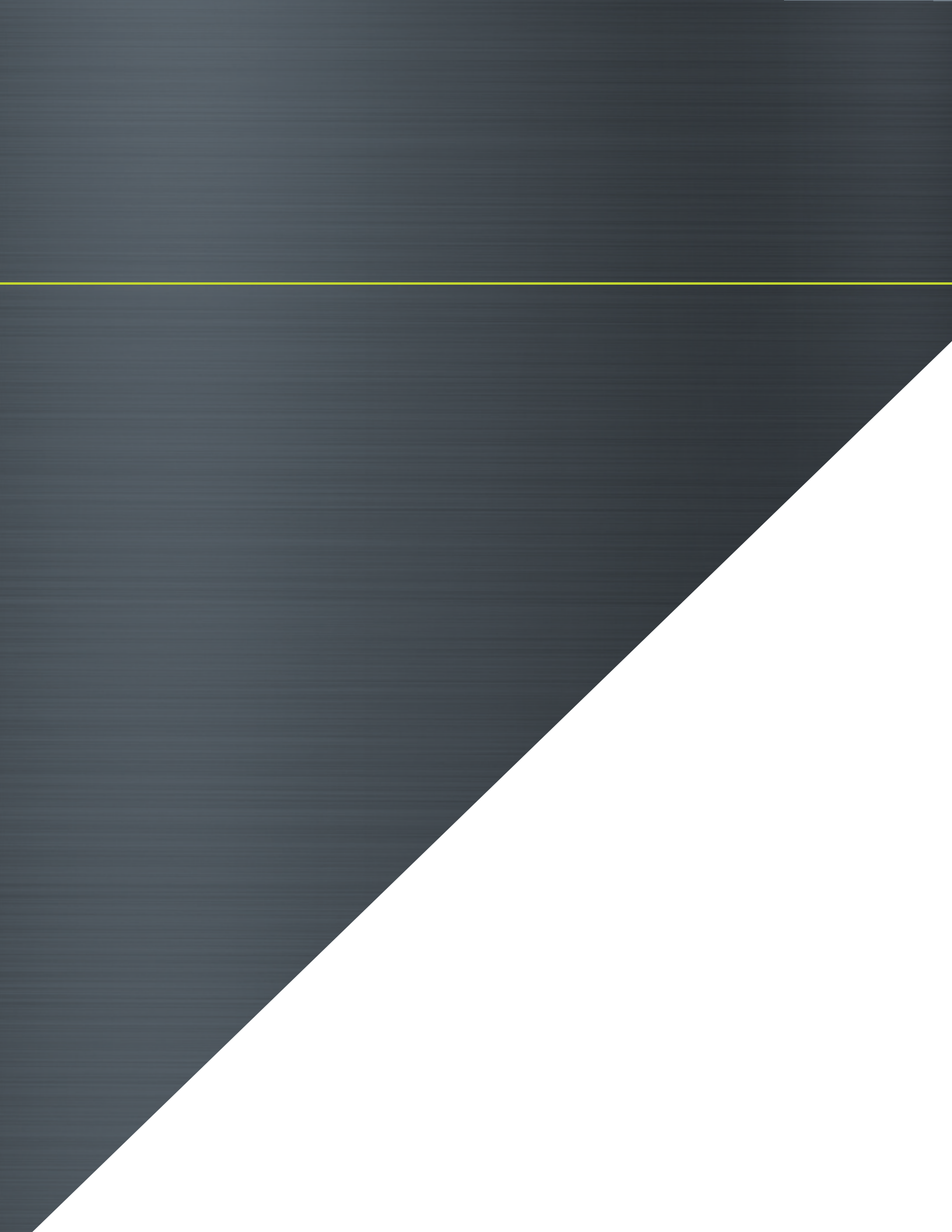




BRACING MANUAL







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MANUAL CREDITS

Seismic Consultant

Patrick Boone
Response Structural Engineers, Inc.

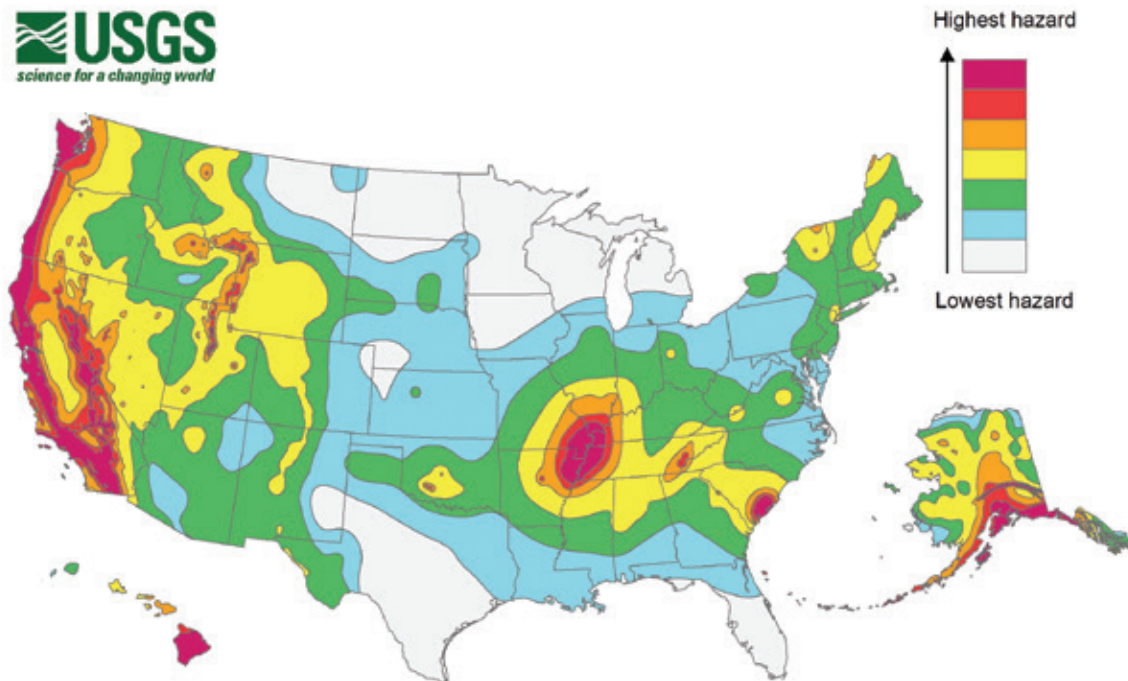


Todd G. Kemen
SE California
Lic. S5409

Why is seismic bracing important?

Studies have shown that earthquake damage to **mechanical, electrical and plumbing (MEP)** systems account for more than half of monetary damage to buildings after such events. Seismic bracing of MEP systems is required in **Seismic Design Categories (SDC) E and F**. A structure's occupancy, location and the soil conditions determine its SDC, but in general, the areas highlighted in orange, yellow, red and pink on the map below constitute moderate to high seismic regions where MEP bracing should be provided. The upfront cost of the bracing systems is offset by the time, energy and labor required to replace/repair damaged systems after a seismic event. Furthermore, components, such as gas lines, fire sprinkler pipes, and electrical conduits, may be required to be operational after a seismic event for critical structures, such as fire stations, hospitals, police stations and water treatment plants.

The **American Society of Civil Engineers (ASCE) Standard 7-16** contains the most recent edition code requirements for MEP bracing systems. The minimum design loads, hazard levels and associated criteria and intended performance goals contained in this standard are derived from research and observed performance of buildings. **ASCE 7** governs seismic design criteria on both the national and worldwide sectors and is required for usage in all seismic design categories.



GENERAL SPECIFICATIONS AND DESIGN NOTES

- All seismic restraint systems should be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.
- Installation of seismic restraints should not cause any change of position of equipment, piping or ductwork, resulting in stresses or misalignment.
- No rigid connections between equipment and the building structure should be made that degrade the noise and vibration-isolation system specified.
- The contractor shall not install any equipment, piping, duct or conduit that makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.
- Coordinate work with other trades to avoid rigid contact with the building.
- Any conflicts with other trades that will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the attention of the architect or engineer prior to installation.
- Prior to installation, bring to the attention of the architect or engineer any discrepancies between the specifications and the field conditions or changes required due to the specific equipment selection.

Overstressing of the building structure should not occur because of overhead support of equipment. Contractors should submit loads to the structural engineer for approval.

Generally, bracing may occur from:

A. Flanges of structural beam

B. Upper truss cords in bar joist construction, and

C. Cast-in-place inserts or wedge-type drill-in concrete anchors.

- Type 6 cable restraints should be installed slightly slacked to avoid short-circuiting the isolated suspended equipment, ductwork, piping or conduit.
- Type 6 cable assemblies should be installed taut on non-isolated systems. Type 7 seismic solid braces may be used in place of cables on rigidly attached systems only.
- Cables should not be installed over sharp corners.
- At all locations where type 6 or 7 restraints are located, the support rods should be braced when necessary to accept compressive loads with type 8 braces. Welding of compression braces to the vertical support rods is not acceptable.

Equipment and systems that should be restrained:

ELECTRICAL EQUIPMENT

- > Battery racks
- > Bus ducts
- > Cable trays
- > Conduit
- > Electrical panels
- > Electrical raceways
- > Generators
- > Light fixtures
- > Motor control centers
- > Switch gear
- > Transformers
- > Unit substations
- > Variable frequency drives

MECHANICAL EQUIPMENT

- > A/C units
- > Air distribution boxes
- > Air-handling units
- > Air separators
- > Boilers
- > Cabinet heaters
- > Chillers
- > Compressors
- > Computer room A/C units
- > Condensers
- > Condensing units
- > Cooling towers
- > Ductwork
- > Fans (all types)
- > Fan coil units (suspended)
- > Fan terminal units
- > Heat exchanges
- > Piping
- > Pumps (all types)
- > Rooftop units
- > Sound attenuators
- > Tanks (all types)
- > Unit heaters
- > Water heaters

GENERAL SPECIFICATIONS AND DESIGN NOTES CON'T.

- *At all locations where type 6 or 7 restraints are attached to a clevis, the clevis cross bolt should be reinforced with type 9 braces.*
- *The vibration-isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails should not be permitted.*
- *When vertical pipe risers are flexibly supported to accommodate thermal motion and/or pipe vibration concerns, the pipe shall be guided with type 13 pipe guides, located to maintain pipe stability and provide horizontal seismic restraint. Where necessary, the riser shall also be anchored with type 12 pipe anchors, located to provide thermal control and vertical seismic restraint.*
- *Seismic restraints should be mechanically attached to the system. It is not sufficient to loop restraints around the system.*
- *Piping crossing building seismic joints, passing from building to building or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections or support connections. Pipe offsets, loops, anchors and guides shall be installed as shown on the plans or as required to provide required motion capability and limit motion of adjacent piping.*
- *Avoid crossing seismic separations. If necessary, cross at the lowest possible floor to provide for flexibility in piping that exceeds the anticipated movement as defined by the structural engineer of record.*
- *Avoid locating equipment (especially water tanks) on the roof of buildings.*
- *Water tanks should be secured to their saddles by welding or proper concrete attachment and those saddles should be properly attached to the structure.*
- *Brace all air distribution terminal units with water coils. Design flexibility into the piping/coil connection.*
- *Design piping systems into zones that can be isolated during emergencies. Provide sectional shut-off valves and readily accessible drainage ports.*
- *Do not brace a system to two different structures such as a wall and a ceiling.*
- *Provide appropriate openings in walls, floors and ceilings or design flexibility into the system for the anticipated movements.*

Per ASCE 7-16, the total design lateral force, F_p , is determined in accordance with the following equation:

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

except that

F_p shall not be greater than $1.6 S_{DS} I_p W_p$

and

shall not be taken as less than $0.3 S_{DS} I_p W_p$

where

- W_p = The element or component operating weight.
- I_p = The component importance factor. The value of I_p shall be 1.0 for all occupancies, except I_p shall be 1.5 for essential and hazardous facilities and all machinery related to life safety systems required to function after an earthquake.
- z = The height in structure of the highest point of attachment of the component. For items at or below grade, z shall be taken as 0. For items at or above the roof, z is not required to be taken greater than the roof height h .
- h = The average structure roof elevation with respect to grade.
- a_p = The in-structure component amplification factor. The value of a_p ranges between 1.0 and 2.5.
- R_p = The component response modification factor. The value of R_p ranges between 1.25 and 5.0. R_p for anchorages shall equal 1.5 for shallow expansion anchors, shallow chemical anchors or shallow cast-in-place anchors. Shallow concrete anchors are those with an embedment-length-to-diameter ratio less than 8.
- S_{DS} = The design spectral response acceleration at short periods and is equal to $2/3 S_{MS}$.
- S_{MS} = The maximum considered earthquake spectral response accelerations for short periods and is equal to $F_a \times S_s$.
- S_s = The mapped spectral response acceleration at short periods.
- F_a = The site coefficient defined in Table 11.4-1 of Chapter 11 ASCE7-16 for a specific site class (A to F) and S_s . Site class is determined from the site-specific soil survey. Site Class A represents hard rock soil and Site Class F represents soft soil. Where soil conditions are not known use Site Class E for S_s values up to 0.5 and Site Class D for all other values of S_s .

