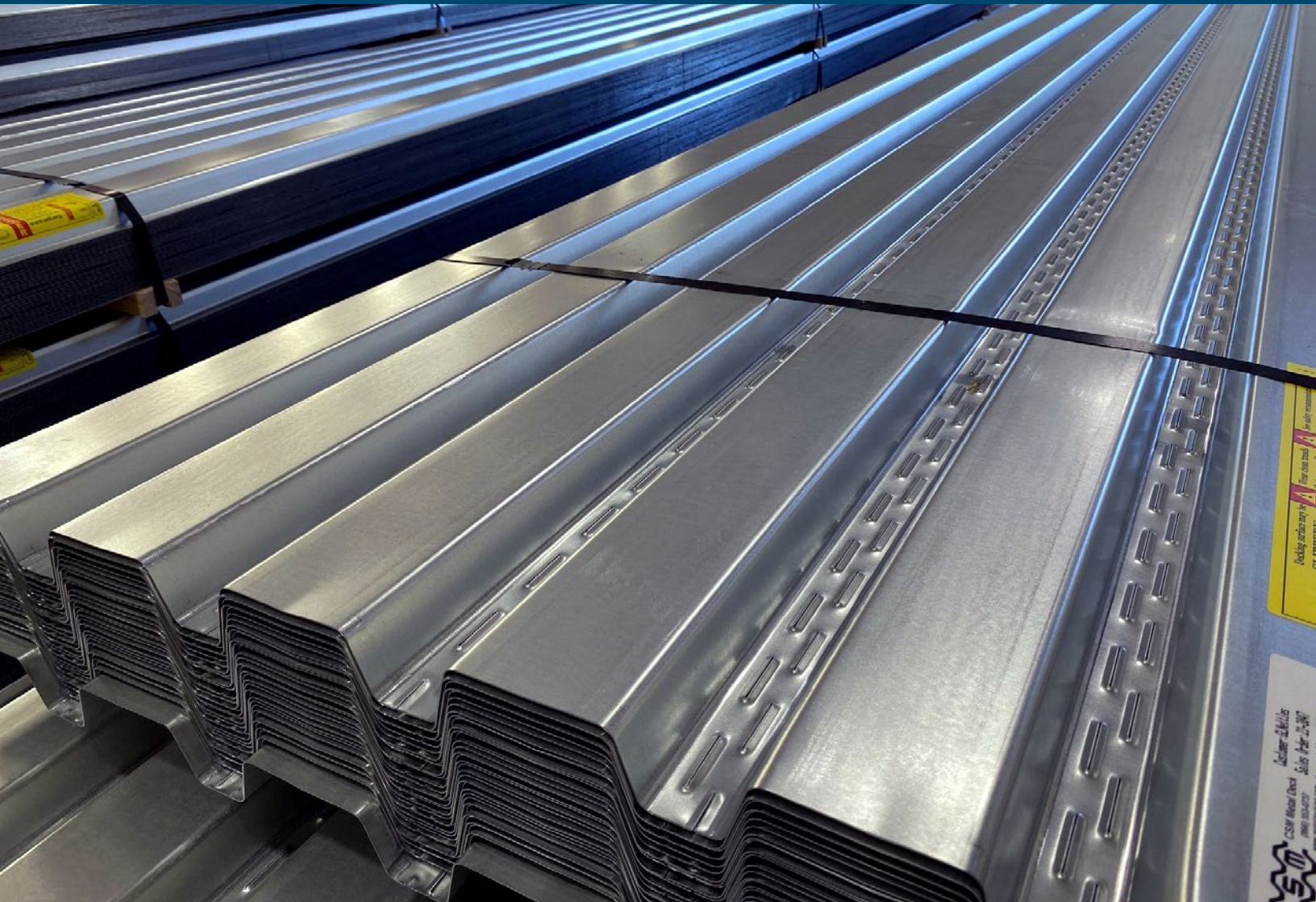


ATTACHMENT GUIDE



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TYPES OF ATTACHMENTS

Depending on the kind of metal deck you are using and what it will be used for, there are a variety of options for attachment. Whether you're using floor deck that needs to support beams and joists, roof deck, form deck, or composite metal decking for concrete will impact the recommended attachment method for your application.

