

Glue Joint Strength Test Block Shear – Calibration & Verification SOP

1.0 Maintenance Objective & Frequency

The objective of this procedure is to calibrate the glue joint strength test block shear fixture and verify its mechanical integrity to ensure accurate, repeatable shear strength measurements of adhesive bonds. This PM prevents false pass/fail results caused by worn shear blades, misaligned loading anvils, or incorrect load cell readings.

Frequency: Every 500 test cycles or quarterly (whichever comes first), and immediately after any suspected overload event or impact damage.

2.0 Lockout/Tagout (LOTO) & Safety

- **Electrical Isolation:** Disconnect the universal testing machine (UTM) from main power and apply a personal lockout tag on the disconnect switch.
- **Pneumatic Isolation:** If the fixture uses pneumatic clamping, close the shut-off valve and bleed residual air from the cylinder using the manual override.
- **Hydraulic Isolation:** For hydraulic UTM systems, close the hydraulic isolation valve and cycle the crosshead to zero pressure before locking out.
- **Mandatory PPE:** Safety glasses with side shields, cut-resistant gloves (ANSI A4 or higher), and steel-toed boots.
- **Additional Safety:** Ensure the area around the test frame is clear of debris and that the emergency stop button is accessible and functional.

3.0 Required Tools, Parts & Lubricants

- 0–5000 lbf (0–22 kN) calibrated load cell verification kit (or certified proving ring)
- Digital micrometer (0–1 inch / 0–25 mm, resolution 0.0001 inch / 0.001 mm)
- Shear fixture alignment gauge (custom ground steel block per ASTM D905 dimensions)
- Torque wrench (0–100 in-lbf / 0–11.3 Nm, with 1/4-inch drive)
- 5 mm hex key (Allen key) for shear blade retaining screws
- Replacement shear blades (if worn beyond tolerance – inspect per step 4.5)
- Anti-seize compound (nickel-based, for shear blade screws)
- Lint-free wipes and isopropyl alcohol (99%) for cleaning fixture surfaces
- ServiceGrid mobile device or paper work order for sign-off

4.0 Step-by-Step Maintenance Procedure

1. Perform LOTO as per Section 2.0. Verify zero energy state by attempting to jog the crosshead – it must not move.
2. Remove the shear fixture from the UTM load frame by loosening the four M10 socket head cap screws (torque to 45 Nm during reinstallation). Place the fixture on a clean, flat workbench.

3. Clean all fixture surfaces (shear blades, anvils, clamping faces) with isopropyl alcohol and lint-free wipes. Remove any adhesive residue or debris.
4. Inspect the shear blades for visible wear, chipping, or deformation. Measure the blade edge radius using a digital micrometer – reject if radius exceeds 0.005 inch (0.13 mm). Replace blades if necessary.
5. Using the alignment gauge, check the gap between the two shear blades. Insert the gauge block between the blades – it must slide with light hand pressure but not be loose. Acceptable gap: 0.002–0.005 inch (0.05–0.13 mm). Adjust by loosening the blade retaining screws (5 mm hex key), repositioning, and retightening to 25 in-lbf (2.8 Nm) with anti-seize.
6. Verify the loading anvil alignment. Place the alignment gauge on the lower anvil and lower the crosshead until the upper anvil contacts the gauge. The gauge must sit flat with no rocking. If misaligned, shim the anvil mounting plate with stainless steel shims (0.001–0.005 inch increments).
7. Reinstall the shear fixture onto the UTM load frame. Torque the four M10 mounting bolts to 45 Nm in a cross pattern.
8. Perform a load cell verification using the calibrated proving ring or load cell verification kit. Apply a known load (e.g., 1000 lbf / 4.45 kN) and record the UTM reading. Acceptable deviation: $\pm 1\%$ of reading. If out of tolerance, recalibrate the load cell per OEM procedure or replace the load cell.
9. Check the crosshead speed control. Set the UTM to the standard test speed (0.05 in/min / 1.27 mm/min per ASTM D905). Run a dry cycle (no specimen) and verify the speed using a stopwatch and displacement indicator. Acceptable tolerance: $\pm 2\%$.
10. Lubricate all pivot points and sliding surfaces with a light machine oil (ISO 32). Wipe off excess to prevent contamination of test specimens.
11. Document all measurements (blade gap, load cell reading, speed check) on the PM work order in ServiceGrid. Attach photos of the alignment gauge in position if possible.

5.0 Verification & Return to Service

1. Remove LOTO tags and restore power to the UTM. Perform a safety function check of the emergency stop button.
2. Run a test cycle using a known good glue joint specimen (e.g., maple-to-maple with a standard adhesive). Record the shear strength – it must fall within the historical control limits (± 3 sigma) for that adhesive. If outside limits, re-inspect the fixture alignment and load cell calibration.
3. If the test passes, sign off the PM work order in ServiceGrid, noting the date, technician name, and any parts replaced (e.g., shear blades).
4. Return the fixture to production use. Notify the quality team that the equipment is ready for routine testing.

Regulatory Disclaimer: This document is a generic maintenance template provided for educational and informational purposes only. It does not constitute professional engineering or reliability advice. The end-user assumes all liability for validating all step sequences, torque specs, and LOTO protocols against specific machinery OEM manuals before deployment to a live production floor.