OVERVIEW

SEISMIC COEFFICIENTS FOR MECHANICAL AND ELECTRICAL COMPONENTS

COMPONENTS	a_p	R_p	Ω_0
MECHANICAL AND ELECTRICAL COMPONENTS			
<i>Manufacturing or process conveyors (non-personnel)</i>	2½	3	2
<i>Air-side HVACR, fans, air handlers, air conditioning units, cabinet heaters, air distribution boxes and other mechanical components constructed of sheet metal framing</i>	2½	6	2
<i>Wet-side HVACR, boilers, furnaces, atmospheric tanks and bins, chillers, water heaters, heat exchangers, evaporators, air separators, manufacturing or process equipment and other mechanical components constructed of high-deformability materials</i>	1	2½	2
<i>Air coolers (fin fans), air-cooled heat exchangers, condensing units, dry coolers, remote radiators and other mechanical components elevated on integral structural steel or sheet metal supports</i>	2½	3	1½
<i>Engines, turbines, pumps, compressors and pressure vessels not supported on skirts and not within the scope of Chapter 15</i>	1	2½	2
<i>Skirt-supported pressure vessels not within the scope of Chapter 15</i>	2½	2½	2
<i>Elevator and escalator components</i>	1	2½	2
<i>Generators, batteries, inverters, motors, transformers and other electrical components constructed of high-deformability materials</i>	1	2½	2
<i>Motor control centers, panel boards, switch gear, instrumentation cabinets and other components constructed of sheet metal framing</i>	2½	6	2
<i>Communication equipment, computers, instrumentation and controls</i>	1	2½	2
<i>Roof-mounted stacks, cooling and electrical towers laterally braced below their center of mass</i>	2½	3	2
<i>Roof-mounted stacks, cooling and electrical towers laterally braced above their center of mass</i>	1	2½	2
<i>Lighting fixtures</i>	1	1½	2
<i>Other mechanical or electrical components</i>	1	½	2
VIBRATION-ISOLATED COMPONENTS AND SYSTEMS ^b			
<i>Components and systems isolated using neoprene elements and neoprene isolated floors with built-in or separate elastomeric snubbing devices or resilient perimeter stops</i>	2½	2½	2
<i>Spring-isolated components and systems and vibration-isolated floors closely restrained using built-in or separate elastomeric snubbing devices or resilient perimeter stops</i>	2½	2	2
<i>Internally isolated components and systems</i>	2½	2	2
<i>Suspended vibration-isolated equipment, including in-line duct devices and suspended internally isolated components</i>	2½	2½	2

COMPONENTS	a_p	R_p	Ω_0
DISTRIBUTION SYSTEMS			
<i>Piping in accordance with ASME B31 (2001, 2002, 2008, and 2010), including in-line components with joints made by welding or brazing</i>	2½	12	2
<i>Piping in accordance with ASME B31, including in-line components, constructed of high- or limited-deformability materials, with joints made by threading, bonding, compression couplings or grooved couplings</i>	2½	6	2
<i>Piping and tubing not in accordance with ASME B31, including in-line components constructed of high-deformability materials, with joints made by welding or brazing</i>	2½	9	2
<i>Piping and tubing not in accordance with ASME B31, including in-line components constructed of high- or limited-deformability materials, with joints made by threading, bonding, compression couplings or grooved couplings</i>	2½	4½	2
<i>Piping and tubing constructed of low-deformability materials such as cast iron, glass and nonductile plastics</i>	2½	3	2
<i>Duct systems, including in-line components constructed of high-deformability materials with joints made by welding or brazing</i>	2½	9	2
<i>Duct systems, including in-line components, constructed of high- or limited-deformability materials, with joints made by means other than welding or brazing</i>	2½	6	2
<i>Duct systems, including in-line components constructed of low-deformability materials such as cast iron, glass, and nonductile plastics</i>	2½	3	2
<i>Electrical conduit, cable trays and raceways</i>	2½	6	2
<i>Bus ducts</i>	1	2½	2
<i>Plumbing</i>	1	2½	2
<i>Pneumatic tube transport systems</i>	2½	6	2

- A A lower value for a_p is permitted where justified by detailed dynamic analyses. The value for a_p shall not be less than 1. The value of a_p equal to 1 is for rigid components and rigidly attached components. The value of a_p equal to 2½ is for flexible components and flexibly attached components.
- B Components mounted on vibration isolators shall have a bumper restraint or snubber in each horizontal direction. The design force shall be taken as $2F_p$ if the nominal clearance (air gap) between the equipment support frame and restraint is greater than 0.25 in. (6 mm). If the nominal clearance specified on the construction documents is not greater than 0.25 in. (6 mm), the design force is permitted to be taken as F_p .
- C Overstrength is required for anchorage to concrete and masonry. See Section 12.4.3 of ASCE 7-16 for seismic load effects, including overstrength.

Component Importance Factor

All components shall be assigned a component importance factor, as indicated in this section. The component importance factor, I_p , shall be taken as 1.5 if any of the following conditions apply:

- ▶ 1| The component is required to function for life-safety purposes after an earthquake, including fire protection sprinkler systems and egress stairways.

- ▶ 2| The component conveys, supports, or otherwise contains toxic, highly toxic or explosive substances where the quantity of the material exceeds a threshold quantity established by the Authority Having Jurisdiction and is sufficient to pose a threat to the public if released.

- ▶ 3| The component is in or attached to a Risk Category IV structure and it is needed for continued operation of the facility or its failure could impair the continued operation of the facility.

- ▶ 4| The component conveys, supports or otherwise contains hazardous substances and is attached to a structure or portion thereof classified by the Authority Having Jurisdiction as a hazardous occupancy.



For the purposes of this chapter, nonstructural components shall be assigned to the same Seismic Design Category as the structure that they occupy or to which they are attached.

Exemptions

The following nonstructural components are exempt from the requirements of this chapter:

- ▶ 1| Furniture, except storage cabinets, as noted in Table 13.5-1 of ASCE 7-16;

- ▶ 2| Temporary or movable equipment;

- ▶ 3| Architectural components in Seismic Design Category B, other than parapets, provided that the component importance factor, I_p , is equal to 1.0;

- ▶ 4| Mechanical and electrical components in Seismic Design Category B;



All other components shall be assigned a component importance factor, I_p , equal to 1.0.

- ▶ 5| Mechanical and electrical components in Seismic Design Category C, provided that either
 - a. The component importance factor, I_p , is equal to 1.0 and the component is positively attached to the structure; or
 - b. The component weighs 20 lbs. (89 N) or less than 5 plf.

- ▶ 6| Discrete mechanical and electrical components in Seismic Design Categories D, E, or F that are positively attached to the structure, provided that either
 - a. The component weighs 400 lbs. (1,779 N) or less, the center of mass is located 4 ft. (1.22 m) or less above the adjacent floor level, flexible connections are provided between the component and associated ductwork, piping, and conduit, and the component importance factor, I_p , is equal to 1.0; or
 - b. The component weighs 20 lbs. (89 N) or less than 5 plf.

- ▶ 7| Distribution systems in Seismic Design Categories D, E, or F included in the exceptions for conduit, cable tray, and raceways in Section 13.6.5, duct systems in 13.6.6 and piping and tubing systems in 13.6.7.3. Where in-line components, such as valves, in-line suspended pumps, and mixing boxes require independent support, they shall be addressed as discrete components and shall be braced considering the tributary contribution of the attached distribution system.

MANUAL USE INSTRUCTIONS

This manual has been designed with the tradesman and general contractor in mind. With design criteria from the approved construction documents, the user will be able to pull out the transverse and longitudinal brace spacing. The necessary seismic design factors are: I_p , SDS , z/h - these factors have been defined earlier in this section and are taken from Chapter 13 of the ASCE 7-16 Standard.

Suggested connection details are also provided in Section C. Note that it is beyond the scope of this document to design site specific connection details from project to project. These details should be provided by the Design Professional of Record.

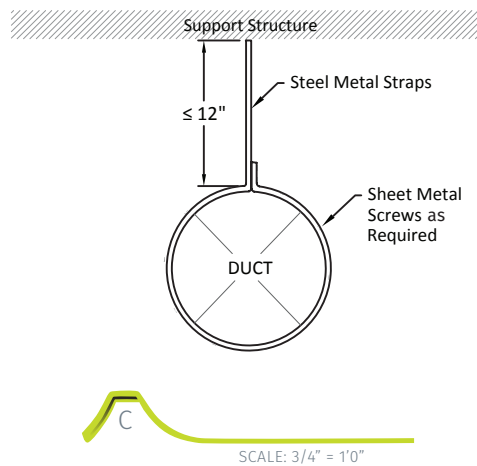
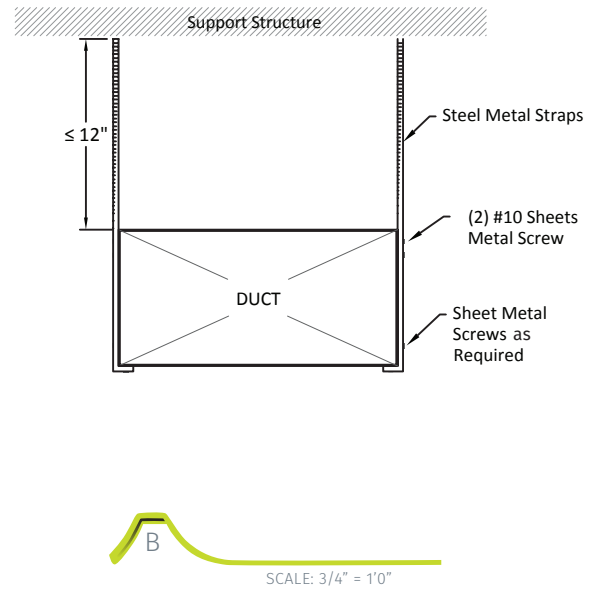
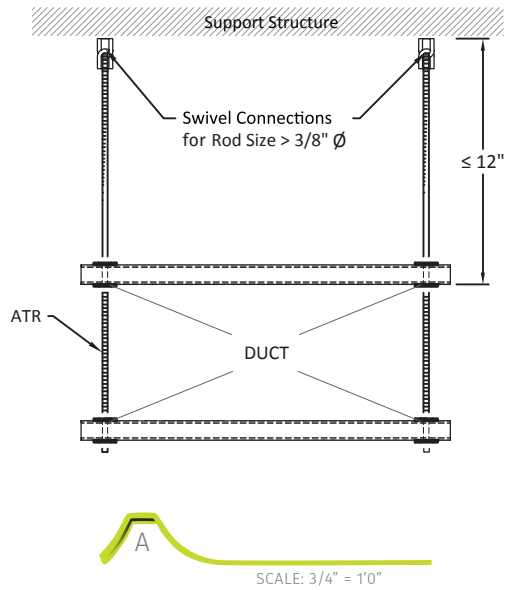
Finally, selected G-STRUT® fittings and components have been provided in Section A. For a full range of G-STRUT® accessories, pricing, and sales information, please visit gregorystrut.com.

LIMITATIONS OF LIABILITY

G-STRUT®/G-FORCE® and Response Structural Engineers are providing these details as suggestions based on industry standards. Project-specific drawings and requirements should be verified prior to applying the schematic details in the following sections. Use of the seismic bracing details for a given project should be accepted by the architect or Structural Engineer of Record. G-STRUT® and G-FORCE® are registered trademarks of Gregory Industries, Inc.

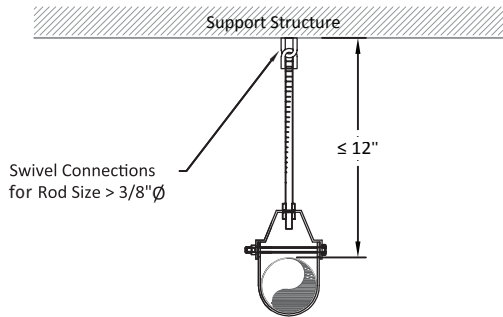
12" RULE

FOR SUSPENDED DUCTWORK

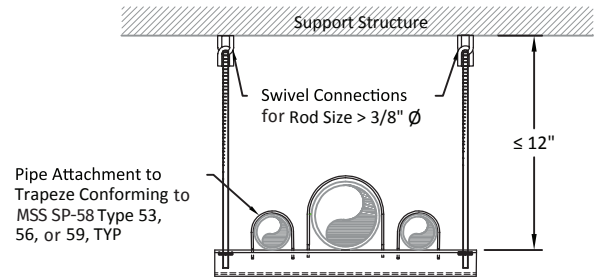


NOTE: It is acceptable to exclude seismic bracing when the following conditions are met, per ASCE 7-16 Ch. 13.