The Engineer of Record shall determine the required fastening type and pattern. This is typically noted on the structural drawings or specifications.

This section's content comes from Steel Deck Institute *Manual of Construction with Steel Deck, Edition 3*. Used with permission.

Deck is installed in accordance with the “Approved for Construction” drawings. The deck must be installed by qualified and experienced workers. The beginning point should be carefully selected for proper deck orientation and edge of roof or floor slab location.

Maintaining rib or flute alignment across the structure is very important. A snap chalk line should be used at reasonable intervals to assure proper alignment of deck panels. Panel cover widths must be maintained to achieve long straight runs of deck.

Roof deck is often left exposed on the bottom. Rib alignment must be parallel to the girders at all girder lines to prevent unsightly conditions.

Floor deck flutes should, if possible, maintain alignment to achieve continuous concrete ribs across abutting sheet ends, minimizing concrete leakage. Flutes that do not align can create closure problems that may interrupt the slab design. Proper alignment can only be achieved by proper adjustment of each deck panel as it is placed. Cover width errors accumulated across the bay cannot be corrected with the last sheets in the run.

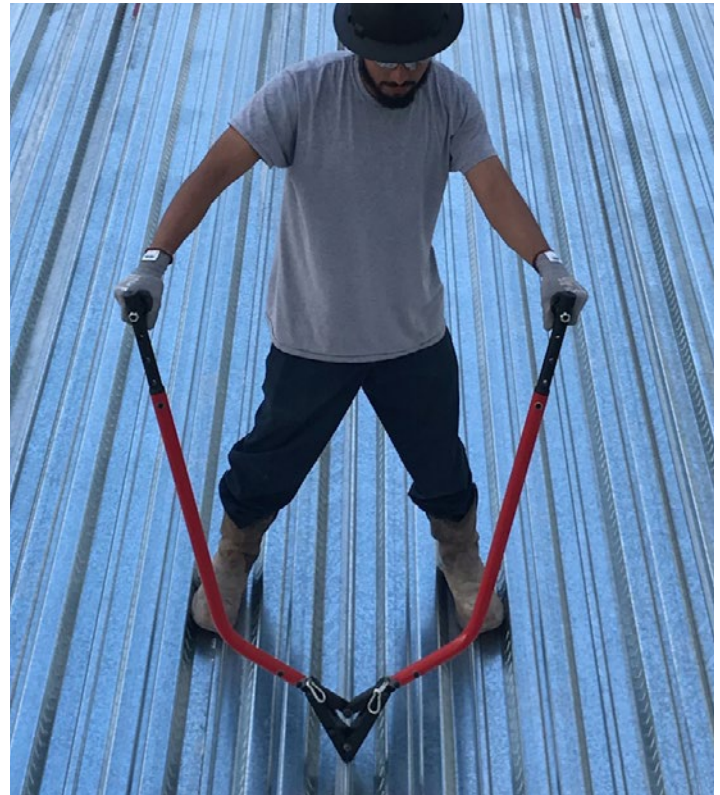
On site experience has demonstrated that the frequency of snapping a chalk line determines the accuracy of rib and flute alignment. This minor effort at the time of deck placement eliminates the need for field corrections.

For deck to perform its design functions and serve as a working platform, it must be adequately and properly attached. Often the deck is used as part of the horizontal bracing system and the fastening method and pattern have been selected to provide a certain strength and stiffness in the plane of the deck.

NO SUBSTITUTION of fastener type or pattern should be made without the approval of the designer.

Deck fastening to the structural frame can be accomplished with welds, self drilling screws, air driven, or powder driven fasteners. A minimum of 1 ½” of end bearing should be provided for deck, unless noted otherwise on the deck installation drawings. If there is less than 1 ½” of bearing, additional fastening should be provided and the deck web crippling capacity should be checked. For deck that is intended to end lap (roof deck), the end lap location should be adjusted so the center of the lapped portion occurs over the support or, when supported by bar joists, over a top chord member.

Only qualified operators may use powder actuated tools. Operators must be trained by the tool manufacturer or other authorized party in accordance with ANSI/ASSE A10.3-2013. Air actuated tools must be used by trained operators familiar with all safety procedures.



