

## 19-1 Flammability of the interior materials for motor vehicle

Refer to: R118 02

19-1.1 Interior material of motor vehicle: seat cushion, seat back, headlining, all trim panels (include the door, front, rear and side panels), carpets and curtains of passenger compartment and the insulation materials which using in engine compartment and any separate heating compartment of class I and class II defined in “The requirement of specification for motor vehicle” of VSTD.

### 19-1.2 Effective date and Scope:

19-1.2.1 Effective date from 2019/1/1, the new vehicle variants of child-only vehicles, school buses, large passenger vehicles, small passenger vehicles and small cargo-passenger vehicles shall comply with this regulation. Effective date from 2021/1/1, all variants of large passenger vehicles of class I and II had already conform to “19 Flammability of the interior materials for motor vehicle”, its cables and any separate heating compartment of separate material flammability shall additional comply with paragraph 19-1.6.2.

19-1.2.2 The same applicant applying for low volume safety approval and the amounts of vehicle not exceed 20 at same year and small passenger vehicle of same type and specification, could exempt from regulation of “the flammability requirement of the interior material of motor vehicle”.

19-1.2.3 The same applicant applying for vehicle-by-vehicle low volume safety approval and the amounts of vehicle not exceed 20 at same year and small passenger vehicle of same type and specification, could exempt from regulation of “the flammability requirement of the interior material of motor vehicle”.

19-1.3 The flammability requirement of the interior material of motor vehicle shall according to suitable types and range of principle : except brand and type series shall be the same, and also the same material composition.

19-1.4 Requirement of the function and specification: shall describe material composition, composing method and thickness.

19-1.5 The inspection methods and standards of vehicles other than vehicles regulated in paragraph 6 :

19-1.5.1 Conditioning: The samples shall be conditioned for at least 24 hours but not more than 7 days at a temperature of  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and a relative humidity of  $50 \pm 5\%$  and shall be maintained under these conditions until immediately prior to testing.

19-1.5.2 The horizontal burning rate calculated according to the following formula; shall not be over 100 mm per minute.

$$\text{Burning rate} = 60 \times (D/T)$$

D= Burning distance, unit: mm.

T= Time of flame reaching to D distance, unit: sec.

19-1.5.3 If the fire is extinguishes before reaching the measuring point, or it has stopped burning within 60 seconds after starting to count the burning time, and the burning distance is within 51 mm, then the specimen under the test is recognized to pass this test.

19-1.5.4 Preparation of specimens:

19-1.5.4.1 Each specimen of material to be tested shall be a rectangle 100 mm wide by 355 mm long, wherever possible. The thickness of the specimen is that of the single or composite material used in the vehicle, except that if the material's thickness exceeds 13 mm, the specimen is cut down to that thickness measured from the surface of specimen closest to the occupant compartment air space. Where it is not possible to obtain a flat specimen because of surface curvature, the specimen is cut to not more than 13 mm in thickness at any point. The maximum available length of a specimen is used where either dimension is less than 355 mm or 100 mm, respectively.

19-1.5.4.2 The specimen is produced by cutting the material in the direction that provides the most adverse test result. The specimen is

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oriented so that the surface closest to the occupant compartment air space faces downward on the test frame.

19-1.5.4.3 Material with a napped or tufted surface is placed on a flat surface and combed twice again the nap with a comb having 7 to 8 smooth, rounded teeth per 25 mm.

#### 19-1.5.5 Test procedure

19-1.5.5.1 Mount the specimen so that both sides 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 a specimen is not more than 50 mm, so that the sides of the specimen cannot be held in the U-shaped frame, place the specimen in position on wire supports, with one end held by the closed end of the U-shaped frame.

19-1.5.5.2 Place the mounted specimen in a horizontal position, in the center of cabinet.

19-1.5.5.3 With the frame adjusted, position the bunsen burner and specimen so that the center of the burner tip is 19 mm below the center of the bottom edge of the open end of the specimen.

19-1.5.5.4 Expose the specimen to the flame for 15 seconds.

19-1.5.5.5 Begin timing (without reference to the period of the burner flame) when the flame from the burning specimen reaches a point 38 mm from the open end of the specimen (Figure 1, line A)

19-1.5.5.6 Measure the time that it takes the flame to progress to a point 38 mm from the clamped end of the specimen (Figure 1, line B). If the flame does not reach the specified end point, time its progress to the point where flaming stops.

