



Reference Manual Book 5: Laboratory Policies and Procedures
Part B: Test Method Section

Method F06 Combustion Resistance of Mattresses

1 SCOPE

- 1.1 This method describes procedures for evaluating the combustion resistance of mattresses by the cigarette test and is applicable to the *Mattresses Regulations* (SOR/2016-183).

2 APPLICABLE DOCUMENTS

- 2.1 Mattresses Regulations (SOR/2016-183)
- 2.2 CAN/CGSB-4.2 No. 27.7-2013: **Textile test methods** - Combustion resistance of mattresses – Cigarette test
- 2.3 Atom G 222 Clicking Press manual
- 2.4 Reference Manual Book 4 – Mattress Flammability Regulations
- 2.5 **PSL-F06: Results of Analysis sheets**
- 2.6 SOP20 Verification of Stopwatches and Timers
- 2.7 **SOP32 Standard Operating Procedure for Operation of the Foster Environmental Chamber (Rm. 233 & 297)**
- 2.8 **SOP83 Verification of SRM 1196a cigarettes**

3 APPLICABLE SOFTWARE

- 3.1 **PSL-F-Cigarette SRM 1196a checklist**

4 DEFINITIONS

- 4.1 Mattress: any product intended, promoted or normally used for the purpose of being slept on that contains resilient material enclosed in a ticking, whether or not such products are referred to as mattresses, excluding: mattress pads; sleeping bags; box springs or other mattress foundations and supports; parts of upholstered furniture that may be used for the purpose of being slept on that are not separate mattresses; infant product pads and crib mattresses and one-of-a-kind prescription mattresses. **Futons** are considered to be mattresses.
- 4.2 Ticking: the outermost layer of fabric or related material that encloses the upholstery and the core
- 4.3 Core: the main support system such as springs, foam or fluid that may be present in a mattress



Reference Manual Book 5: Laboratory Policies and Procedures
Part B: Test Method Section

Method F06 Combustion Resistance of Mattresses

- 4.4 Upholstery: all material, either loose or attached, within the ticking or between the ticking and the core
- 4.5 Draft-free: air speed of less than 0.3 m/s

5 APPARATUS

- 5.1 Atom G 222 hydraulic clicking press with turning arm and high impact resistance cutting board
- 5.2 Specimen cutting template (300 mm x 300 mm x 55 mm)
- 5.3 Anemometer capable of measuring air speed of less than 0.3 m/s to the nearest 0.1 m/s
- 5.4 Lint remover
- 5.5 Mattress fire testing box comprised of an uncovered flame-resistant box approximately 300 mm x 300 mm x 300 mm and a platform approximately 295 mm x 295 mm mounted on a scissor jack within the box (refer to Figures 1 and 2 in CAN/CGSB-4.2 No. 27.7-2013)
- 5.6 PTC Model 302SL durometer with a firmness reading range between 10 and 100 ± 5
- 5.7 Polyurethane foam 300 mm ± 5 mm x 300 mm ± 5 mm x 25 mm ± 5 mm with a density of 16 kg/m³ to 42 kg/m³ and a firmness of 21 to 61 on the prescribed durometer
- 5.8 Testfabrics, Inc. Style #978 woven glass fibre fabric with a mass **per area** of $205 \text{ g/m}^2 \pm 5 \text{ g/m}^2$
- 5.9 Cigarette template: refer to Figure 3 in CAN/CGSB-4.2 No. 27.7-2013
- 5.10 Stopwatch **with audible signal** capable of measuring to the nearest 0.1 s
- 5.11 Environmental chamber capable of maintaining standard atmospheric conditions of $21 \text{ }^\circ\text{C} \pm 3 \text{ }^\circ\text{C}$ and 35 % - 50 % relative humidity (RH)
- 5.12 Temperature and RH recorder capable of measuring a temperature of $21 \text{ }^\circ\text{C} \pm 3 \text{ }^\circ\text{C}$ and an RH of 35% - 50%, to the nearest 0.5 °C and **1** %, respectively
- 5.13 Graduated ruler with 1.0 mm increments
- 5.14 NIST Standard Cigarette for Ignition Resistance Testing SRM 1196**a** with the following specifications:
 - 5.14.1 The cigarette shall be without filter tip and made from natural tobacco, $85 \text{ mm} \pm 2 \text{ mm}$ long with a tobacco packing density of $270 \text{ kg/m}^3 \pm 20 \text{ kg/m}^3$ and a total mass of $1.1 \text{ g} \pm 0.1 \text{ g}$ at $65 \text{ \%} \pm 2 \text{ \%}$ relative humidity (RH) and $20 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$.
 - 5.14.2 The cigarette, when conditioned at $21 \text{ }^\circ\text{C} \pm 3 \text{ }^\circ\text{C}$ and 35 % - 50 % RH for a minimum of 24 h and ignited at one end, shall burn its entire length in $1500 \text{ s} \pm 150 \text{ s}$ when placed horizontally on the surface of a piece of woven glass fibre fabric.



