

Commercial catering gas equipment

This Australian Standard ® was prepared by AG-001, Gas Appliances. It was approved on behalf of the Council of Standards Australia on DD Month 202X.

Preface

This Standard was prepared by the Australian members of Joint Standards Australia/New Zealand Committee AG-001, Gas Appliances to supersede AS 4563—2004, *Commercial catering gas equipment*.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to provide manufacturers, designers, regulatory authorities, testing laboratories and similar organizations with uniform minimum requirements for the safety, performance and use of commercial cooking and catering gas appliances.

This Standard should not be regarded as a design specification or as an instruction manual.

In its preparation, consideration has been given to—

- (a) continuity of satisfactory operation;
- (b) the prevention of fire hazards, and explosions;
- (c) the prevention of injury to persons or property;
- (d) gas rules and regulations now in force; and
- (e) relevant International Standards.

The principal differences between this edition and AS 4563:2004 are the addition of—

- (i) specific requirements for high temperature appliances ([Section 17](#));
- (ii) specific requirements for mobile serving appliances ([Section 18](#));
- (iii) pre-mixed burner system requirements; and
- (iv) temperature limits for adjacent surfaces when the appliance is installed with zero clearance from side and rear walls.

The AS/NZS 5601 series of Standards provides essential requirements and means of conformance for gas installations. Any reference to AS/NZS 5601 in AS 4563 should be considered as reference to the appropriate part of the AS/NZS 5601 series of Standards (i.e. AS/NZS 5601.1 or AS/NZS 5601.2).

The terms “normative” and “informative” are used in Standards to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

1 Scope and general

1.1 Scope and application

1.1.1 Scope

This Standard specifies general requirements and test methods for various types of commercial catering gas equipment. The fuel gases are natural gas (as described in AS 4564), town gas, liquefied petroleum gas (LP Gas, as described by AS 4670) and tempered liquefied petroleum gas.

NOTE Other statutory and regulatory requirements may be applicable to the product(s) that fall within the scope of this Standard. Manufacturers, importers or distributors have legal obligations to ensure that products conform to such requirements.

Figures referred to in this Standard are located in [Appendix A](#).

Equipment for controlling gas pressure and measuring gas volume is specified in [Appendix D](#).

1.1.2 Application

Appliances shall conform to the general requirements of [Sections 2, 3, 4](#) and [5](#), and to the requirements in each of following Sections that is applicable to the nature of the appliance.

[Section 6](#): Boiling tables — Open and closed top, Chinese cooking tables

[Section 7](#): Salamanders, grillers and toasters

[Section 8](#): Solid grill plates and griddles

[Section 9](#): Barbecues

[Section 10](#): Ovens

[Section 11](#): Boiling water units

[Section 12](#): Atmospheric steamers

[Section 13](#): Stockpots and brat pans

[Section 14](#): Fryers

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Section 15: Food warmers including bains marie

Section 16: Pasta cookers and rethermalizers

Section 17: High temperature cookers

Section 18: Mobile serving appliances

AS 3645 specifies essential requirements for gas equipment that require regulatory approval before sale. This Standard is intended to provide a means of demonstrating conformance to AS 3645.

1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

- AS 1722.2, *Pipe threads of Whitworth form, Part 2: Fastening pipe threads*
- AS 4343, *Pressure equipment—Hazard levels*
- AS 4617, *Manual shut off valves*
- AS 4620, *Thermoelectric flame safeguards*
- AS 4621, *Regulator for use with liquid petroleum—Vapour phase*
- AS 4625, *Electronic flame safeguards and flame detectors*
- AS 4627, *Quick-connect devices for gas*
- AS 4629, *Automatic shut-off valves and vent valves*
- AS ISO 7.1, *Pipe threads where pressure-tight joints are made on the threads — Dimensions, tolerances and designation*
- AS/NZS 1869, *Hose and hose assemblies for liquid petroleum gas (LP Gas), natural gas and town gas*
- EN 298, *Automatic gas burner control systems for gas burners and gas burning appliances with or without fans*

1.3 Terms and definitions

1.3.1
ambient temperature
temperature of the air surrounding the appliance, as measured by a dry bulb thermometer or equivalent

1.3.2
appliance connection
point of connection on the appliance to consumer piping or to any hose assembly supplied with the appliance

Note 1 to entry: This may be the same as the gas inlet connection.

1.3.3
appliance regulator
device fitted to an appliance to control the gas pressure or gas volume delivered to that appliance

1.3.4
atmospheric burner
burner system where all the air for combustion is introduced by the inspiring effect of a gas injector and/or by the natural draught in the combustion chamber without mechanical assistance

1.3.5
atmospheric steamer
appliance in which the cooking medium is steam at atmospheric pressure

1.3.6
automatic ignition
lighting of gas at a burner without a manual operation whenever gas flows from the burner

1.3.7
automatic shut off valve
valve that operates automatically to shut off gas supply to an appliance

1.3.8
available gas
line gas
readily available gas with similar characteristics to the reference test gas

1.3.9
bain marie
appliance that keeps cooked food hot for serving

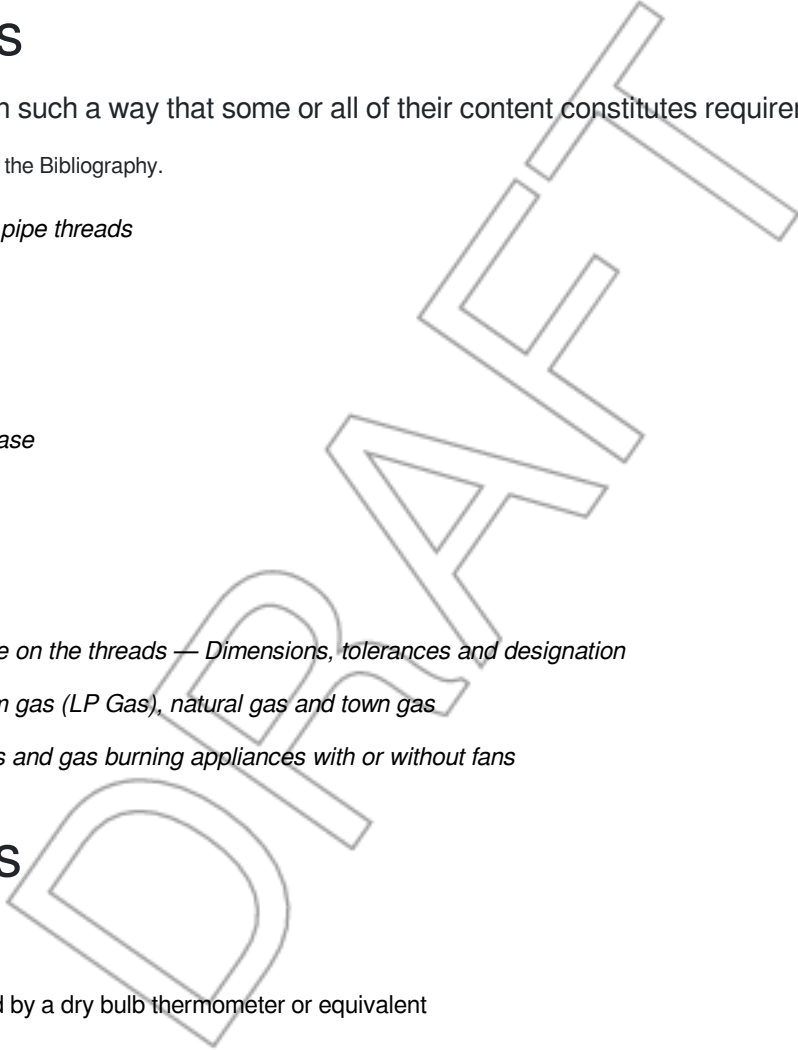
Note 1 to entry: A bain marie may include: fitted food containers with or without lids recessed in the top surface of the appliance; heated cabinet (hotpress); or open wells where food containers are placed on a heated surface.