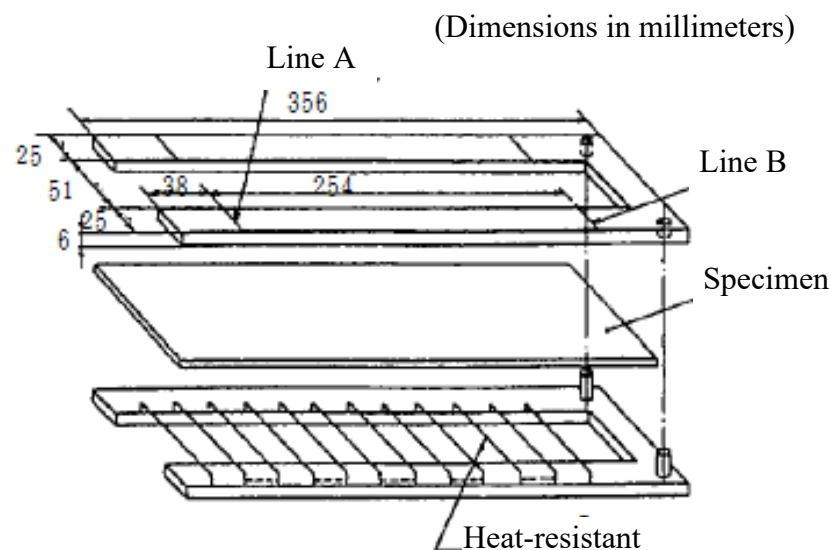


Figure 1: U-shaped frames of metal stock

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19-1.6 The inspection methods and standards of large passenger vehicles of class I and II.

19-1.6.1 Definitions

19-1.6.1.1 "Interior compartment" means any compartment intended for passengers, drivers and/or crew.

The interior compartment shall be bounded by:

- (a) The roof;
- (b) The floor;
- (c) The side walls;
- (d) The doors;
- (e) The outside glazing;
- (f) The rear compartment bulkhead, or the plane of the rear seat;
- (g) Back support.

19-1.6.1.2 "Engine compartment" means the compartment in which the engine is installed and in which a combustion heater may be installed.

19-1.6.1.3 "Separate heating compartment" means a compartment for a combustion heater located outside the interior compartment and the engine compartment.

19-1.6.1.4 "Seat" means a structure which may or may not be integral with the vehicle structure, complete with trim, intended to seat one adult person. The term covers both an individual seat or part of a bench seat intended to seat one adult person.

19-1.6.1.5 "Group of seats" means either a bench-type seat, or seats which are separate but side by side (i.e. with the foremost anchorages of one seat in line with or forward of the rearmost anchorages and in line with or behind the foremost anchorages of another seat) and which accommodate one or more seated adult persons.

19-1.6.1.6 "Bench seat" means a structure complete with trim, intended to seat more than one adult person.

19-1.6.1.7 "Material installed in a vertical position" means materials installed in the interior compartment, the engine compartment and any separate heating compartment of the vehicle such that its slope exceeds 15 per cent from the horizontal when the vehicle is at its mass in running order and it is standing on a smooth and horizontal ground surface.

19-1.6.1.8 "Burning rate" means the quotient of the burnt distance measured according to paragraph 19-1.6.3 and/or paragraph 19-1.6.5 of this regulation and the time taken to burn this distance. It is expressed in millimeters per minute.

19-1.6.1.9 "Composite material" means a material composed of several layers of similar or different materials intimately held together at their surfaces by cementing, bonding, cladding, welding, etc. When different materials are connected together intermittently (for example, by sewing, high-frequency welding, riveting), such materials shall not be considered as composite materials.

19-1.6.1.10 "Exposed face" means the side of a material which is facing towards the passenger compartment, the engine compartment and any separate heating compartment when the material is mounted in the vehicle.

19-1.6.1.11 "Upholstery" means the combination of interior padding and surface finish material which together constitute the cushioning of the seat frame.

19-1.6.1.12 "Interior lining(s)" means material(s) that (together) constitute(s) the surface finish and substrate of a roof, wall or floor.

19-1.6.1.13 "Insulation material(s)" means material(s) used to reduce heat transfer by conduction, radiation or convection and for sound-proofing in the engine compartment and any separate heating compartment.