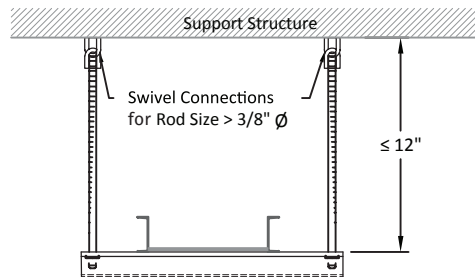
12" RULE FOR SUSPENDED PIPING



A CLEVIS HUNG PIPE
SCALE: 3/4" = 1'0"



B PIPES ON TRAPEZE
SCALE: 1/2" = 1'0"

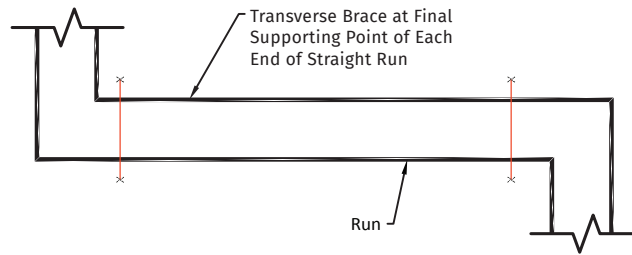


C CONDUIT OR CABLE TRAY ON TRAPEZE
SCALE: 1 1/2" = 1'0"

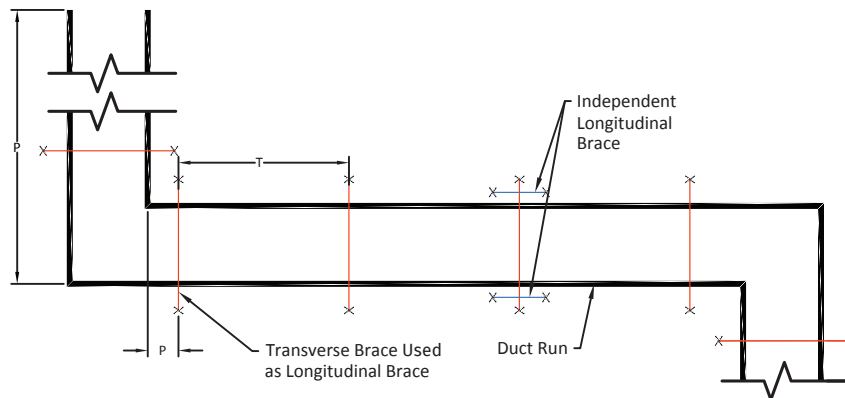
NOTE: It is acceptable to exclude seismic bracing when the following conditions are met, per ASCE 7-16 Ch. 13.

SEISMIC BRACES

LAYOUT

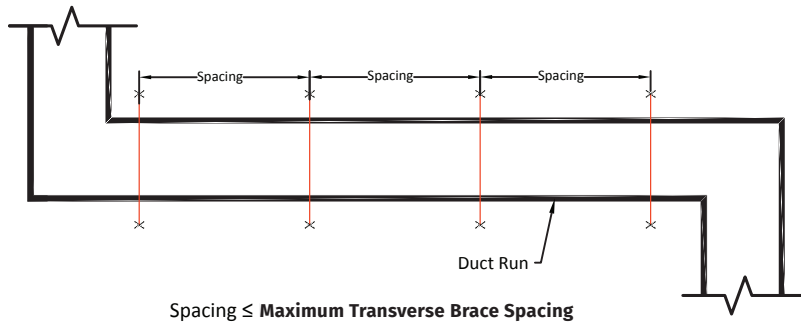


Spacing \leq Maximum Transverse Brace Spacing

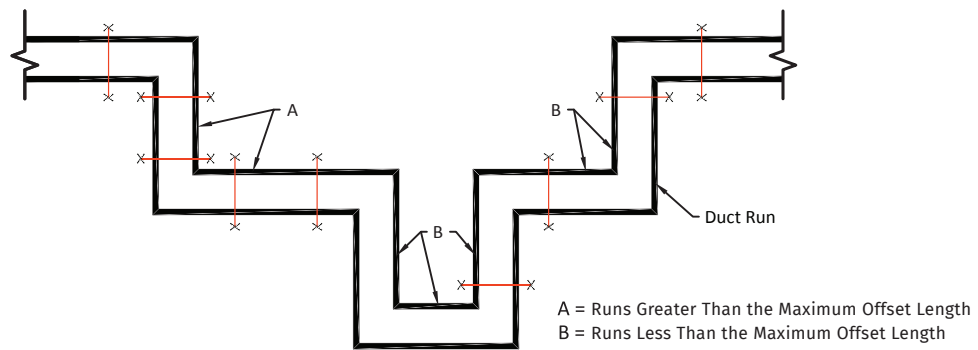


L = Maximum Allowable Longitudinal Brace Spacing
 T = The Distance Between Transverse Braces
 A = Offset Length \leq 2 feet



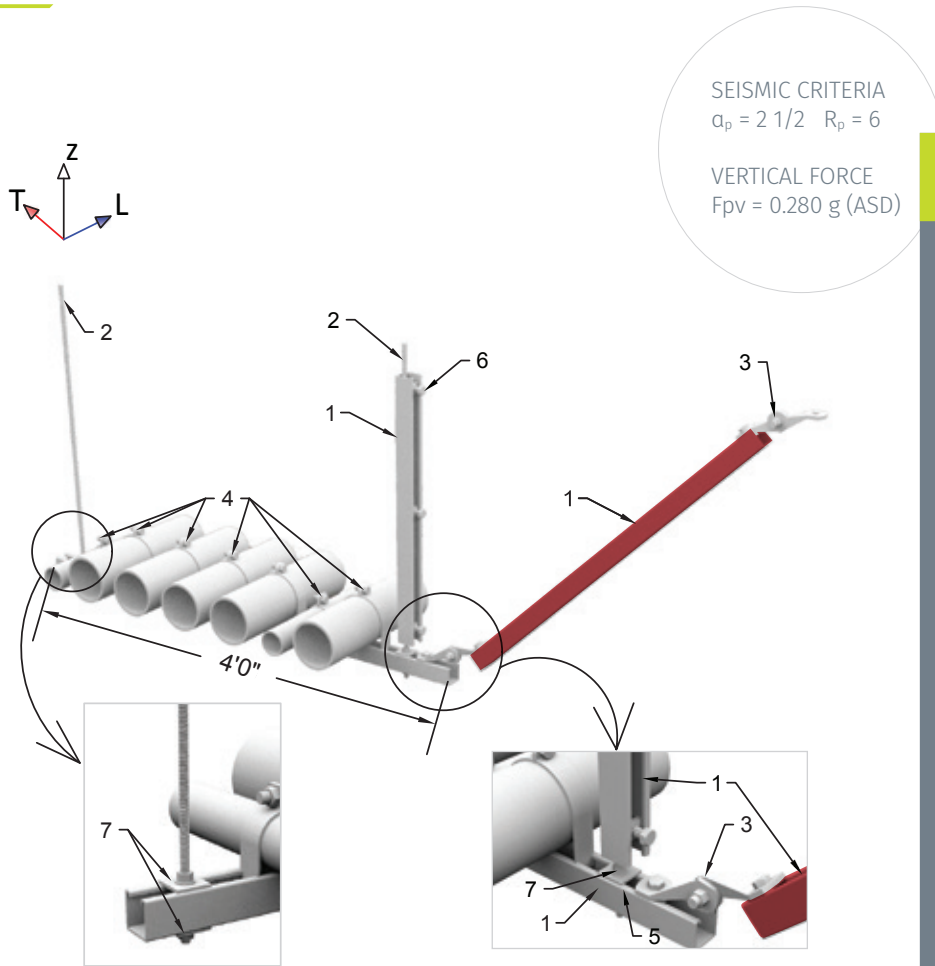


C
PLAN VIEW
SCALE: 3/4" = 1'0"



D
PLAN VIEW
SCALE: 3/4" = 1'0"

4'0" TRAPEZE WITH TRANSVERSE BRACE



SEISMIC CRITERIA
 $\alpha_p = 2 \frac{1}{2}$ $R_p = 6$

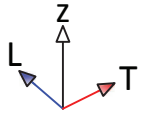
VERTICAL FORCE
 $F_{pv} = 0.280 \text{ g (ASD)}$

MATERIALS LIST

- 1 G582 Strut (QTY 3)
- 2 1/2" ϕ All Thread (QTY 2)
- 3 Seismic Hinges (QTY 2)
- 4 Conduit/Pipe Clamp (QTY 7)
- 5 GN822 (QTY 2)
- 6 GRS375062 (QTY 3)
- 7 G201050 Top and Bottom (QTY 4)

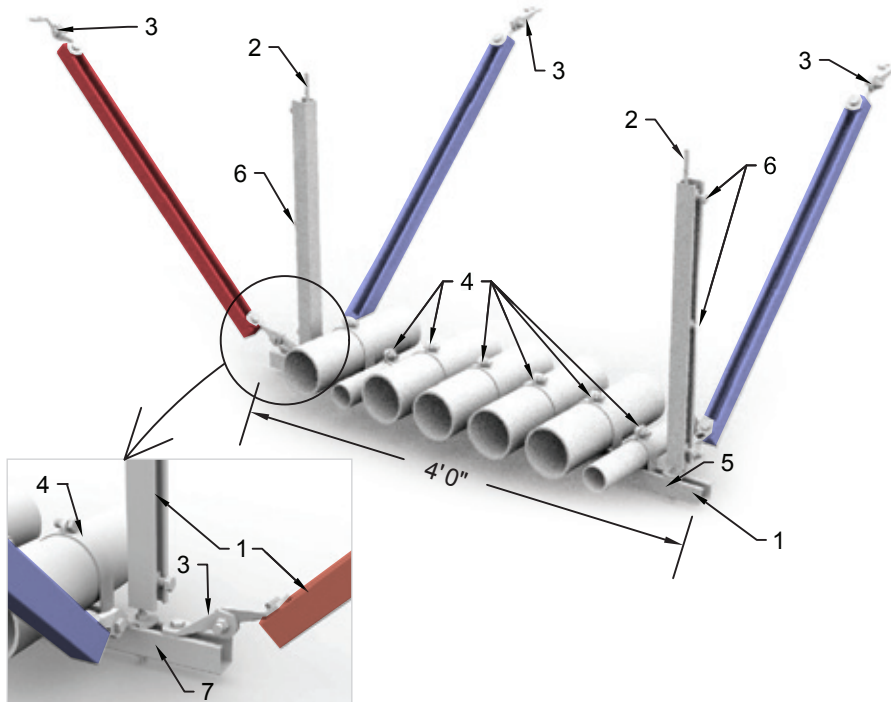
		WEIGHT (TOTAL PER FT.)	HANGER DIA. AND SPACING	SEISMIC PARAMETERS	BRACE SPACING (FT.)			
					$S_{DS} \leq 1.00$ TRANS. SPACING (T)	SEISMIC FACTOR F_{ph} (g) ASD	$1.00 < S_{DS} \leq 2.00$ TRANS. SPACING (T)	SEISMIC FACTOR F_{ph} (g) ASD
IMPORTANCE FACTOR, I_p	$I_p = 1.00$	25 plf	1/2" ϕ	$z/h \leq 0.5$	56'0"	0.210	28'0"	0.420
			14'0"	$z/h \leq 1.0$	56'0"	0.233	28'0"	0.467
		50 plf	1/2" ϕ	$z/h \leq 0.5$	24'0"	0.210	12'0"	0.420
			12'0"	$z/h \leq 1.0$	24'0"	0.233	12'0"	0.467
	$I_p = 1.50$	25 plf	1/2" ϕ	$z/h \leq 0.5$	48'0"	0.263	12'0"	0.630
			12'0"	$z/h \leq 1.0$	36'0"	0.350	12'0"	0.700
		50 plf	1/2" ϕ	$z/h \leq 0.5$	20'0"	0.263	10'0"	0.630
			10'0"	$z/h \leq 1.0$	20'0"	0.350	10'0"	0.700

4'0" TRAPEZE WITH TRANSVERSE AND LONGITUDINAL BRACE



SEISMIC CRITERIA
 $\alpha_p = 2 \frac{1}{2}$ $R_p = 6$

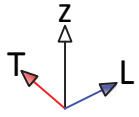
VERTICAL FORCE
 $F_{pv} = 0.280 \text{ g (ASD)}$



MATERIALS LIST	
1	G582 Strut (QTY 6)
2	1/2" ϕ All Thread (QTY 2)
3	Seismic Hinges (QTY 6)
4	Conduit/Pipe Clamp (QTY 7)
5	GN822 (QTY 2)
6	GRS375062 (QTY 6)
7	G201050 Top and Bottom (QTY 4)

IMPORTANCE FACTOR, I_p	WEIGHT (TOTAL PER FT.)	HANGER DIA. AND SPACING	SEISMIC PARAMETERS	BRACE SPACING (FT.)			
				$S_{Ds} \leq 1.00$		$1.00 < S_{Ds} \leq 2.00$	
				TRANS. SPACING (T)	LONGIT. SPACING (L)	TRANS. SPACING (T)	LONGIT. SPACING (L)
$I_p = 1.00$	25 plf	1/2" ϕ	$z/h \leq 0.5$	56'0"	56'0"	28'0"	56'0"
		14'0"	$z/h \leq 1.0$	56'0"	56'0"	28'0"	56'0"
	50 plf	1/2" ϕ	$z/h \leq 0.5$	24'0"	48'0"	12'0"	24'0"
		12'0"	$z/h \leq 1.0$	24'0"	48'0"	12'0"	24'0"
$I_p = 1.50$	25 plf	1/2" ϕ	$z/h \leq 0.5$	48'0"	72'0"	12'0"	24'0"
		12'0"	$z/h \leq 1.0$	36'0"	72'0"	12'0"	24'0"
	50 plf	1/2" ϕ	$z/h \leq 0.5$	20'0"	40'0"	10'0"	20'0"
		10'0"	$z/h \leq 1.0$	20'0"	40'0"	10'0"	20'0"