1.3.9.1
dry bain marie
appliance that keeps cooked food hot with heated air

1.3.9.2
wet bain marie
appliance that keeps cooked food hot using heated water

1.3.10
barbecue
char grill

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cross lighting

lighting of one burner from another either directly or by means of an intermediate flame

1.3.26

cylinder

container for the storage of liquefied petroleum gas

Note 1 to entry: Requirements for LP Gas cylinders are specified in AS 2030.1.

1.3.27

cylinder compartment

compartment partially or fully enclosed on at least three sides that is intended to contain an LP Gas cylinder or cylinders either for storage or for direct connection to an inlet

1.3.28

determined gas consumption

gas consumption rate, using reference gas at specified test pressures and with ambient conditions corrected to metric standard conditions

Note 1 to entry: Determined gas consumption is usually expressed in megajoules per hour (MJ/h).

1.3.29

drain valve

device used to hold and release liquid from an appliance

1.3.30

draught diverter

device, without moving parts, fitted in the flue of an appliance for isolating the combustion system from the effects of pressure changes in the secondary flue

1.3.31

excess air

air in excess of that required for complete combustion that is mixed with the combustion products, in the combustion chamber

1.3.32

fan assisted combustion system

system in which all or part of the combustion air is supplied and/or in which the products of combustion are evacuated by mechanical means that is an integral part of the appliance

1.3.33

flame abnormality

flame condition that results in spitting, sputtering, lifting or floating flames, lighting back, extinction, yellow tipping, carbon deposition, objectionable odour and undue noise

Note 1 to entry: If the length of the yellow tipping is less than 20 % of the total length of the flame on visual inspection, it is not considered to be “appreciable” yellow tipping.

Note 2 to entry: In appliances designed specifically for a luminous effect, yellow tipping and limited lifting or floating flames or limited carbon deposition within the appliance are not considered abnormal.

1.3.34

flame detector

device that is sensitive to flame properties and initiates a signal when flame is detected

1.3.35

flame establishment period

period that begins when the fuel valve is first energized and ends when the flame supervision system is first required to supervise that flame

1.3.36

flame failure response time

time taken for the flame safeguard to detect loss of flame and de-energize the shut off valve

1.3.37

flame lifting

separation of a flame from a burner port, whilst continuing to burn with its base some distance from the port

1.3.38

flame proving period

supervised period following the flame establishment period and before any further operation other than shut down is permitted

1.3.39

flame safeguard

safety device that automatically cuts off the gas supply if the actuating flame is not detected

1.3.40

flame safeguard system

system consisting of a flame detector(s) plus associated circuitry, integral components, valves and interlocks the function of which is to shut off the fuel supply to the burner(s) in the event of ignition failure or flame failure

1.3.41

flame tracking

flame travel

ignition of discharged gas or gas/air mixture from one burner port to an adjacent burner port

1.3.42

flue

passage through which flue gases are conveyed away from an appliance, excluding draught diverter, barometric device, fan or similar part

Note 1 to entry: The terms “flue” and “exhaust duct” may be used interchangeably when related to gas appliances.

1.3.43

flue connection

device incorporated in an appliance for the connection of a flue system

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Note 1 to entry: Jointing material may be in the form of a tape, cord or sheet.

1.3.75

light back

transfer of the flame from the burner tip or port into the body of the burner or back to the injector

1.3.76

lockout

1.3.76.1

non-volatile lockout

safety shut down condition of the control system which can only be reset by a manual operation

1.3.76.2

volatile lockout

safety shut down condition of the control system which can be reset by a manual operation or by the loss and subsequent restoration of the electricity supply

1.3.77

lower explosive limit

LEL

lowest percentage of gas in air at which combustion can be self-sustaining

Note 1 to entry: Lower explosive limit is usually determined at metric standard conditions.

1.3.78

manual ignition

1.3.78.1

direct manual ignition

lighting of a burner by the use of a hand held ignition device

1.3.78.2

remote manual ignition

lighting of a burner by a manual operation where the ignition activating device is remote from the ignition point

1.3.79

mechanical air supply equipment

device used to bring air to the burner for the purpose of combustion

1.3.80

metric standard conditions

absolute temperature of 288.15 K (15 °C) and an absolute pressure of 101.325 kPa

1.3.81

mixing tube

part of an atmospheric burner in which the air and gas are mixed

1.3.82

mobile serving appliance

appliance, with wheels, incorporating an integral LP Gas supply designed to be easily moved by one person for hot food service in areas outside of the commercial kitchen area

1.3.83

natural draught

upward flow produced by the tendency of warmed gases to rise

1.3.84

nominal gas consumption

appliance gas consumption, as stated in manufacturer's specifications, instructions, general communications and on the appliance

Note 1 to entry: This is the fundamental quantity on which all methods of test are based and is the starting point for all performance requirements.

Note 2 to entry: Nominal gas consumption is usually expressed in megajoules per hour (MJ/h).

1.3.85

nominal test point pressure

gas pressure specified by the manufacturer, at which the burner is designed to operate, and measured at a test point after any regulator or other valve in the gas train to the burner

1.3.86

normal test gas pressure

minimum gas supply pressure, measured at the gas inlet connection

1.3.87

open flued appliance

indoor appliance designed to be connected to a flue system, its combustion air being drawn from the room or space in which it is installed

1.3.88

open top boiling table

boiling table with pan supports

1.3.89

orifice

precise aperture that functions as a metering device to control the gas consumption of a burner

Note 1 to entry: The orifice also acts as a directional guide for the gas injected into the burner throat.