A typical steel deck installation

Screws

Special electric screw guns are used to drive self drilling screws to attach deck to the structural frame. These screw guns are equipped with a clutch and depth limiting nosepiece to prevent over torquing. Screws are typically #12's or 1/4" diameter with a special drill point selected according to the total thickness of metal (deck plus frame) being joined.

Power-Actuated Fasteners (Powder Cartridge Actuated)

Powder-actuated tools are designed to drive fasteners, specifically designed for deck attachment, through the sheet metal decking and into the base steel. A powder cartridge (blank cartridge) is used as the energy source to drive the fastener into the steel. Low-velocity tools utilize a captive piston which has much greater mass than the fastener. The energy from the powder cartridge acts on the piston which in turn drives the fastener. Only low-velocity tools, designed specifically for the decking application, should be used to fasten metal deck. OSHA requires that users of these tools are qualified in the operation of the particular tool in use.

Powder-actuated fasteners are made from hardened steel, with a ballistic point to penetrate the sheet steel and base steel. The fasteners typically have a knurling pattern which improves the hold of the fastener in the steel. Powder-actuated fasteners used for decking attachment should have one or more integrated washers which serve to clamp the deck sheet metal to the base steel, thereby improving the shear resistance capacity of the connection as well as the uplift capacity.

Power-Actuated Fasteners (Compressed Gas/Air Actuated)

Air driven tools are operated at a pre-set pressure level consistent with the fastening requirements of the deck attachment. Air is supplied by a compressor or equipped with a regulator that prevents over driving or under driving the fastener. The fasteners have a flat head at the drive end and a ballistic point at the penetrating end. A variety of sizes are available to meet the penetration requirements of the steel substrate.