8'0" DOUBLE TRAPEZE WITH TRANSVERSE BRACE

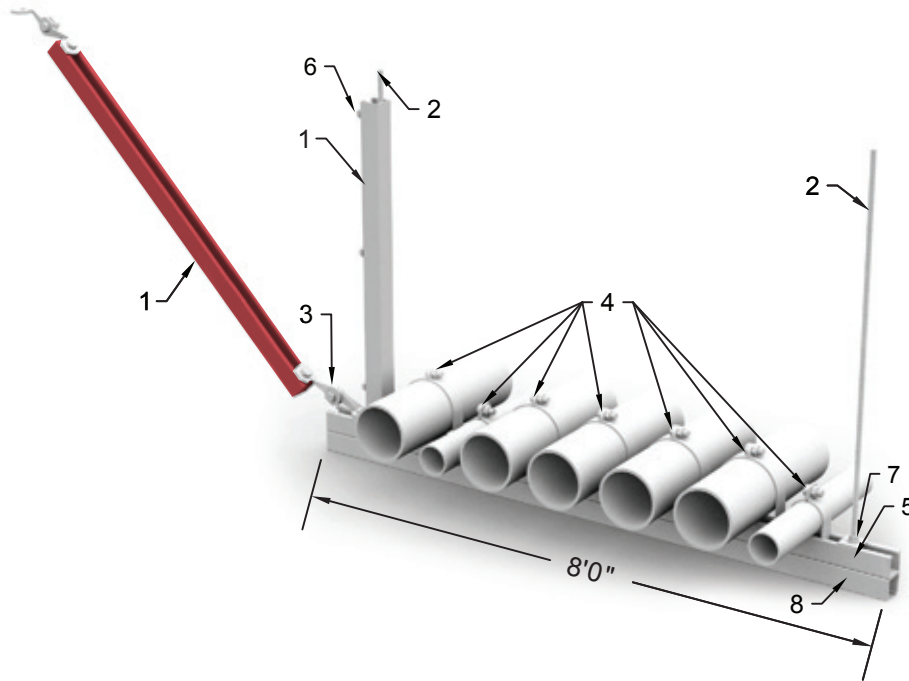


SEISMIC CRITERIA
 $\alpha_p = 2 \frac{1}{2}$ $R_p = 6$

VERTICAL FORCE
 $F_{pv} = 0.280 \text{ g (ASD)}$

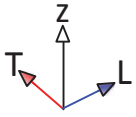
MATERIALS LIST

- 1 G582 Strut (QTY 2)
- 2 1/2" ϕ All Thread (QTY 2)
- 3 Seismic Hinges (QTY 2)
- 4 Conduit/Pipe Clamp (QTY 7)
- 5 GN822 (QTY 2)
- 6 GRS375062 (QTY 3)
- 7 G201050 Top and Bottom (QTY 4)
- 8 G582A Strut (QTY 1)



IMPORTANCE FACTOR, I_p	WEIGHT (TOTAL PER FT.)	HANGER DIA. AND SPACING	SEISMIC PARAMETERS	BRACE SPACING (FT.)			
				$S_{DS} \leq 1.00$ TRANS. SPACING (T)	SEISMIC FACTOR F_{ph} (g) ASD	$1.00 < S_{DS} \leq 2.00$ TRANS. SPACING (T)	SEISMIC FACTOR F_{ph} (g) ASD
$I_p = 1.00$	50 plf	1/2" ϕ	$z/h \leq 0.5$	28'0"	0.210	14'0"	0.420
		14'0"	$z/h \leq 1.0$	28'0"	0.233	14'0"	0.467
	75 plf	1/2" ϕ	$z/h \leq 0.5$	20'0"	0.210	10'0"	0.420
		10'0"	$z/h \leq 1.0$	20'0"	0.233	10'0"	0.467
$I_p = 1.50$	50 plf	1/2" ϕ	$z/h \leq 0.5$	20'0"	0.263	10'0"	0.630
		10'0"	$z/h \leq 1.0$	20'0"	0.350	10'0"	0.700
	75 plf	1/2" ϕ	$z/h \leq 0.5$	10'0"	0.263	5'0"	0.630
		5'0"	$z/h \leq 1.0$	10'0"	0.350	5'0"	0.700

8'-0" DOUBLE TRAPEZE WITH TRANSVERSE AND LONGITUDINAL BRACE

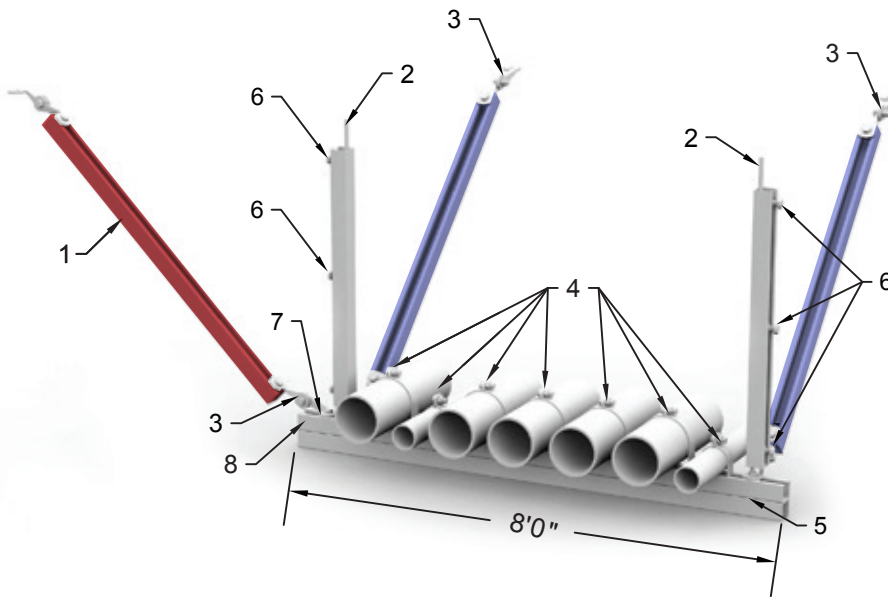


SEISMIC CRITERIA
 $\alpha_p = 2 \frac{1}{2}$ $R_p = 6$

VERTICAL FORCE
 $F_{pv} = 0.280 \text{ g (ASD)}$

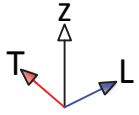
MATERIALS LIST

- 1 G582 Strut (QTY 5)
- 2 1/2" ϕ All Thread (QTY 2)
- 3 Seismic Hinges (QTY 6)
- 4 Conduit/Pipe Clamp (QTY 7)
- 5 GN822 (QTY 2)
- 6 GRS375062 (QTY 6)
- 7 G201050 Top and Bottom (QTY 4)
- 8 G582A Strut (QTY 1)



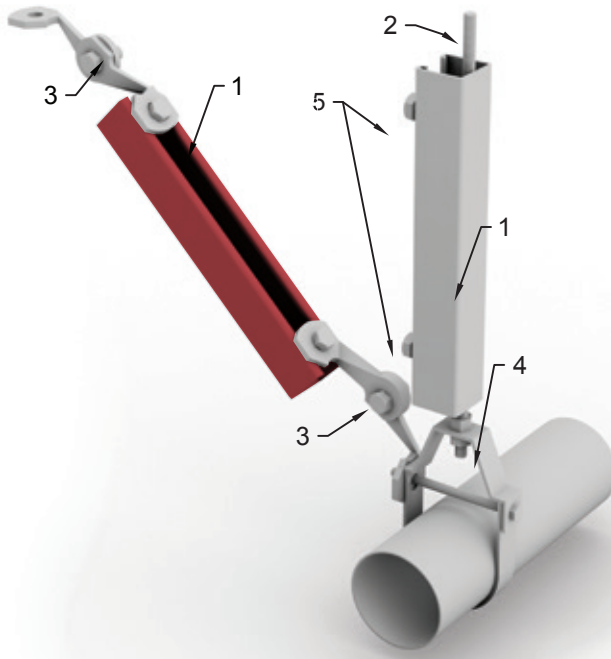
IMPORTANCE FACTOR, I_p	WEIGHT (TOTAL PER FT.)	HANGER DIA. AND SPACING	SEISMIC PARAMETERS	BRACE SPACING (FT.)			
				$S_{DS} \leq 1.00$		$1.00 < S_{DS} \leq 2.00$	
				TRANS. SPACING (T)	LONGIT. SPACING (L)	TRANS. SPACING (T)	LONGIT. SPACING (L)
$I_p = 1.00$	50 plf	1/2" ϕ	$z/h \leq 0.5$	28'0"	56'0"	14'0"	28'0"
		14'0"	$z/h \leq 1.0$	28'0"	56'0"	14'0"	28'0"
	75 plf	1/2" ϕ	$z/h \leq 0.5$	20'0"	40'0"	10'0"	20'0"
		10'0"	$z/h \leq 1.0$	20'0"	40'0"	10'0"	20'0"
$I_p = 1.50$	50 plf	1/2" ϕ	$z/h \leq 0.5$	20'0"	40'0"	10'0"	20'0"
		10'0"	$z/h \leq 1.0$	20'0"	40'0"	10'0"	20'0"
	75 plf	1/2" ϕ	$z/h \leq 0.5$	15'0"	30'0"	5'0"	10'0"
		5'0"	$z/h \leq 1.0$	10'0"	25'0"	5'0"	10'0"

SINGLE PIPE WITH TRANSVERSE BRACE



SEISMIC CRITERIA
 $\alpha_p = 2 \frac{1}{2}$ $R_p = 6$

VERTICAL FORCE
 $F_{pv} = 0.280 \text{ g (ASD)}$



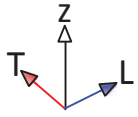
MATERIALS LIST

- 1 G582 Strut (QTY 2)
- 2 1/2" ϕ All Thread (QTY 1)
- 3 Seismic Hinges (QTY 2)
- 4 Conduit/Pipe Clamp (QTY 1)
- 5 GRS375062 (QTY 2)

PIPING MEETING ASME B31 REQUIREMENTS

IMPORTANCE FACTOR, I_p	WEIGHT (TOTAL PER FT.)	HANGER DIA. AND SPACING	SEISMIC PARAMETERS	BRACE SPACING (FT.)			
				$S_{DS} \leq 1.00$ TRANS. SPACING (T)	SEISMIC FACTOR F_{ph} (g) ASD	$1.00 < S_{DS} \leq 2.00$ TRANS. SPACING (T)	SEISMIC FACTOR F_{ph} (g) ASD
$I_p = 1.00$	25 plf	1/2" ϕ	$z/h \leq 0.5$	56'0"	0.210	28'0"	0.420
		14'0"	$z/h \leq 1.0$	56'0"	0.233	28'0"	0.467
	50 plf	1/2" ϕ	$z/h \leq 0.5$	24'0"	0.210	12'0"	0.420
		12'0"	$z/h \leq 1.0$	24'0"	0.233	12'0"	0.467
$I_p = 1.50$	25 plf	1/2" ϕ	$z/h \leq 0.5$	48'0"	0.263	12'0"	0.630
		12'0"	$z/h \leq 1.0$	36'0"	0.350	12'0"	0.700
	50 plf	1/2" ϕ	$z/h \leq 0.5$	20'0"	0.263	10'0"	0.630
		10'0"	$z/h \leq 1.0$	20'0"	0.350	10'0"	0.700

SINGLE PIPE WITH TRANSVERSE AND LONGITUDINAL BRACE

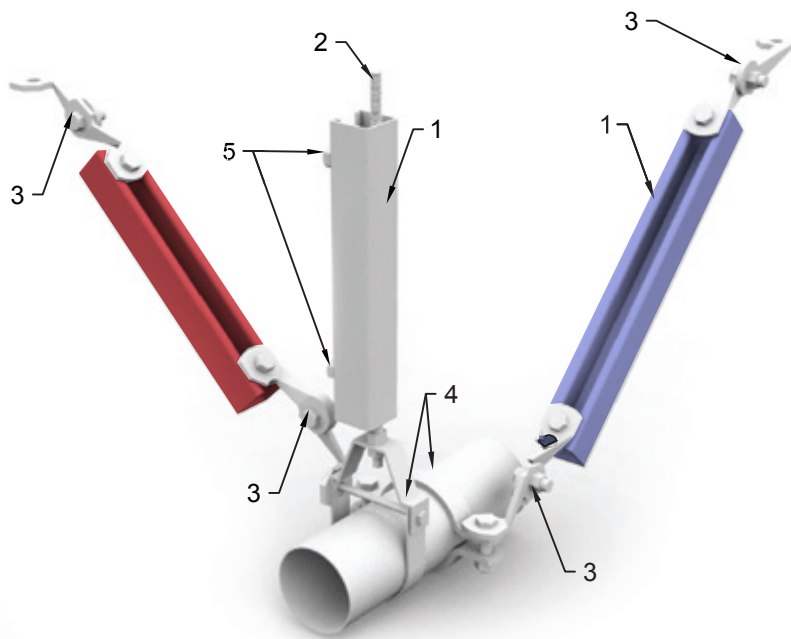


SEISMIC CRITERIA
 $\alpha_p = 2 \frac{1}{2}$ $R_p = 6$


VERTICAL FORCE
 $F_{pv} = 0.280 \text{ g (ASD)}$

MATERIALS LIST

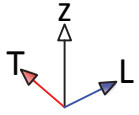
- 1 G582 Strut (QTY 3)
- 2 1/2" ϕ All Thread (QTY 1)
- 3 Seismic Hinges (QTY 4)
- 4 Conduit/Pipe Clamp (QTY 2)
- 5 GRS375062 (QTY 2)