1.3.90

oven

enclosed and insulated cabinet in which food is cooked

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volume of the combustion chamber and all areas where combustion products and combustible vapours, dusts or gases may accumulate in the appliance

quick-connect device

two-part mating plug and socket assembly for connecting an appliance to a gas supply without the use of tools

rated

maximum value for which a component is designed to operate without deterioration or failure, as specified by the manufacturer

regulator

device that automatically regulates the outlet pressure or the outlet volume of gas passing through it to a predetermined value

Note 1 to entry: Regulators may be adjustable (usually spring-loaded) or non-adjustable (usually weight-loaded).

relative density

specific gravity
ratio of the mass of a volume of gas to the mass of the same volume of dry air under metric standard conditions

Note 1 to entry: Calculation of relative density is in accordance with ISO 6976.

relief device

safety device designed to forestall the development of a dangerous condition by preventing pressure, temperature or vacuum build-up

removable

components that are intended to be removed with or without the use of a tool

safety shut down

action of shutting off all gas and ignition energy by means of a safety control such that restart cannot be accomplished without a full start cycle

safety shut off system

arrangement of valves and associated control systems which shuts off the supply of gas when required, using a device which senses the approach to an unsafe condition

safety shut off valve

safety shut off valve
automatic valve used to shut off gas supply to an appliance when a signal is generated indicating the approach to an unsafe condition

salamander

stand-alone griller

Note 1 to entry: Grillers are commonly incorporated into an appliance with other cooking functions. An appliance that is a dedicated griller is known as a salamander.

secondary flue

that portion of the flue system conveying flue gases from the draught diverter, barometric device, fan or similar part to the flue terminal

standard test vessel

vessel with specified dimensions and properties for testing purposes

Note 1 to entry: See [Table A.8](#) for specifications of standard test vessels.

start flame establishment period

period during which the start gas safety shut off system is permitted to be open before the flame safeguard is required to supervise the start gas flame (see [Appendix E](#))

start gas

gas flowing at a pilot or, when no pilot is fitted, at a main burner during the flame establishment period for initial ignition

start gas rate

restricted gas flow rate admitted either to a separate pilot burner or to the main burner during the start flame establishment period

steamer

appliance that heats food by exposure to steam

Note 1 to entry: The steam in a steamer may be either at atmospheric pressure or higher pressure.

stockpot

appliance that heats a large vessel from below designed for the bulk cooking of liquid foodstuffs

Note 1 to entry: Liquid foodstuffs typically include soup, stock and porridge.

surface combustion burner

burner where combustion takes place on the surface of a perforated or porous material or gauze

1.3.124

test gas

gas intended for the verification of the operational characteristics of appliances

Note 1 to entry: Test gases consist of reference gases and limit gases.

1.3.125

thermostat

device that automatically maintains a pre-determined temperature

1.3.126

thermostat bypass

integral part of a thermostat control that enables a pre-set volume of gas to bypass the thermostat valve

1.3.127

universal LP Gas appliance

appliance intended for use with propane, butane or any mixture of propane and butane

1.3.128

unsafe condition

condition which may lead to the following:

- (a) injury to persons or animals;
- (b) damage to the appliance; or
- (c) damage to the surroundings

1.3.129

valve

device for the purpose of controlling or shutting off flow

1.3.130

Wobbe index

Wobbe number

gas property which measures the amount of heat released by a gas burner with a constant orifice

Note 1 to entry: Wobbe index is an indicator of the interchangeability of fuel gases, such as natural gas, liquefied petroleum gas, and town gas, and is used to compare the combustion energy output of a burner.

Note 2 to entry: Wobbe index is expressed in megajoules per cubic metre (MJ/m³) and is calculated as —

$$WI = \frac{\text{Heating value}}{\sqrt{\text{Relative density}}}$$

1.3.131

working parts

components intended to be handled by the user while operating the appliance

Note 1 to entry: These may include controls, door handles, and buttons to operate piezo ignition systems.

1.3.132

working surfaces

surfaces through which heat passes as part of the primary function of the appliance

1.3.133

wok

rounded bottom cooking vessel

1.4 Test methods

The test methods listed below are located in [Appendix B](#).

- B.1 Gas leakage test
- B.2 Gas consumption
- B.3 Gas pressure regulator test
- B.4 Burner ignition — Pilot light back and blocked aeration
- B.5 Ignition at reduced pilot rate test
- B.6 Holding time of thermoelectric flame safeguard test
- B.7 Flame tracking at ignition test
- B.8 Shut off time for safety shut off system test
- B.9 Ignition gas flow rate (delayed ignition) test
- B.10 Ignition cycles — Prior to lockout/after flame failure test
- B.11 Determination of CO/CO₂ ratio for independent burners — Overload
- B.12 Determination of CO/CO₂ ratio for permanent pilots — Overload
- B.13 Determination of CO/CO₂ ratio and O₂ levels — Appliances for which [Clause 4.2.1](#) is not applicable
- B.14 Determination of CO/CO₂ ratio for independent surface combustion burners — Underload test
- B.15 Flame characteristics at maximum and minimum limiting conditions
- B.16 Burner ignition at maximum and minimum limiting conditions
- B.17 Delayed ignition at maximum and minimum limiting conditions
- B.18 Unburnt gas release from burner system
- B.19 Combustion air supply test
- B.20 Spillage of combustion products test
- B.21 Performance with updraught, downdraught and blocked flue tests
- B.22 Burner stability to draught test
- B.23 Pilot stability to draught test

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- B.24 Effect of appliance door operation on flame stability test
- B.25 Blocked condensate drain test
- B.26 Temperature hazards test
- B.27 Temperature hazards — Zero clearance test
- B.28 Heat resistance
- B.29 Heat resistance — Light back condition
- B.30 Electrical supply variation test
- B.31 Zinc based alloy test
- B.32 Permanent markings test
- B.33 Strength of boiling tables
- B.34 Effect of spillover on ignition systems test
- B.35 Strength test — Shelves — Salamanders and grillers
- B.36 Strength of ovens
- B.37 Strength test — Shelves — Ovens
- B.38 Strength test — Drop down doors — Ovens
- B.39 Strength test — Side hinged doors — Ovens
- B.40 Strength of atmospheric steamers
- B.41 Temperature of surfaces and cooking oil
- B.42 Operation of low water level safety device
- B.43 Strength of stockpots
- B.44 Automatic control — Fryers
- B.45 Over-temperature device — Fryers
- B.46 Strength of fryers, pasta cooker and rethermalizers
- B.47 Temperature control and maintenance — Wet bains marie
- B.48 Automatic temperature control — Food warmers and bains marie
- B.49 Temperature maintenance — Dry bain marie
- B.50 Heating time — Hot press
- B.51 Temperature maintenance and variation — Food warmers
- B.52 Strength test — Shelves, food warmers and bains marie
- B.53 Stability and strength test — High temperature ovens
- B.54 Determination of CO/CO₂ ratio for independent burners — Mobile serving appliance
- B.55 Containment of hot liquids — Mobile serving appliance
- B.56 Strength test — Mobile serving appliance
- B.57 Stability test — Mobile serving appliance

2 Design and construction

2.1 General

2.1.1 Controls and safety components

All components relating to the safe operation of the appliance shall conform to the requirements of the relevant component Standard(s) as far as they reasonably apply.

NOTE This includes, but is not limited to, automatic ignition systems, flame safeguards, flue cowls, gas valves, regulators, pressure switches and transducers, whether or not these carry gas.

2.1.2 Manual shut off valves

Manual shut off valves fitted to an appliance shall conform to AS 4617 and be classified as a Type 1 or Type 2.

2.1.3 Classification of safety shut off valves

Where a safety shut off system is required, the minimum classification of the valve shall be selected in accordance with [Table 2.1](#).

Table 2.1 — Safety shut off valve selection and classification	
Burner type	Standard and classification
Atmospheric	AS 4620 or AS 4629, Class 3
Induced draught	AS 4629, Class 3
Forced draught with air pressure not exceeding 3 kPa	AS 4629, Class 2
Forced draught with air pressure exceeding 3 kPa	AS 4629, Class 1

2.1.4 Safety devices and interlocks

Safety devices, interlocks and their associated parts shall be adequately protected and shall not be capable of being inadvertently overridden. Safety shut off valve(s) shall not be rendered inoperable.

