



Test Method for Determining the Flammability of Interior Trim 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 test procedure shall be used to determine the horizontal burn rate of automotive materials. Burn rate is determined immediately following an exposure for a short duration to a small flame. The small flame is placed in contact with one (1) edge of the material.

1.2 Applicability. The method permits testing of materials and parts of the vehicle interior, individually or in combination up to a thickness of 13 mm. It is normally only applicable to materials and parts within a 13 mm range to the passenger compartment air space.

1.2.1 Testing Frequency. All sources supplying parts or materials to this requirement must perform routine quality control testing to confirm compliance of each lot of material or parts produced.

1.2.2 Lot Identification. Each lot of material shall remain readily available and identifiable, until the tests are complete so it may be retrieved in the event of inspection and/or test failure. Each lot of material shall have a unique identification.

1.2.3 Use of Incoming Material Test Data. When a source location can demonstrate that their process does not adversely affect flammability, the source location may use test data from each lot of incoming material. See 4.1.3 through 4.1.3.2.1.

2 References

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

2.1 External Standards/Specifications.

CONTRAN Resolution GB8410
675/86

KMVSS Article 95

FMVSS 302 ISO 2768

2.2 GM Standards/Specifications.

GMW3221

2.3 Additional References.

GMW3232 PROT8EFENG - available at <http://www.gmsupplypower.com>.

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.

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3.2 Equipment.

3.2.1 Test Cabinet. One (1) configuration satisfying these requirements is shown in Appendix A, Figure A1 through Figure A3. The test cabinet consists of a rectangular steel cabinet with internal dimensions of 381 mm $\pm$ 0.5 mm long, 203 mm $\pm$ 0.5 mm deep and 356 mm $\pm$ 0.5 mm high. It shall have a heat resisting glass observation window, a closable opening to permit insertion of the test specimen mounting fixture and a hole to accommodate tubing for a gas burner. A 13 mm clearance space around the top of the cabinet, ten (10) 19 mm diameter holes in the base of the cabinet and legs to elevate the bottom of the cabinet by 10 mm are to be provided for ventilation.

3.2.2 Apparatus for conditioning as required and to the appropriate requirements as described in GMW3221, (Code A), unless otherwise specified in the relevant material specification.

3.2.3 Oven. Drying oven capable of maintaining the specified temperature within the specified tolerances.

3.2.4 Chemical Fume Cupboard. Chemical fume cupboard suitable for mounting the test cabinet to avoid the diffusion of combustion products to the laboratory during test. A natural venting hood is permissible, provided adequate ventilation is assured. Any forced air ventilation shall be the minimum required for venting.

3.2.4.1 Specific Chinese Legal Requirements (GB8410) Ventilating Cabinet (Reference Deviation Section). The combustion box shall be placed in a ventilating cabinet. The inner volume of the cabinet shall be 20x to 110x that of the combustion box, and none of the length, width or height may be more than 2.5x greater than either of the other two (2) dimensions. At points 100 mm from the front and back of the final position of the combustion box, measure the speed of air passing the ventilating cabinet. The speed must be 0.10 m/s to 0.30 m/s.

3.2.5 Test Specimen Mounting Fixture. One (1) configuration satisfying these requirements is shown in Figure A4 and Figure A5. This shall consist of two (2) matching U-shaped frames of metal (e.g., aluminum) stock 25 mm wide and 10 mm thick. The interior dimensions of the U-shaped frames shall be 51 mm wide by 330 mm long. Gauge lines shall be marked (e.g., by slots) on the upper frame 38 mm and 292 mm respectively from its open end.

In order to support sub size test specimens and those that soften and bend during test, the lower frame shall have the means to accommodate thin heat resistance wires that span the width of the U-shaped frame at 25 mm intervals. (Grooves cut into the lower frame to accommodate 0.2 mm, nickel-chrome, thermo wire are recommended.)

3.2.5.1 Specific Korean Legal Requirements (KMVSS Article 95) (Reference Deviation Section). In order to support sub size specimens where the maximum available width is 50 mm or less, the lower frame shall have the means to accommodate thin heat resistant wires that span the width of the lower U-shaped frame at 25 mm intervals. Wires shall not be used for other reasons than above for certification to KMVSS Article 95. (Grooves cut into the lower frame to accommodate 0.2 mm, nickel chrome, thermo wire are recommended.)

