
Shelf Loading Deflection Test

1.0 Objective & Quality Standard

The objective of this procedure is to verify that each shelf, when subjected to its rated uniform load, does not exceed the maximum allowable deflection of 2.0 mm measured at the center of the span. This ensures the shelf will perform reliably under normal use without permanent deformation or failure.

Acceptable deflection tolerance: 0.0 mm to 2.0 mm. Any deflection exceeding 2.0 mm constitutes a failure and requires immediate red-tagging and rework.

2.0 Required Tools & Gauges

- Digital dial indicator with magnetic base (0.01 mm resolution)
- Calibrated test weights (e.g., sandbags or steel plates) totaling the rated shelf load (e.g., 50 kg)
- Straightedge (1 meter, precision ground)
- Feeler gauge set (0.5 mm to 3.0 mm)
- Test fixture or support frame replicating cabinet installation

3.0 Safety & Material Handling

- Wear steel-toed safety boots and cut-resistant gloves when handling test weights.
- Use two-person lift for weights exceeding 25 kg to prevent back strain.
- Ensure test area is clear of obstructions and marked with caution tape during testing.
- Place shelf on padded supports to avoid scratching or damaging the finish.

4.0 Step-by-Step Procedure

1. Inspect the shelf for any visible defects, cracks, or warpage before testing. Reject if any are found.
2. Place the shelf on the test fixture exactly as it would be installed in the cabinet (supports at each end, no overhang).
3. Position the straightedge across the top of the shelf at mid-span, perpendicular to the length.
4. Set the dial indicator on the magnetic base and zero it against the straightedge at the center of the shelf span.
5. Carefully apply the rated test load uniformly across the shelf surface. Distribute weights evenly to simulate real-world use.
6. Wait 30 seconds for the shelf to settle under load. Record the maximum deflection reading from the dial indicator.
7. Remove the test load and wait 30 seconds. Check for permanent deflection by re-zeroing the indicator and measuring any residual sag.
8. If residual deflection exceeds 0.5 mm, the shelf has undergone plastic deformation and must be rejected.
9. Document the test results on the QA checklist, including load applied, deflection measured, and any observations.

10. Clean the shelf and test area after completion. Return weights to storage.

5.0 Verification & Defect Reporting

1. Compare the recorded deflection against the 2.0 mm maximum allowable. If exceeded, immediately red-tag the shelf with a non-conformance label.
2. Move the red-tagged shelf to the quarantine area and notify the production supervisor and QA manager.
3. Initiate a corrective action request in ShopDocs, documenting the defect, test conditions, and shelf batch number.
4. Rework options: reinforce the shelf with additional bracing or replace the material. Retest after rework.
5. If the same defect appears in more than 5% of a batch, escalate to engineering for design review.

Regulatory Disclaimer: This document is a generic quality assurance template. The end-user assumes all liability for validating all dimensional tolerances, testing procedures, and engineering specifications against actual production requirements before deployment.