Reference Manual Book 5: Laboratory Policies and Procedures
Part B: Test Method Section

Method F06 Combustion Resistance of Mattresses

6 PROCEDURE

6.1 General

- 6.1.1 Take a picture of the sample.
- 6.1.2 Remove label and keep in sample folder.
- 6.1.3 Record sample description (e.g., brand, manufacturer, country of origin).

6.2 Specimen preparation

- 6.2.1 The specimen shall exclude any spring or fluid assembly and shall include:
 - 6.2.1.1 The entire mattress assembly, where its thickness does not exceed 50 mm or, notwithstanding 6.2.1.3 and 6.2.1.4, where it can be reasonably accommodated in the mattress fire testing box;
 - 6.2.1.2 All of the ticking and upholstery, where the thickness of such ticking and upholstery does not exceed 50 mm, measured in an unrestrained condition;
 - 6.2.1.3 The outermost 50 mm of ticking and upholstery measured in an unrestrained condition, where the thickness of such ticking and upholstery is greater than 50 mm or
 - 6.2.1.4 The outermost 50 mm of ticking and plastic or synthetic rubber measured in an unrestrained condition, where the mattress is a plastic or natural or synthetic rubber assembly exceeding 50 mm in thickness.
- 6.2.2 Using the specimen cutting template, cut the specimen to 300 mm ± 5 mm x 300 mm ± 5 mm with the clicking press
- 6.2.3 Cutting a mattress
 - 6.2.3.1 Identify each side of the mattress as side A and side B and separate the outermost 50 mm of the mattress.
 - 6.2.3.2 Cut 5 specimens from side A and 5 specimens from side B using the clicker press and identify the side immediately after cutting.
 - 6.2.3.3 If present, ensure that the stitching line is centrally located when cutting the specimen.
 - 6.2.3.4 If the mattress is designed to be used on one side only (i.e., a pillow top mattress), cut 10 specimens from the one side.



Reference Manual Book 5: Laboratory Policies and Procedures
Part B: Test Method Section

Method F06 Combustion Resistance of Mattresses

6.2.3.5 Take a picture of the cross-section of the specimen and record its description including the thickness of each layer and the layers tested.

6.2.4 Cutting a futon

6.2.4.1 Identify each side of the futon as side A or side B.

6.2.4.2 If the futon is less than 100 mm thick

6.2.4.2.1 Cut 10 specimens from the full thickness of the sample and identify each side (side A/side B).

6.2.4.2.2 If present, ensure that the stitching line is centrally located when cutting the specimen.

6.2.4.2.3 If applicable, separate the outermost 50 mm of the specimen, 5 specimens from side A and 5 specimens from side B.

6.2.4.3 If the futon is greater than 100 mm thick

6.2.4.3.1 Cut 5 specimens from the full thickness and identify each side (side A/side B). It may be necessary to separate the futon in half if the futon is too thick to be accommodated by the clicking press.

6.2.4.3.2 Separate the outermost 50 mm of the specimen.

Take a picture of the full cross-section of the specimen and record its description including the thickness of each layer and the layers tested.

6.3 Conditioning

6.3.1 Remove cigarettes from packaging.

6.3.2 Condition specimens and cigarettes at $21\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ and 35 % - 50 % RH for a minimum of 24 h immediately prior to testing.

6.4 Testing

6.4.1 Remove the front panel of the test box and place the specimen on the platform.

6.4.2 To obtain the required firmness reading for each specimen

6.4.2.1 Verify the durometer using the verification device included with the durometer and record the value prior to use.



