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| GM | WORLDWIDE ENGINEERING STANDARDS | Material Specification | GMW3262 |

# Finished Genuine Leather

## 1 Scope

**1.1 Material Description**. Leathers covered by this specification include all interior automotive grade leathers. All leather is to be full, top grain unless otherwise specified in Appendix B, Figure B1, and must come from steer, heifer or bull hides only. For steering wheels, split is applicable if specified in the Leather Statement of Requirements (SOR). All soft quality leathers shall be milled full grain only. All leathers shall be flexible, free from tackiness, and conform to trim fabrications.

**Note:** For requirements for vehicles without solar absorbing glass, contact the appropriate Materials Engineer. All interior materials are developed to be used in vehicles with solar glass; performance may be compromised if non-solar glass is used.

**1.2 Symbols**. This code defines the material construction and will be assigned by the responsible department.

**1.3 Applicability**. This specification describes leather material used for automotive interior trim applications, such as seat cushions and backs, seat inserts, doors, shift knobs, shift boots, steering wheel covers, instrument panels, consoles, and armrests.

**1.4 Remarks**. All materials covered by this specification are subject to part performance testing through part validation including GMW14444.

## 2 References

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

**2.1 External Standards/Specifications.**

| | | | |
|---|---|---|---|
| ISO 105-A02 | ISO 105-X12 | ISO 11640 | ISO/IEC 17025 |
| ISO 105-A03 | ISO 2589 | ISO 11644 | VDA 230-206 |
| ISO 105-B06 | ISO 5084 | ISO 13937-2 | |
| ISO 105-E04 | ISO 5402 | ISO 15701 | |

**2.2 GM Standards/Specifications.**

| | | | |
|---|---|---|---|
| GMW3010 | GMW3390 | GMW14134 | GMW15058 |
| GMW3059 | GMW3402 | GMW14136 | GMW15377 |
| GMW3182 | GMW3405 | GMW14140 | GMW15634 |
| GMW3205 | GMW3417 | GMW14146 | GMW15635 |
| GMW3208 | GMW6992 | GMW14162 | GMW15717 |
| GMW3211 | GMW14102 | GMW14270 | GMW16348 |
| GMW3220 | GMW14124 | GMW14296 | GMW16553 |
| GMW3221 | GMW14126 | GMW14364 | GMW16853 |
| GMW3232 | GMW14127 | GMW14444 | |
| GMW3235 | GMW14130 | GMW14445 | |
| GMW3259 | GMW14132 | GMW14864 | |

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**2.3 Additional References.**

- GMW3262 - Leather Construction and Color Certification Data Form - available at www.gmsupplypower.com
- GM Natural Markings and Defects Manuals: Leather Natural Marking Book No.1 (LNM1) and Leather Natural Marking Book No.2 (LNM2) - available at Thierry Corporation. 4319 Normandy Court. Royal Oak, MI 48073 info@thierry-corp.com.
- Statement of Requirements (SOR) - available at www.gmsupplypower.com.

## 3 Requirements

**3.1 General Requirements.**

**3.1.1 Requirements on Test Specimens.** Reference GMW3221.

**3.1.2 Standard Conditions GMW3221, Code A.** All test specimens shall be conditioned to GMW3221, Code A, unless the test method indicates that standard conditioning is not required.

**3.1.3 Sampling and Test Specimen Preparation.** Test specimens shall be cut from random areas of the hide, as required in the test method. Cut specimens relative to the backbone direction as specified in the test method. If the backbone direction cannot be determined, cut specimens from random areas of the hide in the orientation as described by the test method. The test report should indicate the backbone direction could not be determined.

**3.1.3.1** Specimens should not be cut within 50 mm of any edge of the sample.

**3.1.3.2** If all individual readings of a specific test meet or exceed the specified requirements, report the average. Unless otherwise stated, any individual reading outside the specified limit does not meet the requirement; report all individual test results that do not meet the requirements.

**3.1.3.3** All test specimens shall be prepared from areas which are in accordance with the GM Natural Leather Markings and Defects Manuals.