PIPING MEETING ASME B31 REQUIREMENTS

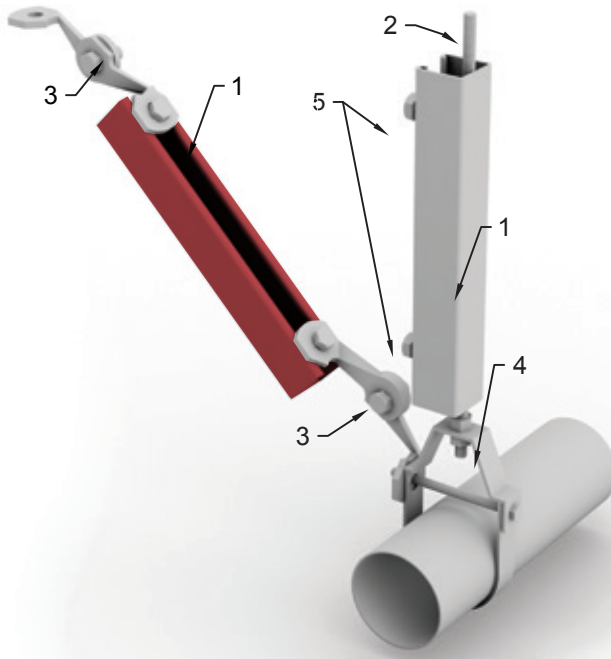
	WEIGHT (TOTAL PER FT.)	HANGER DIA. AND SPACING	SEISMIC PARAMETERS	BRACE SPACING (FT.)				
				$S_{DS} \leq 1.00$		$1.00 < S_{DS} \leq 2.00$		
				TRANS. SPACING (T)	LONGIT. SPACING (L)	TRANS. SPACING (T)	LONGIT. SPACING (L)	
IMPORTANCE FACTOR, I_p	$I_p = 1.00$	25 plf	1/2" ϕ	$z/h \leq 0.5$	56'0"	56'0"	28'0"	56'0"
			14'0"	$z/h \leq 1.0$	56'0"	56'0"	28'0"	56'0"
		50 plf	1/2" ϕ	$z/h \leq 0.5$	24'0"	48'0"	12'0"	24'0"
			12'0"	$z/h \leq 1.0$	24'0"	48'0"	12'0"	24'0"
	$I_p = 1.50$	25 plf	1/2" ϕ	$z/h \leq 0.5$	48'0"	72'0"	12'0"	24'0"
			12'0"	$z/h \leq 1.0$	36'0"	72'0"	12'0"	24'0"
		50 plf	1/2" ϕ	$z/h \leq 0.5$	20'0"	40'0"	10'0"	20'0"
			10'0"	$z/h \leq 1.0$	20'0"	40'0"	10'0"	20'0"

SINGLE PIPE WITH TRANSVERSE BRACE



SEISMIC CRITERIA
 $\alpha_p = 2 \frac{1}{2}$ $R_p = 3$

VERTICAL FORCE
 $F_{pv} = 0.280 \text{ g (ASD)}$



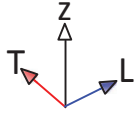
MATERIALS LIST

- 1 G582 Strut (QTY 2)
- 2 1/2" ϕ All Thread (QTY 1)
- 3 Seismic Hinges (QTY 2)
- 4 Conduit/Pipe Clamp (QTY 1)
- 5 GRS375062 (QTY 2)

PIPING NOT MEETING ASME B31 REQUIREMENTS

		WEIGHT (TOTAL PER FT.)	HANGER DIA. AND SPACING	SEISMIC PARAMETERS	BRACE SPACING (FT.)			
					$S_{DS} \leq 1.00$ TRANS. SPACING (T)	SEISMIC FACTOR F_{ph} (g) ASD	$1.00 < S_{DS} \leq 2.00$ TRANS. SPACING (T)	SEISMIC FACTOR F_{ph} (g) ASD
IMPORTANCE FACTOR, I_p	$I_p = 1.00$	25 plf	1/2" ϕ	$z/h \leq 0.5$	28'0"	0.350	14'0"	0.700
			14'0"	$z/h \leq 1.0$	28'0"	0.467	14'0"	0.933
		50 plf	1/2" ϕ	$z/h \leq 0.5$	16'0"	0.350	8'0"	0.700
			8'0"	$z/h \leq 1.0$	16'0"	0.467	8'0"	0.933
	$I_p = 1.50$	25 plf	1/2" ϕ	$z/h \leq 0.5$	16'0"	0.525	8'0"	1.050
			8'0"	$z/h \leq 1.0$	16'0"	0.700	8'0"	1.400
50 plf	1/2" ϕ	$z/h \leq 0.5$	10'0"	0.525	5'0"	1.050		
	5'0"	$z/h \leq 1.0$	10'0"	0.700	5'0"	1.400		

SINGLE PIPE WITH TRANSVERSE AND LONGITUDINAL BRACE

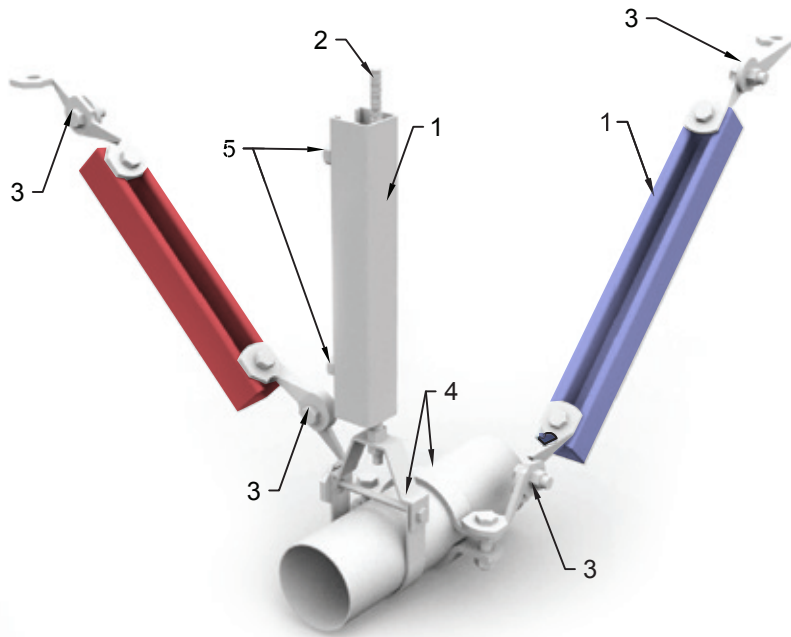


SEISMIC CRITERIA
 $\alpha_p = 2 \frac{1}{2}$ $R_p = 3$

VERTICAL FORCE
 $F_{pv} = 0.280 \text{ g (ASD)}$

MATERIALS LIST

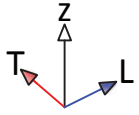
- 1 G582 Strut (QTY 3)
- 2 1/2" ϕ All Thread (QTY 1)
- 3 Seismic Hinges (QTY 4)
- 4 Conduit/Pipe Clamp (QTY 1)
- 5 GRS375062 (QTY 2)



PIPING NOT MEETING THE REQUIREMENTS ASME B31

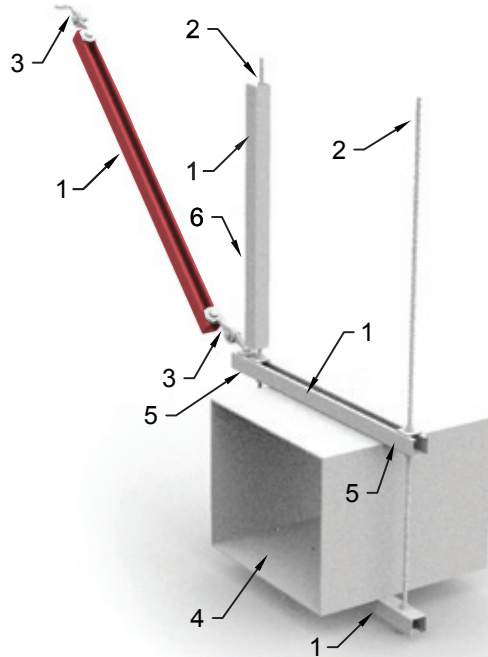
IMPORTANCE FACTOR, I_p	WEIGHT (TOTAL PER FT.)	HANGER DIA. AND SPACING	SEISMIC PARAMETERS	BRACE SPACING (FT.)			
				$S_{DS} \leq 1.00$		$1.00 < S_{DS} \leq 2.00$	
				TRANS. SPACING (T)	LONGIT. SPACING (L)	TRANS. SPACING (T)	LONGIT. SPACING (L)
$I_p = 1.00$	25 plf	1/2" ϕ	$z/h \leq 0.5$	28'0"	56'0"	14'0"	28'0"
		14'0"	$z/h \leq 1.0$	28'0"	56'0"	14'0"	28'0"
	50 plf	1/2" ϕ	$z/h \leq 0.5$	16'0"	32'0"	8'0"	16'0"
		8'0"	$z/h \leq 1.0$	16'0"	32'0"	8'0"	16'0"
$I_p = 1.50$	25 plf	1/2" ϕ	$z/h \leq 0.5$	16'0"	40'0"	8'0"	24'0"
		8'0"	$z/h \leq 1.0$	16'0"	32'0"	8'0"	16'0"
	50 plf	1/2" ϕ	$z/h \leq 0.5$	10'0"	20'0"	5'0"	10'0"
		5'0"	$z/h \leq 1.0$	10'0"	20'0"	5'0"	10'0"

SINGLE DUCT WITH TRANSVERSE BRACE



SEISMIC CRITERIA
 $\alpha_p = 2 \frac{1}{2}$ $R_p = 6$

VERTICAL FORCE
 $F_{pv} = 0.280 \text{ g (ASD)}$

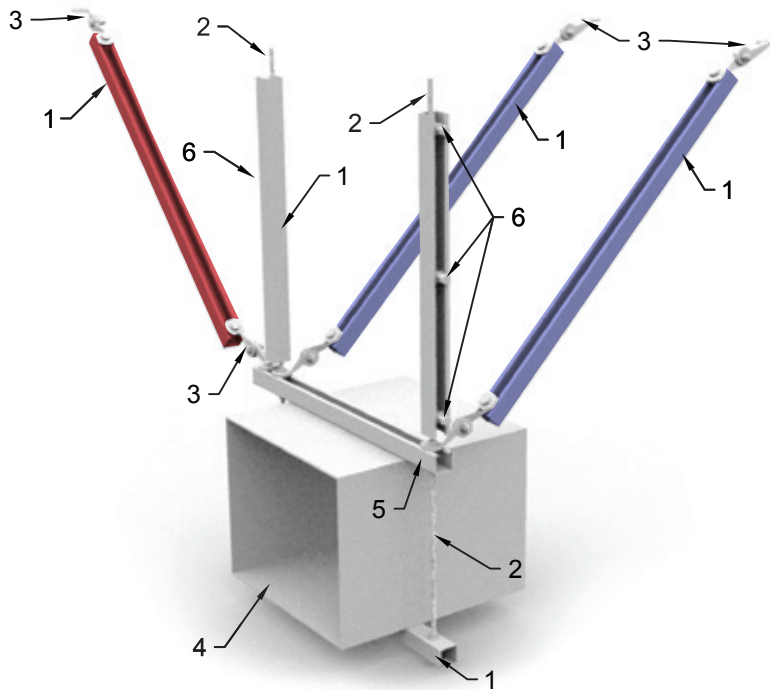
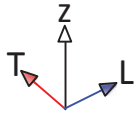


MATERIALS LIST

- 1 G582 Strut (QTY 4)
- 2 1/2" ϕ All Thread (QTY 2)
- 3 Seismic Hinges (QTY 2)
- 4 24" x 48" Max Duct (QTY -)
- 5 GN822 (QTY 4)
- 6 GRS375062 (QTY 3)

		WEIGHT (TOTAL PER FT.)	HANGER DIA. AND SPACING	SEISMIC PARAMETERS	BRACE SPACING (FT.)			
					$S_{DS} \leq 1.00$ TRANS. SPACING (T)	SEISMIC FACTOR F_{ph} (g) ASD	$1.00 < S_{DS} \leq 2.00$ TRANS. SPACING (T)	SEISMIC FACTOR F_{ph} (g) ASD
IMPORTANCE FACTOR, I_p	$I_p = 1.00$	15 plf	1/2" ϕ	$z/h \leq 0.5$	56'0"	0.210	28'0"	0.420
			14'0"	$z/h \leq 1.0$	56'0"	0.233	28'0"	0.467
		30 plf	1/2" ϕ	$z/h \leq 0.5$	36'0"	0.210	24'0"	0.420
			12'0"	$z/h \leq 1.0$	36'0"	0.233	24'0"	0.467
	$I_p = 1.50$	15 plf	1/2" ϕ	$z/h \leq 0.5$	60'0"	0.263	36'0"	0.630
			12'0"	$z/h \leq 1.0$	60'0"	0.350	24'0"	0.700
30 plf	1/2" ϕ	$z/h \leq 0.5$	40'0"	0.263	10'0"	0.630		
	10'0"	$z/h \leq 1.0$	30'0"	0.350	10'0"	0.700		

