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**STANDARD METHOD OF TEST FOR FIRE GROWTH OF
MATTRESSES (OPEN FLAME TEST)**

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CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

STANDARD METHOD OF TEST FOR FIRE GROWTH OF MATTRESSES
(OPEN FLAME TEST)

ICS 13.220.40

Prepared and Published by:



Approved by:



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STANDARD METHOD OF TEST FOR FIRE GROWTH OF MATTRESSES (OPEN FLAME TEST)

PREFACE

This is the Second Edition of the Standard Method of Test for Fire Growth of Mattresses (Open Flame Test), CAN/ULC-S137.

This Edition of the Standard was developed by the ULC Standards Task Group on Combustibility and has been formally approved by the ULC Standards Committee on Fire Tests.

This Standard has been developed in compliance with the requirements of SCC for accreditation of a Standards Development Organization.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

Appendices A, B and C, identified as Informative, are for information purposes only.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This Second Edition National Standard of Canada is based on, and now supersedes, the First Edition.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patent rights. ULC Standards shall not be held responsible for identifying any or all such patent rights.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a “yes” or “no” answer based on the literal text of the requirement concerned.

The review and action to revise or reaffirm this Standard will not exceed 5 years from the date of publication, unless the Standard is identified as fitting within a stabilized category, whereby the review will commence within the appropriate time frame set out by ULC Standards.

This Standard is intended to be used for conformity assessment.

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1 SCOPE

1.1 The purpose of this test method is to investigate the ability of *mattresses* to resist rapid heat release by measuring specific fire test responses when the *mattress* or *mattress set* is subjected to a specified flaming ignition source under well ventilated conditions.

1.2 This test method is applicable only to the finished *mattresses* and *mattress sets* and does not apply to testing of individual component materials used, such as *ticking* and *upholstery materials*, foams, cotton battings, etc.

1.3 This test method does not provide information on the performance of a *mattress* or *mattress set* in other fire conditions or the contribution of the *mattress* to a developing fire condition.

2 REFERENCE PUBLICATIONS

2.1 The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this ULC Standard.

Document Published by the American Society for Testing and Materials (ASTM International)
100 Barr Harbour Drive, PO Box C700, West Conshohocken, PA 19428-2959 U.S.A.
Telephone: (610) 832-9585
www.astm.org

- ASTM E1590-13, Standard Test Method for Fire Testing of Mattresses

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- CAN/ULC-S138:2006 (R2016), Standard Method of Test for Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration
- CAN/ULC-9705-13 (ISO 9705:1993, MOD), Fire Tests – Full-Scale Room Test for Surface Products

Document Published by the US Consumer Product Safety Commission
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- 16 CFR Part 1633-15, Standard for the Flammability (Open Flame) of Mattress Sets

3 GLOSSARY

NOTE: Terms used in this Standard that are in *italic* print are defined as follows:

3.1 **FOUNDATION** — a *ticking* covered structure used to support a mattress or sleep surface. The structure may include constructed frames, foam, box springs, or other materials, used alone or in combination.

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3.2 MATTRESS — a resilient material or combination of materials enclosed by a *ticking* (used alone or in combination with other products) intended or promoted for sleeping upon.

NOTE 1: This term includes: but is not limited to: adult *mattresses*, youth *mattresses*, crib *mattresses* (including portable crib *mattresses*), bunk bed *mattresses*, futons, flip chairs without a permanent back or arms, sleeper chairs, and water beds or air *mattresses* if they contain upholstery material between the *ticking* and the *mattress* core. *Mattresses* used in or as part of upholstered furniture are also included; examples are convertible sofa bed *mattresses*, corner group *mattresses*, day bed *mattresses*, roll-away bed *mattresses*, high risers, and trundle bed *mattresses*.

NOTE 2: The term *mattress* excludes: *mattress* pads, *mattress* toppers not exceeding a total of 25 mm thick (items with resilient filling, with or without *ticking*, intended to be used with or on top of a *mattress*), sleeping bags, pillows, liquid and gaseous filled *tickings*, such as water beds and air *mattresses* that contain no upholstery material between the *ticking* and the *mattress* core, upholstered furniture that does not contain a *mattress*, juvenile product pads such as car bed pads, carriage pads, basket pads, infant carrier and lounge pads, dressing table pads, stroller pads, crib bumpers, and playpen pads.