**3.1.3.4** Unless otherwise specified in the material specification or test procedure, test three (3) samples.

**3.1.4 Visual Evaluation of Automotive Trim, GMW6992.** The color, pattern, aesthetics and other related appearance qualities shall be approved by the appropriate Design Quality department as an acceptable match to the standard when viewed under conditions set forth in GMW6992. See Appendix B, Figure B1, available upon request from the Materials Engineering.

**3.1.4.1 Haptics and Surface Feel.** The aesthetic haptics of the leather shall be approved by GM to the existing target hand of the originating leather construction, when one exists, or to GM's color and trim design direction as identified by GM for new construction developments. Aesthetic hand masters will be signed off by the GM Leather Design Quality Representative responsible for leather development. GM and the leather supplier shall retain signed pieces representing the acceptable hand of the leather. The hand of the leather of every shipment shall be equivalent to the original approved construction piece, as well as not degrade from the originating source.

**3.1.5 Construction Specification Sheets**. GM issues a construction specification sheet for each leather construction code.

**3.1.5.1** Construction Specification Sheets define both physical and aesthetic requirements for a leather construction. See Appendix B, Figure B1 for reference.

**3.1.5.2** Construction Specification Sheets are available for each leather construction code and can be obtained from the GM Leather Materials Engineer**.**

**3.1.5.3** For test methods that reference the construction specification sheet for construction specific testing values, i.e., thickness, weight, tensile, etc., it is the supplier's responsibility to obtain the construction specification sheet and apply the construction specific requirements into the Appendix A, Figure A1 reporting data sheet under the column labeled **Specification**.

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**3.1.6 Deviations from Defined Test Methods.** Deviations from the conditions of any test method shall have been agreed upon between supplier and vehicle manufacturer. All deviations shall be specified on the component drawings, material specifications, etc., and shall be indicated on test certificates, reports, etc.

**3.1.7 Test Data.** Laboratory testing shall be performed by a laboratory that conforms (meets requirements but may not be formally recognized by a third party), to ISO/IEC 17025 and is acceptable to the responsible GM department. Test reports must conform to ISO/IEC 17025. Supplier shall submit a letter of compliance.

**3.1.8 Types.** Where stated, tests may be specific to a certain type of leather. Otherwise, all methods apply to all leather types.

**3.1.9 Documentation.** Samples of components or material released to this standard shall be tested for conformity with the requirements of this standard and approved by the responsible GM department prior to the start of delivery of production level components or materials.

**3.1.9.1** Any change to the component or material, e.g., design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

**3.1.9.2** If not otherwise agreed to, the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases, a shorter test can be agreed to between the responsible GM department and the supplier.

**3.2 Construction Requirements.**

**3.2.1 Weight, GMW3182.** Refer to Appendix A, Figure A1, and complete accordingly per 3.1.5. Report the average in grams/meter$^2$ (g/m$^2$).

**3.2.2 Thickness.**

**3.2.2.1** For unlaminated leather: ISO 2589.

**3.2.2.2** For laminated leather: ISO 5084. Use a 4.0 N load and 200 mm ± 0.8 mm diameter presser foot to achieve a pressure of 0.127 kPa. All readings should be taken after the presser foot has been in contact with the material for at least 5 s. Acceptable production tolerance will be ± 10% for face leather, and ± 15% for laminate composites, Use specimens from 3.2.1 to measure thickness, and report the average of three (3) specimens.

**3.2.3 Breaking Load and Elongation, GMW3010, Code B.** Four (4) groups of five (5) specimens, for a total of 20 specimens, must be tested. See Figure 1 for sampling. Each group of five (5) must be sampled according to GMW3010.

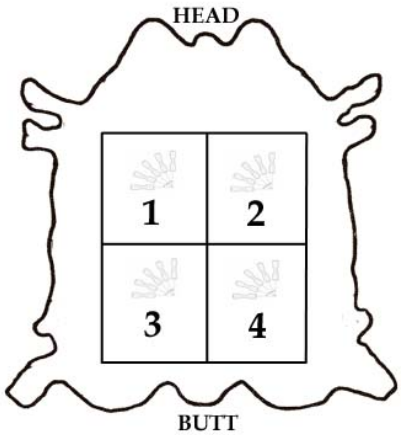


**Figure 1: Breaking Load Sampling**

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**3.2.3.1 Breaking Load**. Report the average of all 20 specimens. The average must meet the minimum requirement specified for each construction, per 3.1.5. Additionally, 75% of the specimens must meet the minimum requirement. All results are to be reported in Newton.