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19-1.6.1.14 "Capability to repel fuel or lubricant" means the capability of materials to repel fuel or lubricant when measured according to paragraph 19-1.6.6 of this Regulation.

19-1.6.2 Specifications

19-1.6.2.1 The following materials shall undergo the test described in paragraph 19-1.6.3:

- (a) Material(s) and composite material(s) installed in a horizontal position in the interior compartment and,
- (b) Insulation material(s) installed in a horizontal position in the engine compartment and any separate heating compartment.

The result of the test shall be considered satisfactory if, taking the worst test results into account, the horizontal burning rate is not more than 100 mm/minute or if the flame extinguishes before reaching the last measuring point.

Materials fulfilling the requirements of paragraph 19-1.6.2.3. are considered to fulfil the requirements in this paragraph.

19-1.6.2.2 The following materials shall undergo the test described in paragraph 19-1.6.4:

- (a) Material(s) and composite material(s) installed more than 500 mm above the seat cushion and in the roof of the vehicle,
- (b) Insulation material(s) installed in the engine compartment and any separate heating compartment.

The result of the test shall be considered satisfactory if, taking the worst test results into account, no drop is formed which ignites the cotton wool.

19-1.6.2.3 The following materials shall undergo the test described in paragraph 19-1.6.5:

- (a) Material(s) and composite material(s) installed in a vertical position in the interior compartment,
- (b) Insulation material(s) installed in a vertical position in the engine compartment and any separate heating compartment.

The result of the test shall be considered satisfactory if, taking the worst test results into account, the vertical burning rate is not more than 100 mm/minute or if the flame extinguishes before the destruction of one of the first marker threads occurred.

19-1.6.2.4 Materials achieving an average CFE (critical heat flux at extinguishment) value greater or equal to 20 kW/m<sup>2</sup>, when tested according to ISO 5658-23, are deemed to comply with the requirements of paragraphs 19-1.6.2.2 and 19-1.6.2.3, provided no burning drops are observed when taking the worst test results into account.

19-1.6.2.5 All insulation material(s) installed in the engine compartment and any separate heating compartment shall undergo the test described in paragraphs 19-1.6.6.

The result of the test shall be considered satisfactory if, taking the worst test results into account, the increase of the weight of the test sample does not exceed 1 g.

Recesses necessary for technical reasons, e.g. tubes or structural members that need to pass through the material shall be allowed as long as the protection is maintained (e.g. sealant, tape ...).

19-1.6.2.6 Electric cables shall undergo the resistance to flame propagation test described in ISO standard 6722:2006, paragraph 12.

The result of the test shall be considered satisfactory if, taking into account the worst test result, any combustion flame of insulating material shall extinguish within 70 seconds and a minimum of 50 mm insulation at the top of the test sample shall remain unburned.

19-1.6.2.7 Materials which are not required to undergo the tests described in paragraphs 19-1.6.3 to 19-1.6.5:

19-1.6.2.7.1 Parts made of metal or glass;

