



المهارة الذكية
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METHOD STATEMENT

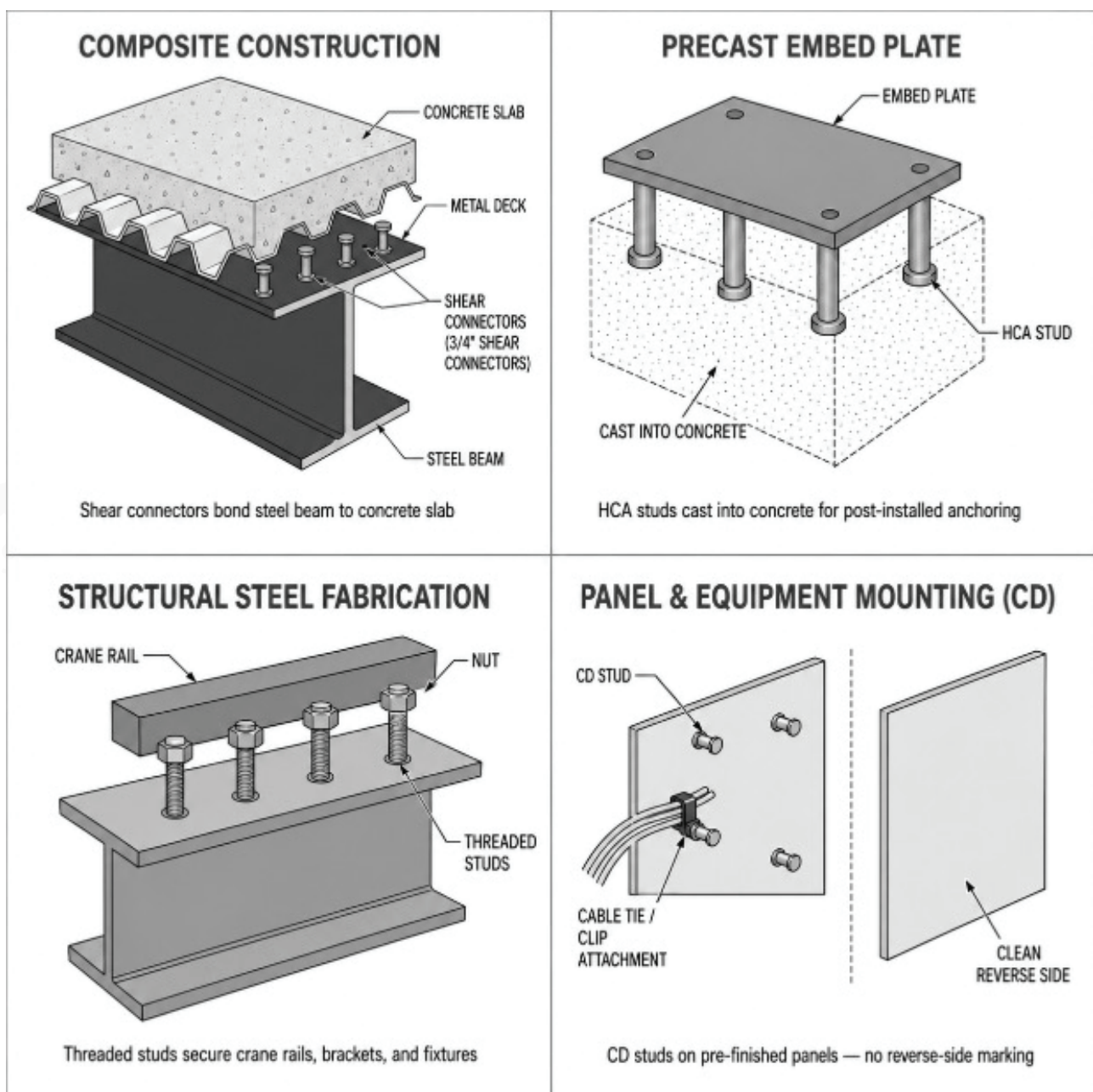
Supply & Installation of
Shear Stud Connectors (Type B)

by Drawn-Arc Stud Welding

METHOD STATEMENT

1. Purpose & Scope

This Method Statement describes the procedure for supply, handling, and site welding installation of Type B headed shear stud connectors with ceramic ferrules onto structural steel beams/decking for composite construction, in accordance with ISO 13918, ISO 14555, AWS D1.1 and the project structural design based on Eurocode 4.