Reference Manual Book 5: Laboratory Policies and Procedures
Part B: Test Method Section

Method F06 Combustion Resistance of Mattresses

- 6.4.2.2 Place durometer on a level section of the specimen, never on a stitch line and as close to the centre as possible.
 - 6.4.2.3 Turn the jack handle of the test box clockwise to compress the specimen until a firmness reading of 75 is achieved. If this reading is exceeded by the relaxed specimen, record the firmness achieved and proceed with testing.
 - 6.4.2.4 If a firmness reading of 75 cannot be achieved with the specimen alone, add a piece of foam. If the reading is still less than 75, add another piece of foam.
 - 6.4.2.5 Record the number of foam pieces used, if applicable.
 - 6.4.2.6 If a firmness reading of 75 cannot be achieved with 2 pieces of foam, record the firmness achieved and proceed with testing.
- 6.4.3 Place the cigarette template on the surface of the mattress assembly in a central location in the orientation shown in Figure 1.

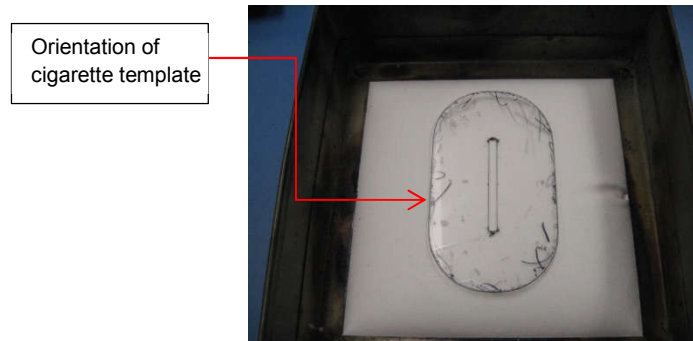


Figure 1

- 6.4.4 In the case of a quilted ticking or a deep panel scroll ticking, place the cigarette template with as much of the length of the cigarette as possible in a stitch line. This stitch line should be as close as possible to the centre of the mattress assembly as shown in Figure 2.



Reference Manual Book 5: Laboratory Policies and Procedures
Part B: Test Method Section

Method F06 Combustion Resistance of Mattresses

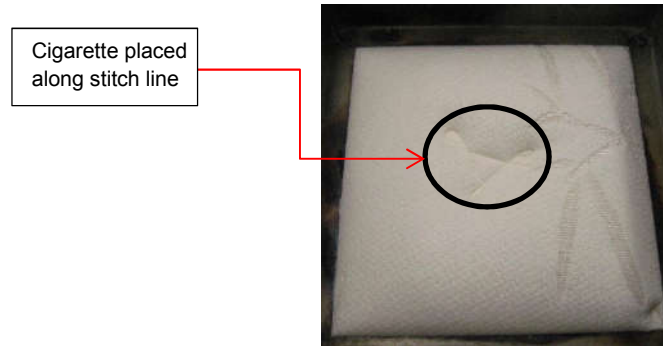


Figure 2

- 6.4.5 Draw a line around the cigarette using the cigarette template such that any given point on the line is a distance of 50 mm from the closest point of the cigarette. Mark the placement location of the two ends of the cigarette.
- 6.4.6 Remove any lint from the specimen surface.
- 6.4.7 Orientate the mattress fire testing box in the fume hood such that the analyst is capable of observing the tip of the cigarette when it extinguishes.
- 6.4.8 With the fume hood on low, measure the air speed directly in the centre of the test area above the top edge of the mattress fire test box. Take 3 anemometer measurements and calculate the average air speed.
- 6.4.9 Mark each conditioned cigarette at a distance of 80 mm from one end. Ignite the cigarette. When burning reaches the mark, place the lit cigarette on the specimen on the location indicated in 6.4.5.
- 6.4.10 Record whether charring or melting on the specimen surface extends beyond the line drawn 50 mm from the cigarette. Terminate the test when combustion of the ticking exceeds a distance of 50 mm in any horizontal direction from the cigarette location.
- 6.4.11 If charring or melting does not extend beyond the 50 mm line, look for continued combustion 10 minutes after the cigarette has extinguished.
- 6.4.11.1 To verify for continued combustion of the specimen, look for smoke and place a hand above the specimen to feel for heat.
 - 6.4.11.2 Carefully remove the specimen from the holder to avoid burns in case of continued smouldering. Examine the layers of the specimen to look for continued combustion.