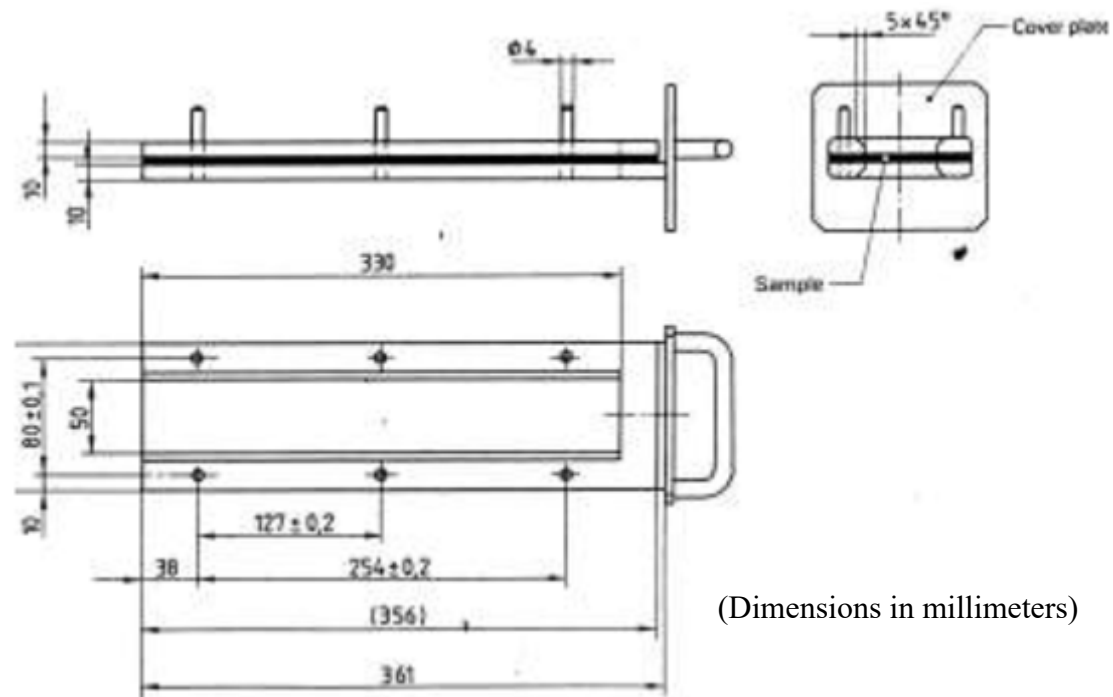
19-1.6.2.7.2 Each individual seat accessory with a mass of non-metallic material less than 200 g. If the total mass of these accessories exceeds 400 g of non-metallic material per seat, then each material must be tested;

19-1.6.2.7.3 Elements of which the surface area or the volume does not exceed respectively:

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- 19-1.6.2.7.3.1 100 cm<sup>2</sup> or 40 cm<sup>3</sup> for the elements which are connected to an individual seating place;
- 19-1.6.2.7.3.2 300 cm<sup>2</sup> or 120 cm<sup>3</sup> per seat row and, at a maximum, per linear metre of the interior of the interior compartment for these elements which are distributed in the vehicle and which are not connected to an individual seating place;
- 19-1.6.2.7.4 Elements for which it is not possible to extract a sample in the prescribed dimensions as specified in paragraph 19-1.6.3.2.1 and paragraph 19-1.6.4.2.
- 19-1.6.3 Test to determine the horizontal burning rate of materials
  - 19-1.6.3.1 Sampling and principle
    - 19-1.6.3.1.1 Five samples shall undergo the test in the case of an isotropic material or ten samples in the case of a non-isotropic material (five for each direction).
    - 19-1.6.3.1.2 The samples shall be taken from the material under test. In materials having different burning rates in different material directions, each direction has to be tested. The samples are to be taken and placed in the test apparatus so that the highest burning rate will be measured. When the material is supplied in widths, a length of at least 500 mm shall be cut covering the entire width. From this the samples shall be taken so as to be at least 100 mm from the material edge and equidistant from each other. Samples shall be taken in the same way from finished products, when the shape of the product permits. When the thickness of the product is more than 13 mm, it shall be reduced to 13 mm by a mechanical process applied to the side which does not face the respective compartment (interior, engine or separate heating compartment). If it is impossible, the test shall be carried out, in accordance with the Technical Service, on the initial thickness of the material, which shall be mentioned in the test report. Composite materials shall be tested as if they were of uniform construction. In the case of materials made of superimposed layers of different composition which are not composite materials, all the layers of material included within a depth of 13 mm from the surface facing towards the respective compartment shall be tested individually.
    - 19-1.6.3.1.3 A sample is held horizontally in a U-shaped holder and is exposed to the action of a defined flame for 15 seconds in a combustion chamber, the flame acting on the free end of the sample. The test determines if and when the flame extinguishes or the time in which the flame passes a measured distance.
    - 19-1.6.3.1.4 The pins serve as the measuring points at the beginning and end of the burning distance (see figure 2).



(Dimensions in millimeters)

Figure 2: Example of sample holder

#### 19-1.6.3.2 Samples

##### 19-1.6.3.2.1 Shape and dimensions

19-1.6.3.2.1.1 The shape and dimensions of samples are given in Figure 3. The thickness of the sample corresponds to the thickness of the product to be tested. It shall not be more than 13 mm. When taking the sample permits, the sample shall have a constant section over its entire length.

