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ATTACHMENT OF STEEL DECKING USING MECHANICAL FASTENERS AND POWDER ACTUATED OR PNEUMATIC TOOLS

THE NEED

An alternative method of attaching steel metal decks onto open web bar joist or structural steel beams. Erectors require a fast, reliable, efficient fastening method that can be used independent of weather conditions, and is easy, cost effective and verifiable.

FIGURE 1 FASTENING A FLOOR DECK WITH A STAND UP TOOL WHICH USES 40 BOOSTERS AND 40 NAILS WITHOUT RELOADING

THE TECHNOLOGY

Steel framed structures commonly use cold-formed profiled steel panels for both roof and floor decking. The steel structure itself may consist of open web steel bar joists or wide structural steel beams. Because the whole assembly is frequently designed to act as a shear diaphragm the individual deck panels must be properly attached to the structure.

Attachment of the deck panels has historically been performed using puddle welding, with self-drilling screws used only when necessary. Today, special nails, driven either by powder propellant (powder actuated tools) or by compressed air (pneumatic tools), are experiencing ever-increasing usage due to the speed, versatility and cost-effectiveness benefits derived by the installer and owner.

FIGURE 2 BOOSTERS

Within these tools the energy source accelerates a piston which impacts the nail, driving it through the deck sheet into the steel base material. The nails are made from specially hardened steel and usually have a knurled shaft to enhance anchorage performance in the base material. No predrilling of holes is necessary since the driving operation displaces the base material generating a connection similar to a friction weld, which results in a strong, stiff connection. The driving depth can be adjusted for varying jobsite conditions by regulation of the tool power. Tools are simple and safe to operate, and do not require extensive training or expertise, making them "user friendly" on any jobsite.

FIGURE 3 TOOLS

Different jobsite applications (bar joists with thin flanges, or thick flange I or H-beams) do have different requirements regarding fastening design, tools and handling. Today a wide range of fasteners, ranging from hardened heat treated up to special stainless steels, pneumatic and powder actuated hand-held as well as stand-up tools are available to meet the various jobsite requirements.

THE BENEFITS

A major benefit is the more consistent and measurable fastening quality achieved by nails compared to puddle welds. Further important advantages of this technology are its usability in cold or wet environments; and a more rapid installation, saving time and labor cost. Also, since burn-throughs are eliminated, no deck touch-up is required.

BARRIERS

Designers and specifiers are not familiar with the attachment of shear diaphragms using nails instead of welds, therefore these fastening systems are not widely used. Erectors are also not fully aware of this emerging new technology.

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REVIEWERS

Peer reviewed as an emerging construction technology

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