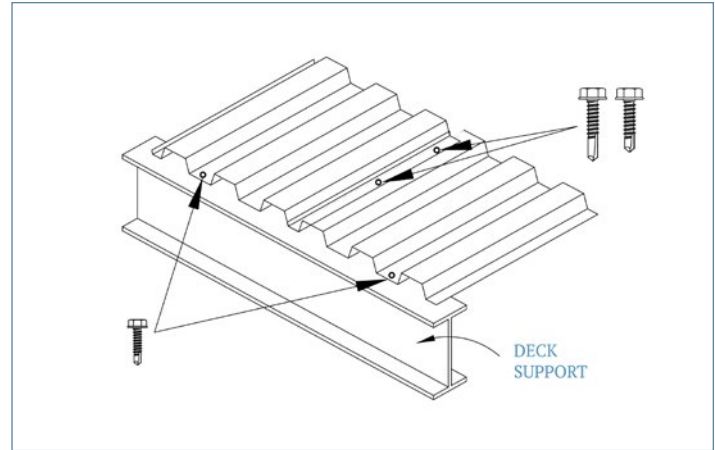


Figure 1A Support and side lap screws

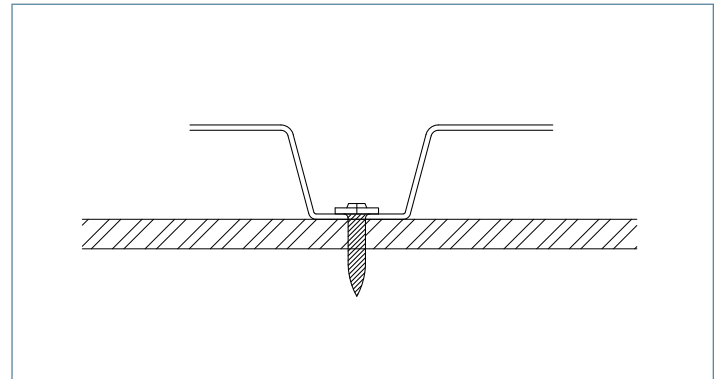


Figure 1B Power-actuated fastener attachment

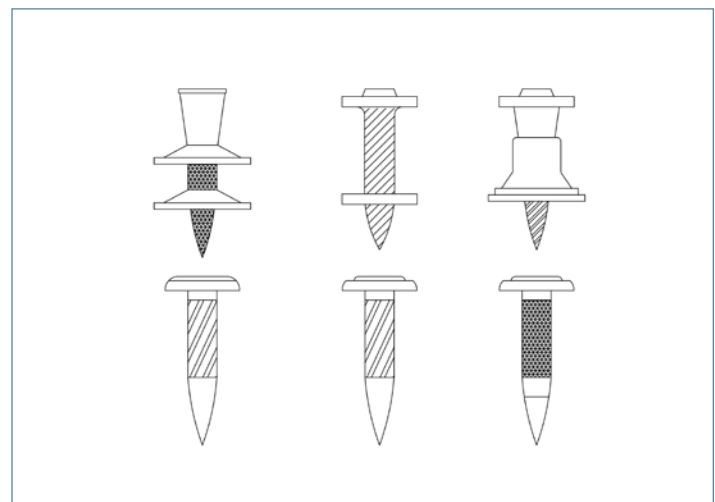


Figure 1C Examples of power-actuated fasteners

Welding must be done by a qualified welder during proper weather conditions. Quality welding of deck requires experience and the selection of proper amperage and electrodes. A weld quality control test procedure is shown in Figure 2. All welding should be done in accordance with the Structural Welding Code, AWS D1.1 or D1.3.

Weld washers are not recommended for deck thicknesses of 0.028 inches thick (minimum 22 gage) and greater. Weld washers are required for metal thicknesses less than 0.028 inches. Proper welding requires good metal to metal contact; therefore, lapping composite deck sheets with embossments is not recommended. For the same reason, built in hanger tabs (in floor deck) that bear on structural steel should be flattened or removed.

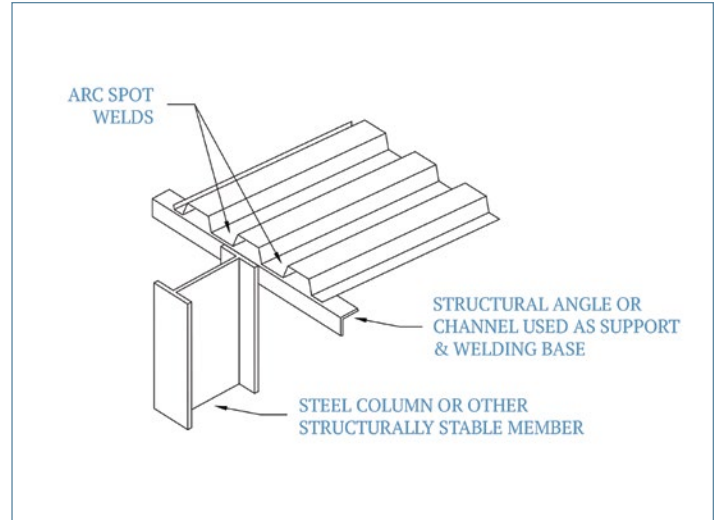


Figure 2 Weld quality control test procedure

Shear studs, welded in place with special equipment (in accordance with AWS D1.1) can serve as welding to hold the deck to the frame when installed as shown in Figure 3. These studs are usually installed after the deck has been spread to act as a working platform. Therefore, it is necessary that the platform be adequately attached to the structure before the studs are installed.

Shear studs can be welded through the double metal thickness of cellular deck. Note: If the deck is heavier than 16 gage the stud manufacturer should be consulted for installation procedures. Shear studs, like all other fasteners, must be installed in accordance with the design drawings.

Since most construction work is done in open air, ventilation for welding is usually adequate. However, for closed in areas, ventilation must be provided. Adequate ventilation is extremely important when welding galvanized deck. All workers involved in the welding operation must wear eye protection to avoid weld flash.