3.3 MATTRESS SET — means a *mattress* and *foundation*, which are sold as a set.

3.4 TEST SPECIMEN — a *mattress* or *mattress set* representing the end-use construction.

NOTE: *Mattresses* for sale with a *foundation* shall be tested with the corresponding *foundation*. *Mattresses* for sale without a *foundation* shall be tested alone.

3.5 TICKING — the outermost layer of fabric or related material of a mattress or foundation. It does not include any other layers of fabric or related materials quilted together with, or otherwise attached to, the outermost layer of fabric or related material.

3.6 TWIN SIZE — any *mattress* with the dimensions 965 mm x 1892 mm, all dimensions may vary by ± 13 mm.

3.7 UPHOLSTERY MATERIAL — all material, either loose or attached, between the *mattress ticking* and the core of a *mattress*, if a core is present.

4 SUMMARY OF METHOD

4.1 This test method determines a number of fire-test-response characteristics from a full scale *test specimen*, ignited with a pair of T-shaped gas burners and allowed to burn for a period of 30 min. Measurements to be made include rate of heat release and total amount of heat released.

NOTE: Additional optional measurements include specimen mass loss and smoke obscuration.

4.2 Fire testing of products and materials is inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting these tests. This test method may involve hazardous materials, operations and equipment.

4.3 The exhaust system shall be checked for proper operation before testing and must discharge into a building exhaust system with adequate capacity. Provision shall be made for collecting and venting any combustion products that should for whatever reason fail to be collected by the normal exhaust system of the apparatus.

5 APPARATUS

5.1 GENERAL

5.1.1 The test apparatus shall consist of the following components:

- A A test area;
- B Dual T-shaped gas burner ignition source;
- C A collection hood and exhaust system;
- D Velocity measuring instrumentation;
- E Gas sampling and oxygen analysis equipment;
- F A data acquisition system;
- G Bed frame;
- H A smoke obscuration measuring system (Optional); and
- I A weight measuring system (Optional).

5.2 TEST AREA

5.2.1 The test area shall have either a Test Room as described in Subsection 5.3, or an Open Calorimeter as described in Subsection 5.4. The test area conditions shall be maintained at a temperature greater than 15 °C and a relative humidity less than 75 %.

5.3 TEST ROOM

5.3.1 The room as illustrated in Figure 1 shall consist of four walls at right angles, a floor and a ceiling and shall have the following inner dimensions:

- A length: 3050 ± 50 mm
- B width: 3600 ± 50 mm
- C height: 2400 ± 50 mm

The room shall be placed indoors in an essentially draught free, heated space, large enough to ensure that there is no influence on the test fire. In order to facilitate the mounting of the instruments and of the ignition source, the test room may be placed so that the floor can be reached from beneath.

5.3.2 There shall be a doorway in one of the 3.60 m x 2.40 m walls and no other wall, floor or ceiling shall have any openings that allow ventilation. The location of the doorway shall be as illustrated in Figure 1. The doorway shall have the following dimensions:

- A width: 960 ± 10 mm
- B height: 2000 ± 10 mm

5.3.3 The test room shall be constructed of noncombustible material with a density of 500 kg/m³ to 800 kg/m³. The minimum thickness of the construction shall be 12 mm.

NOTE: Calcium silicate board (minimum 6 mm thick) has been found suitable for this purpose.

5.3.4 The test room shall have a collection hood and exhaust system as described in Subsection 5.6, Collection Hood and Exhaust Duct, and illustrated in Figure 9.

5.3.5 The location of the *test specimen* is illustrated in Figure 7. One corner of the *test specimen* shall be 130 mm to 170 mm from the wall and the other corner shall be 250 mm to 300 mm from the wall. The test room shall contain no other furnishings or combustible materials except for the *test specimen*.

NOTE: The angled placement is intended to minimize the interaction of flames on the side surfaces of the *test specimen* with the room walls.

5.4 OPEN CALORIMETER

5.4.1 The open calorimeter shall have a capacity and be designed in such a way that all of the combustion products are collected. The open calorimeter shall have a duct of diameter 0.4 m and a square hood with a minimum opening of 2.40 m x 2.40 m and a height of 1.00 m. See Figure 9. The hood feeds into a plenum having a 0.90 m x 0.90 m cross-sectional area. The plenum has a height of 0.9 m. The maximum plenum height is 1.80 m, depending on building constraints. See Appendix C1.1.2.