**3.2.3.2 Elongation at Break**. Report the results.

**3.2.3.3 Stress Strain Curve**. Report the stress in Newton at the following strains: 5%, 10%, 15%, and 25% for information only.

**3.2.4 Tear Force, ISO 13937-2 (Preload 0.5 N).** The electronic method of calculation shall be used. Cut three (3) specimens approximately parallel to the backbone and three (3) specimens approximately perpendicular to the backbone. The strength shall be a minimum of 20 N.

**3.2.5 Seam Fatigue, GMW3405 (Seating and Shift Boot Only**). Use a number 23 (metric 160) round needle. Three (3) specimens shall be tested: Backbone to backbone, backbone to against backbone, and against backbone to against backbone. The joining seam shall have no needle holes measuring > 2 mm or an objectionable seam appearance after 2500 cycles. Seam appearance shall be judged on the sew line when observed from the face.

**3.2.6 Dimensional Stability, All Types.**

**3.2.6.1 Instrument Panel (IP) and Steering Wheel (SW) Leather**. Requires six (6) specimens. Test two (2) specimens, one (1) each direction per Cycle R and Cycle M per GMW14124 and High Heat. Report the percent change in each direction of each sample.

**3.2.6.2 Seating Leather.** Requires two (2) specimens, test one (1) each direction per Cycle M. Report the percent change in each direction of each sample.

**3.2.6.3 Sample Preparation.** Cut 300 mm× 300 mm specimens. One direction of the square specimen must be cut parallel to the backbone. Mark the backbone direction on the backside of the specimens. Reference the shrinkage test specimen drawing in Figure 2. Test according to the specified requirements based on application. Leather is subject to GMW14444 part performance.

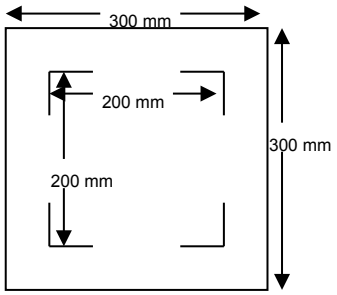


**Figure 2: Shrinkage Test Specimen**

**3.2.6.4 Exposure Cycles for Dimensional Stability**.

**3.2.6.4.1 Heat/Humidity Cycle Test to GMW14124, Cycle R.** Repeat cycle 20 times for a total of 240 h of exposure. Report the results, accordingly per 3.1.5.

**3.2.6.4.2 Environmental Cycling Test to GMW14124, Cycle M**. Repeat for a total of two (2) cycles. Report the results, accordingly per 3.1.5.

**3.2.6.4.3 High Heat**. Expose samples to 102 °C mechanically circulated air for 168 h. Report the results, accordingly per 3.1.5.

**3.2.7 Stretch and Set, GMW3211**. Test two (2) specimens parallel to the backbone and two (2) specimens perpendicular to the backbone from both the butt and neck area of the hide for a total of eight (8) specimens. Report the range and arithmetic mean value in percent accordingly per 3.1.5.

**3.2.8 Softness and Flexibility.**

**3.2.8.1 Leather Depression, GMW14134 BLC Softness ST300 Tester**. Report the results, accordingly per 3.1.5.

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**3.2.8.2 Flexibility, GMW3390.** Cut three (3) specimens parallel to the backbone direction and three (3) specimens perpendicular to the backbone direction. Measure all six (6) specimens finish side up and finish side down for a total of twelve readings. See Appendix A, Figure A1 for requirements.