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2.1.5 Over-temperature cut-out device

The over-temperature cut-out device shall—

- (a) be of the fail safe type; and
- (b) cause a non-volatile lockout.

2.1.6 Main burner automatic shut off valves

For appliances with automatic ignition all gas to the main burner shall pass through at least two automatic shut off valves in series that may be in a single control body.

2.1.7 Suitability of bearings

Bearings for motors, blowers or fans shall be suitable for the temperatures to which they are subjected in normal operation.

NOTE Normal operation means operating at nominal gas consumption with the fan operating at all fan speeds (including the “OFF” position if the appliance will function in that condition).

2.1.8 Protection of bearings

Fan and motor bearings shall be protected from dust and lint. Where for this purpose, filters are fitted to the inlet air stream, they shall not interfere with the combustion air of the appliance.

2.1.9 Protection of vitreous enamel

Screw heads in contact with cover coat vitreous enamel shall be provided with means of preventing enamel damage.

NOTE This provision is optional in the case of ground coat or wiped areas.

2.1.10 Protection of electric lamps

Electric lamps shall be protected from damage.

2.1.11 Provision for removal of condensate

Where the appliance is specifically designed to operate under condensing conditions, adequate provision shall be made for the collection and removal of condensate.

2.1.12 Appliance base

The base of an appliance intended to stand on surfaces that may become wet shall be designed to resist corrosion of the base material.

2.1.13 Provision for moving appliances

Mobile appliances shall be provided with means to facilitate moving the appliance safely.

2.1.14 Adequacy of means of support

Appliances shall be provided with adequate means of support which shall allow the appliance to remain stable on the intended supporting surface and shall not have sharp edges in contact with the supporting surface.

2.1.15 Positioning of removable components

User accessible removable components shall be positioned positively. Reasonable rearrangement of such parts shall not be possible unless it can be demonstrated that the changes do not adversely affect combustion or appliance safety.

NOTE Removable components include, for example, pan supports, flame tamers and decorative coals.

2.1.16 Provision for an LP Gas cylinder

Appliances other than mobile serving appliances shall not incorporate provision for an LP Gas cylinder.

2.2 Features specially required

2.2.1 Normal gas inlet pressure

Normal gas inlet pressure shall be as follows:

- (a) LP Gas appliances: 2.75 kPa.
- (b) Natural gas appliances: 1.13 kPa.
- (c) TG and TLP appliances: 0.75 kPa.

2.2.2 Provision of pressure regulators

A gas pressure regulator shall be provided with each appliance.

An appliance with an adjustable regulator shall have a nominated test point pressure not exceeding:

- (a) Town gas, TLP: 0.63 kPa.
- (b) Natural gas: 1.00 kPa.
- (c) LP Gas: 2.75 kPa.

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An appliance with a non-adjustable regulator shall have a nominated test point pressure for validation purposes.

An appliance incorporating a zero pressure regulator or an air/fuel ratio controller, pneumatic type (ISO 23551-2) satisfies this requirement and does not need a separate gas appliance regulator.

2.2.3 Positioning of regulators

Regulators shall be so placed that—

- (a) breather holes cannot become easily blocked; and
- (b) overheating and the risk of ignition of gas leaking from the breather hole is minimized.

2.2.4 Means for gas pressure measurement

Readily accessible means that are designed to accept 6 mm bore flexible tubing shall be provided to allow the gas pressure in the appliance to be measured while the appliance is in operation.

When a dedicated pressure test point is fitted, it shall contain a limiting orifice not exceeding 1.0 mm or equivalent restriction.

2.2.5 Fitting of flame safeguards

Each burner system shall be protected by a flame safeguard.

2.2.6 Bypass for thermostatically controlled burners

Thermostatically controlled burners shall include a thermostat bypass or other means to ensure automatic reignition of the burner.

2.2.7 Control of bleed lines

Bleed lines from diaphragm type automatic valves shall be constructed so that there is no continuous bleed during the “off” period and terminate in a location such that—

- (a) ignition of the bleed gas by the main burner or pilot is ensured; and
- (b) blockage of the bleed line tip is prevented.

2.2.8 Means to turn off gas supply to pilots

Accessible means shall be provided for turning off the gas supply to pilot burners without altering the setting of any pilot gas consumption adjusting device.

2.2.9 Programmable electronic systems

Where a programmable electronic system (PES) is employed for safety related functions of burner management systems, the PES shall conform to the relevant requirements of AS 4625 and EN 298 (or equivalent.)

2.3 Burners and ignition systems

2.3.1 Aeration adjustment for universal LP Gas appliances

For universal LP Gas appliances, any means of primary burner aeration adjustment shall require the use of a tool.

2.3.2 Protection of ports and injectors

Any ports and injectors that may be exposed in their normal operation to falling particle, grease drippings, accidental spill or boilover shall be protected against blockage.

2.3.3 Restrictions on gauze over primary air ports

Gauze shall not be fitted over primary air ports of burners other than pilots.

2.3.4 Positive location of flash ignition tubes

Flash ignition tubes shall be positively located in relation to source of ignition and flame ports, to prevent misalignment or rendering of the lighting system inoperative by normal handling, dismantling or reassembling, or cleaning of the appliance.

2.3.5 Support of pilots, ignitors and flame sensing devices

Pilots, ignitors and flame sensing devices shall be supported in such a manner that their position relative to each other and the main burner(s) shall remain fixed.

2.3.6 Location of burner mixing tubes

Burner mixing tubes shall be positively located in relation to gas injectors. Where a mixing tube rests on an injector, provision shall be made to prevent the mixing tube from interfering with the correct functioning of the valve or injector.

2.3.7 Burner supports

Burner supports shall be such that the burners cannot be easily displaced in normal usage.

2.3.8 Securing of removable burner components

Removable burner components, when in position, shall be secure and designed so that they cannot be disturbed in normal usage.

2.3.9 Fixing of gas manifolds

Gas manifolds shall be firmly fixed to prevent displacement during handling or installation.

2.3.10 Burners with media

The specification for the media shall include the following:

- (a) Clear definition of the type of material.
- (b) Size and size distribution.
- (c) Maximum and minimum depth of media bed.

2.3.11 Tray type burner-turndown limits

Appliances using tray type burners with granular or other porous media through which gas passes before ignition shall be fitted with a device that limits turndown gas consumption to prevent flame abnormality at the turndown condition.

2.3.12 Burners with remote manual ignition

The remote manual ignition of a burner, including pilots, shall be visible or visibly indicated to the user while operating the ignition devices and appropriate gas controls.

2.3.13 Burners with direct manual ignition

The direct manual ignition of a burner, including pilots, shall be accessible and visible while operating the appropriate gas controls.

2.3.14 Manually operated burners enclosed in a compartment

Where manually operated burners are enclosed in a compartment in which an explosive accumulation of gas can occur it shall be necessary to open the compartment to light the burner, unless an adequate interlock purge is provided.

2.4 Materials

2.4.1 Suitability of materials and finishes

The quality and thickness of the materials and finishes, including dressings and lubricants used in the construction of an appliance shall be such that the constructional and performance characteristics do not alter significantly during a reasonable life and under normal conditions of installation and use.

When the appliance is installed in accordance with the manufacturer's instructions, all components shall withstand the mechanical, chemical and thermal conditions to which they may be subjected in the course of normal operation.

