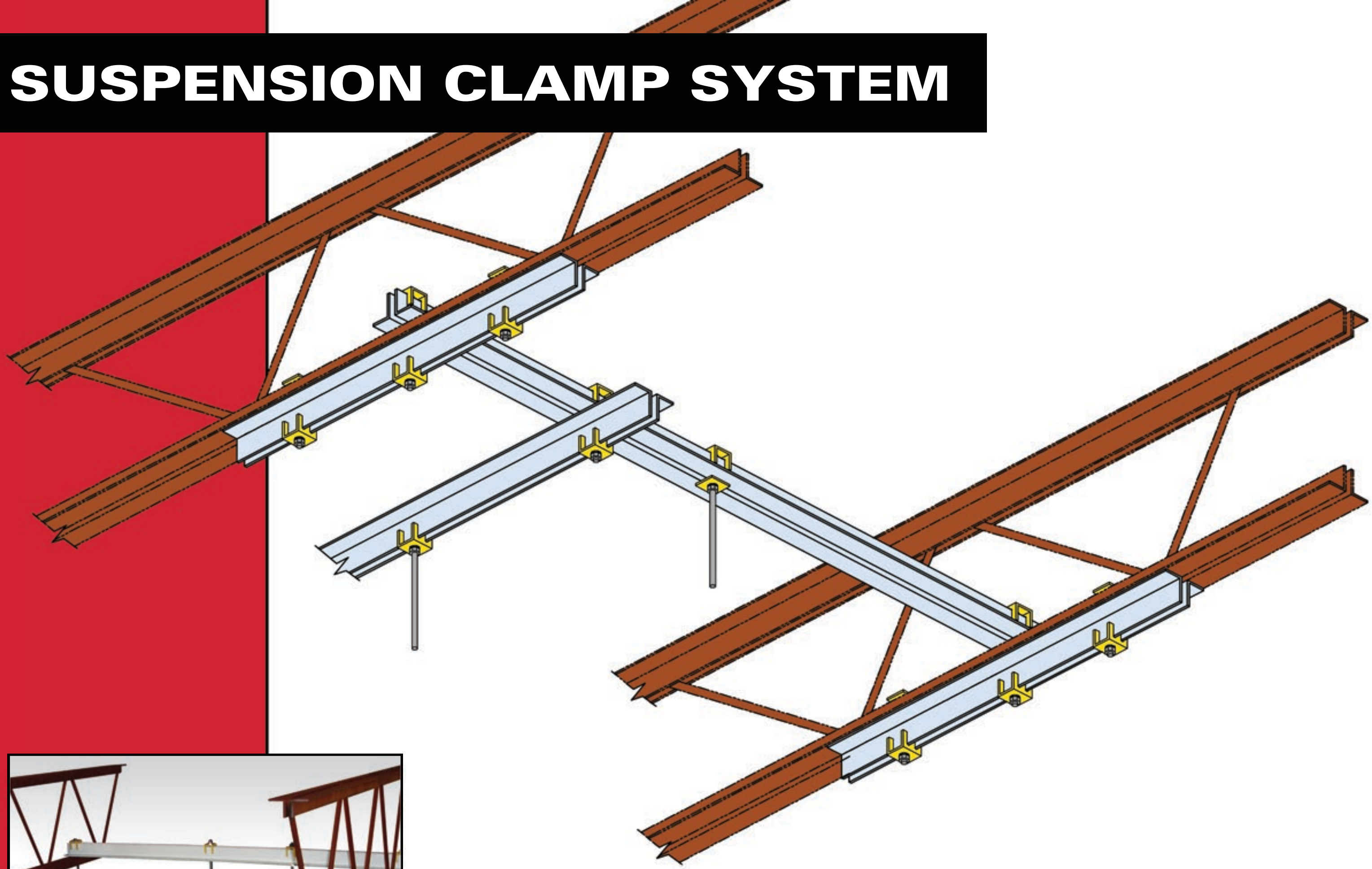
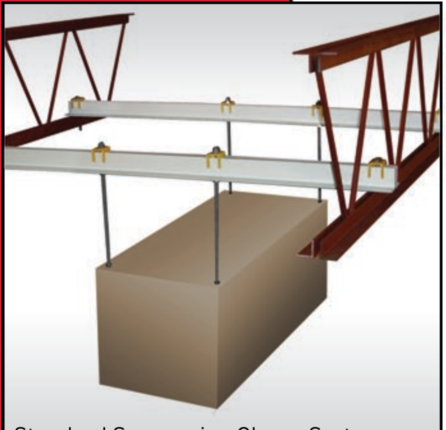
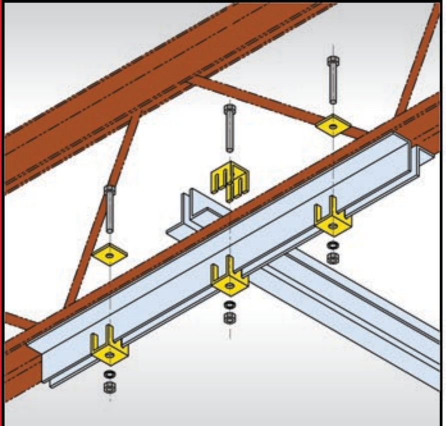
SUSPENSION CLAMP SYSTEM