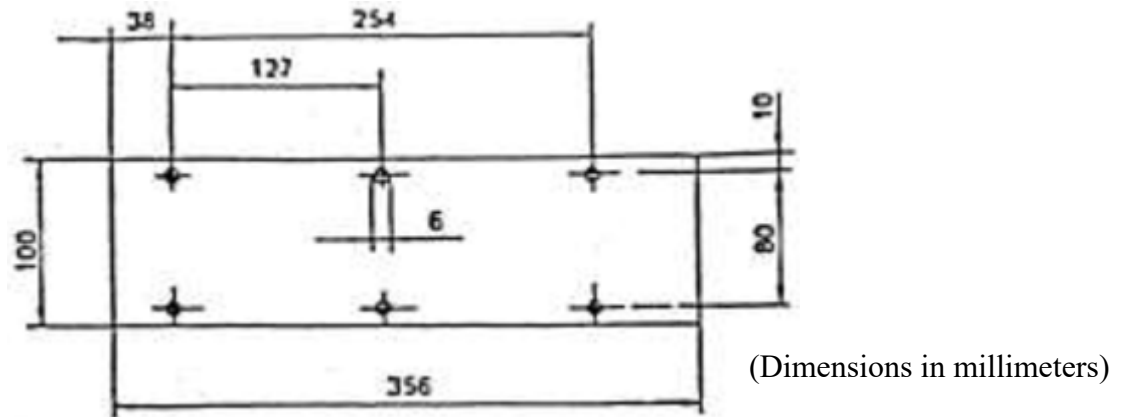


Figure 3: Sample

19-1.6.3.2.1.2 If the shape and dimensions of a product do not permit taking a sample of the given size, the following minimum dimensions shall be maintained:

- (a) For samples having a width of 3 to 60 mm, the length shall be 356 mm. In this case the material is tested in the product's width;
- (b) For samples having a width of 60 to 100 mm, the length shall be at least 138 mm. In this case the potential burning distance corresponds to the length of the sample, the measurement starting at the first measuring point.

#### 19-1.6.3.2.2 Conditioning

The samples shall be conditioned for at least 24 hours but not more than 7 days at a temperature of 23 deg. C +/- 2 deg. C and a relative humidity of 50 +/- 5 per cent and shall be maintained under these conditions until immediately prior to testing.

#### 19-1.6.3.3 Procedure

- 19-1.6.3.3.1 Place samples with napped or tufted surfaces on a flat surface and comb twice against the nap using the comb.
- 19-1.6.3.3.2 Place the sample in the sample holder so that the exposed side will be downwards to the flame.
- 19-1.6.3.3.3 Adjust the gas flame to a height of 38 mm using the mark in the chamber, the air intake of the burner being closed. Before starting the first test, the flame shall burn at least for 1 min for stabilization.
- 19-1.6.3.3.4 Push the sample-holder into the combustion chamber so that the end of the sample is exposed to the flame, and after 15 seconds cut off the gas flow.
- 19-1.6.3.3.5 The measurement of the burning time starts at the moment when the foot of the flame passes the first measuring point. Observe the flame propagation on the side burning faster than the other (upper or lower side).
- 19-1.6.3.3.6 Measurement of burning time is completed when the flame has come to the last measuring point or when the flame extinguishes before coming to the last measuring point. If the flame does not reach the last measuring point, measure the burnt distance up to the point where the flame extinguished. Burnt distance is the decomposed part of the sample, which is destroyed on its surface or in the interior by burning.

19-1.6.3.3.7 In so far as the sample does not ignite or does not continue burning after the burner has been extinguished, or when the flame extinguishes before reaching the first measuring point, so that no burning time is measured note in the test report that the burning rate is 0 mm/min.

19-1.6.3.3.8 When running a series of tests or repeat tests, ensure that the combustion chamber and sample holder have a maximum temperature of 30 deg. C before starting the next test.

#### 19-1.6.3.4 Calculation

The burning rate,  $B^1$ , in millimeters per minute, is given by the formula:

$$B = 60 s/t$$

where:

s = the burnt distance, in millimeters;

t = the time, in seconds, to burn distance s.

<sup>1</sup> The burning rate (B) for each sample is only calculated in the case where the flame reaches the last measuring point or the end of the sample.

#### 19-1.6.4 Test to determine the melting behaviour of materials

##### 19-1.6.4.1 Sampling and principle

19-1.6.4.1.1 Four samples, for both faces (if they are not identical) shall undergo the test.