2.4.2 Resistance to corrosion

All materials shall be resistant to corrosion under normal conditions of installation and operation of the appliance.

2.4.3 Materials containing asbestos

Materials containing asbestos shall not be used.

2.4.4 Materials in contact with gas

Materials in contact with gas shall be suitable for all gases that the appliance is intended to use.

2.4.5 Components required to be placed in a flame

Pilots, thermocouples and other components required to be placed in a flame shall be resistant to the effects of heat and corrosion. When refractory alloys are used, they shall not produce a catalytic cracking effect.

2.4.6 Zinc based alloys

Zinc based alloys shall not be used in contact with water or condensate. Brass is excluded from this requirement.

2.4.7 Jointing compounds and jointing materials

Jointing compounds and jointing materials shall be of a type demonstrated as suitable for the conditions of use. Refer to AS 4623 for information on jointing compounds and materials.

2.4.8 Thermal insulation

Thermal insulation shall—

- (a) not contaminate food or water in the appliance, nor produce obnoxious odours, fumes, nor corrode materials with which it is in contact;
- (b) be fitted in such a way that it is not rendered ineffective or objectionable by—
 - (i) settling;
 - (ii) dislodgment; or
 - (iii) condensation during the normal operation of the appliance; and
- (c) be protected against rodents.

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2.4.9 Protection of aluminium tubing

Aluminium tubing in areas of restricted ventilation shall be provided with a protective barrier to prevent corrosion due to contact with condensation, insulation and other materials of the appliance.

2.5 Design for assembly and installation

NOTE Refer to AS/NZS 5601 (series) for further requirements on the installation of catering gas equipment.

2.5.1 Compliance in alternative forms

If appliances are so designed that certain components may be fitted or omitted, e.g. legs or trolleys, the appliances shall conform to all requirements in their alternative forms.

2.5.2 Fixing of gas connections

The gas inlet connection and appliance connection shall be fixed to prevent rotation.

This requirement is met if the connection can be held in position by means of a spanner while making or breaking the connection in accordance with the manufacturer's instructions.

NOTE The gas inlet connection and the appliance connection may be the same.

2.5.3 Gas inlet connection

Where the appliance is to be connected to consumer piping, the gas inlet connection shall—

- (a) have a thread in accordance with AS ISO 7.1 or AS 1722.2; or

NOTE Refer to AS 3688 for guidance on the appropriate class of thread for various types of connection.

- (b) have a quick-connect device in accordance with AS 4627 Type 1 or 2.

Where the appliance is to be directly connected to an LP Gas cylinder, the inlet connection to the hose and regulator shall conform to AS 4627, Type 27.

2.5.4 Access to connection

The gas inlet and water connections shall have sufficient free space to enable connection and disconnection.

2.5.5 Appliance connection for appliances connecting directly to an LP Gas cylinder

2.5.5.1 Gas hose connection

Where the appliance is intended to be directly connected to an LP Gas cylinder, the appliance connection between the hose assembly and the appliance shall be—

- (a) a threaded connection using threads in accordance with AS ISO 7.1 or AS 1722.2;
- (b) a Type 2 quick-connect device in accordance with AS 4627; or
- (c) a 3/8" SAE Flare connection with 5/8-18 UNF threads.

2.5.5.2 Gas hose assemblies

Gas hose assemblies shall conform to AS/NZS 1869 and be Class B or Class D.

2.5.5.3 Protection of hose assembly

An appliance that may be installed with a hose assembly, shall be constructed so that when installed in accordance with the manufacturer's instructions with a hose assembly supplied or specified by the manufacturer and operated under normal conditions, the hose assembly shall not be—

- (a) exposed to temperatures exceeding that for which it is designed or tested; nor
- (b) subject to tension, abrasion, kinking or permanent deformation.

2.5.5.4 Restraint where a hose assembly is used

Where an appliance is supplied with castors and is to be connected to a fixed gas supply via a flexible hose connection, a restraining tether of adequate strength shall be fixed to the appliance and be suitable to be fixed to the wall within 50 mm of the connection point. The length of the tether shall not exceed 80 % of the length of the hose assembly.

NOTE The tether is to prevent stress being imparted onto the hose assembly when the appliance is moved out of its normal operating position.

2.5.6 Compression fittings

Compression fittings on gas lines shall conform to the following conditions:

- (a) They shall be made to an acceptable standard and the mating surfaces shall be compatible.
- (b) Loose olives, where used, shall be symmetrical to prevent incorrect assembly.
- (c) Shear olives, where used, may be asymmetrical.

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Table 2.5.9 — Torque values

Nominal size, mm	Torque, Nm
6	15
8	20
10	35
15	50
20	75
25	125
32	160
40	200
50	250

2.5.7 Design of air entry and combustion product discharge

Appliances shall be so designed and constructed that the flueway terminals, explosion reliefs and openings for the entry of combustion air or discharge of combustion products are part of the appliance structure, and unlikely to be obstructed by cabinets, walls or partitions when the appliance is installed.

In the case of appliances specifically designed to be built-in, any clearance necessary to the safe and effective operation of the appliance shall be ensured by means of permanently attached spacers.

2.5.8 Flue terminal and draught diverter construction

Flue terminals and draught diverters shall be constructed so that they can only be installed in the correct position.

2.5.9 Design to prevent flueway blockage

Flueways and terminals shall be designed such that they are:

- (a) not easily blocked under normal use;
- (b) readily cleanable; and
- (c) unsuitable for the placement of vessels over the flueway terminals.

2.5.10 Adequacy of means of support

Appliances having more than two wheels shall be provided with means to prevent movement of the appliance when in use.

2.5.11 Means to level appliance

Appliances intended for stationary installations shall be fitted with means for levelling.

2.6 Design for maintenance

2.6.1 Accessibility for adjustment

Components and integral parts that may require adjustment shall be accessible for such adjustment. In particular, the following shall be readily and easily adjusted without risk of injury while the appliance is installed:

- (a) Aeration controls.
- (b) Pilots.
- (c) Thermostat bypasses where provided.
- (d) Thermostat calibration.
- (e) Regulator adjustments.
- (f) Gas consumption adjusters.
- (g) Ignition devices.
- (h) Safety devices.
- (i) Pressure control devices.
- (j) Vacuum control devices.
- (k) Belt tension adjusters.
- (l) Water flow rate controls.

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- (h) Normal working liquid level (where applicable).
- (i) Where manufacturer’s instructions require an appliance to be installed on a non-combustible floor, the marking:
NOT TO BE INSTALLED ON A COMBUSTIBLE BASE
- (j) Where manufacturer’s instructions require an appliance to be installed on fire resistant material, the marking:
TO BE INSTALLED ON FIRE RESISTANT MATERIAL

2.8.3 Marking of doors and covers

Those doors, covers and other components that shall be left open, closed or removed during operation shall be indicated with a permanent marking.

2.8.4 Marking of flash ignition tubes

Flash ignition tubes that are used for the manual ignition of burners shall have the point of ignition suitably marked.

2.8.5 Indication of function

The off position of all gas valves shall be clearly indicated. Gas valves serving more than one function shall have the position of each function including any special lighting position, clearly indicated.

2.8.6 Identification of gas valves

Each gas valve, including pilot valves, shall be identified with the burner it controls.