NOTE 1: A steel skirt extending 1.00 m downwards giving a total hood height of 2.00 m may be required to ensure that all combustion products are collected.

NOTE 2: A larger hood system or a conical hood may be used if it has been shown to produce equivalent results by complying with the requirements specified in Subsection 6.2, Heat Release Rate Calibration.

5.4.2 The calorimeter hood shall be placed indoors in an essentially draught free, heated space, large enough to ensure that there is no influence on the test fire.

5.4.3 In the plenum chamber, two plates 0.50 m x 0.90 m are located to increase mixing of the combustion gases. The hood must be designed and manufactured so that no leakage occurs.

5.4.4 An exhaust duct is connected with the plenum chamber. The minimum length of the duct shall be 4.80 m. To facilitate flow measurement, guide vanes are located at both ends of the exhaust duct.

5.4.5 The exhaust capacity shall comply with Clause 5.6.1.

5.4.6 The *test specimen* shall be centred under the calorimeter hood as illustrated in Figure 13.

5.5 IGNITION SOURCE

5.5.1 General

5.5.1.1 The ignition source shall consist of two T-shaped burners as illustrated in Figures 2 and 3. One burner impinges flames on the top surface of the *mattress*. The second burner impinges flames on the side of the *mattress* and on the side of the *foundation*. Each of the burners shall be constructed from stainless steel tubing (12.7 mm diameter with 0.89 ± 0.05 mm wall thickness). Each burner shall incorporate a standoff foot to set its distance from the *test specimen* surface. See Figure 4. Both burners shall be mounted with a mechanical pivot point but the side burner shall be locked in place to prevent movement about this pivot in normal usage. The top burner, however, shall be free to rotate about its pivot

during a burner exposure and shall be lightly weighted so as to exert a downward force on the *mattress* top through its stand-off foot so that the burner follows a receding top surface on the *test specimen*. See Figure 5.

NOTE: The combination of burner stand-off distance and propane gas flow rate to the burners determines the heat flux they impose on the surface of the *test specimen* so that both of these parameters are tightly controlled.

5.5.2 Top Surface Burner

5.5.2.1 The T head of the top surface burner (horizontal burner as illustrated in Figure 1) shall be 305 ± 2 mm long with gas tight plugs in each end. Each side of the T shall contain 17 holes equally spaced over a 135 mm length (8.5 ± 0.1 mm apart). The holes on each side shall begin 8.5 mm from the centreline of the burner head. The holes shall be 1.45 mm to 1.53 mm in diameter. The holes shall be pointed 5° out of the plane as illustrated in Figure 2. This broadens the width of the heat flux profile imposed on the surface of the *test specimen*.

5.5.3 Side Surface Burner

5.5.3.1 The T head of the side surface burner (vertical burner) shall be constructed similarly to the top surface burner as illustrated in Figure 3, except that its overall length shall be 254 ± 2 mm. Each side of the burner head shall contain 14 holes spaced evenly over a 110 mm length (8.5 ± 0.1 mm apart). The holes shall be 1.45 mm to 1.53 mm in diameter. The holes shall be pointed 5° out of the plane. See Figure 4.

5.5.4 Burner Stand-Off

5.5.4.1 The burner stand-off on each burner shall consist of a collar fixed by a set screw onto the inlet tube of the burner head as illustrated in Figure 4. The collar shall hold a 3 mm diameter stainless steel rod having a 12.7 mm by 50.8 mm by 2.5 mm thick stainless steel pad welded on its end with its face (and long axis) parallel to the T head of the burner. The foot pad shall be displaced about 10 mm to 12 mm from the longitudinal centreline of the burner head so that it does not rest on the *test specimen* in an area of peak heat flux. A copper tubing section 9.5 mm OD, about 80 mm long shall be placed in the inlet gas line just before the burner to facilitate making the burner nominally parallel to the *test specimen* surface (Clause 6.5.6). The gas inlet lines (12.7 mm OD stainless steel tubing) serve as arms leading back to the pivot points and beyond. See Figure 5. The length to the pivot for the top burner shall be approximately 1000 mm.

NOTE: The copper tube on the top surface burner may need to be protected from excessive heat and surface oxidation by wrapping it with a suitable layer of high temperature insulation.