19-1.6.4.1.2 A sample is placed in a horizontal position and is exposed to an electric radiator. A receptacle is positioned under the specimen to collect the resultant drops. Some cotton wool is put in this receptacle in order to verify if any drop is flaming.

##### 19-1.6.4.2 Samples

The test samples shall measure: 70 mm x 70 mm. Samples shall be taken in the same way from finished products, when the shape of the product permits. When the thickness of the product is more than 13 mm, it shall be reduced to 13 mm by a mechanical process applied to the side which does not face the respective compartment (interior, engine or separate heating compartment). If it is impossible, the test shall be carried out, in accordance with the Technical Service, on the initial width of the material which shall be mentioned in the test report.

Composite materials shall be tested as if they were of uniform construction. In the case of materials made of superimposed layers of different composition which are not composite materials, all the layers of material included within a depth of 13 mm from the surface facing towards the respective passenger compartment (interior, engine or separate heating compartment) shall be tested individually.

The total mass of the sample to be tested shall be at least 2 g. If the mass of one sample is less, a sufficient number of samples shall be added.

If the two faces of the material differ, both faces must be tested, which means that eight samples are to be tested. The samples and the cotton wool shall be conditioned for at least 24 hours at a temperature 23 deg. C +/- 2 deg. C and a relative humidity of 50 +/- 5 per cent and shall be maintained under these conditions until immediately prior to testing.

##### 19-1.6.4.3 Procedure

The sample is placed on the support and the latter is so positioned that the distance between the surface of the radiator and the upper side of the sample is 30 mm.

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The receptacle, including the cotton wool, is placed beneath the grill of the support at a distance of 300 mm.

The radiator is put aside, so that it cannot radiate on the sample, and switched on. When it is on full capacity it is positioned above the sample and timing is started.

If the material melts or deforms, the height of the radiator is modified to maintain the distance of 30 mm.

If the material ignites, the radiator is put aside three seconds afterwards. It is brought back in position when the flame has extinguished and the same procedure is repeated as frequently as necessary during the first five minutes of the test.

After the fifth minute of the test:

(i) If the sample has extinguished (whether or not it has ignited during the first five minutes of the test) leave the radiator in position even if the sample reignites;

(ii) If the material is flaming, await extinction before bringing the radiator into position again.

In either case, the test shall be continued for an additional five minutes.

#### 19-1.6.4.4 Results

Observed phenomena shall be noted in the test-report, such as:

(i) The fall of drops, if any, whether flaming or not;

(ii) If ignition of the cotton wool has taken place.

#### 19-1.6.5 Test to determine the vertical burning rate of materials

##### 19-1.6.5.1 Sampling and principle

19-1.6.5.1.1 Three samples shall undergo the test in the case of an isotropic material, or six samples in the case of a non-isotropic material.

19-1.6.5.1.2 This test consists of exposing samples, held in a vertical position, to a flame and determining the speed of propagation of the flame over the material to be tested.

##### 19-1.6.5.2 Samples

19-1.6.5.2.1 The samples dimensions are: 560 x 170 mm.

If the dimensions of a material do not permit taking a sample of the given dimensions the test shall be carried out, in accordance with the Technical Service, on the fitted size of the material which shall be mentioned in the test report.

19-1.6.5.2.2 When the thickness of the sample is more than 13 mm, it shall be reduced to 13 mm by a mechanical process applied to the side which does not face the respective compartment (interior, engine or separate heating compartment). If it is impossible, the test shall be carried out in accordance with the Technical Service the initial thickness of the material, which shall be mentioned in the test report. Composite materials shall be tested as if they were of uniform construction. In the case of materials made of superimposed layers of different composition which are not composite materials, all the layers of material included within a depth of 13 mm from the surface facing towards the respective compartment shall be tested individually.

19-1.6.5.2.3 The samples shall be conditioned for at least 24 hours at a temperature of 23 deg. C +/- 2 deg. C and a relative humidity of 50 +/- 5 per cent and shall be maintained under these conditions until immediately prior to testing.

##### 19-1.6.5.3 Procedure

19-1.6.5.3.1 The test shall be carried out in an atmosphere having a temperature between 10 deg. C and 30 deg. C and a relative humidity between 15 per cent and 80 per cent.