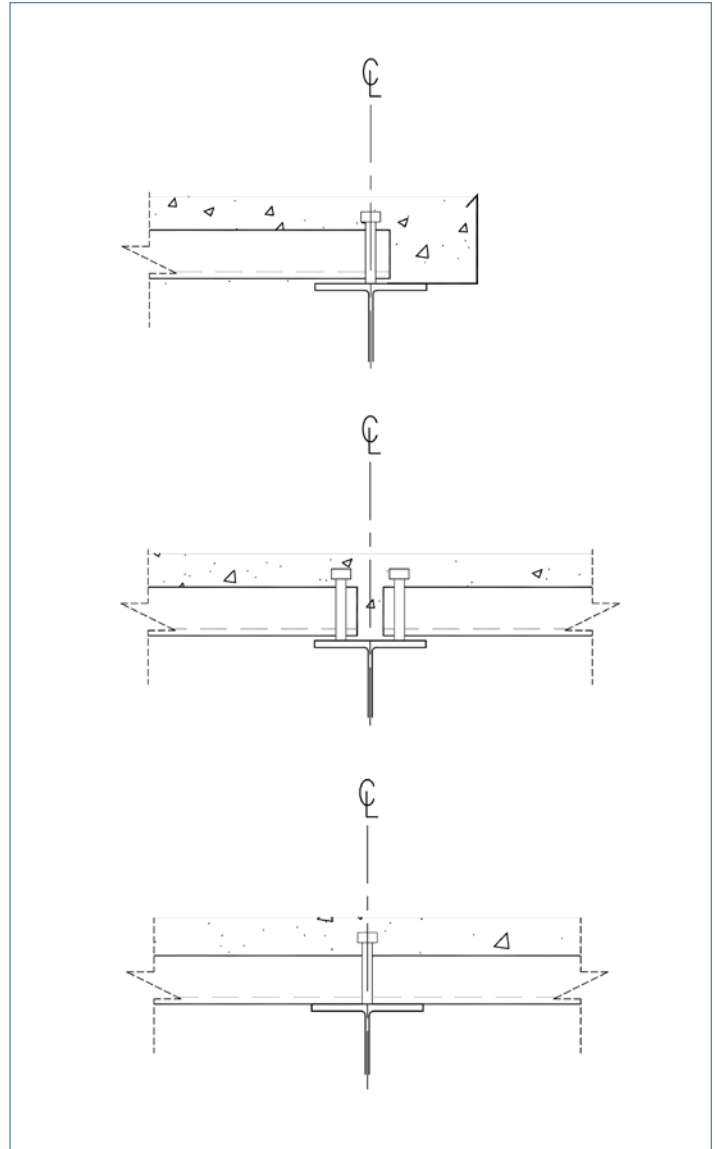


Figure 3 Examples of proper deck attachment with studs

SIDE LAP CONNECTIONS



Sheet to sheet connections may be required at the side laps of deck. These are frequently referred to as stitch connections. Self drilling screws, welds, clinching or button punches are the usual stitch connections. Stitch screws are usually self drilling type; #8's through 1/4 inch diameter can be used but screws smaller than #10 diameter are not recommended. The installer must be sure that the underlying sheet is drawn tightly against the top sheet. Again, as when screws are used as the frame attachment, the special screw driving guns are used to prevent over torquing.

Manual button punching of side laps requires a special crimping tool. Button punching requires the worker to adjust his weight so the top of the deck stays level across the joint. Since the quality of the button punch attachment depends on the strength and care of the tool operator, it is important that a consistent method be developed. Automatic power driven devices are also used.

Good metal to metal contact is necessary for good side lap welds. Burn holes are the rule rather than the exception and an inspector should not be surprised to see them in the deck. The weld develops its strength by holding around the perimeter. A good weld will have 7/8th's or more of its perimeter working. On occasion, side lap welds will be specified for deck that has the button punchable side lap arrangement (see Figure 4A for comments on this subject; see Figures 4B for welding these deck sheets to the frame). Welding side laps is not recommended for 22 gage decks (0.028 inch minimum) or lighter. Weld washers should never be used at side laps between supports. Just as when welding to the frame, adequate ventilation must be available and welding near combustibles is prohibited.