5.5.4.2 The copper tubing shall be replaced if they become work-hardened or crimped in any way.

5.5.5 Burner Frame

5.5.5.1 Figure 5 shows the portable frame that holds the burners and their pivots, which are adjustable vertically in height. All adjustments (burner height, burner arm length from the pivot point, counterweight positions along the burner arm) are facilitated by the use of knobs or thumbscrews as the set screws. The three point footprint of the burner frame, with the two forward points on wheels, facilitates burner movement and burner stability when stationary.

5.5.6 Arms

5.5.6.1 The metal arms attached to the burners shall be attached to a separate gas control console by flexible, reinforced plastic tubing. The gas control console is mounted separately so as to facilitate its safe placement outside of the test room throughout the test procedure. The propane gas lines running between the console and the burner assembly must be anchored on the assembly before running to the burner inlet arms. A $1.5\text{ m} \pm 25\text{ mm}$ length of flexible, reinforced tubing between the anchor point and the end of each burner inlet allows free movement of the top burner about its pivot point. The top burner arm shall have a pair of moveable cylindrical counterweights that are used, as described below, to adjust the downward force on the stand-off foot.

NOTE: Fibre-reinforced plastic tubing (6 mm ID and 9.5 mm OD) made of PVC should be used.

5.5.7 Burner Head

5.5.7.1 Each burner head shall have a separate pilot light consisting of a 3 mm OD copper tube with an independently controlled supply of propane gas. The tube terminates within 10 mm of the centre of the burner head. Care must be taken to set the pilot flame size small enough so as not to heat the test specimen before the timed burner exposure is begun.

5.5.8 Flow Control System

5.5.8.1 Each burner shall have a flow control system of the type shown in Figure 6. Propane gas from a source such as a bottle is reduced in pressure to approximately 70 kPa and fed to the system. The gas flow to the burner is delivered in a square-wave manner (constant flow with rapid onset and termination) by means of the solenoid valve upstream of the flowmeter. An interval timer (accurate to $\pm 0.2\text{ s}$) determines the burner flame duration. The pilot light assures that the burner will ignite when the solenoid valve opens. The gas flow shall be set using a rotameter type of flowmeter, with a 150 mm scale, calibrated for propane. When calibrating the flowmeter, take into account that the flow resistance of the burner holes causes a finite pressure increase in the flowmeter above ambient (if a calibration at one atmosphere is provided by the manufacturer, the flowmeter reading, at the internal pressure existing in the meter, required to get the flow rates listed in this paragraph must be corrected, typically by the square root of the absolute pressure ratio. This calls for measuring the actual pressure in the flow meters when set near the correct flow values. A value roughly in the range of 1 kPa to 3 kPa can be expected). Calibration procedures are provided in Subsection 6.3, Calibration of Propane Flow Meter.

5.5.9 Gas Flow Rate

5.5.9.1 Use propane gas with a known net heat of combustion of $46.5 \pm 0.5\text{ MJ/kg}$ (nominally 99% to 100% propane). Each burner has a specific propane gas flow rate set with its respective, calibrated flowmeter. The gas flow rate to the top burner is $12.9 \pm 0.1\text{ L/min}$ at a pressure of $101 \pm 5\text{ kPa}$ (standard atmospheric pressure) and a temperature of $22 \pm 3\text{ }^{\circ}\text{C}$. The gas flow rate to the side burner is $6.6 \pm 0.05\text{ L/min}$ at a pressure of $101 \pm 5\text{ kPa}$ (standard atmospheric pressure) and a temperature of $22 \pm 3\text{ }^{\circ}\text{C}$. For the flowmeters supplied with the burner assembly, the black float setting for the top burner is expected to be in the 85 mm to 95 mm range. For the side burner, the expected range for the black float is 115 mm to 125 mm. The total heat release rate of the burners is 27 kW.

5.6 COLLECTION HOOD AND EXHAUST DUCT

5.6.1 The hood and exhaust duct system for collecting the combustion products shall have a sufficient capacity and be designed so that all of the combustion products during a test are collected. The exhaust capacity shall be at least $3.5\text{ m}^3\cdot\text{s}^{-1}$ at normal pressure and a temperature of $25\text{ }^{\circ}\text{C}$.

NOTE: See Figures 9 & 10 for an example of a hood and exhaust duct design and gas collection schematic. Refer to Appendix C for additional information. Additional information on heat release measurement systems are provided in CAN/ULC-9705, Fire Tests - Full-Scale Room Test for Surface Products, ASTM E1590, Standard Test Method for Fire Testing of Mattresses, and CAN/ULC-S138, Standard Method of Test for Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration.