3.2.6 Support Stand. One (1) configuration satisfying these requirements is shown in Figure A6. A metal stand to locate and support the test specimen mounting fixture (3.2.5) in the center of the cabinet during test is required.

3.2.7 Weights. In order to detect when the flame front has progressed to each of the gauge lines, it is recommended to use lightweight cotton thread counterbalanced with approximately 14 g weights spanning the full width of the lower U-shaped frame at the gauge lines (Figure A4).

3.2.8 Timer. A stopwatch calibrated to an accuracy of 0.5 s.

3.2.9 Burner. Bunsen burner with a tube of 10.0 mm $\pm$ 0.5 mm inside diameter and provided with a gas adjusting valve to give a flame 38 mm $\pm$ 1 mm high when the tube is vertical and the air inlet to the burner is closed.

3.2.10 Gas Source. Gas to provide a flame temperature equivalent to that of natural gas.

3.2.11 Comb. Comb with seven (7) to eight (8) smooth rounded teeth per 25 mm.

3.2.12 Cutting Instruments. Cutting dies or shears for preparation of test specimens.

3.3 Test Vehicle/Test Piece.

3.3.1 Wherever possible, from the available material or component, rectangular test specimens $355 \text{ mm} \pm 2 \text{ mm}$ long and $100 \text{ mm} \pm 2 \text{ mm}$ wide, shall be taken. The thickness of the test specimens shall be that of the single or composite material used in the vehicle, except when the materials or composites thickness exceeds 13 mm. If material or composite thickness exceeds 13 mm, the test specimens shall be cut down to 13 mm, measured from the surface of the specimen closest to the passenger compartment air space.

3.3.2 Where it is not possible to obtain flat test specimens due to surface curvature, the test specimens shall be cut to not more than 13 mm in thickness at any point. As far as possible, the test specimens shall be of uniform thickness.

3.3.2.1 Specific Chinese Legal Requirements (GB8410) (Reference Deviation Section). If the part is bent so that it is impossible to take a flat sample, take the part that is most flat and make the arch rise of the sample not more than 13 mm. If the arch rise of the sample exceeds 13 mm, make a standard sample with the same material, same technique and same structure as the part (356 mm long $\times$ 100 mm wide), and let the thickness be the minimum width but not greater than 13 mm.

3.3.3 Testing of Smaller Sized Samples.

3.3.3.1 General Requirements. The maximum available length or width of test specimens shall be used where either dimension is $< 355 \text{ mm} \pm 2 \text{ mm}$ long and $100 \text{ mm} \pm 2 \text{ mm}$ wide respectively.

3.3.3.2 Specific Japanese Legal Requirements (Reference Deviation Section). The minimum acceptable sample size shall be 25 mm in width and 293 mm in length.

3.3.3.3 Specific Brazilian Legal Requirements (Reference Deviation Section). (CONTRAN Resolution 675/86). The minimum acceptable sample size shall be 3 mm in width, but samples 3 mm to 60 mm wide shall be $355 \text{ mm} \pm 2 \text{ mm}$ long, and samples 60 mm to 100 mm wide shall be at least 138 mm long.

3.3.3.4 Specific Chinese Legal Requirements (GB8410) (Reference Deviation Section). Where the shape and size of the part are insufficient to be made into a standard sample of the specified size, make a sample of the following minimum size, and keep records per 3.3.3.4.1 thru 3.3.3.4.3.

- a. If the part is 3 mm to 60 mm wide, it shall be at least 356 mm long. In this case, make the width of the sample as close to that of the part as possible.
- b. If the part is wider than 60 mm, it shall be at least 138 mm long. In this case, the possible burnt distance is equivalent to the distance from the first gauge mark to the place where the flame goes out or from the first gauge mark to the end of the sample as shown in Figure 2.
- c. If the part is 3 mm to 60 mm wide but shorter than 356 mm, or if it is wider than 60 mm but shorter than 138 mm, it shall not be tested per GB8410. Samples that are narrower than 3 mm shall also not be tested.

3.3.4 Where sample sizes or shapes restrict the ability to test, molded samples of raw material or composites shall be made 100 mm in width and 355 mm in length with a thickness no greater than the thinnest component cross section from the actual part for which the sample is being substituted.