SINGLE DUCT WITH TRANSVERSE AND LONGITUDINAL BRACE



SEISMIC CRITERIA
 $\alpha_p = 2 \frac{1}{2}$ $R_p = 6$

VERTICAL FORCE
 $F_{pv} = 0.280 \text{ g (ASD)}$

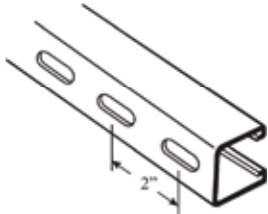
MATERIALS LIST

- 1 G582 Strut (QTY 7)
- 2 1/2" ϕ All Thread (QTY 2)
- 3 Seismic Hinges (QTY 6)
- 4 24" x 48" Max Duct (QTY -)
- 5 GN822 (QTY 4)
- 6 GRS375062 (QTY 6)

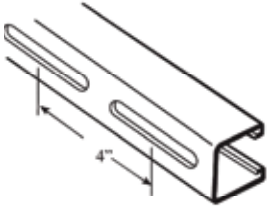
IMPORTANCE FACTOR, I_p	WEIGHT (TOTAL PER FT.)	HANGER DIA. AND SPACING	SEISMIC PARAMETERS	BRACE SPACING (FT.)			
				$S_{Ds} \leq 1.00$		$1.00 < S_{Ds} \leq 2.00$	
				TRANS. SPACING (T)	LONGIT. SPACING (L)	TRANS. SPACING (T)	LONGIT. SPACING (L)
$I_p = 1.00$	25 plf	1/2" ϕ	$z/h \leq 0.5$	56'0"	56'0"	28'0"	56'0"
		14'0"	$z/h \leq 1.0$	56'0"	56'0"	28'0"	56'0"
	50 plf	1/2" ϕ	$z/h \leq 0.5$	36'0"	48'0"	24'0"	48'0"
		12'0"	$z/h \leq 1.0$	36'0"	48'0"	24'0"	48'0"
$I_p = 1.50$	25 plf	1/2" ϕ	$z/h \leq 0.5$	60'0"	60'0"	36'0"	36'0"
		12'0"	$z/h \leq 1.0$	60'0"	60'0"	24'0"	36'0"
	50 plf	1/2" ϕ	$z/h \leq 0.5$	40'0"	50'0"	10'0"	30'0"
		10'0"	$z/h \leq 1.0$	30'0"	50'0"	10'0"	30'0"

Profile Styles

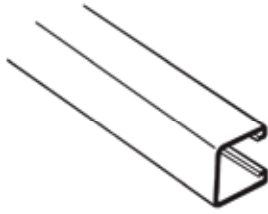
G-STRUT® can be ordered in six basic styles: solid, holes, oval slots, long slots, knock out, and back-to-back. The perforated styles are denoted in the catalog number as -H, -OS, -LS, -KO, and -A. Catalog numbers without these suffixes are solid. Please note hole dimensions on each drawing below. Centerline dimensions are important when ordering G-STRUT® manufactured-to-length custom sizes.



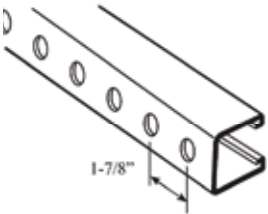
Oval Slot (OS)
9/16" by 1 1/8" on center



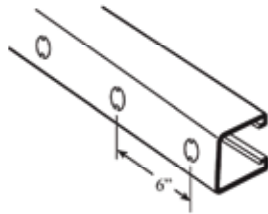
Long Slot (LS)
13/32" by 3" by 4" on center



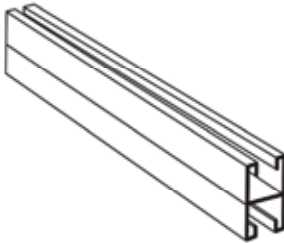
Solid
No perforation



Hole (H)
9/16" diameter by 1 7/8" on center



Knock Out (KO)
7/8" diameter by 6" on center



Back-to-Back (A)
Spot welded, available with perforation

Welded Combinations

SUFFIX 'A'



SUFFIX 'B'



SUFFIX 'C'



SUFFIX 'D'



SUFFIX 'E'



SUFFIX 'F'



SUFFIX 'G'



SUFFIX 'H'



SUFFIX 'I'



NOTE: Welds available in all channel sizes. Consult factory for special welds not illustrated.

Finishes

Find a comprehensive list of available coatings/material types for G-STRUT® channel and accessories.



PRE-GALVANIZING

A zinc coating is applied by hot dipping the steel coil on Gregory's specialty continuous galvanizing line. The channel is roll-formed, cut and/or punched as specified in conformance to ASTM 653 for hot-dipped pre-galvanizing, with a G-90 coating (0.90 ounces of zinc per square foot of steel).



HOT-DIPPED GALVANIZED

The material is zinc coated after fabrication, providing an extra heavy total product protection on all surfaces. The channel is pretreated, pickled, and then dipped into tanks of molten zinc, creating an electrolyzed bond. HDG provides superior corrosion resistance for highly corrosive exterior applications, as compared to pre-galvanized material. G-STRUT® hot-dipped galvanized is in conformance with ASTM A-123 specification.



GALVANNEALED

A zinc coating is applied by first continuous pre-galvanizing the steel coil. The coil then passes through an additional heat induction process, forming a matted gray finish alloy coating that is preferred for its superior paintability. Galvannealed G-STRUT® is conveniently painted post-installation without costly pre-treatment.



ELECTROGALVANIZED

Electrogalvanized, or "zinc plated," adheres zinc to steel forming a bond via an electrolysis process. Electrogalvanizing is more commonly applied to G-STRUT®'s fittings and hardware, but can be used on strut channel for select applications as well.

**POWDER COAT (GREEN)**

The process of powder coating is a superior alternative to conventional liquid paint. It is applied electrostatically in the form of a uniform, free-flowing dry polyester powder; then subsequently heat cured, creating a hard finish that is more resistant to chipping, scratching and fading. (Electrodeposition coating, or E-Coat is also available as a 'paint' alternative).

**ALUMINUM**

G-STRUT® channel is available in extruded aluminum alloy suitable for a variety of applications.

**BLACK/PLAIN**

Plain finish steel is hot-rolled or cold-rolled carbon steel generally with only a light oil finish. There is no protective or bonded coating inhibiting red rust.

**YELLOW ZINC (GOLD)**

Yellow zinc is an electrogalvanized finish. The fabricated plain steel part is immersed in a yellow electro-zinc bath, plating and sealing with a protective, iridescent yellow finish.

**PVC COATED**

A polyvinyl chloride (PVC) plastic coating is bonded to the channel or accessory by immersing the part in fluid PVC tanks. PVC can be applied over galvanized or plain steel without costly pre-treatment.

**STAINLESS**

G-STRUT® channel and accessories are available Grades 304 and 316 stainless steel substrate.

REGULAR CHANNEL NUTS

G-STRUT® HARDWARE

REGULAR CHANNEL NUTS



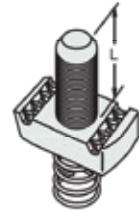
	THREAD SIZE	THICKNESS	NO SPRING ALL CHANNEL 100 pcs./ctn.	TOP SPRING ALL CHANNEL 100 pcs./ctn.	SHORT SPRING 13/16 CHANNEL 100 pcs./ctn.	REGULAR SPRING 1 5/8 CHANNEL 100 pcs./ctn.	LONG SPRING 3 1/4 CHANNEL 50 pcs./ctn.
REGULAR CHANNEL NUTS	8-32	1/4"	GN832800 6.1 lbs./100 pcs.	GTSN832800 6.4 lbs./100 pcs.	GN832810 6.4 lbs./100 pcs.	GN832820 6.7 lbs./100 pcs.	GN832830 7 lbs./100 pcs.
	10-32	1/4"	GN1032800 5.9 lbs./100 pcs.	GTSN1032800 6.2 lbs./100 pcs.	GN1032810 6.2 lbs./100 pcs.	GN1032820 6.5 lbs./100 pcs.	GN1032830 6.8 lbs./100 pcs.
	10-24	1/4"	GN1024800 5.9 lbs./100 pcs.	GTSN1024800 6.2 lbs./100 pcs.	GN1024810 6.2 lbs./100 pcs.	GN1024820 6.5 lbs./100 pcs.	GN1024830 6.8 lbs./100 pcs.
	1/4-20	1/4"	GN800 6 lbs./100 pcs.	GTSN800 6 lbs./100 pcs.	GN810 7 lbs./100 pcs.	GN820 7 lbs./100 pcs.	GN830 7 lbs./100 pcs.
	3/8-16	3/8"	GN801 9 lbs./100 pcs.	GTSN801 9 lbs./100 pcs.	GN811 9 lbs./100 pcs.	GN821 10 lbs./100 pcs.	GN831 10 lbs./100 pcs.
	1/2-13	3/8"	GN802 9 lbs./100 pcs.	GTSN802 9 lbs./100 pcs.	GN812 9 lbs./100 pcs.	GN822 10 lbs./100 pcs.	GN832 10 lbs./100 pcs.
	1/2-13	1/2"	GN803 12 lbs./100 pcs.			GN823 13 lbs./100 pcs.	GN833 13 lbs./100 pcs.
	5/8-11	7/16"	GN804 13 lbs./100 pcs.			GN824 13 lbs./100 pcs.	GN834 13 lbs./100 pcs.
	3/4-10	7/16"	GN805 13 lbs./100 pcs.			GN825 13 lbs./100 pcs.	GN835 13 lbs./100 pcs.
	5/8-11	3/8"	GN806 13 lbs./100 pcs.		GN814 10 lbs./100 pcs.		
	3/4-10	3/8"	GN807 13 lbs./100 pcs.		GN815 9 lbs./100 pcs.		
	5/16-18	3/8"	GN808 7 lbs./100 pcs.	GTSN808 7 lbs./100 pcs.	GN818 7 lbs./100 pcs.	GN828 7 lbs./100 pcs.	GN838 7 lbs./100 pcs.
	7/8-9	7/16"	GN809 13 lbs./100 pcs.			GN829 13 lbs./100 pcs.	
	M6-1	1/4"	GNM6800 6.6 lbs./100 pcs.		GNM6810 5.5 lbs./100 pcs.	GNM6820 5.8 lbs./100 pcs.	GNM6830 6.1 lbs./100 pcs.
	M8-1.25	1/4"	GNM8800 5.5 lbs./100 pcs.		GNM8810 5.8 lbs./100 pcs.	GNM8820 5.8 lbs./100 pcs.	GNM8830 6.1 lbs./100 pcs.
	M10-1.5	3/8"	GNM10801 7.8 lbs./100 pcs.		GNM10811 8.1 lbs./100 pcs.	GNM10821 8.4 lbs./100 pcs.	GNM10831 8.7 lbs./100 pcs.
	M12-1.75	3/8"	GNM12801 7.4 lbs./100 pcs.		GNM12811 7.7 lbs./100 pcs.	GNM12821 8 lbs./100 pcs.	GNM12831 8.3 lbs./100 pcs.
	M12-1.75	1/2"	GNM12803 9.5 lbs./100 pcs.			GNM12823 10 lbs./100 pcs.	

NOTE: *G-STRUT® channel nuts are case hardened and made from steel conforming to ASTM A575, Grade M1015 3/8" or thicker.

! All parts are electrogalvanized. For other finishes, please specify finish type by adding the following suffix to the part #: **STAINLESS STEEL = SS** **HOT DIP GALVANIZED = HDG**
 Example: When ordering a 3/8-16 thread, 3/8" thickness, regular spring, hot dip galvanized spring nut, the part # would be: **GN821HDG**

SPECIALTY CHANNEL NUTS

FITTINGS AND ACCESSORIES



REGULAR SPRING CHANNEL NUTS WITH STUDS

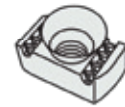
	PART #	NUT SIZE	THREAD SIZE	STUD LENGTH (L)	CARTON QTY.	lbs./100 pcs.
REGULAR SPRING CHANNEL NUTS WITH STUDS	GSTN25100	1/4"	1/4-20	1"	50	7
	GSTN25125			1 1/4"	50	8
	GSTN25150			1 1/2"	50	8
	GSTN37100	3/8"	3/8-16	1"	50	11
	GSTN37125			1 1/4"	50	12
	GSTN37150			1 1/2"	50	13
	GSTN50100	1/2"	1/2-13	1"	50	17
	GSTN50125			1 1/4"	50	18
	GSTN50150			1 1/2"	50	19

MINI CHANNEL NUTS FOR MINI STRUT



	THREAD SIZE	NO SPRING	SHORT SPRING	LONG SPRING	CARTON QTY.
MINI CHANNEL NUTS FOR MINI STRUT	8-32	-	GMN832S	GMN832	200
	10-32	GMN1032N	GMN1032S	GMN1032	200
	10-24	GMN1024N	GMN1024S	GMN1024	200
	1/4-20	GMN1025N	GMN0255S	GMN0255	200

EZ NUTS FOR ALL CHANNELS



	PART #	THREAD SIZE	THICKNESS	CARTON QTY.	lbs./100 pcs.
EZ NUTS FOR ALL CHANNELS	GCN800	1/4-20	3/8"	100	9
	GCN801	3/8-16	3/8"	100	9
	GCN802	1/2-13	3/8"	100	8

3/8" DOUBLE CONVEYOR ADJUSTING NUT

GDCN031

CARTON QTY.: 50

lbs./100 pcs.: 17

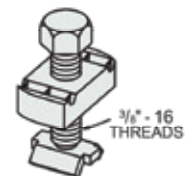


SEISMIC ROD STIFFENER

GRS375062

CARTON QTY.: 100

lbs./100 pcs.: 16



ALL THREADED ROD

G-STRUT® HARDWARE



ALL THREADED ROD

	PART #	THREAD SIZE	ROD LENGTH	PIECE/TUBE	TUBES/BUNDLES	LBS./PIECE
ALL THREADED ROD	GAT0256	1/4-20	6'	50	40	.7
	GAT02510		10'		25	1.2
	GAT02512		12'		25	1.4
	GAT0316	5/16-18	6'	35	40	1.1
	GAT03110		10'		25	1.9
	GAT03112		12'		25	2.3
	GAT0376	3/8-16	6'	25	40	1.7
	GAT03710		10'		25	2.9
	GAT03712		12'		25	3.5
	GAT0506	1/2-13	6'	12	40	3.2
	GAT05010		10'		25	5.3
	GAT05012		12'		25	6.4
	GAT0626	5/8-11	6'	8	40	5.0
	GAT06210		10'		25	8.3
	GAT06212		12'		25	10.0
	GAT0756	3/4-10	6'	5	40	7.3
	GAT07510		10'		25	12.2
	GAT07512		12'		25	14.6
	GAT0876	3/4-10	6'	4	40	9.9
	GAT08710		10'		25	16.5
	GAT08712		12'		25	19.8
	GAT1006	1-8	6'	2	50	13.3
	GAT10010		10'		50	22.2
	GAT10012		12'		50	26.6
GAT1126	1 1/8-7	6'	1	10	16.9	
GAT11210		10'		10	28.1	
GAT11212		12'		10	33.7	
GAT1256	1 1/4-7	6'	1	10	21.0	
GAT12510		10'		10	35.0	
GAT12512		12'		10	42.0	

NOTE: *The 5/16", 1 1/8", 1 1/4" sizes are only available in the electrogalvanized finish. The 1/4" sizes are not available in the hot dip galvanized finish.