5.7 GAS COLLECTION SYSTEM

5.7.1 The gas exhaust collection system shall be constructed with the following minimal requirements: a blower, steel hood, duct, bi-directional probe, thermocouple(s), oxygen measurement system, and combustion gas sampling and analysis system. A typical gas exhaust collection system is shown in Figures 9 and 10.

5.7.2 Ensure that the system for collecting the smoke (which includes gaseous combustion products) has sufficient exhaust capacity and is designed in such a way that all of the combustion products leaving the burning *test specimen* are collected. Design the capacity of the evacuation system such that it will exhaust, minimally, all combustion gases leaving the *test specimen*. See Appendix C1.1.6.

5.7.3 Place probes for the sampling of combustion gas and measurement of flow rate as shown in Figure 9 (see also Appendix C2). The flow rate in the exhaust duct shall be measured by a bi-directional probe, or an equivalent measuring system, with an accuracy of at least $\pm 6\%$. The response time to a stepwise change of the duct flow rate shall not exceed 5 s to reach 90 % of the final value.

5.7.4 Make all measurements of gas concentrations, or flow rates at a position in the exhaust duct where the exhaust is mixed uniformly so that there is a nearly uniform velocity across the duct section. If smoke obscuration measurement is desired, make all measurements at a position in the exhaust duct where the exhaust is mixed uniformly so that there is a nearly uniform velocity across the duct section. To ensure uniform mixing of the exhaust, provide a straight section of duct before the measuring system having a length equal to at least eight times the inside diameter of the duct. If a measuring system is positioned at a distance of less than 8 diameters, demonstrate the achievement of equivalent results.

5.7.5 The sampling lines shall be constructed of a material not influencing the concentration of the combustion gas species to be analyzed. The following sequence of the gas train has been shown to be acceptable: sampling probe, soot filter, cold trap, gas path pump, vent valve, plastic drying column and carbon dioxide removal columns (if used), flow controller and oxygen analyzer. See Figure 9 and Appendix C2 for further details. Alternative designs of the sampling line must yield equivalent results. The gas train shall include appropriate spanning and zeroing facilities.

5.7.6 Oxygen Measurement

5.7.6.1 Measure the oxygen concentration with an accuracy of ± 0.01 % oxygen, or better, in order to have adequate measurements of the rate of heat release. Take the combustion gas sample from the end of the sampling line. Calculate the time delay, including the time constant of the instrument, from the test room since it is a function of the exhaust duct flow rate. The time delay shall not exceed 60 s.

5.7.7 Carbon Monoxide and Carbon Dioxide Measurements (Optional)

5.7.7.1 Measure the combustion gas species with an instrument having an accuracy of at least ± 0.1 vol. % for carbon dioxide and ± 0.02 vol. % for carbon monoxide. A suitable output range is from 0 to 1 vol. % for carbon monoxide and 0 to 6 vol. % for carbon dioxide. Take the combustion gas sample from the end of the sampling line. Calculate the time delay, including the time constant of the instrument, from the test room; it is a function of the exhaust duct flow rate. It shall be a maximum of 60 s.

5.8 OPTICAL DENSITY (OPTIONAL)

5.8.1 An optical system, such as a white light photocell lamp/detector or laser, shall be installed for measuring light obscuration across the centreline of the exhaust duct. The optical density of the smoke shall be determined by measuring the light transmitted with a photometer system consisting of a white light source and a photocell/detector or a laser system (see Appendix C2.4 for additional information).

5.8.2 The smoke meter shall be calibrated initially to read correctly for two neutral density filters of significantly different values, and also at 100 % transmission. Once this calibration is set, the zero value of extinction coefficient (100 % transmission) must be verified prior to each test. If departure from the zero line is detected, the problem shall be corrected and a new calibration shall be performed in accordance with this clause.

NOTE: The use of neutral-density filters at 0.5 and 1.0 values of optical density has been shown to be satisfactory for this calibration.

5.9 THERMOCOUPLES (OPTIONAL FOR ROOM TEST)

5.9.1 Type K Chromel–Alumel thermocouples, 0.30 mm $\pm$ 0.05 mm in diameter, shall be used at each required location. The junction of the thermocouple wire shall be welded with 10 $\pm$ 2 mm of bare wire exposed to the air.