In sampling the test panels, it shall be ensured that they are fully representative of the material or composite under test.

3.3.5 In the case of materials made of superimposed layers of different materials which are not composite materials, all the layers of the materials included within a depth of 13 mm from the surface facing towards the passenger compartment air space shall be tested individually.

3.3.6 Test specimens shall be cut from materials or composites both in production direction and perpendicular to this (e.g., warp and weft direction, longitudinal and lateral direction respectively) if possible. The material direction of the longitudinal and lateral test specimens must be clearly marked in a manner to identify their original orientation within the roll as shown in Figure 1. There shall be no ink markings to prevent contamination or alteration within the test area of the specimen.

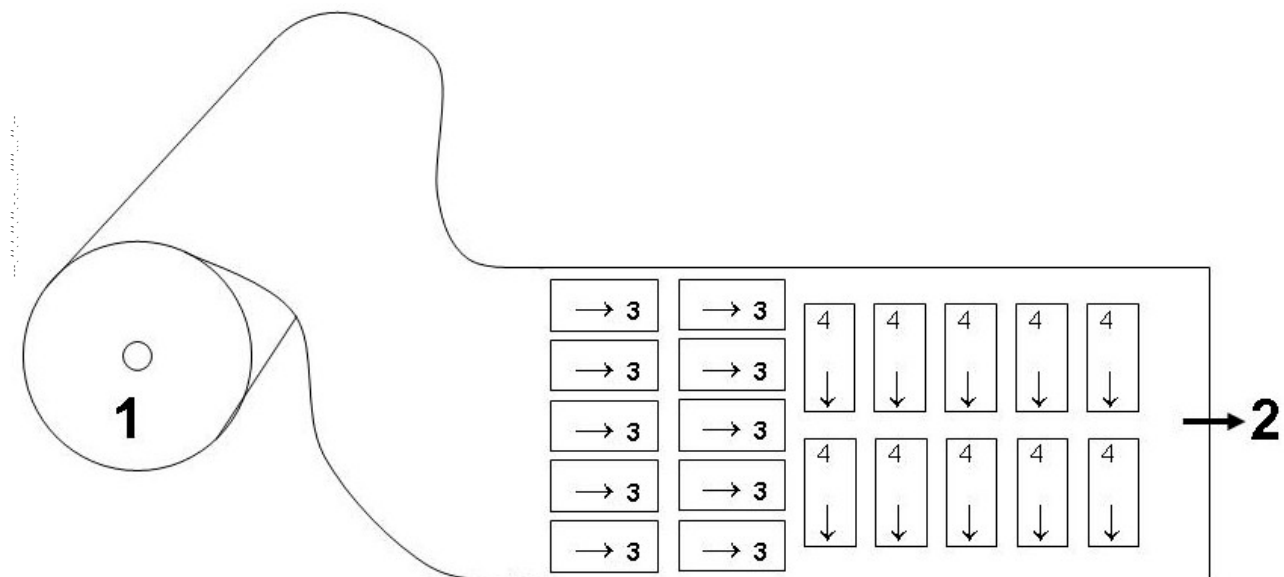
3.3.7 The requirement concerning transmission of a flame front shall not apply to a surface created by the cutting of a test specimen for purposes of testing.

3.3.8 Materials or composites with napped or tufted surface shall be placed on a flat surface and combed twice against the nap with a comb as listed in section 3.2.11.

3.3.9 For painted or molded in color plastic parts, the data of the initial tested color can be used for other colors, if the burn rate (B_{max} and B_{stat}) is ≤ 50 mm/minute for the tested color and if all of the criteria in 3.3.9.1 are fulfilled.

3.3.9.1 Criteria.

- Material is painted, natural or integrally colored plastic.
- Material is painted or made of one (1) layer (no laminate, no composite, no cellular structure).
- Same filler/additive package is used.
- Part has material thickness of ≥ 2 mm.



1 Example, Material Roll

2 Material Direction

3 Longitudinal Test Specimens

4 Lateral Test Specimens

Note: For specimens cut from direction 3, mark in alternating directions so that the material may be burned with the flame traveling into the roll (nearest to furthest) or out from the roll (furthest to nearest). For specimens cut from direction 4, mark in alternating directions so that the material may be burned from left to right or from right to left. See 4.3.1.1.