General arrangement: shear studs welded to steel beam supporting a composite metal-deck slab



2. References

- ISO 13918 - Welding: Studs and ceramic ferrules for arc stud welding
- ISO 14555 - Welding: Arc stud welding of metallic materials
- AWS D1.1/D1.1M - Structural Welding Code – Steel
- ASTM A1044/A1044M - Standard Specification for Steel Stud Assemblies
- Eurocode 4 (EN 1994-1-1) - Design of composite steel and concrete structures
- Approved project structural drawings, specifications, and stud layout schedule

3. Materials & Equipment

3.1 Materials

- Type B shear stud connectors (diameter/length per approved schedule), ISO 13918 compliant
- Matching ceramic ferrules (single use)

3.2 Equipment

- Drawn-arc stud welding machine (SDA / SDAi series) with calibrated welding current and time settings
- Stud welding gun (SAG type) with correct stud chuck and ferrule holder
- Power supply: 3-phase, 415V, 50 Hz (per machine rating)
- Welding cables, earth/ground cable, and PPE (welding gloves, face shield, safety glasses)
- Bend-test hammer, inspection gauges, and calibrated ammeter/timer (if required)

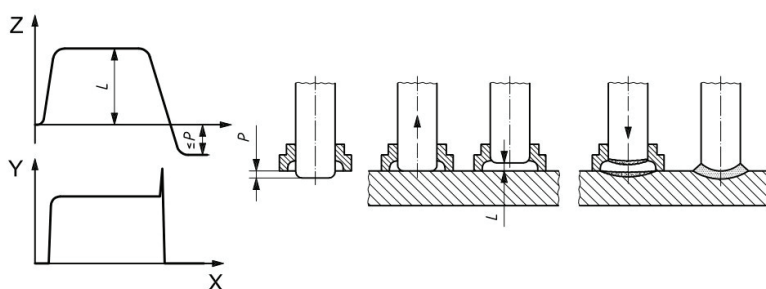


4. Pre-Installation Requirements

1. Verify stud diameter, length, and layout against approved shop/structural drawings.
2. Confirm steel flange/base metal thickness $\geq 0.25 \times$ stud diameter.
3. Ensure base metal surface is free of oil, paint, rust, mill scale, or moisture within at least 50 mm of the weld location.
4. Verify welding machine calibration and that welding current/time settings match the stud diameter per the manufacturer's recommended welding table.
5. Carry out trial welds (minimum 2 studs) on a representative test piece at the start of each shift, on a new batch of material, or after any change of welding position, equipment, or operator.
6. Trial weld studs shall be bend-tested to 30° from vertical without weld fracture, per ISO 14555/AWS D1.1 acceptance criteria.

5. Welding Procedure (Drawn-Arc Stud Welding)

1. Insert stud into the welding gun chuck and fit the matching ceramic ferrule over the stud weld end.
2. Position the gun perpendicular to the work surface at the marked stud location.
3. Set lift and protrusion per the manufacturer's recommended table (typically lift 8–9 mm, protrusion 3–4 mm).
4. Trigger the weld cycle: the gun lifts the stud to draw the arc, melting both stud end and base metal, then plunges the stud into the molten pool under spring force.
5. Hold the gun in position until the weld pool solidifies (per the set weld time, typically 200 ms or greater depending on diameter).
6. Remove the ceramic ferrule once solidified and inspect the weld collar - a full 360° fillet collar should be visible with no undercut or porosity.
7. Repeat for each stud location per the approved layout.