**3.2.9 Resistance to Rubbing, ISO 11640, All Types**. Test three (3) specimens, wet and dry. For all evaluations, use the white felt. There shall be no rupture of the leather finish. Loss of gloss is acceptable, but a complete color change, or exposure of the russet at 10x magnification, or grain loss is not acceptable. Upon completion of the test, use cheesecloth or the white cotton fabric of ISO 105-F09 moistened with water to clean the surface of the abraded specimen. Moistening the specimen will cause a darkening of the russet in any areas where the topcoat has been ruptured. A rating of ≥ 4 is required when the felt pad is evaluated using the gray scale for staining, ISO 105-A03. A rating of ≥ 4 is required when the leather is rated using the gray scale for color change, ISO 105-A02.

**Note:** When evaluating perforated leathers after wet rubbing, only the durability of the finish shall be considered. Any distortion to the shape or size of the perforated hole caused by the russet being exposed to water is acceptable.

**3.2.9.1 Dry**. Test to 2000 cycles.

**3.2.9.2 Wet**. Test to 1000 cycles.

**3.2.9.3 Steering Wheel and Knob Constructions**.

**3.2.9.3.1 Acidic Perspiration Solution**. Five hundred (500) cycles with acidic perspiration solution per ISO 105-E04.

**3.2.9.3.2 Basic Perspiration Solution**. Five hundred (500) cycles with basic perspiration solution per ISO 105-E04.

**3.2.10 Flammability GMW3232**. Specimens are to be cut parallel to the backbone and perpendicular to the backbone. Report the $B_{STAT}$ value of each direction and condition. For initial approvals and routine quality control see GMW3232.

**Note:** If material is a composite (as defined in the test procedure) or is to be used in composite, the composite must meet this requirement.

**3.2.10.1 After Conditioning.** Immediately prior to tests, all test specimens shall be conditioned for a minimum of 24 h according to GMW3221-A.

**3.2.10.2 After Aging.** The test cycle shall commence with 48 h ± 1 h at 40 °C ± 3 °C and 93% ± 5% relative humidity (RH), followed by 168 h ± 1 h at 90 °C ± 3 °C and completed without interruption. Repeat 3.3.10.1 before testing flammability.

**3.2.11 Mildew Resistance, GMW3259.** Test three (3) specimens. No visible mildew or mildew odor is allowed.

**3.2.12 Interior Emissions (GMW16853).** Run material in both a Black (600R-Jet Black or similar value and hue) and a Light Beige (314N-Vy Lt Cashmere or similar value and hue) prior to construction approval. For required tests, refer to GMW16553, Overview of Test Procedures Required for the Individual Materials and Part Approvals and Table Emission Requirements for Interior Material/Parts/Assembly List.

**3.2.12.1 Odor, GMW3205**. Record the results for both wet and dry. Rating of minimum six (6) is required for both conditions. Use a ratio of 1:100 test specimens to container volume.

**3.2.12.2 Fogging, GMW3235 B, Gravimetric Method**. Precondition by desiccation for 168 h ± 2 h over $P_2O_5$ at room temperature, by electric desiccation, or according to GMW3235.

**3.2.12.2.1 Test Temperature +100 °C.** The amount for standard leather shall be 3 mg maximum. The amount of fog shall be 4 mg maximum for perforated leathers, or 5 mg maximum for aromatic leathers.

**3.2.12.2.2 Instrument Panel Leather**. Test temperature +110 °C. The amount of fog shall be 4 mg maximum.

**3.2.12.3 Volatile Organic Compounds (VOC)/Semi-Volatile Organic Compounds (SVOC) (GMW15634).** The total amount of VOC/SVOC shall be ≤ 0.5/2.5 mg/kg.

**3.2.12.4 Carbonyls (GMW15635).** Record the amount of each chemical listed along with the sum of C2 to C6 Carbonyls.

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**3.2.13 Flex Resistance, ISO 5402, (Bally Flex), Seating, Door and Shift Boot.** Record any damage in the flexed area. Evaluate using 10x magnification. No cracks through the finish to the russet, or lifting of the finish allowed. Micro cracks allowed for Cycle Q exposure.