2.8.7 Gas type marking

A marking stating the type of gas for which the appliance has been manufactured and adjusted shall be located in a prominent position near the gas connection.

For appliances intended for use with a flexible connection to a fixed gas supply system, additional wording shall refer to the local gas supplier for confirmation of the gas type, if in doubt.

2.8.8 Gas type colour code

Where a colour code only is used to indicate the type of gas for which an appliance or component is to be used, it shall conform with [Table 2.8.8](#).

Table 2.8.8 — Gas type colour codes			
Gas type	Colour code (refer to AS 2700)	PMS colour code	RAL colour code
Natural gas (Australia)	Black	419	9005
Natural gas (NZ)	Black	419	9005
Propane	Signal orange	1595	2010
Butane	Grass green	363	6010
Universal LP Gas	Signal red	1805	3001
NZLPG	Vivid yellow	130	1003
TLP	Light pink	1895	3015
TG	Ultramarine blue	2747	5002
All gases	Primrose	121	1018
NOTE The RAL Classic Colour System Series and Pantone Matching System (PMS) colour codes are indicative only.			

2.8.9 Markings on packaging

The packaging shall be marked in a prominent position with—

- (a) Except for mobile appliances, the following:
TO BE INSTALLED ONLY BY AN AUTHORIZED PERSON
- (b) The maximum packaged weight in kilograms.

2.8.10 Marking of thermostat dials

Variable setting thermostats and temperature controls shall clearly indicate the action required to raise or lower the temperature.

2.8.11 Interference with combustion air

Where it is possible to remove any part of an appliance without the use of tools and this removal could cause interference with flueing or the entry of combustion air, the appliance shall be marked with a suitable warning.

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Injectors shall carry an identifying cipher. The cipher shall be in the form of numerals indicating the orifice size in millimetres or the drill size number. In the case of pilot injectors, a colour coding in accordance with [Table 2.8.8](#) is acceptable. Alternatively, the injector size shall be marked on the appliance.

2.9.1 Language

2.9.2 Installation

2.9.2.1 Instructions supplied with the appliance

- (a) Model or type of appliance.
- (b) The gas for which the model or type of appliance is intended, and data such as gas consumptions, pressures, etc, or reference to where this information is marked on the appliance.
- (c) The requirements of AS/NZS 5601 (series), local authority, gas, electricity and any other relevant statutory regulations.
- (d) Overall dimensions of the appliance and location by measurement of connecting points of gas, water, electricity, flues.
- (e) The alternative types of installations which may be made.
- (f) Details of removal of any transit protection.
- (g) Details of the methods of connection and alternatives.
- (h) Required surroundings of the appliance, clearance from cupboards and fixings, walls, curtains, floors, or other combustible materials.
- (i) Details of methods of installation that affect other trades, e.g. details of built-in flues. Where electrical connections are required, details for the electrician.
- (j) Special conditions that shall be avoided, e.g. marine environment, and any conditions necessary to ensure optimum performance.
- (k) Details of any assembly work required to be done by the installer.
- (l) Explicit instructions to the installer to test the operation of the appliance after installation.
- (m) Details of the necessary testing and instructions for minor adjustments.
- (n) Instructions on the procedure to be adopted if the appliance cannot be adjusted to perform correctly.
- (o) Fitting of temperature and pressure relief valve(s) where applicable.
- (p) For open flued appliances, details of the necessary ventilation requirements including the size of any openings in accordance with AS/NZS 5601 (series).
- (q) A wiring diagram with the connection terminals, including those for external controls.
- (r) An indication of the external controls that can be used with the appliance.
- (s) Method of connection to other services e.g. water, electricity, drainage, etc.
- (t) The removal of any part of an appliance that could cause interference with the entry of combustion air.
- (u) The injector size(s).
- (v) The maximum dimensions of overhanging projections
- (w) For appliances with fan assisted combustion systems, conditions when a barometric device is required in the flue system and the method of its installation.
- (x) Details of the commissioning requirements, including instruments required.

2.9.2.2 Built-in appliances

Appliances designed as “built in” units shall be provided with clearly defined and prominent instructions for their installation. These instructions shall specify the uses of non-combustible materials for the immediate surrounds of the appliance, unless combustible materials are suitable.

2.9.3 Operation

2.9.3.1 General

Operating instructions shall be supplied with each appliance covering each separate function of the appliance and such dismantling, cleaning and assembly as is necessary for the user and that include the following:

- (a) For programmed appliances, a clear explanation of programming and the effect of any power supply interruption.
- (b) Information to assist the user to recognize abnormal operation which requires service.
- (c) A recommended maintenance schedule for the life expectancy of the appliance.

- (d) Where service and any necessary replacement parts may be obtained.
- (e) Clear and complete instructions for lighting and/or shut down where incorrect procedures can result in a hazardous condition.
- (f) Where necessary, a safe purge before the appliance is re-lit.
- (g) Where symbols are used to indicate the functions of operating controls, the meanings of these symbols.
- (h) Where an integral LP Gas supply is incorporated, the specific size and/or capacity of the cylinder to be used.
- (i) The use of large utensils.
- (j) For high temperature cookers, the manufacturer's recommended load.
- (k) For universal LP Gas appliances, a statement that the primary aeration adjustment must not be altered from the position specified by the manufacturer.

2.9.3.2 Warning statements

The instructions shall contain the following or similar statements:

DO NOT SPRAY AEROSOLS IN THE VICINITY OF THIS APPLIANCE WHILE IT IS IN OPERATION

DO NOT USE OR STORE FLAMMABLE MATERIALS IN OR NEAR THIS APPLIANCE

DO NOT PLACE ARTICLES ON OR AGAINST THIS APPLIANCE

DO NOT MODIFY THIS APPLIANCE

2.9.4 Maintenance

2.9.4.1 Documents supplied with the appliance

Any document referencing servicing instructions, supplied with the appliance, shall contain a warning that servicing shall be carried out only by authorized personnel, and that the appliance shall not be modified.

2.9.4.2 Servicing instructions and maintenance schedule

Servicing instructions shall be available and they shall include reference to the following:

- (a) Removal of covers and other parts for access to all components.
- (b) Removal of components, where applicable, for service, including—

- (i) burners;
- (ii) pilot and flame safeguard;
- (iii) ignition devices;
- (iv) thermostat;
- (v) combination control;
- (vi) water controls;
- (vii) injectors;
- (viii) filters (gas and water);
- (ix) baffles when flue cleaning is necessary;
- (x) drip trays;
- (xi) pressure and vacuum control devices; and
- (xii) printed circuit boards.

- (c) Parts replacement, including—

- (i) fan;
- (ii) over-temperature cut-out device; and
- (iii) heat exchanger or cylinder;

- (d) Adjustments to the following—

- (i) pilot;
- (ii) aeration controls;
- (iii) thermostat;
- (iv) ignition devices (spark gap);
- (v) gas rate adjuster;
- (vi) regulator;
- (vii) safety devices;
- (viii) pressure control devices;
- (ix) vacuum control devices;

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- (x) belt tension adjusters; and
- (xii) water flow rate controls.
- (e) Fault finding chart.
- (f) Wiring diagram as specified in [Clause 2.9.2.1\(q\)](#).

