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fasteners

Cold-Formed Steel…
Better Connected Than You Know
How New Pin Designs & Drive Systems Pay Off!

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Been on a commercial construction jobsite lately?

The perceived "bedlam" from materials meeting design by skilled labor can be either overwhelming or something of a marvel! And, oh…DO NOT forget your hardhat!

One might look at a combination of dissimilar materials and the skills needed to bring them together and wonder if there's a 'common thread' to it all. Well, there is….it's the fastener(s)! Choose the right one(s) and your job is 'design perfect' and maybe ahead of schedule; choose the wrong one and well,….serious delays, if not disaster can occur. Don't believe me? Just try and drive to Boston's Logan Airport today! Oh, and…..DO NOT forget your hardhat there either!

Let's get back to that jobsite. Look around you and what do you see for fasteners? Nuts, bolts, screws, nails, pins, crimps, welds, wires, rods and adhesives just to name a few! One fastener in particular has been common place in commercial construction for over 50 years…the steel pin. Specifically a hardened steel, ballistic point pin has been used for many years to successfully attach a variety of materials to concrete and/or structural steel. More recently, the pin has evolved and is used to mechanically fasten materials to cold-formed steel (CFS) framing or in some cases the 'steel to steel' itself. Roof, floor and wall systems can be designed using pins and CFS. Tools used with pins are lighter, faster and more versatile than a screw gun!

HOW DO THEY DO THAT?

Pin connections to CFS use a combination of forces to perform their job. The first is the impact force of the chosen drive system on the pin itself. This enables the pin to make its way through a variety of materials including the CFS. Second are the friction forces created at the drive and destination points of the pin. These add to a pin's withdrawal resistance. And lastly, there's the compressive force of the steel back against the pin after penetration. They all complement withdrawal resistance.

Add to the withdrawals the superior 'shear' values from hardened steel pins, and you have what design professionals need to make the right fastening selection.

Laborers continue to experience faster and faster driving systems that are now five to seven times quicker than conventional methods. Pretty good….right? But….

WHAT'S NEXT?

More CFS is being used than ever before for commercial low- to mid-rise structures like office buildings, schools, hospitals and others. Design criteria many times call for the attachment of multiple layers of CFS of a variety of gauges and tensile—often in hard to reach places, too. Good examples are the extra straps or shear wall construction sometimes used for hurricane resistance. Or we can even see CFS being fastened to structural red iron steel.

We see pin design 'morphing' to meet these new CFS fastening requirements. Just like pins went from fastening into concrete and then into CFS steel, they now show new head sizes, shank configurations and point designs for the new CFS connections. These pin features can combine to offer optimal shear and tensile values. For example, a change in shank configuration can not only improve withdrawal values, but also facilitate driving through multiple layers (3+) of CFS.

Conventional delivery systems for pins include powder actuated 'pin & load', the old reliable pneumatic tools operating at 80-120 psi, newer 'gas' internal combustion tools and, of course, the die-hard 'do-it-by-hand' workers. The latter are easily recognized on the job by their slow movement and big arms!

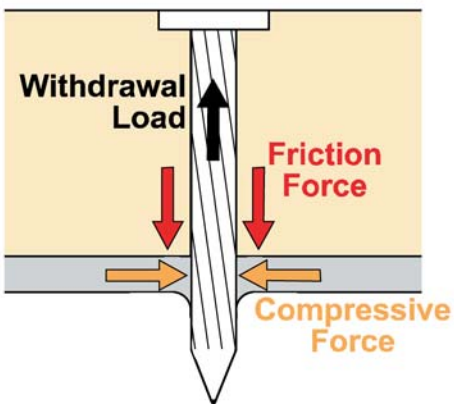
Recent and new on the market is a revolutionary delivery system to accompany some of the new generation of pins. That is the 'high pressure' (HP) pneumatic system of tool(s), compressor, hoses and fittings. They operate from 250-400 psi and offer advantages of a high initial impact, less recoil, noise or deflection than a 'conventional' system. The tools are typically lighter weight and smaller in size than not only other air tools, but also electric screw guns! They handle 2-3-4 layers of CFS with ease; or move from the steel and fasten to concrete.

Now the speed of pneumatics can be used with the CFS commercial construction connections of today to cut time, cost and design restrictions.

HOW DO THEY PERFORM?

Currently, several low rise (five floors or less), multi-use, commercial CFS buildings are being built with over three dozen connection designs that caused over 100 steel-to-steel combinations to be rigorously tested under AISI CF 92-1 "Test Methods for Mechanically Fastened Cold Formed Steel Connections".

The results are astounding when you consider only a single, high pressure pin per connection was tested. The designs were loaded to failure per AISI CF 92-1 protocol and "Ultimate Shear Capacities" achieved started at 294 lbs. for 25-gauge materials to a high of over 1,200 lbs. for multi-layered 14- and 16-gauge materials! On average, the tests yielded over 840 lbs. of Ultimate Shear Capacity per all connections.



It is easy to see why pins are gaining in popularity:

- Improved design flexibility
- Faster installation
- Greater shear, tensile and withdrawal strengths
- Greater value

For more information on pin fastening of cold-formed steel, you can contact the Steel Framing Alliance in Washington, DC, at steelframingalliance.com or the Light Gauge Steel Engineers Association at steel.org.

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