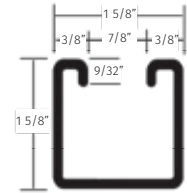
! All parts are electrogalvanized. For other finishes, please specify finish type by adding the following suffix to the part #:

STAINLESS STEEL = SS HOT DIP GALVANIZED = HDG PLAIN = PO

Example: When ordering 10' long, 1/2" size, hot dip galvanized all-thread, the part # would be: **GAT05010HDG**

G582/G582A

1 5/8" X 1 5/8" (1.625" X 1.625") – 12 GAUGE (0.102" THICK)



PRE-GALVANIZED – BUNDLE QUANTITY – 500 FT. – WT./100 FT. – 180 LBS.

CATALOG NO.	DESCRIPTION	
G5821	Solid, 10 ft.	1 5/8" x 1 5/8"; pre-galv., 12 g
G5822	Solid, 20 ft.	1 5/8" x 1 5/8"; pre-galv., 12 g
G582H1	With 9/16" Hole, 10 ft.	1 5/8" x 1 5/8"; pre-galv., 12 g
G582H2	With 9/16" Hole, 20 ft.	1 5/8" x 1 5/8"; pre-galv., 12 g
G582OS1	With 9/16" x 1 1/8" Slot, 10 ft.	1 5/8" x 1 5/8"; pre-galv., 12 g
G582OS2	With 9/16" x 1 1/8" Slot, 20 ft.	1 5/8" x 1 5/8"; pre-galv., 12 g
G582LS1	With 13/32" x 3" Slot, 10 ft.	1 5/8" x 1 5/8"; pre-galv., 12 g
G582LS2	With 13/32" x 3" Slot, 20 ft.	1 5/8" x 1 5/8"; pre-galv., 12 g
G582A1*	Back-to-Back Welded, 10 ft. (Wt./100 ft.=360 lbs.)	3 1/4" x 1 5/8"; pre-galv., 12 g
G582A2*	Back-to-Back Welded, 20 ft. (Wt./100 ft.=360 lbs.)	3 1/4" x 1 5/8"; pre-galv., 12 g
G582KO1	With 9/16" Knock-Out, 10 ft.	1 5/8" x 1 5/8"; pre-galv., 12 g
G582KO2	With 9/16" Knock-Out, 10 ft.	1 5/8" x 1 5/8"; pre-galv., 12 g

GREEN – BUNDLE QUANTITY – 500 FT. – WT./100 FT. – 180 LBS.

CATALOG NO.	DESCRIPTION	
G5821 POP	Solid, 10 ft.	1 5/8" x 1 5/8"; green, 12 g
G5822 POP	Solid, 20 ft.	1 5/8" x 1 5/8"; green, 12 g
G582H1 POP	With 9/16" Hole, 10 ft.	1 5/8" x 1 5/8"; green, 12 g
G582H2 POP	With 9/16" Hole, 20 ft.	1 5/8" x 1 5/8"; green, 12 g
G582OS1 POP	With 9/16" x 1 1/8" Slot, 10 ft.	1 5/8" x 1 5/8"; green, 12 g
G582OS2 POP	With 9/16" x 1 1/8" Slot, 20 ft.	1 5/8" x 1 5/8"; green, 12 g
G582LS1 POP	With 13/32" x 3" Slot, 10 ft.	1 5/8" x 1 5/8"; green, 12 g
G582LS2 POP	With 13/32" x 3" Slot, 20 ft.	1 5/8" x 1 5/8"; green, 12 g
G582A1* POP	Back-to-Back Welded, 10 ft. (Wt./100 ft.=360 lbs.)	3 1/4" x 1 5/8"; green, 12 g
G582A2* POP	Back-to-Back Welded, 20 ft. (Wt./100 ft.=360 lbs.)	3 1/4" x 1 5/8"; green, 12 g
G582KO1 POP	With 7/8" Knock-Out, 10 ft.	1 5/8" x 1 5/8"; green, 12 g
G582KO2 POP	With 7/8" Knock-Out, 20 ft.	1 5/8" x 1 5/8"; green, 12 g

G582/G582A

1 5/8" X 1 5/8" (1.625" X 1.625") – 12 GAUGE (0.102" THICK)

SPECIAL FINISHES/TYPES (CONSULT FACTORY FOR BUNDLE QUANTITIES AND WEIGHTS)

CATALOG NO.	DESCRIPTION	
G582YZ	Gregory Gold, Yellow Zinc Dichromate	1 5/8" x 1 5/8", 12 g
G582AL	Aluminum Extruded	1 5/8" x 1 5/8", 12 g
G582GN	Galvannealed	1 5/8" x 1 5/8", 12 g
G582PO	Plain, Pickled and Oiled	1 5/8" x 1 5/8", 12 g
G582HDG	Hot-Dipped Galvanized	1 5/8" x 1 5/8", 12 g
G582SS	Stainless Steel (Grade 304 or 316)	1 5/8" x 1 5/8", 12 g
G582PVC	PVC Coated (Galvanized or Black)	1 5/8" x 1 5/8", 12 g

NOTE: *Designate OS, LS or H if perforation is desired.

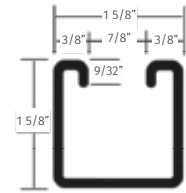
! Consult factory for special lengths, custom colors and special finishes

ELEMENTS OF SECTION

ELEMENTS OF SECTION	STRUT SECTION NUMBER	WEIGHT/ FOOT lbs.	AREA OF SECTION in. ²	XX-AXIS			YY-AXIS		
				MOMENT OF INERTIA in. ⁴	SECTION MODULUS in. ³	RADIUS OF GYRATION in.	MOMENT OF INERTIA in. ⁴	SECTION MODULUS in. ³	RADIUS OF GYRATION in.
	G582	1.827	0.537	0.178	0.194	0.576	0.230	0.283	0.654
	G582A	3.655	1.074	0.891	0.548	0.911	0.460	0.566	0.654

G582/G582A

1 5/8" X 1 5/8" (1.625" X 1.625") – 12 GAUGE (0.102" THICK)



BEAM AND COLUMN LOADS

	STRUT SECTION NUMBER	BEAM SPAN OR COLUMN HEIGHT in.	MAXIMUM COLUMN LOAD lbs.	TOTAL UNIFORM LOAD AT 25,000 PSI lbs.	DEFLECTION AT 25,000 PSI in.	UNIFORM LOAD AT 1/240 SPAN DEFLECTION lbs.
BEAM AND COLUMN LOADS	G582	12	10960	3230	0.01	-
		18	10630	2150	0.03	-
		24	10250	1610	0.05	-
		30	9830	1290	0.08	-
		36	9370	1070	0.12	-
		42	8870	920	0.17	-
		48	8330	800	0.22	710
		54	7750	710	0.28	560
		60	7140	640	0.34	450
		66	6490	580	0.42	370
		72	5790	530	0.49	310
		84	4360	460	0.68	230
		96	3340	400	0.89	170
		108	2640	350	1.11	140
		120	2140	320	1.39	110
		132	1760	290	1.68	90
		144	-	260	1.95	70
		156	-	240	2.29	60
		168	-	230	2.75	50
		180	-	210	3.08	50
		192	-	200	3.57	30
		204	-	190	4.06	30
		216	-	170	4.32	30
		228	-	170	5.08	30
240	-	160	5.75	20		

G582/G582A

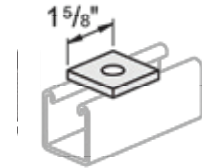
1 5/8" X 1 5/8" (1.625" X 1.625") – 12 GAUGE (0.102" THICK)

BEAM AND COLUMN LOADS CON'T.

	STRUT SECTION NUMBER	BEAM SPAN OR COLUMN HEIGHT in.	MAXIMUM COLUMN LOAD lbs.	TOTAL UNIFORM LOAD AT 25,000 PSI lbs.	DEFLECTION AT 25,000 PSI in.	UNIFORM LOAD AT 1/240 SPAN DEFLECTION lbs.
BEAM AND COLUMN LOADS	G582A	12	22450	9130	0.00	-
		18	22150	6080	0.01	-
		24	21820	4560	0.03	-
		30	21460	3650	0.04	-
		36	21080	3040	0.07	-
		42	20660	2600	0.09	-
		48	20220	2280	0.12	-
		54	19760	2020	0.16	-
		60	19270	1820	0.19	-
		66	18400	1660	0.24	-
		72	17180	1520	0.28	-
		84	14530	1300	0.38	1170
		96	11630	1140	0.50	890
		108	9180	1010	0.64	700
		120	7440	910	0.79	570
		132	6150	830	0.96	470
		144	5160	760	1.14	390
		156	4400	700	1.33	330
		168	-	650	1.55	290
		180	-	600	1.76	250
		192	-	570	2.03	220
204	-	530	2.26	190		
216	-	500	2.53	170		
228	-	480	2.86	150		
240	-	450	3.13	140		

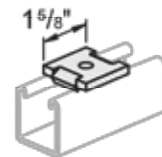
SQUARE WASHERS

SMALL FLAT PLATE FITTINGS



SQUARE WASHER

	PART #	HOLE SIZE	CARTON QTY.	lbs./100 pcs.
SQUARE WASHER	G201025	1/4"	100	16
	G201031	5/16"	100	16
	G201037	3/8"	100	16
	G201050	1/2"	100	16
	G201062	5/8"	100	16
	G201075	3/4"	100	16



NO-TURN SQUARE WASHER

	PART #	HOLE SIZE	CARTON QTY.	lbs./100 pcs.
NO-TURN SQUARE WASHER	G202025	1/4"	100	16
	G202031	5/16"	100	16
	G202037	3/8"	100	16
	G202050	1/2"	100	16
	G202062	5/8"	100	16
	G202075	3/4"	100	16

ANGLE FITTINGS

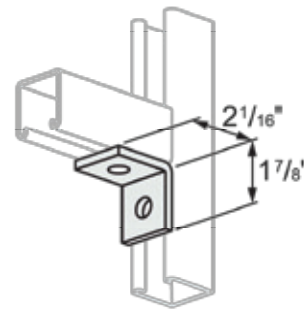
FITTINGS AND ACCESSORIES

90 ANGLE FITTINGS TWO-HOLE CONNECTION ANGLE

G302

CARTON QTY.: 50

lbs./100 pcs.: 35

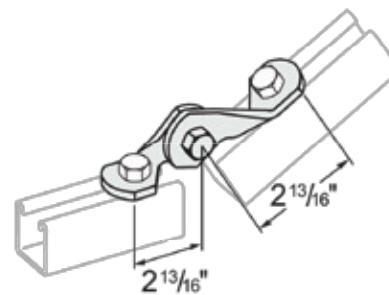


TWO-HOLE ADJUSTABLE HINGE

G316

CARTON QTY.: 10

lbs./100 pcs.: 89

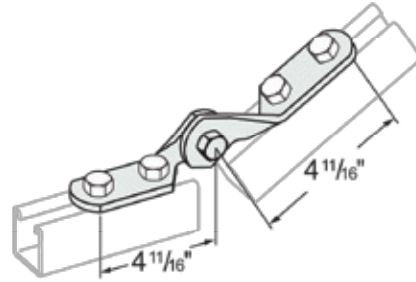


**FOUR-HOLE
ADJUSTABLE HINGE**

G3161

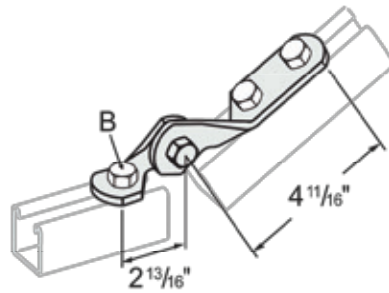
CARTON QTY.: 10

lbs./100 pcs.: 120



THREE-HOLE ADJUSTABLE HINGE

PART #	BOLT (B)	CARTON QTY.	lbs./100 pcs.
G33001	3/8"	10	106
G33002	1/2"	10	104
G33003	5/8"	10	102
G33004	3/4"	10	100