Standard Suspension Clamp System



Panel Point Bridge

SAFELY SUSPEND HVAC EQUIPMENT, CONVEYORS OR OTHER CEILING FIXTURES WITHOUT WELDING OR DRILLING

- No Welding Or Drilling
- System Bolts Into Place
- Easily Suspend Up To 2,000 lbs
- Flexibly Hang Loads Where Needed
- Adaptable For Relocation If Necessary

The Suspension Clamp System offers unmatched flexibility in suspension hardware. Using 5/8" bolts or threaded rod, equipment can be attached or suspended from joists at the necessary locations.

The Panel Point Bridge uses Suspension Clamps to transfer and share loads between panel points. This allows engineers to design for midspan loads along the bottom chord. This System offers a reliable and adaptable solution for hanging pipes, air handlers, conveyors, fans, or other equipment.

Meticulously Engineered. Rigorously Tested.

CHICAGO CLAMP® CO

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DESIGN OF SUSPENSION CLAMP SYSTEM

Summary

The Suspension Clamp System uses back-to-back angles that are spaced apart by the rod fittings. Initially, the allowable load was assumed to be 1,000 lbs for a pair of angles. Analytically, the task then was to find the maximum spans for various sizes of angles. The AISC equations (see Chapter F of the 2010 Specification) were used for a single angle, unbraced for its entire span and supporting 500 lbs at midspan. An unrestrained angle, subject to a vertical force parallel to one leg, will deflect both vertically and horizontally.

Subsequent testing demonstrated that this analytical approach was overly conservative. The rod fitting did provide a substantial amount of bracing.

Thus a more accurate analytical model was considered. This model included the benefit of symmetry: i.e., at the rod fitting, each angle exerted an equal but opposite horizontal force on the other. The net result is no net horizontal movement at the load point (rod). Load-deflection equations, for the principal axes of the angles, were used to find the horizontal force needed to prevent horizontal deflection of a single angle for a given vertical load. This horizontal force is a fixed percentage of the vertical force, for each angle size. For a particular vertical load, this combination of forces resulted in significantly less bending stress, and thus a higher bending strength, as compared to the first approach. In addition, to allow for the fact that the concentrated load could be placed anywhere in the span, the unbraced length was taken as 0.75 times the span. Chapter F of the AISC Specification was also used for this model.

With the second model, the predicted (nominal) load capacity was much closer to, but still less than, the factored maximum-capacity for load at midspan, for a given test span and angle size. A reduction factor (equal to the ratio of the specified minimum-yield stress to test-coupon yield stress for each angle size tested) was multiplied times the test-determined maximum load to determine a reduced maximum-capacity. This reduced maximum-capacity constitutes an expected lower-bound on the actual strength.

