



Dent Resistance for Plastic Roll Goods

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 test method shall be used to determine the denting deformation in Plastic Roll Goods (PRG) used in Door Uppers when subjected to ambient temperature.

1.2 Applicability. Automotive interior PRG of Thermo Plastic Olefin (TPO) materials in combination with Cross Linked Polyolefin (XLPP) foams used to cover components such as Door uppers, Inner Panel (IP) Upper Panels (UP), etc.

1.3 Remarks. This standard is written to evaluate covered material with denting deformation risk.

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

2.3 Additional References. None.

3 Resources

3.1 Facilities.

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 Load Device. Weights (see Appendix A, Figure A1) of a total 15 kg or alternative pneumatic piston (see Appendix A, Figure A2), to exert a minimum force of 150 N.

3.2.2 Indenter. A sphere with a diameter of 5.0 cm (approximately 2 in) and a weight of 500 g (see Appendix A, Figure A3).

3.2.3 Gauge. (Mitutoyo Digimatic indicator ID-H0530/0560 or similar). The indicator gauge with measuring range of 0 mm to 60 mm shall be perpendicular to the test specimen. Accuracy 0.0025 mm or less at 20 °C. (see Appendix A, Figure A4).

3.2.4 Test Holding Fixtures. Test fixtures shall be capable of securely holding the sample to be tested. The sample shall be retained securely within the fixture such that the base of the specimen and holding fixture are perpendicular to one another to apply uniaxial load.

3.3 Test Vehicle/Test Piece.

3.3.1 Test Pieces. Samples should be representative of production PRG with polyolefin foam laminated and should be provided in enough amount to permit cut 7 cm × 7 cm specimens; double coated adhesive tape should be used to attach the laminated roll good to the substrate. Substrate should be 10 cm × 10 cm and around 0.3 cm homogenies thickness.

For a substrate if a representative sample of the production substrate intent material is not available, a general-purpose Acrylonitrile Butadiene Styrene (ABS) plaque can be used.

3.4 Test Time. This test need to be performed after the time for environmental conditions and normally the test takes 1 d to do the three (3) test specimens.

Calendar time: 1 d

Test time: 6 h

Coordination time: 1 h

3.5 Test Required Information. Not applicable.

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

4 Procedure

4.1 Preparation.

4.1.1 Cut specimen TPO of 7 cm × 7 cm dimension. (see Appendix A, Figure A5 and Figure A6).

4.2 Conditions.

4.2.1 Environmental Conditions. According to GMW3221(A).

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.

4.3.1. Induce Denting. First draw the center lines from the middle of each side of specimen and the specimen shall be supported and secured with holding fixtures ensuring that centerline of the specimen is aligned with the centerline of the indenter to apply the uniaxial compression load. (see Appendix A, Figure A7).

4.3.2 Load weights (15 kg) over indenter ensuring centerlines are aligned to apply a uniaxial load to have this mark as reference to do the measuring. If Pneumatic Piston is used, adjust indenter to zero (0) and apply 150 N uniaxial compression force. (see Appendix A, Figure A7).

4.3.3. Maintain the applied force for 30 minutes (± 2 minutes) and then remove the indenter from the test specimen.

4.3.4 Place indicator gauge over plastic panel (substrate) to set zero (0) (see Appendix A, Figure A8)

4.3.5 After the load application described in 4.3.3, place the measurement indicating gauge on the center line of the tested area after 30 minutes (± 2 minutes). Record the change. Repeat for two (2) additional 30 minutes intervals and record up to 90 minutes (1.5 h) of time. This is the measurement of recovery (see Appendix A, Figure A9).

5 Data

5.1 Calculations. For each interval, with recovery thickness data, calculate the percentage (see Appendix A, Figure A10):

$$\text{Denting} = (\text{Total thickness} - \text{Thickness with denting}) \text{ mm}$$

$$\% \text{ Recovery} = \frac{(\text{Denting}) * (100)}{\text{Total thickness}} \%$$

Record all measurements at the prescribed intervals for each test specimen. Repeat the process for all three (3) specimens and provide averages to quantify the denting.

5.2 Interpretation of Results. According to established criteria, to the applying a weight of 15 kg or 150 N for 30 minutes with a sphere of 5.0 cm (approximately 2 in) diameter at Room Temperature (RT) (23 °C), the specimen must recover more or equal than 80% in at least in 60 minutes.

5.3 Test Documentation. Provide all data in the format shown in Table 1.

Table 1: Results of Percent (%) Recovery Denting After 30 minutes (mins), 60 mins and 90 mins at RT

Sample	Total Thickness (mm)	Deformation at 0 mins Note1	Thickness with Denting (mm).			% Recovery @ RT		
			After 30 mins	After 60 mins	After 90 mins	After 30 mins	After 60 mins	After 90 mins
1	4.09	2.90	3.42	3.45	3.50	84%	85%	86%
2	4.10	2.89	3.46	3.51	3.56	85%	86%	87%
3	4.04	2.80	3.42	3.45	3.51	84%	85%	86%

Note 1: The thickness at 0 minutes represent the initial deformation of sample after to induce denting.

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. Not applicable.

7.2 Acronyms, Abbreviations, and Symbols.

%	Percent
ABS	Acrylonitrile Butadiene Styrene
GSSLT	Global Subsystem Leadership Team
IP	Inner Panel
mins	minutes
mm	millimeters
PRG	Plastic Rolled Good
RT	Room Temperature
TPO	Thermo Plastic Olefin
UP	Upper Panel
XLPP	Cross Linked Polyolefin

8 Coding System

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

Test to GMW18119