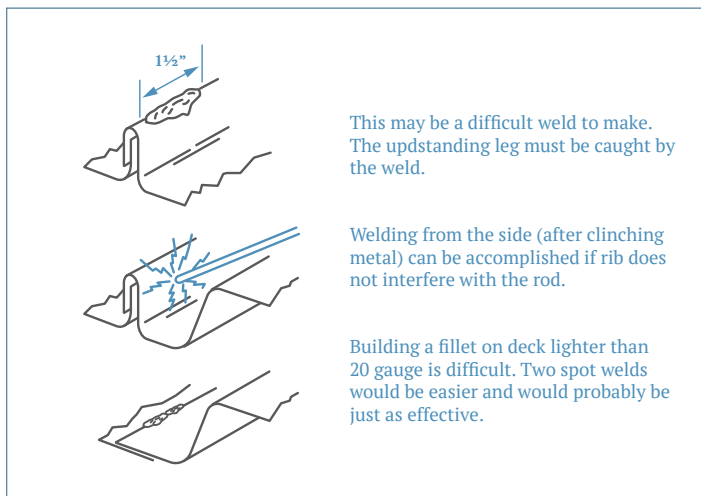


Figure 4A Side lap welds between supports

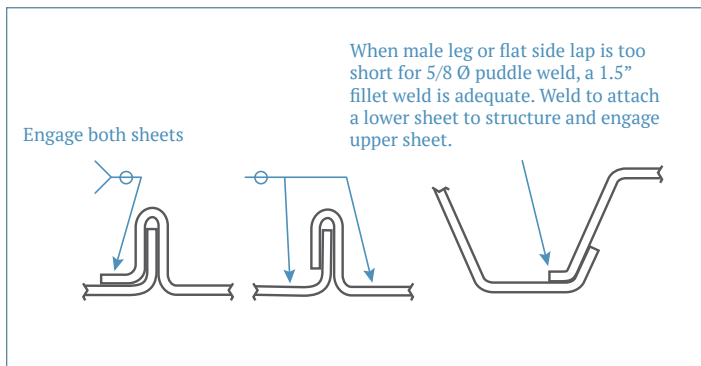


Figure 4B Side lap welds at supports

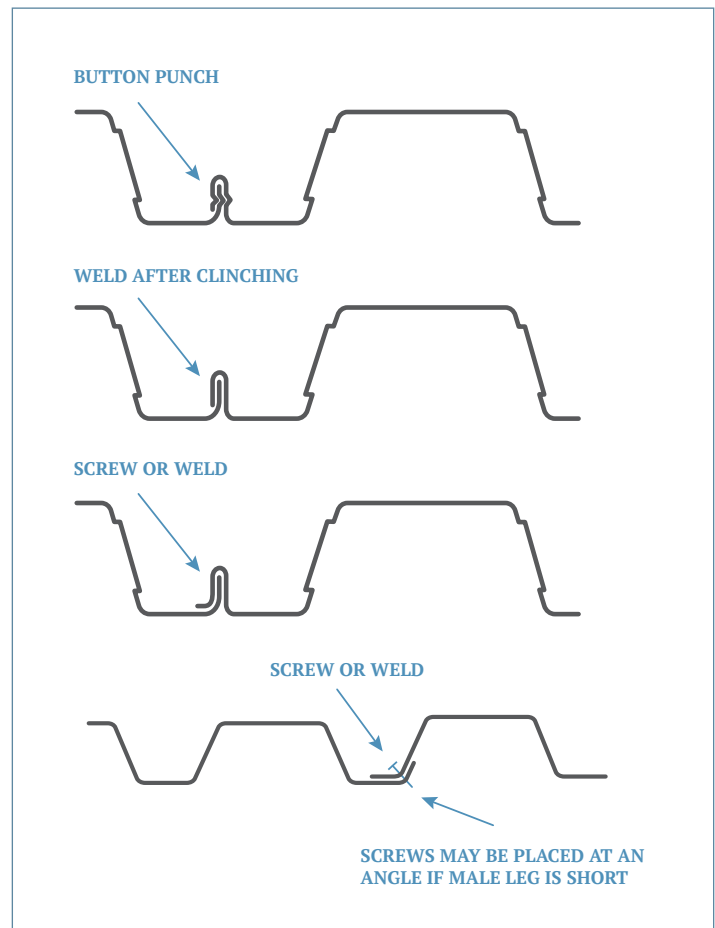
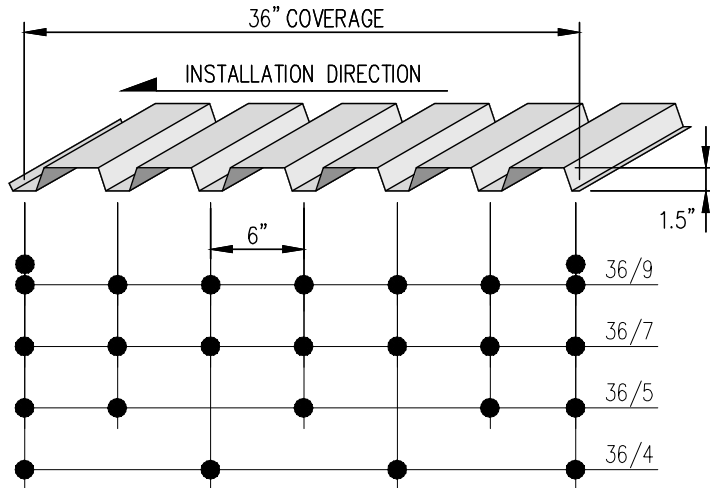