The allowable load, based on strength for each span/size combination of angles, was taken to be the calculated, nominal-load capacity divided by a safety factor of 2.0. The unbraced length was taken as 0.75 times the span. For some combinations, the deflection limit of span/240 resulted in an allowable load less than the value based on strength alone.

Live Load Capacity (pounds) vs. Span of Back-to-Back Angles1-11

Size of Each of an Angle pair	Span (feet)													
	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2" x 2" x 3/16"	1,690	1,123	821	635	511	-	-	-	-	-	-	-	-	-
2" x 2" x 1/4"	2,000	1,459	1,088	856	693	**569**	-	-	-	-	-	-	-	-
2 1/2" x 2" x 3/16"	2,000	1,707	1,237	956	769	635	536	-	-	-	-	-	-	-
2 1/2" x 2" x 1/4"	2,000	2,000	1,691	1,313	1,061	882	748	643	**528**	-	-	-	-	-
3" x 2" x 3/16"	2,000	2,000	1,645	1,270	1,020	842	708	604	521	-	-	-	-	-
3" x 2" x 1/4"	2,000	2,000	2,000	1,791	1,446	1,200	1,016	873	759	665	587	**520**	-	-
3 1/2" x 2 1/2" x 1/4"	2,000	2,000	2,000	2,000	2,000	1,682	1,428	1,232	1,074	945	837	746	667	599
4" x 3" x 1/4"	2,000	2,000	2,000	2,000	2,000	2,000	1,873	1,618	1,414	1,246	1,106	988	886	798
5" x 3" x 1/4"	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,932	1,700	1,507	1,344	1,203	1,081

Longest angle leg is vertical.

1 Two Spanning Angles required per Suspension Clamp System, purchase though your local vendor.
2 Angles are back-to-back, but spaced apart by Suspension Clamps.
3 Allowable net load, per pair, may be located anywhere along the span. Weight of angles has been accounted for.
4 Angle dimensions are listed "Vertical Leg" x "Horizontal Leg" x "Thickness".
5 No values below 500 lbs. are listed. Allowable loads have been limited to 2,000 lbs. maximum.
6 Allowable loads are based on 36 ksi minimum yield steel and the AISC specifications.
7 A single load equal to the tabulated capacity or multiple loads with a sum equal to the tabulated capacity is allowable.
8 Live Load Capacities based on Safety Factor of 2.0.
9 Loads in bold (528) are governed by deflection limit of Span/240; (e.g., 0.500'' for 10' span).
10 Tabulated values are based upon the additional bracing provided by Suspension Clamp System.
11 Tabulated loads based on vertical loading only.

DESIGN OF SUSPENSION CLAMP SYSTEM USED AS PANEL-POINT BRIDGE

Summary

The bridge angles utilize a back-to-back configuration. They are parallel to a joist and span between panel points of a joist's bottom chord. The angles are spaced apart horizontally by Suspension Clamps. With standard clamps, a 5/8" clearance is necessary between chord angles to allow for bolt attachment.

The allowable concentrated load, based on stiffness, is 1,000 lbs for a pair of angles. This is the load which results in about 0.04" deflection for a 48" span, if the 3" x 2" x 1/4" bridge angles alone resist the load applied at midspan. An allowable load based on strength alone would be greater.

However, in a typical application, there will be some load-sharing between the bridge angles and the joist chord angles. The load percentage carried by each angle pair (bridge and chord) will be in proportion to its relative bending stiffness, assuming that the bridge angles are initially in contact with the chord angles. Each pair's stiffness will be affected by both its section properties and type of span (simple or continuous).

ATTENTION ENGINEER OF RECORD

It is the responsibility of the project's engineer-of-record (EOR) to consider the joist's design adequacy with regard to the joist's overall structural integrity for all design loads and to local effects on the joist due to the suspended load. Examples of local effects on the joist chord include the effects of axial force (truss behavior of joist), bending stresses (beam behavior of chord due to hanger and end-clamp loads between joist's panel points), shear stress (in chord, due to hanger and end clamps) and bearing of hanger and end clamps on chord angles.

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