Reference Manual Book 5: Laboratory Policies and Procedures
Part B: Test Method Section

Method F06 Combustion Resistance of Mattresses

- 6.5 Keep one tested specimen for a minimum of 6 months. If the sample produces both passing and failing specimens, keep one of each.

7 HEALTH AND SAFETY

- 7.1 Always wear Safety glasses.
- 7.2 Always keep hands clear of the cutting area and ensure to operate the clicking press properly.
- 7.3 Ensure testing is performed in the walk-in fume hood while set on "low" and the chamber door is as low as possible during testing.
- 7.4 After each test, turn on the fume hood to "high" and open the test chamber door to evacuate smoke.
- 7.5 Always use the tubing (i.e., aspirator) connected to the fume hood suction nozzle when lighting the cigarette.
- 7.6 Always wear a respirator to prevent inhalation of smoke during testing and a dust mask during cutting.
- 7.7 Always wear a lab coat to protect skin and clothing.
- 7.8 Always wear heat protective gloves when extinguishing or removing burning specimens.
- 7.9 Always ensure specimens are fully extinguished before disposing in the garbage by using the test box cover, a water spray bottle and/or by dousing the specimen in a bucket of water.
- 7.10 Always test at most 5 specimens at a time.
- 7.11 Always perform as many steps above as possible within the fume hood.

8 QUALITY ASSURANCE

- 8.1 During conditioning and testing, maintain and record temperature and RH conditions.
- 8.2 Ensure the durometer and the anemometer are within calibration.
- 8.3 Verify the firmness reading of the foam to ensure it is between 21 to 61.
- 8.4 Ensure testing is conducted in a draft-free area.
- 8.5 Verify the cigarettes meet the required specifications.
- 8.6 Ensure stopwatches, rulers and durometer are verified prior to testing.



Reference Manual Book 5: Laboratory Policies and Procedures
Part B: Test Method Section

Method F06 Combustion Resistance of Mattresses

9 TEST RESULTS

- 9.1 The test report shall contain, at a minimum, the following information
- 9.1.1 Number and title of **this** test method **including** the effective date.
 - 9.1.2 **Photograph of the specimen and its cross-section with a description and linear dimension of each layer, or the top 50 mm for mattresses.**
 - 9.1.3 **The number of specimen tested from each side.**
 - 9.1.4 Whether charring or melting extended more than 50 mm in any horizontal direction from the original location of the cigarette.
 - 9.1.5 Whether combustion continued in the mattress assembly 10 min after the cigarette had completely extinguished.
 - 9.1.6 The firmness reading of the durometer.
 - 9.1.7 If the cigarette extinguished before burning its entire length.
- 9.2 The report may be prepared in the format illustrated in Appendix A.



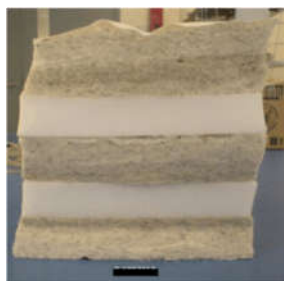
Reference Manual Book 5: Laboratory Policies and Procedures
Part B: Test Method Section
Method F06 Combustion Resistance of Mattresses

APPENDIX A

TEST REPORT FORMAT

Test method: Method F06: Combustion Resistance of Mattresses (YYYY-MM-DD)

Sample description



Outer covering (white ticking) Side A
Batting (60 mm - 70 mm)
Foam (50 mm)
Batting (50 mm - 60 mm)
Foam (50 mm)
Batting (60 mm - 70 mm)
Outer covering (white ticking) Side B

Results

Specimen #	Side	Firmness reading	Surface charring or melting extended beyond 50 mm	Continued combustion 10 min after cigarette has completely extinguished
1	A	75	no	yes
2	A	75	no*	yes
3	A	75	no	no
4	A	75	yes	n/a
5	A	75	no	yes
6	B	75	no	yes
7	B	75	no	yes
8	B	75	yes	n/a
9	B	75	no	yes
10	B	75	no	yes

* Cigarette extinguished before burning entire length