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- 19-1.6.5.3.2 The burner shall be preheated for 2 minutes. The flame height shall be adjusted to 40 +/- 2 mm measured as the distance between the top of the burner tube and the tip of the yellow part of the flame when the burner is vertically oriented and the flame is viewed in dim light.
- 19-1.6.5.3.3 The specimen shall be placed (after the reward\*/ marker threads have been located) on the pins of the test frame, making certain that the pins pass through the points marked off from the template and that the specimen is at least 20 mm removed from the frame. The frame shall be fitted on the support so that the specimen is vertical.
- 19-1.6.5.3.4 The marker threads shall be attached horizontally in front of and behind the specimen at the locations shown in Figure 4. At each location, a loop of thread shall be mounted so that the two segments are spaced 1 mm and 5 mm from the front and rear face of the specimen. Each loop shall be attached to a suitable timing device. Sufficient tension shall be imposed to the threads to maintain their position relative to the specimen.



for 15 seconds to another conditioned specimen.

19-1.6.5.3.6 If any result in any set of three specimens exceeds the minimum result by 50 per cent, another set of three specimens shall be tested for that direction or face. If one or two specimens in any set of three specimens fail to burn to the top marker thread, another set of three specimens shall be tested for that direction or face.

19-1.6.5.3.7 The following times, in seconds, shall be measured:

- (a) From the start of the application of the igniting flame to the severance of one of the first marker threads (t1);
- (b) From the start of the application of the igniting flame to the severance of one the second marker threads (t2);
- (c) From the start of the application of the igniting flame to the severance of one the third marker threads (t3).

19-1.6.5.3.8 If the sample does not ignite or does not continue burning after the burner has been extinguished or if the flame extinguishes before the destruction of one of the first marker threads occurred, so that no burning time is measured, the burning rate is considered to be 0 mm/min.

19-1.6.5.3.9 If the sample does ignite and the flames of the burning sample do reach the height of the third marker threads without destroying the first and second marker threads (e.g. due to material characteristics of thin material sample), the burning rate is considered to be more than 100 mm/min.

#### 19-1.6.5.4 Results

The observed phenomena shall be written down in the test-report, to include:

- (a) The durations of combustion: t1, t2 and t3 in seconds, and
- (b) The corresponding burnt distances: d1, d2 and d3 in mm.

The burning rate V1 and the rates V2 and V3, if applicable, shall be calculated (for each sample if the flame reaches at least one of the first marker threads) as follows:

$$V_i = 60 d_i/t_i \text{ (mm/min)}$$

The highest burning rate of V1, V2 and V3 shall be taken into account.

#### 19-1.6.6 Test to determine the capability of materials to repel fuel or lubricant

##### 19-1.6.6.1 Scope

This lists prescriptions to test the capability of insulation materials used in engine compartments and separate heating compartments.

##### 19-1.6.6.2 Sampling and principle

19-1.6.6.2.1 The test samples shall measure: 140 mm x 140 mm.

19-1.6.6.2.2 The thickness of the samples shall be 5 mm. If the thickness of the test sample is more than 5 mm, it shall be reduced to 5 mm by a mechanical process applied to the side which does not face the engine compartment or separate heating compartment.

19-1.6.6.2.3 The test liquid shall be diesel fuel according to CNS 1471, standard EN 590:1999 (Market fuels). Or alternatively diesel fuel according to UN Regulation No. 83.

19-1.6.6.2.4 Four samples shall undergo the test.

##### 19-1.6.6.3 Procedure

19-1.6.6.3.1 The test sample and the apparatus shall be conditioned for at least 24 hours at a temperature of 23 deg. C +/- 2 deg. C and a relative humidity of 50 +/- 5 per cent and shall be maintained under these conditions until immediately prior to

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testing.

19-1.6.6.3.2 The test sample shall be weighed.

19-1.6.6.3.3 The test sample, with its exposed face uppermost, shall be placed on the base of the apparatus by fixing the metal cylinder in a centred position with sufficient pressure on the screws. No test liquid shall leak.

19-1.6.6.3.4 Fill the metal cylinder with test liquid to a height of 20 mm and let the system rest for 24 hours.

19-1.6.6.3.5 Remove the test liquid and the test sample from the apparatus. If residue of the test liquid is found on the test sample it shall be removed without compressing the test sample.

19-1.6.6.3.6 The test sample shall be weighed.