3 Preliminary tests — Line gases

3.1 General

3.1.1 Gases for testing

Unless otherwise specified, tests in this Standard shall be carried out using the following gases (see [Table 3.1.2](#) for test gas characteristics):

- (a) Appliances intended for use with NG shall be tested using available NG but in the case of dispute or borderline results test gas “N” shall be used.
- (b) Appliances intended for use with TG test gas “D” shall be used.
- (c) Appliances intended for use with propane only shall be tested with test gas “X”.
- (d) Appliances intended for use with butane only shall be tested with test gas “Y”.
- (e) Universal LP Gas appliances shall be tested with test gas “X” for all performance tests except for [Clauses 5.5](#) and [5.6](#) where test gas “Y” shall be used.

NOTE Nominal gas consumption is determined using test gas “X” and this is the figure marked on the appliance.

- (f) Appliances intended for use with TLP shall be tested with test gas “T”.

NOTE Where an appliance is being tested for multi-gas certification, performance results for the gas type having the highest gas consumption may be deemed to apply to other gas types for the tests in [Clauses 5.4](#) and [5.5](#).

3.1.2 Test gas composition

Reference gases and limit gases used in this Standard are specified in the test gas table ([Table 3.1.2](#)) and are based on pure components. Actual test gases shall be made up to the respective Wobbe index within $\pm 2\%$ using constituent gases of purity not less than—

- (a) 99 % for hydrogen and nitrogen;
- (b) 95 % for methane ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$);
- (c) 95 % for propane ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$);
- (d) 95 % for propene ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$); and
- (e) 95 % for butane ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$).

Where gases of the required composition or purity are not readily available, suitable blended gases of the same Wobbe index and other combustion characteristics may be used.

In case of dispute, the purity of the constituent gases shall not be less than the above values

3.1.3 Test gas pressure

For appliances for use in Australia, normal test gas pressure shall be:

- (a) When the appliance is supplied with vaporized LP Gas to the inlet at unregulated pressure from refillable containers, the pressure as specified in [Table 3.1.1](#).
- (b) When the appliance is supplied with vaporized LP Gas to the inlet at unregulated pressure from non-refillable containers, the pressure corresponding to the saturated vapour pressure of the fuel gas at a temperature of 15 °C.
- (c) For other appliances, the pressure as follows:
 - (i) 0.75 kPa for TG and TLP.
 - (ii) 1.13 kPa for natural gas and SNG.
 - (iii) 2.75 kPa for LP Gas.

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Table 3.1.1 — Normal test gas pressure		
Appliance gas type	Gas	Pressure kPa
Propane	X (propane)	630
Butane	Y (butane)	110
Universal LP Gas	X (propane)	630
	Y (butane)	110

For appliances for use in New Zealand, normal test gas pressure shall be:

(A) NZLPG: 2.75 kPa.

(B) Natural gas: The manufacturer’s marked minimum gas inlet pressure or 1.13 kPa where no minimum is marked.

3.1.4 Burners with displaceable media

Where the displacement of any coals, logs or media may interfere with the ignition or combustion of any burner, including pilots, the tests required in this Section shall be repeated with the media in the displaced position, and in the case of granular media both in the displaced position and with the media partially removed.

Table 3.1.2 — Test gas table												
Test gas	Application	Composition, percent							Characteristics ^a			
		Hydrogen	Methane	Propane	Propylene	Butane	Nitrogen	Air	Specific energy MJ/kg	Heating value MJ/m³	Relative density	Wobbe index MJ/m³
N	Natural gas	—	97.5	1	—	—	1.5	—	—	37.8	0.571	50.0
Na		—	86	14	—	—	—	—	—	45.7	0.692	55.0
Nb		13	87	—	—	—	—	—	—	34.4	0.492	49.0
Nc		—	90	—	—	—	10	—	—	34.0	0.596	44.0
S		—	—	55	—	—	—	45	—	52.1	1.296	45.0
X	LP Gas	—	—	100	—	—	—	—	50.4	95.8	1.553	76.9
Y		—	—	—	—	100	—	—	49.5	125.7	2.078	87.0
Z		—	—	—	100	—	—	—	—	88.5	1.476	72.9
T	TLP	—	—	27	—	—	—	73	—	25.4	1.142	23.0
D	TG	50	—	15	—	—	35	—	—	20.2	0.602	26.0

^a The reference conditions for the characteristics are 15 °C, 101.325 kPa, dry. The test gases shall be of a composition and of combustion characteristics as shown in the table. Where base gases of the required combustion purity are not available suitably blended gases of the same Wobbe index and other combustion characteristics may be used. In case of dispute, only gases shown in the table shall be used.

NOTE The listed characteristics for test gas “Y” are based on the properties of iso-butane.

3.2 Preparation for testing

3.2.1 Electrical safety requirements

The appliance shall conform to the following electrical safety requirements:

(a) When the appliance is disconnected from the power supply the measured resistance between the earth pin of the plug and any exposed metal on the appliance shall not exceed 1 Ω for rotating parts and 0.1 Ω for all other parts with all switches in the “ON” position.

(b) When the appliance is disconnected from the power supply the measured insulation resistance between current carrying conductors and any exposed metal shall not be less than 1 MΩ. The resistance for double insulated equipment shall not be less than 10 MΩ.

3.2.2 Setting up appliance for testing

The appliance shall be set up in accordance with the manufacturer’s instructions unless otherwise specified in this Standard. This includes the adjustment in response to combustion performance of zero pressure regulators and gas/air ratio controllers.

All services (e.g. gas, electricity, water etc.) shall be connected.

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The appliance gas train and any gas meter shall be purged with the appropriate test gas before commencing a test and when a test procedure calls for a change in the test gas.

The appliance shall be examined to ensure that it does not have any structural, mechanical or operational defects.

The gas consumption, aeration, temperature settings and other adjustments shall be checked to ensure they have been made in accordance with the manufacturer's recommendations. Adjustments shall be made with the test gas that is applicable with the inlet pressure set at normal test gas pressure.

All panels, covers and doors shall be in the fitted position during testing.

Appliances designed for use with proprietary flue components shall be tested for conformance to the requirements of this Standard with the components in place.

3.2.3 Appliance regulator not to be removed during testing

Appliance regulators are to be considered an integral part of the appliance and shall not be removed during tests, unless specifically instructed otherwise.

3.2.4 Protection from accidental draughts

The appliance under test shall be protected from accidental draughts.

3.2.5 Prevention of gas rate variation

Provision shall be made to prevent thermostats, or any other variable restriction in the gas line, from varying during tests unless otherwise specified in this Standard.

3.2.6 Turndown gas consumption

Where a test is required to be performed at turndown gas consumption, the appliance shall be tested as follows:

- (a) For non-thermostatic gas controls with limited turndown: at the lowest gas consumption to which the burner control can be set.
- (b) For non-thermostatic gas controls with unlimited turndown: at 25 % of the nominal gas consumption.
- (c) For thermostatic gas controls: at the rate determined by the bypass or where no bypass is provided, at the marked turndown setting.

3.3 Gas leakage

When tested in accordance with Test Method B.1, the leakage rate from the fully assembled gas train shall not exceed 1 mL/min when the appliance is subjected to an inlet gas pressure of 1.5 times the working pressure or 14.0 kPa, whichever is greater.

NOTE It is intended that this is the first test performed in any test program.