Figure 4C Side lap welds at supports

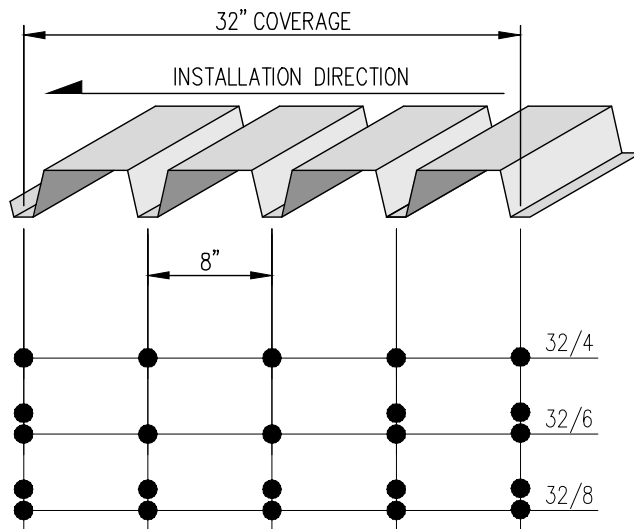
TYPICAL FASTENER LAYOUTS

The engineer of record designs the deck attachment patterns. The type of fastening system depends on factors like uplift capacity, diaphragm shear capacity, and the thickness of the supporting members. The different system types include power-driven fasteners, arc spot welds, arc seam welds, and self-drilling screws.

