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# Assembly Glue Penetration Depth Check – Preventative Maintenance & Calibration SOP

## 1.0 Maintenance Objective & Frequency

The objective of this procedure is to verify that the glue penetration depth on assembled parts meets the specified bond line requirement (typically 0.5–1.5 mm depending on material stack-up). Inadequate penetration leads to weak bonds and field failures; excessive penetration causes squeeze-out and cosmetic defects. This PM ensures the dispensing nozzle height, pressure, and dwell time are calibrated correctly to maintain consistent penetration depth.

Frequency: Perform this check at every shift start (Daily) and after any nozzle change, adhesive batch change, or unplanned machine stoppage exceeding 30 minutes.

## 2.0 Lockout/Tagout (LOTO) & Safety

- Electrical Isolation: Disconnect main power to the dispensing robot and conveyor system. Apply personal lock and tag.
- Pneumatic Isolation: Close the compressed air supply valve to the dispensing unit and bleed residual pressure from the regulator.
- Chemical Safety: Verify that the adhesive is not in a curing state (e.g., UV-curable glue must be shielded from UV light during inspection). Wear appropriate gloves and safety glasses.
- PPE: Safety glasses, nitrile gloves, and cut-resistant gloves when handling test parts.

## 3.0 Required Tools, Parts & Lubricants

- Digital depth gauge (0–10 mm range, 0.01 mm resolution) or calibrated dial indicator with magnetic base
- Test coupons (same material and thickness as production parts) – minimum 3 per check
- Cleaning solvent (isopropyl alcohol 99% or manufacturer-recommended solvent)
- Lint-free wipes
- Feeler gauge set (0.05–1.00 mm)
- Torque wrench (0–5 Nm range) with appropriate bit for nozzle retaining screw
- Calibrated stopwatch or timer (for dwell time verification)
- Manufacturer's specification sheet for glue penetration depth

## 4.0 Step-by-Step Maintenance Procedure

1. Perform LOTO as per Section 2.0. Confirm zero energy state on the dispensing robot and conveyor.
2. Remove the nozzle guard and inspect the nozzle tip for wear, clogs, or damage. Clean the nozzle orifice with solvent and a lint-free wipe if necessary.
3. Using the torque wrench, verify the nozzle retaining screw is torqued to the manufacturer's specification (typically 2.5 Nm  $\pm$ 0.2 Nm). Re-torque if loose.

4. Place a clean test coupon on the dispensing fixture. Ensure the coupon is flat and free of debris.
5. Manually jog the dispensing head to the start position above the coupon. Set the nozzle height to the nominal gap specified in the work instruction (e.g., 1.0 mm above the substrate). Use a feeler gauge to confirm the gap.
6. Initiate a manual dispense cycle using the teach pendant. Observe the glue bead application. Allow the glue to cure per the adhesive manufacturer's instructions (e.g., 30 seconds for UV cure or 2 minutes for air-dry).
7. After curing, carefully section the test coupon perpendicular to the glue bead using a sharp utility knife or shear cutter. Avoid distorting the bond line.
8. Measure the glue penetration depth using the digital depth gauge or dial indicator. Insert the probe into the glue channel until it contacts the substrate. Record the depth at three points along the bead (start, middle, end).
9. Compare the measured depths against the specification (e.g., 0.8 mm  $\pm$ 0.2 mm). If any reading is out of tolerance, adjust the dispensing parameters (pressure, dwell time, or nozzle height) and repeat steps 4–8 until all readings are within spec.
10. If adjustments are required, document the new parameters on the PM work order. Update the machine recipe if the change is permanent.
11. Repeat the penetration check on two additional test coupons to confirm repeatability. All three coupons must pass.
12. Clean the work area, remove test coupons, and reinstall the nozzle guard.

## 5.0 Verification & Return to Service

1. Remove LOTO devices. Restore electrical and pneumatic power to the dispensing robot and conveyor.
2. Run a full production cycle on a scrap part to verify that the glue bead is consistent and that penetration depth is maintained under automatic operation.
3. Visually inspect the glue bead for squeeze-out, voids, or uneven flow. If any defects are observed, repeat the calibration procedure.
4. Sign off on the PM work order in ServiceGrid, noting the measured penetration depths, any parameter changes, and the technician's name.
5. Return the machine to production. Notify the shift supervisor that the glue penetration check is complete and the equipment is ready for use.

**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.