TERMS AND CONDITIONS OF SALE

- A. *These terms and conditions ("TCA") shall, along with the quantities and price reflected in any material quote ("Quote") or order ("Order"), constitute the complete understanding between Gregory Industries, Inc. ("Gregory") and Purchaser and shall supersede any and all prior terms and conditions, negotiations or other written and oral agreements. Unless specifically noted otherwise, in the event of any ambiguity between the TCA and any Order or Quote, the TCA shall govern.*
- B. *This TCA shall be deemed accepted and agreed upon in full upon either the written acceptance of the TCA, the receipt and acceptance of any goods delivered pursuant to the TCA or the payment for any goods shipped under the TCA (whichever is the first to occur.)*
- C. *Gregory hereby excludes, rejects and disavows any and all non-conforming or differing terms, conditions or qualifications contained within any Purchaser order, quote or any other form of confirmatory memorandum, regardless of when or in what order such non-conforming or differing terms were delivered or offered to Gregory.*
- D. *Each and every term set forth herein shall be deemed material and germane to the transaction. This TCA and any order or quote may not be modified by Purchaser in any respect and may only be modified by a writing signed by Gregory. This TCA and any quote or order shall not be subject to either oral modification or modification by conduct.*
- E. *All payments are due within 30 days of the date of invoice ("Net 30") unless an extended term is agreed upon in a writing signed by a Gregory authorized representative. All payments beyond Net 30 shall be subject to compounding interest charges of .75%/month. Gregory reserves the right to suspend all performance if payment is later than Net 30 and also reserves the right to accept late payments at its sole discretion. No acceptance of any payment later than Net 30 shall be deemed to waive any right or future rights that Gregory may otherwise have to cancel or suspend its future performance.*
- F. *Any quote shall expire and be deemed revoked 30 calendar days after delivery of the quote, unless otherwise specified, if there is no act of acceptance as such is defined in paragraph 2 herein. Delivery shall be deemed made upon the transmission by Gregory, by any means, of a quote.*
- G. *Any quote which is delivered to Gregory and accepted by Gregory may only be changed or altered with the express written consent of Gregory.*
- H. *All prices quoted herein are subject to change at the sole discretion of Gregory based upon the prevailing steel and related supplies markets. Gregory shall provide Purchaser three (3) business days written notice of any such price change.*
- I. *This agreement shall be deemed made in Stark County, Ohio, and any dispute herein shall be governed by the laws of the state of Ohio. The venue for any action or proceeding arising in any respect between Gregory and Purchaser shall be in either the state or federal court situated in Stark County, Ohio. Should any portion of this paragraph be deemed unenforceable, then only such portion deemed unenforceable shall be struck.*
- J. *In the event that Gregory has to employ attorneys to either enforce its rights, defend its rights or to seek payment or any other remedy available at law or equity, then Purchaser agrees to pay for all attorneys' fees and costs expended by Gregory in any such action, regardless of the outcome.*
- K. *This TCA and the underlying materials quote shall be subject to termination at the convenience of Gregory without any further obligation whatsoever on the part of Gregory.*
- L. *In the event of any breach or allegation of breach on the part of Gregory, the only damages for which Gregory may be held responsible shall be the cost of any cover (as defined by the Uniform Commercial Code) for a period of thirty (30) calendar days from the alleged date of breach. Gregory hereby disclaims and Purchaser hereby waives any and all other damages, whether arising under contract, tort or statute, including, but not limited to, damages arising from alleged delay, non-delivery, lost profits, lost commercial expectancy, reputation or any other type or theory of damages.*

- M. *Gregory reserves the right, at any point in time, to request information concerning bonding, information related to mechanics' lien rights, or information related to the financial strength of Purchaser. Such information, if requested by Gregory, shall be provided by Purchaser within three (3) business days of any request. Failure to provide such information shall constitute a material breach.*
- N. *Upon any act of breach, Gregory shall have the right to repossess product delivered, sue for all amounts due, including attorneys' fees as provided herein, suspend any further performance and or cancel any and all existing agreements without any further obligation by Gregory.*
- O. *Gregory agrees to deliver the agreed product within the time specified in the Quote or Order or as soon as is commercially reasonable. Unless otherwise specifically noted, all deliveries are F.O.B. at Gregory loading docks. If shipped freight is prepaid, the charge for freight will be added to the invoice. Risk of loss or damage shall be borne by Purchaser and claims made directly with the carrier.*
- P. *Gregory hereby disclaims any implied or express warranty or merchantability or fitness for an intended or any particular purpose. Gregory represents that the product shall reasonably conform to applicable federal and state specifications, and Gregory will provide necessary material test reports representing such.*
- Q. *Any and all claims for damaged, defective, nonconforming material or claims of shortages shall be made in writing to Gregory within 24 hours of delivery to Purchaser, or such claims are deemed to be affirmatively waived.*
- R. *Should any term or condition set forth herein be deemed by a court of competent jurisdiction to be unenforceable, then all other terms shall survive such ruling and shall be deemed to govern the parties' relationship.*



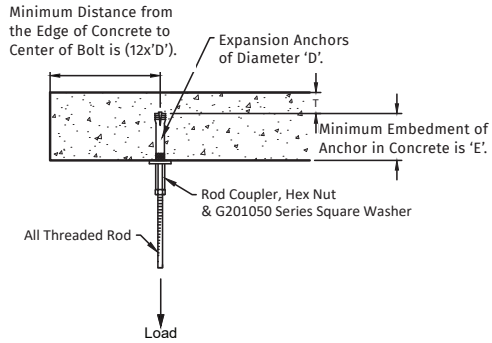
READY TO PARTNER WITH US?

Safeguard your mechanical, electrical and plumbing systems with G-STRUT® Seismic. Talk to an experienced member of our team to configure your system today.

Visit gregorystrut.com/seismic to learn more.

G-STRUT® HANGER ROD ATTACHMENTS

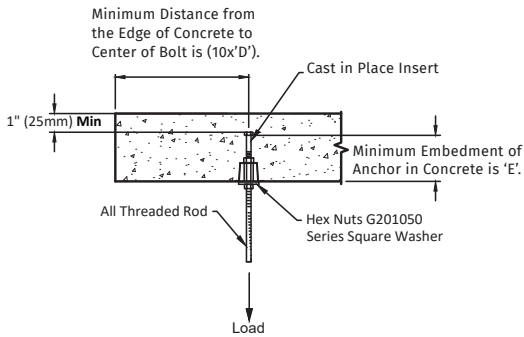
CONCRETE & COMPOSITE DECK



CONCRETE ATTACHMENTS TO SLAB

DIAMETER 'D'		ALLOWABLE LOAD** (IN TENSION)		MIN. EMBEDMENT 'E'		MIN. CONCRETE COVERAGE 'T'	
in.	(mm)	lbs.	(kN)	in.	(mm)	in.	(mm)
3/8"	(9)	712	(3.17)	2 1/2"	(63)	1 1/4"	(31.7)
1/2"	(13)	1024	(4.56)	3 1/2"	(89)	1 3/4"	(44.4)
5/8"	(16)	1402	(6.24)	4"	(101)	2"	(50.8)
3/4"	(19)	1978	(8.80)	4 3/4"	(120)	2 3/8"	(60.3)

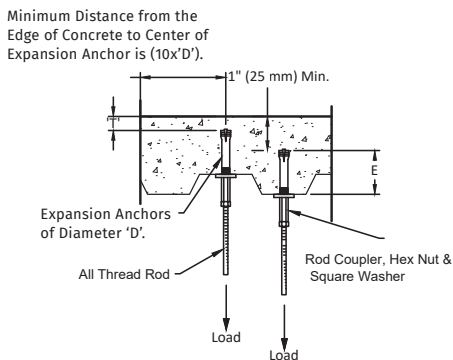
A CONCRETE ATTACHMENTS TO SLAB
SCALE: 3/4" = 10"



CONCRETE ATTACHMENTS TO SLAB

ANCHOR PART #	ROD SIZE		ALLOWABLE LOAD** (IN TENSION)		MIN. EMBEDMENT 'E'	
	in.	(mm)	lbs.	(kN)	in.	(mm)
B2501-3/8	3/8"	(9)	610	(2.71)	3"	(76)
B2501-1/2	1/2"	(13)	1130	(5.02)	4"	(101)

B CONCRETE ATTACHMENTS TO SLAB
SCALE: 3/4" = 10"



C CONCRETE ATTACHMENTS TO COMPOSITE SLAB
SCALE: 3/4" = 10"

LIGHT WEIGHT CONCRETE

DIAMETER 'D'		ALLOWABLE LOAD** (IN TENSION)		MIN. EMBEDMENT 'E'		MIN. CONCRETE COVERAGE 'T'	
in.	(mm)	lbs.	(kN)	in.	(mm)	in.	(mm)
3/8"	(9)	508	(2.26)	2 1/2"	(63.5)	1 1/4"	(31.7)
1/2"	(13)	738	(3.28)	3 1/2"	(88.9)	1 3/4"	(44.4)
5/8"	(16)	1101	(4.90)	4"	(101.6)	2"	(50.8)

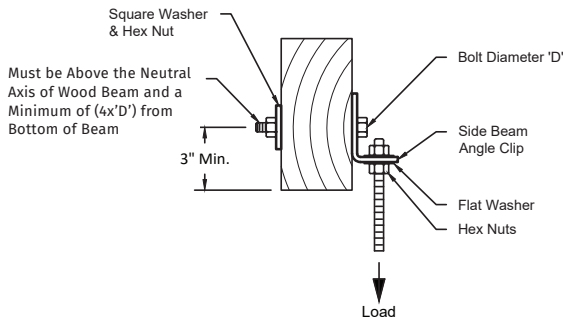
NORMAL WEIGHT CONCRETE

DIAMETER 'D'		ALLOWABLE LOAD** (IN TENSION)		MIN. EMBEDMENT 'E'		MIN. CONCRETE COVERAGE 'T'	
in.	(mm)	lbs.	(kN)	in.	(mm)	in.	(mm)
3/8"	(9)	508	(2.26)	2 1/2"	(63.5)	1 1/4"	(31.7)
1/2"	(13)	738	(3.28)	3 1/2"	(88.9)	1 3/4"	(44.4)
5/8"	(16)	1101	(4.90)	4"	(101.6)	2"	(50.8)
3/4"	(19)	1978	(8.80)	4 3/4"	(120.6)	2 3/8"	(60.3)

NOTE: Allowable loads should be used for estimation purposes only. Final anchorage schemes should be site specific by a licensed professional.

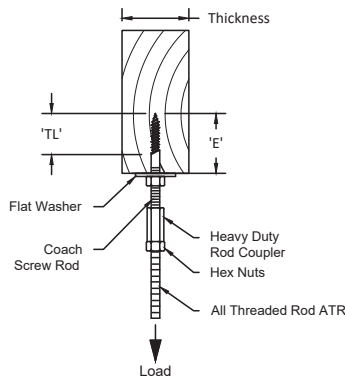
G-STRUT® HANGER ROD ATTACHMENTS

WOOD & STEEL



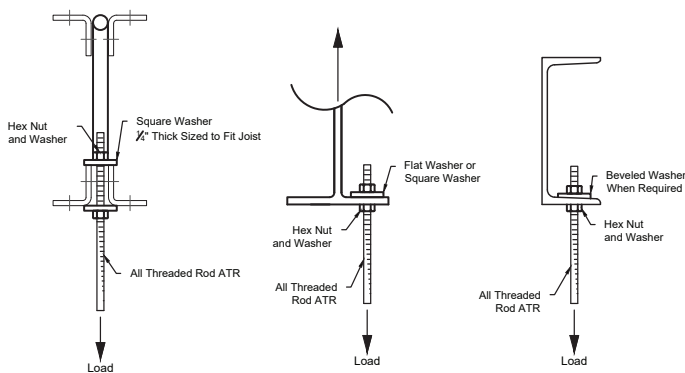
WOOD ATTACHMENTS TO SLAB

ROD SIZE	DESIGN LOAD		MIN. EMBEDMENT 'E'		THREAD LENGTH 'TL'	
	lbs.	(kN)	in.	(mm)	in.	(mm)
3/8"-16	559	(2.48)	3"	(76)	2"	(51)
1/2"-13	659	(2.93)	3"	(76)	2 1/2"	(63)



WOOD ATTACHMENTS TO SLAB

ATR ROD DIA.	BOLT DIA. 'D'	ALLOWABLE LOAD FOR BEAM THICKNESS			
		1 1/2" (38 mm) MIN.		3 1/2" (89 mm) MIN.	
		lbs.	(kN)	(kN)	lbs.
3/8"-16	3/8" - 16	200	(.89)	250	(1.11)
1/2"-13	1/2" - 13	300	(1.33)	460	(2.04)
5/8"-11	5/8" - 11	360	(1.60)	700	(3.11)
3/4"-10	3/4" - 10	420	(1.87)	870	(3.87)



STRUCTURAL STEEL TO SLAB

ATR SIZE	ALLOWABLE LOAD	
	lbs.	(kN)
3/8"-16	610	(2.71)
1/2"-13	1130	(5.02)
5/8"-11	1810	(8.05)
3/4"-10	2710	(12.05)
7/8"-9	3770	(16.77)





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