Figure 1: Example of Sampling

3.4 Test Time. Not applicable.

3.5 Test Required Information. Material component information such as vendor name, raw material, production date and pretreatment shall be reported to the test engineer.

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 Conditioning. Immediately prior to testing all test specimens shall be conditioned for a minimum of 24 h according to GMW3221, Code A.

4.1.2 Ageing. In addition to tests conducted in the as received condition, all materials which do not meet criteria to 3.3.9.1, shall also be tested for flammability after the following Aged Test Cycle. Both exposures defined in the Aged Test cycle shall be completed without interruption:

Aged Test Cycle:

- 48 h $\pm$ 1 h at +40 °C $\pm$ 3 °C and 93% $\pm$ 5% relative humidity
- 168 h $\pm$ 1 h at +90 °C $\pm$ 3 °C

4.1.3 Quantity of Test Specimens.

4.1.3.1 Initial Approval and Arbitration. For Initial sample approval and arbitration purposes, at least 20 specimens shall be tested except when any individual specimen burn rate exceeds 100 mm/minute. If any individual specimen has a burn rate that exceeds 100 mm/minute, the material does not meet the flammability requirement and all additional testing shall be terminated. If all burn rates are < 100 mm/minute, test at least 10 specimens each, from the longitudinal and lateral directions with at least five (5) specimens tested as received, and at least five (5) specimens tested after having been aged. For each direction and aging condition, see 5.2.1.2 to determine if additional specimens must be tested.

4.1.3.2 Routine Quality Control. For quality control purposes, at least two (2) specimens each from both the lateral and longitudinal direction in the as received condition shall be tested from each production lot. For the samples from any one direction, half of the samples shall have the burn direction 180° from the burn direction of the other half of the samples. For each direction (lateral and longitudinal), test specimens in alternating directions following the **Note** in Figure 1. The test shall be performed and the material must comply with the requirements of 5.2.2 and 5.2.2.1 of this procedure prior to the release of the lot from the manufacturing facility.

4.1.3.2.1 Inherently Flame Resistant Materials. Materials which contain no added flame retardant additives and exhibit no burn rates in excess of 75 mm/minute during approval testing and after quality control testing of twenty successive production lots, shall be considered inherently flame resistant. No further production quality control testing shall be required.

4.2 Conditions.

4.2.1 Environmental Conditions. Test shall be conducted at ambient conditions according to GMW3221 (Code 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. See Appendix C.

4.3 Instructions.

4.3.1 Test samples are to be cut to the specified dimensions prior to standard conditioning and any required aging cycles.

4.3.2 Mount the test specimen, the surface closest to the passenger compartment air space facing downward, so that both sides and one end are held by the U-shaped frame, and one end is even with the open end of the frame. Where the maximum available width of the test specimen is 50 mm or less, so that the sides of the test specimen cannot be held in the U-shaped frame, place the test specimen in position on the wire supports with one end held by the closed end of the U-shaped frame. Test specimens shorter than 355 mm shall be positioned so that one end aligns with the open end of the U-shaped frame.

4.3.2.1 Test specimens with an identifiable material orientation, (e.g., warp and weft direction, longitudinal and lateral direction) should be tested as follows:

- Specimens from any one direction, e.g.; warp and weft direction, longitudinal and lateral direction (3.3.6 and Figure 1), shall be tested in alternate material directions (right to left versus left to right, and nearest to farthest versus farthest to nearest). For example; the longitudinal test specimens should be alternatively tested in both the material and opposite material directions.
- The same is valid for the lateral direction. In this case, using the flame as a reference point, the material direction of the test specimens shall be alternatively tested from both the right to left and left to right directions. If the material does not display an identifiable direction, the samples should be tested randomly with respect to the direction of burn and notation of this exception made on the test report.

4.3.3 If the two (2) counter balanced cotton threads are used (3.2.7), place them over the test specimen at the gauge marks.

4.3.4 Place the upper U-shaped frame onto the lower frame so that both frames are matching in the plan view and the test specimen is held between the two (2) frames under the weight of the upper frame. If necessary, align the threads in the grooved gauge marks in the upper frame.

4.3.5 Place the mounted test specimen on the support stand (3.2.6) in a horizontal position in the center of the test cabinet.