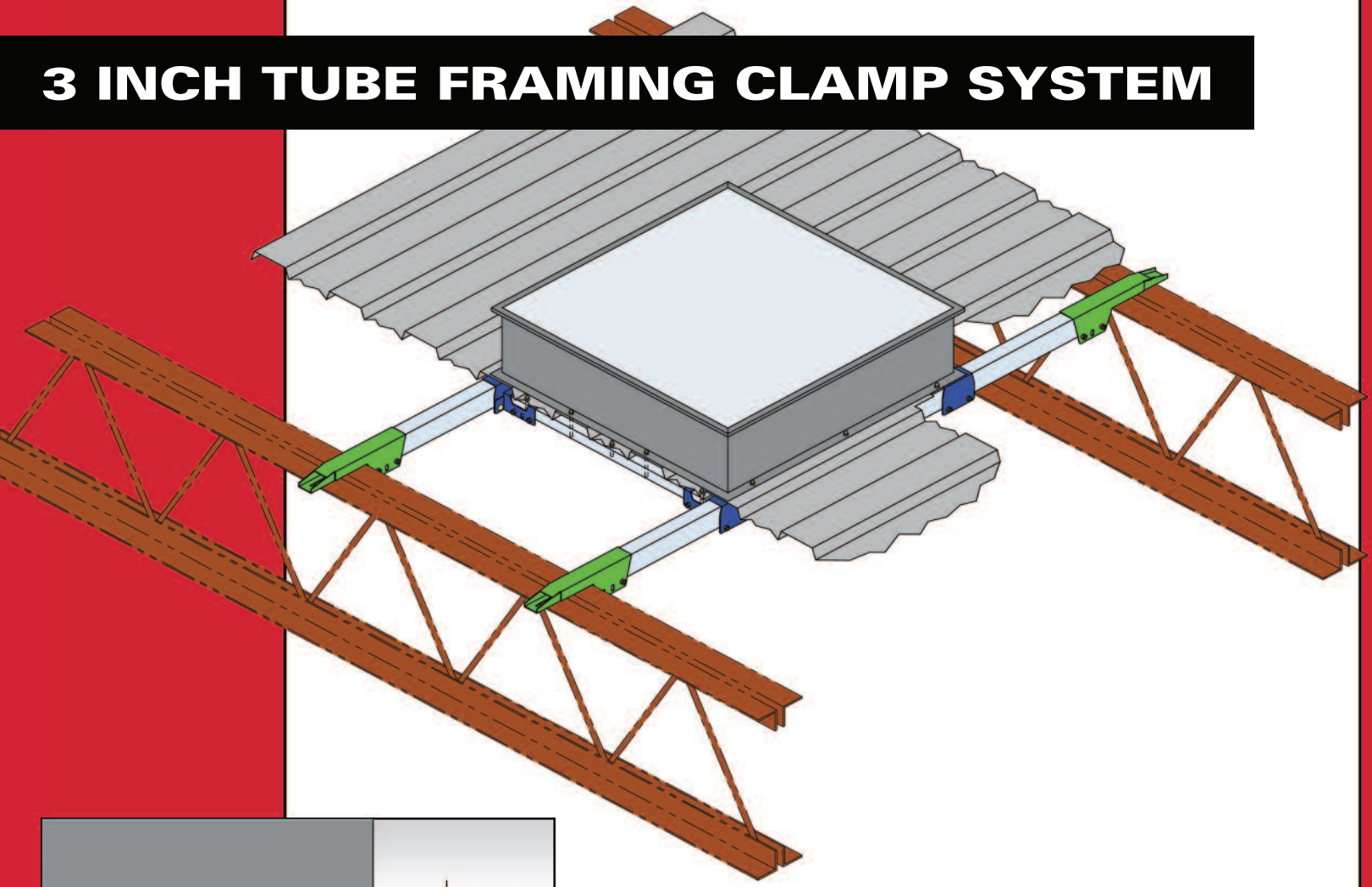
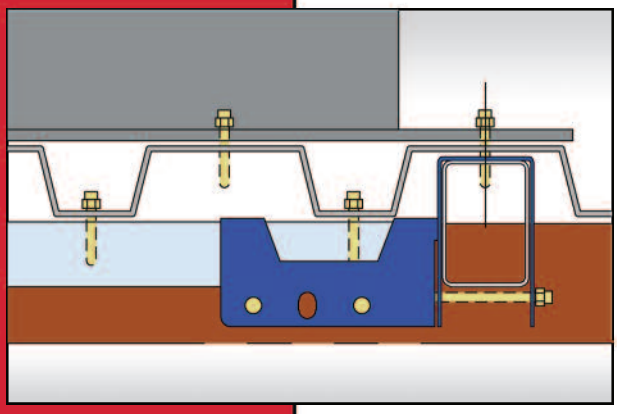
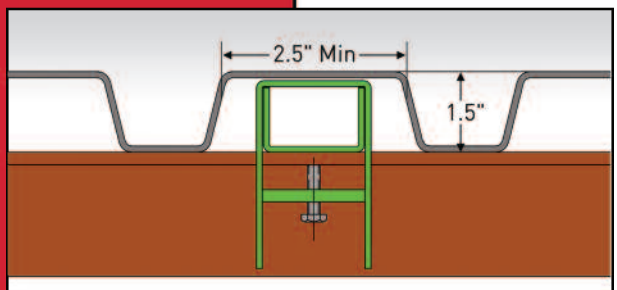
3 INCH TUBE FRAMING CLAMP SYSTEM







Roof Deck Minimun
Dimension Requirements

A SIMPLE, SAFE & FAST METHOD FOR PROVIDING ALL THE SUPPORT NEEDED FOR ROOF ACCESSORIES

- No Welding Or Drilling On The Structure
- One Person Installs In 90 Min Or Less
- Installs With Roof Deck In Place
- Reduces Cost & Shortens Schedule

The 3 Inch Tube Framing Clamp design allows the Main Tube support to be installed right at the top of the roof deck flutes. Each End Clamp is rated for 250 lbs, giving a complete system load rating of up to 1,000 lbs in uplift or download conditions. The 3 Inch Tube Framing Clamp System is the support of choice for all skylight, exhaust fan, roof hatch, and other light duty roof penetrations.