**3.2.13.1 As Received**. See 3.2.13.1.1 through 3.2.13.1.2 for test cycles based on construction type.

**3.2.13.1.1 Standard Seating Constructions**. Requirement is 100 000 cycles. Test six (6) specimens: one (1) specimen parallel, and one (1) specimen perpendicular to the backbone direction to 50 000 cycles. Test two (2) specimens parallel, and two (2) specimens perpendicular to the backbone direction to 100 000 cycles.

**3.2.13.1.2 High Performance Seating Constructions**. Requirement is 150 000 cycles. Test eight (8) specimens: one (1) specimen parallel, and one (1) specimen perpendicular to the backbone direction to 50 000 cycles. Test one (1) specimen parallel, and one (1) specimen perpendicular to the backbone direction to 100 000 cycles. Test two (2) specimens parallel, and two (2) specimens perpendicular to the backbone direction to 150 000 cycles.

**3.2.13.1.3 Steering Wheel, Shift Knob and Instrument Panel Constructions**. Test four (4) specimens: two (2) specimens parallel, and two (2) specimens perpendicular to the backbone direction to 50 000 cycles for information only.

**3.2.13.2 Cold.** Condition four (4) specimens and the test equipment, to -10 °C for 4 h, then immediately test specimens: two (2) specimens parallel, and two (2) specimens perpendicular to the backbone direction at -10 °C for 30 000 cycles. Steering wheel, shift knob and instrument panel constructions are for information only.

**3.2.13.3 After Humidity Exposure**. Following exposure of six (6) specimens to GMW14124 Cycle Q, with the exception that the temperature is at 75 °C, condition specimens for 24 h to GMW3221-A. Then test one (1) specimen parallel, and one (1) specimen perpendicular to the backbone direction to 50 000 cycles and two (2) specimens parallel, and two (2) specimens perpendicular to the backbone direction to 100 000 cycles. Steering wheel, shift knob and instrument panel constructions are for information only.

**3.2.14 Impact Cold Crack Resistance, GMW14127 (Procedure A**). Seating, doors and instrument panel (IP) only. Cut three (3) specimens from random areas of the sample. Condition the equipment and specimens for a minimum of 4 h at -30 °C ± 2 °C. Test all specimens at -30 °C ± 2 °C using 4 J of impact. Evaluate the specimens by flexing the specimen at the point of impact. There shall be no cracking of the finish or russet when evaluated using naked eye (no magnification).

**3.2.15 Cold Crack, GMW14126 – H = 150 mm, G = 500 g**. Test two (2) specimens in each direction: with the backbone and perpendicular to the backbone direction. There shall be no cracking of the finish or russet when evaluated with the naked eye (no magnification).

**3.2.16 Finish Adhesion.**

**3.2.16.1 Finish Adhesion, Method A, ISO 11644.**

**3.2.16.1.1 As Received**. Test four (4) specimens, two (2) with the backbone direction, and two (2) perpendicular to the backbone direction. The minimum force shall be ≥ 4 N/cm.

**3.2.16.1.2 Wet.** Test four (4) specimens, two (2) with the backbone direction, and two (2) perpendicular to the backbone direction. The minimum force shall be ≥ 3 N/cm. IP applications shall have a minimum force of 1.2 N/cm.

**3.2.16.2 Finish Adhesion, Method B, GMW15717.**

**3.2.16.2.1 As Received**. Cut three (3) specimens. The specimen shall exhibit no lifting, peeling, or removal of the topcoat from the russet.

**3.2.16.2.2 After Humidity**. Cut three (3) specimens. All three (3) specimens shall be tested after 24 h humidity at 38 °C ± 2 °C and 95% RH ± 3% RH. Specimens shall be tested to GMW15717 within 10 minutes of removal from humidity.

**3.2.17 Resistance to Blocking, GMW14132**. There shall be no removal of topcoat, tackiness, blistering, or loss of grain when tested to GMW14132 using a 3600 g mass.

**3.2.17.1 As Received**. Three (3) test specimens are tested in as received condition.

**3.2.17.2 After Humidity**. Three (3) test specimens are tested after 24 h ± 30 minutes pre-conditioning at 38 °C ± 2 °C and 95% RH ± 3% RH. Start blocking test within 10 minutes of removal from humidity.

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