ROOF DECK ATTACHMENT LAYOUTS

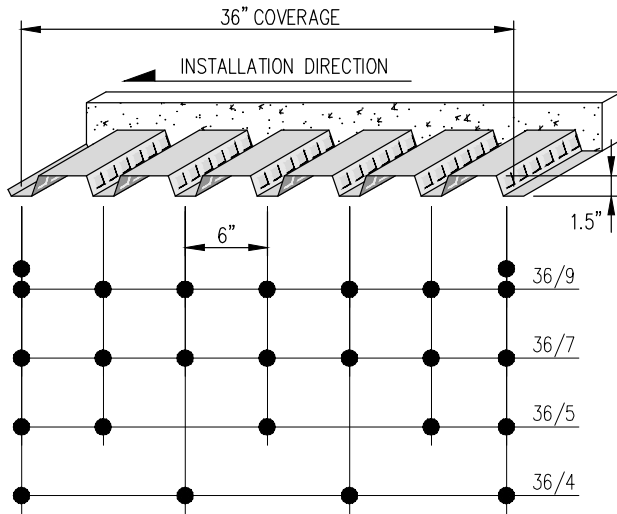


B-Deck BW-36, Wide Rib, 1.5B
36" Coverage

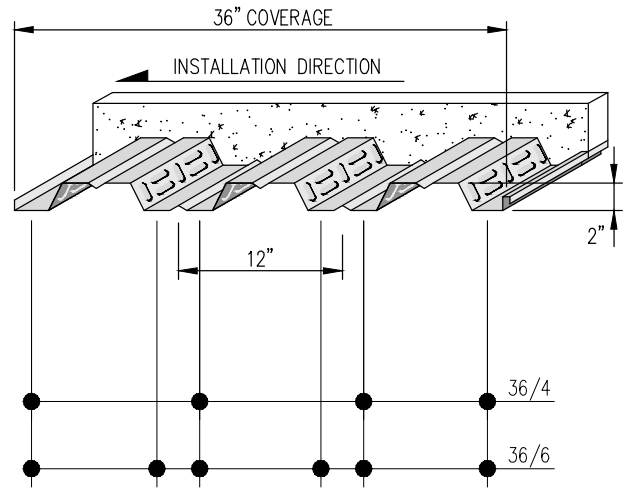


N-Deck Deep Rib, 3N
32" Coverage

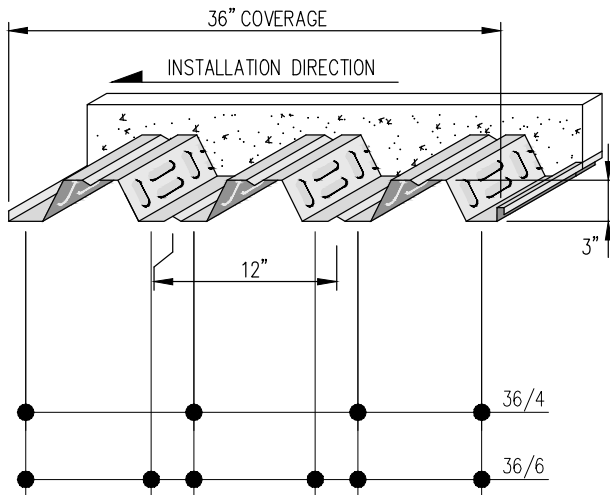
COMPOSITE DECK ATTACHMENT LAYOUTS



1.5" Composite Deck
36" Coverage

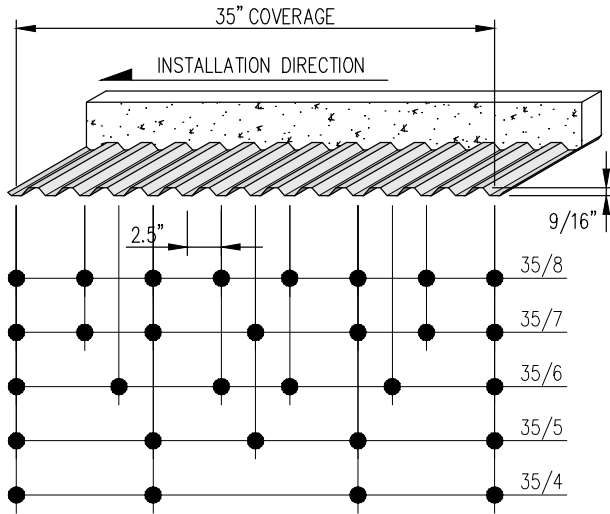


2" Composite Deck
36" Coverage

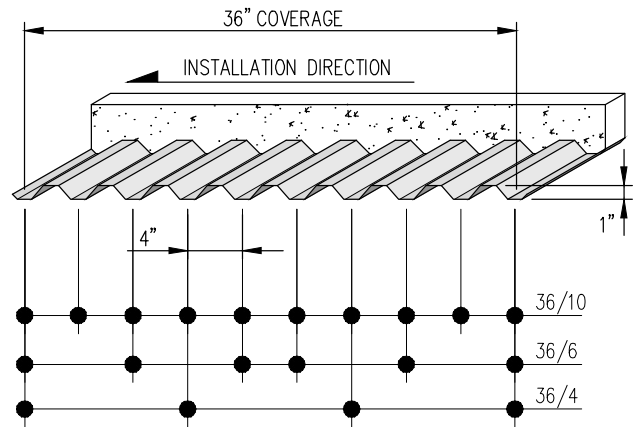


3" Composite Deck
36" Coverage

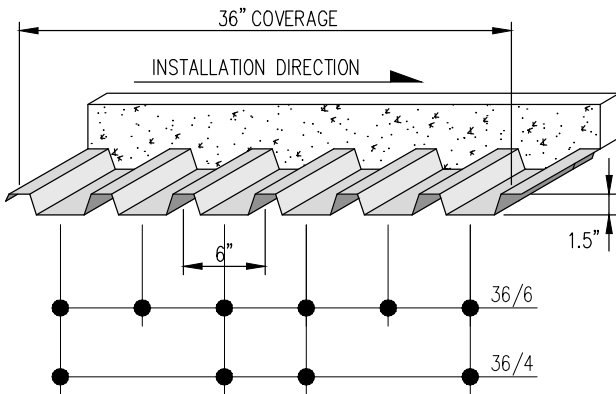
FORM DECK ATTACHMENT LAYOUTS



9/16" Form Deck
35" Coverage



1" Form Deck
36" Coverage



1.5" Form Deck
36" Coverage