Meticulously Engineered. Rigorously Tested.
CHICAGO CLAMP® CO
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ANALYSIS & TESTING OF THE 3 INCH TUBE FRAME SYSTEM FOR SKYLIGHT OR EQUIPMENT LOAD TRANSFER TO ROOF

Summary

The Chicago Clamp Company's 3 Inch Tube Frame System, for the transfer of small equipment loads (skylights, exhaust fans, etc.) to roof joists, consists of steel components: joist-clamp brackets (End Clamps), framing members (Tubes), T-brackets, and hardware. The End Clamps connect the Primary Tubes to the top chords of the joists. The T-brackets connect the Cross Tubes to the primary tubes. The positions of the Cross Tubes between joists can be adjusted by sliding the T-brackets.

Testing imposed both shear and bending on the bolts that transfer load from the Cross Tubes to the T-brackets and from the Primary Tubes to the End Clamps. The bolts are SAE J429 (Grade 5), tightened to a snug condition.

The tested framing system consisted of cold-formed HSS tubes conforming to A500 Grade B (46 ksi minimum yield). The primary tubes (larger dimension vertical) were HSS 3" x 2" x 1/8" and the cross-tubes (short dimension vertical) were HSS 2" x 1.5" x 1/8". The two Primary Tubes were spaced at 4.7' c/c. The two Cross Tubes were spaced at 1.8' c/c and centered on the midspan of the primary tubes. The maximum primary span tested was 7.5' c/c, with both Cross Tubes spanning 4.5' c/c. A maximum static test load of 3,700 lbs downward (two symmetrically placed loads of 1,850 lbs each; 1.7' apart) was applied to the Cross Tubes. The Cross Tubes yielded in bending.

In other testing, the Cross Tube's T-brackets each had an ultimate load of at least 3,150 lbs in each direction, down and up. The Cross Tube yielded at the maximum load of 6,300 lbs. The Primary Tubes' End Clamps each had an ultimate load of at least 5,100 lbs down (10,200 lbs at the middle of the 2' clear span; tube permanently deformed).

A maximum static test load of 3,000 lbs was applied in the upload direction (negative) at midspan of an isolated Primary Tube with End Clamps. Joist chord simulators, free to rotate about their longitudinal axis, were used to support each End Clamp. No failure of the End Clamps, or of the relatively short Primary Tube, occurred. This loading corresponds to a reaction of 1,500 lbs at each End Clamp. The ratio of this test reaction to the maximum allowable reaction is 5.0. If the test assembly's yield and ultimate strengths are assumed to be 1.2 times the specified minimums, then a minimum-strength assembly would have a failure load of at least 4.17 times the allowable, which exceeds the desired safety factor of 3.0 for a connection with rivets. Loading should never exceed allowable limits.

Analysis of the tubes for the load table was based on the 2010 edition of the AISC Specification (14th edition of the Steel Construction Manual) and a desired safety factor of 2.0, which exceeds the minimum required value of 1.67 for flexure. Tubes are considered in this analysis to be braced only at the ends. For each of the Main and Cross Tubes, the allowable total (net) load per tube is limited to 500 lbs. The allowable span is governed by the load table below. The maximum allowable end reaction is 250 lbs.

The effect of 3/8" diameter holes on the tubes was explored. The worst case was considered (holes at midspan of the tension flange). For concentrated and uniform loads, the holes do not affect the permissable loads or span lengths for both the Main Tubes and Cross Tubes. Additional holes may be added without affecting the allowable load as long as the holes are at least 4" apart along the span.

The Engineer of Record is responsible for the design adequacy of the joists or beams that support the tube system.

Allowable Loads (lbs)

Max Allowable Spans for 500 lbs		
Main Tube [a-g]	Max Span for Concentrated Load	Max Span for Uniform Load
HSS 3" x 2" x 1/8"	10' 2"	12' 11"
HSS 3" x 2" x 3/16"	11' 11"	15' 1"
Cross Tube [a-f, h]	Max Span for Concentrated Load	Max Span for Uniform Load
HSS 2" x 1.5" x 1/8"	4' 5"	5' 7"
HSS 2" x 1.5" x 3/16"	5' 0"	6' 4"

Component Capacities Allowable Load	Download Positive	Uplift Negative
3 Inch End Clamp	250 lbs	250 lbs
3 Inch T-Bracket	250 lbs	250 lbs

Notes:

a) Allowable net concentrated load, per tube, may be located anywhere in the span. Weight of tube has been accounted for.

b) Allowable uniform load is the net loading on the tube. Weight of tube has been accounted for.

c) Allowable loads are based on 46 ksi min yield steel (A500, Gr B) and the AISC specification.

d) All max spans for net (applied) loads are governed by deflection limit of Span/240 (e.g., 0.250" for 5' span), rather than by strength.

e) Tube-wall thicknesses are nominal. Min is 0.93 times nominal, per 2010 AISC specification.

f) Allowable loads ("max" loads) are based on a safety factor of 2.0.

g) Long dimension of tube cross-section is vertical, parallel to load (major axis bending).

h) Short dimension of tube cross-section is vertical, parallel to load (minor axis bending).

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