Drawn-arc weld cycle: lift, protrusion, weld time and current vs. stud movement



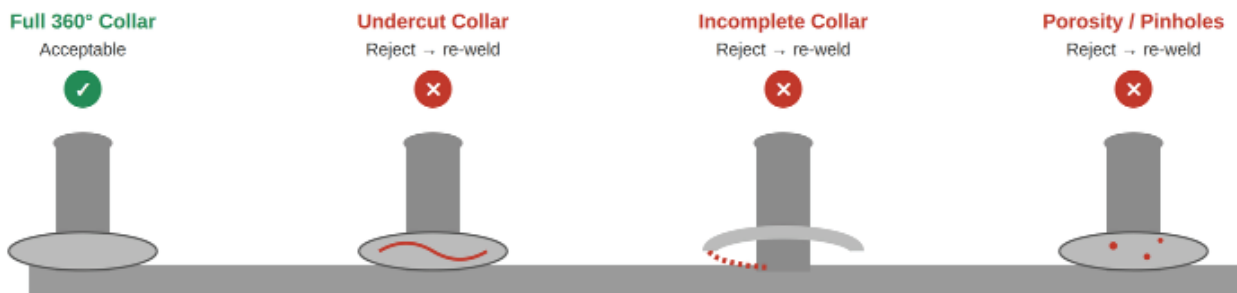
Drawn-arc stud welding in progress - completed 360° weld collar

6. Inspection & Testing

6.1 Visual Inspection (100%)

- Full 360° weld collar around the stud base, free from excessive flash, undercut, or porosity
- Stud verticality within tolerance (typically $\leq 5^\circ$ from perpendicular, per project specification)
- Correct stud location and spacing per approved drawing

WELD COLLAR VISUAL INSPECTION CRITERIA



Inspect 100% of welds visually; verify a continuous, uniform 360° fillet collar free of cracks, undercut, porosity, or incomplete fusion.

Visual inspection criteria: acceptable full collar vs. common rejectable defects

6.2 Bend Testing

- Random sample bend test: bend stud to 15° – 30° from vertical using a hammer or bending bar
- Acceptance: no visible cracking at the weld collar or heat-affected zone; studs may be left bent if structurally acceptable, or straightened back per engineer's approval
- Sampling frequency and acceptance criteria to follow project specification / ISO 14555 / AWS D1.1, whichever govern

STUD BEND TEST - ACCEPTANCE CRITERIA



Bend test method and accept/reject criteria



METHOD STATEMENT

6.3 Documentation

- Daily weld inspection log recording stud location, diameter, welding parameters, trial weld and bend test results
- Non-conformance reporting and re-weld procedure for rejected studs (adjacent to original location, subject to engineer approval)

7. Health, Safety & Environment

- All operators to be trained and competent in drawn-arc stud welding equipment operation
- PPE: welding face shield/goggles, gloves, fire-resistant clothing, safety footwear
- Fire watch and fire extinguisher on standby; remove combustible materials from the welding area
- Adequate ventilation; barrier/screening to protect other trades from arc flash
- Electrical safety: inspect cables and earthing before each use; machine to be operated only by authorised personnel
- Work at height to comply with project HSE plan and permit-to-work system

8. Roles & Responsibilities

Role	Responsibility
Site Supervisor	Coordinates layout marking, sequencing, and access; ensures method statement is followed
Qualified Stud Welding Operator	Performs welding per approved parameters; carries out trial welds and visual checks
QA/QC Inspector	Conducts inspection, bend testing, and records results; raises NCRs as required
HSE Officer	Monitors compliance with site safety requirements during welding operations

9. Attachments

- Approved structural/stud layout drawings
- Welding parameter table (per machine model and stud diameter)
- Trial weld / bend test record forms
- Material test certificates and ferrule certification



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