WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW3390

Procedure for Determining the Flexibility of Automotive Upholstery Materials

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This procedure uses a 45 degree cantilever testing apparatus to determine flexibility of automotive upholstery materials based on bending length. It is not recommended that this test be performed on laminated materials whose laminates have been removed.

1.2 Applicability. Automotive upholstery materials.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3221

3 Resources

3.1 Facilities. Not applicable.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 A 45 degree Cantilever Bending Tester.

3.2.1.1 Horizontal platform with a minimum area of 35 mm x 200 mm, and having a smooth, low-friction, flat surface such as polished metal, plastic or smooth varnished wood.

3.2.1.2 Weighted hold-down plate not less than 25 mm x 200 mm and with sufficient mass to ensure the test specimen moves with the hold-down plate. Hold-down plate may have a rubber like surface on the side that will contact the test specimen to eliminate slippage.

3.2.1.3 Scale (in millimeters) and reference point to measure the length of the overhang.

3.2.2 Apparatus for conditioning to the appropriate requirements as described in GMW3221, Code A, unless otherwise specified in the relevant materials specification.

3.2.3 Cutting die or shears for preparation of the test specimens.

3.3 Test Vehicle/Test Piece. Not applicable.

3.4 Test Time.

Calendar time:	2 days
Test time:	1 hours
Coordination time:	1 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Personnel trained in accordance with the laboratory accreditation Standard Operating Procedure requirements.

4 Procedure

4.1 Preparation.

4.1.1 Cut three (3) test specimens from each direction: machine direction (MD) and cross machine direction (CMD) or for leather, parallel to the backbone and perpendicular to the backbone. Cut test specimens to a size of 25 mm ± 1 mm x 200 mm ± 1 mm with the long direction considered the direction of the material (MD or CMD).

4.1.2 Unless otherwise specified in the relevant material specification, conditioning shall be performed according to GMW3221, Code A.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

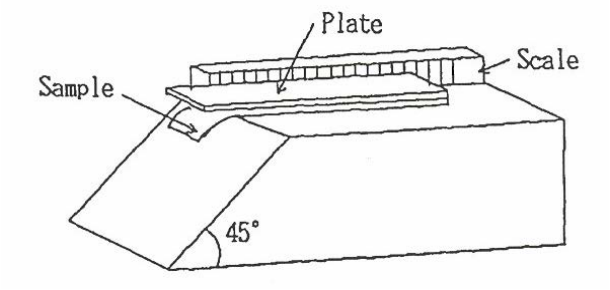
4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions. Using a hold-down plate, the specimen is moved slowly along the horizontal surface until it drapes to the 45 degree incline of the cantilever testing apparatus.

When the test specimen contacts the 45 degree incline, movement is stopped and bending length is measured.

4.3.1 Set the Cantilever Bending Tester (see Figure 1) on a stable surface making sure that the horizontal platform is level.

Figure 1: 45 Degree Cantilever Bending Tester



4.3.2 Place the test specimen, appearance side up alongside the metric scale, on the horizontal platform with the length of the specimen parallel to the length of the platform. Align one end of the test specimen at the scale's 0-point and the other end with the beginning of the 45 degree downward slope.

4.3.3 Place the hold-down plate directly over the test specimen being careful not to change its initial position.

4.3.4 Slowly slide the hold-down plate and the test specimen over the sloped side of the tester.

Note: It is important that the hold-down plate remain directly over the test specimen and move as one during the course of the test.

4.3.5 Continue to slide the test specimen until the leading edge first touches the sloped surface or bends 45 degrees.

4.3.6 Read and record the overhang length from the metric scale by the end position of the test specimen and hold-down plate on the horizontal platform.

4.3.7 If required in the material specification, repeat 4.3.2 through 4.3.6 with the appearance side down using the same test specimen**.**

5 Data

5.1 Calculations.

5.1.1 Bending Length. Calculate the bending length as the average of the overhang length of the three (3) test specimens for each individual direction, (MD and CMD) in millimeters, appearance side up.

If required by material specification, calculate the bending length as the average of the overhang length of the three (3) test specimens for each individual direction (MD and CMD) in millimeters, appearance side down.

5.2 Interpretation of Results. Report the average bending length in millimeters (appearance side up) for machine direction. Also, separately report the average bending length (appearance side up) in the cross machine direction or parallel to the backbone and perpendicular to the backbone.

Note: There may be a maximum of four (4) averages reported. See 5.1.1.

5.2.1 Report the average bending lengths for each individual direction (MD and CMD).

5.3 Test Documentation. Report data as required per the material specification using the appropriate lab data sheet.

6 Safety

This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.

7 Notes

7.1 Glossary.

Bending Length: A measure of stiffness of a material based on how the material bends in one plane under the force of gravity.

Flexibility: A term relating to the haptic feel of the material, referring to the ease of bending and ranging from pliable to stiff.

7.2 Acronyms, Abbreviations, and Symbols.

CMD	Cross Machine Direction
GSSLT	Global Subsystem Leadership Team
MD	Machine Direction

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Test to GMW3390

9 Release and Revisions

This standard was originated in October 1999. It was first approved in April 2000. It was first published in December 2000.

Issue	Publication Date	Description (Organization)
1	DEC 2000	Initial publication.
2	MAY 2007	Editorial changes associated with Global Textile Development Group Conference (Global Textile Development Group). Section 1 Editorial change. Section 3.1.1 Added the equipment option to use a smooth varnished wood. Section 5.1 Editorial changes. Section 5.2.1 Changed the correct size of the specimens for testing and added direction. Section 5.3.Subsection renumbered and deleted section 5.3.1. Section 5.3.3 Renumbered as 5.3.2 and editorial changes. Section 5.3.4 Speed not applicable for the test. Section 5.3.7 Editorial changes. Section 6.1.1 Editorial change, deleted the note section and deleted section 6.1.2 and section 6.2 and the following subsection. Section 7.1 Editorial changes. 7.4 Was deleted and replaced as Section 7.3. Appendix A was deleted and moved to Section 9.1 Glossary and renumbered. Flexural rigidity definition was deleted. Section 9 Coding system became Section 10. Section 10 Release and Revision became Section 11.
3	DEC 2012	Five year refresh of standard. Converted from a Test Method into a Test Procedure template. Origination month corrected from original publication. (Global Textiles and Trim Materials Subsystem Leadership Team)
4	SEP 2017	Revised to current template. (Materials - Textiles/Trim Materials GSSLT)