5.9.2 The welded junction of five thermocouples shall be located 100 $\pm$ 2 mm below the ceiling (see Figure 12). The thermocouples shall be mounted on supports or shall penetrate through the ceiling. Any ceiling penetration shall be just large enough to permit passage of the thermocouples. Spackling compound or ceramic fiber insulation shall be used to backfill the holes around the thermocouple wire.

5.10 DATA ACQUISITION

5.10.1 A data acquisition system shall be used to collect and record oxygen analyzer measurements, pressure gauge measurements, and temperature measurements. The speed and capacity of the data acquisition system shall be sufficient to collect the data at 5 s or less intervals.

5.11 BED FRAME

5.11.1 For *twin size mattresses*, the specimen shall be placed on top of a welded bed frame (1.90 m by 0.99 m by 115 mm high) made from 38 mm steel angle. The frame shall be completely open under the *foundation* except for two crosspieces, 25 mm wide at the one-third (1/3) length points. If testing a size other than twin, the relationship of the *mattress* to the frame shall be comparable to that specified in this paragraph.

5.11.2 The bed frame feet shall rest on a surface of either calcium silicate board or fibre cement board, 13 mm thick, 2.11 m by 1.19 m. The board serves as a catch surface for any flaming melt/drip material falling from the bed assembly and may be the location of a pool fire that consumes such materials. This surface must be cleaned between tests to avoid build-up of combustible residues.

NOTE: The surface can be lined with ceramic fibre paper to facilitate cleaning between tests. The ceramic fibre paper should be installed flat against the surface of the pan. Lining this surface with aluminium foil to facilitate cleaning is not recommended since this might increase fire intensity via reflected radiation. No absorbent material should be used to line the pan.

5.12 WEIGHT MEASURING SYSTEM (OPTIONAL)

5.12.1 A weight measuring system shall be used to continuously record the mass of the specimen during each test. The system shall consist of a weight measuring device and a noncombustible platform on which the *test specimen* is mounted as illustrated in Figure 11.

5.12.2 The weight measuring device shall have a capacity sufficient to record the mass of the *test specimen* and a precision sufficient to record the mass to the nearest 45 g.

5.12.3 The weight measuring device shall be installed in such a way that the heat from the burning specimen and any eccentricity of the load does not affect accuracy. There shall be no range shifts during measurements. All parts of the weight measuring device shall be below the top surface of the noncombustible platform.

5.12.4 The distance from the lower surface of the noncombustible platform to floor level shall not exceed 305 mm. The area between the noncombustible platform and the floor level shall be shielded in order to avoid lifting forces, due to induced air flow that might influence the measurements.

5.12.5 If mass loss is measured, perform calibration of the mass-measuring device by loading the weighing platform with known masses corresponding to the measuring range of interest to an accuracy of $\pm 1\%$. Conduct this calibration daily, or before each series of tests.

6 CALIBRATION OF EQUIPMENT

6.1 CALIBRATION

6.1.1 Calibrate all instruments carefully with standard sources after initial installation. Among the instruments to be calibrated are load cells or weighing platforms, smoke meters, flow or velocity transducers, and gas analyzers. Perform recalibration tests on the entire system, using standard output burners. See Clause 6.2.2 and Figure 14.

6.2 HEAT RELEASE RATE CALIBRATION

6.2.1 The heat release measurement instrumentation located in the exhaust duct shall be calibrated daily or before each series of tests and following any modifications or maintenance. The calibration shall be performed by burning propane and comparing the heat release rates measured from oxygen consumption and those calculated from the metered gas input. The calibration burner shall be placed in the same location that the specimen is to be placed during the test.

6.2.2 The calibration burner shall be a non-premixed diffusion burner. A suitable calibration burner is a sand diffusion burner with a nominal 305 mm x 305 mm top surface and 150 mm depth. See Figure 14.

6.2.3 The heat release measurement instrumentation shall be calibrated at a minimum of four theoretical heat release rates based upon metered gas input.

6.2.4 The calibration of the burner for the test shall be performed with the burner heat outputs as shown in Table 1 with the burner positioned directly under the hood. Measurements shall be taken at least every 5 s and shall be started 1 min prior to ignition of the burner. At steady state conditions, the difference between the mean rate of heat release over 1 min calculated from the metered gas input shall not exceed 5 % for each level of output.