3.4 Gas consumption

3.4.1 Tolerance on determined gas consumption

The determined gas consumption in MJ/h of each burner other than a pilot, shall be within ± 5 % of nominal gas consumption when tested in accordance with Test Method B.2.

3.4.2 Total determined gas consumption — All burners operating

Total determined gas consumption for all burners operating together shall be within 20 % of the sum of the nominal gas consumptions when tested in accordance with Test Method B.2.

3.4.3 Determined gas consumption of pilots

The determined gas consumption of each continuously burning pilot shall not be more than 1 MJ/h when tested in accordance with Test Method B.2.

3.5 Gas pressure regulators

When tested in accordance with Test Method B.3, the measured test point pressure shall not vary by more than ± 20 % from the nominal test point pressure when the appliance inlet pressure is varied between the limits shown in Table 3.5.

For appliances incorporating zero pressure regulator, the measured test point pressure shall remain at or below atmospheric pressure.

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Table 3.5 — Test pressures — Regulator performance		
Gas type	Minimum pressure kPa	Maximum pressure kPa
Natural gas	1.13	5.0
Propane	2.75	7.0
Butane	2.75	7.0
Universal LP Gas	2.75	7.0
TLP/TG	0.75	3.0

3.6 Ignition and safety shut off systems

3.6.1 General

If the appliance is fitted with gas consumption devices that are not sealed to prevent unauthorized alteration, then the requirements shall be met at maximum and minimum settings.

3.6.2 General requirements

3.6.2.1 Pilot light back

When tested in accordance with Test Method B.4, any aerated pilots during light back, shall either ignite the main burner promptly and without undue noise or cause a safety shut off valve to close.

3.6.2.2 Aerated pilot — Blocked air

When tested in accordance with Test Method B.4, any aerated pilots, when the primary air opening is closed, shall either ignite the main burner promptly and without undue noise or cause the safety shut off valve to close.

3.6.2.3 Ignition at reduced pilot rate

When tested in accordance with Test Method B.5, the pilot flame is turned down to the point where it just actuates the flame safeguard system. In this condition, the main burner, operating at any rate at which its control will permit, shall light safely and reliably from that pilot flame or operation of the main burner shall cause the safety shut off valve to close without ignition.

3.6.2.4 Means of ignition other than permanent pilot

For any means of ignition other than a permanent pilot, when the voltage supplied to the appliance is lowered to any point where the main gas valves will still actuate, the main burner, operating at any rate at which its control will permit, shall light safely and reliably from that means of ignition, or the ignition system shall shut down safely.

3.6.2.5 Holding time of thermoelectric flame safeguard

On carrying out the normal lighting procedure on a manually ignited atmospheric burner protected by a thermoelectric flame safeguard system, the flame safeguard shall hold open within 1 min of igniting the operating flame, when tested in accordance with Test Method B.6.

3.6.2.6 Flame tracking at ignition

When tested in accordance with Test Method B.7, flames shall track freely to all ports on a burner when the gas is ignited in accordance with the manufacturer’s instructions and at any gas consumption in the operating range of the burner.

3.6.2.7 Cessation of ignition spark

If the means of ignition can interfere with the flame sensing system, then the means of ignition shall cease at the end of the start flame establishment period.

3.6.2.8 Commencement of ignition after purge

Where a pre-ignition purge period is included, the means of ignition shall commence immediately upon the completion of the purge period.

3.6.2.9 Proving of start flame

Gas shall not flow beyond the ignition safety time unless the start flame has been proven.

3.6.2.10 Self-check for safety shut off systems

Safety shut off systems shall incorporate a self-check of integral circuitry to verify that the system is not in the flame proved condition prior to start-up.

Manually operated “thermoelectric” types are exempt from this requirement.

3.6.2.11 Flame failure

Flame failure of a burner supervised by a flame safeguard shall result in safety shut down.

3.6.2.12 Main flame establishment period for burners with interrupted and intermittent pilot

Where an interrupted or intermittent pilot is used, the main flame establishment period shall not exceed 5 s.

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- (a) The start gas rate shall not exceed 4 MJ/h and the maximum start flame establishment period shall not exceed 90 s.
- (b) Throughout the flame establishment period, the gas concentration in relation to the proved air flow rate for that period shall not exceed 50 % of the lower explosive limit (LEL) for natural and town gases, or 25 % of the LEL for other fuels provided that—
 - (i) the gases during the start gas flame establishment period shall be thoroughly mixed with the air flow except in the immediate vicinity of the burner; and
 - (ii) the preheated air temperature shall not exceed 400 °C.
- (c) When tested in accordance with Test Method B.9, the ignition shall remain satisfactory when delayed for up to twice the flame establishment period.

Where the gas valves open and close multiple times during an ignition cycle, the calculation of energy released or flame establishment period shall take into account the total time that the valves are open during the cycle.

3.6.4.3 Ignition cycles prior to lockout (no flame established)

The total number of ignition cycles prior to lockout, shall be limited to five.

When tested in accordance with Test Method B.10, the following criteria shall apply to each ignition cycle after the first:

- (a) The main burner shut off valve shall remain closed during pre-ignition purge.
- (b) Each ignition cycle shall commence with the pre-ignition purge and the requirements of [Clause 3.6.4.2](#) shall be met.
- (c) The duration of the pre-ignition purge period shall be sufficient to ensure that the volume of the purging medium is at least five times the purge volume.

3.6.4.4 Reignition cycles after flame failure

When tested in accordance with Test Method B.10, up to five reignition attempts after flame failure may be made prior to lockout provided—

- (a) the main burner shut off valve is closed within 3 s of loss of flame and remains closed during pre-ignition purge;
- (b) each reignition commences with a pre-ignition purge and the requirements of [Clause 3.6.4.2](#) are met; and
- (c) the duration of the pre-ignition purge period is sufficient to ensure that the volume of the purging medium is at least five times the purge volume.

3.6.4.5 Start flame proving period

Where the nominal gas consumption of the supervised burner exceeds the maximum gas flow rate permitted in [Clause 3.6.4.2\(a\)](#), then there shall be a start flame proving period of not less than 5 s.

4 Tests under limiting conditions

4.1 General

Appliances shall conform to the requirements of this Section when supplied with the test gases and under the limiting conditions specified in each clause.

Where there is a possibility that user controls may affect ignition or combustion performance of the appliance, testing to confirm conformance to the requirements of this Section shall be carried out with the controls set to the least favourable control position.

Where the displacement of any coals, lava rock or any other media may interfere with the ignition or combustion of any burner, including pilots, the tests required in this Section shall be repeated with the media in the displaced position and in the case of granular media both in the displaced position and with the media partially removed.

4.2 Combustion performance for any independent burner — Overload

4.2.1 CO/CO₂ ratio limits for any independent burner — Overload

When tested in accordance with Test Method B.11, the CO/CO₂ ratio of the combustion products of any independent burner of an appliance operating at the test conditions specified in [Table 4.2.1](#) shall not exceed 0.02 after 10 min.

Where the overload condition cannot be achieved as the appliance incorporates a non-adjustable regulator that delivers gas only in response to the operation of an electronic control and mechanical air supply, then [Clause 4.2.2](#) is applicable.

Table 4.2.1 — Limiting conditions — Overload		
Appliance gas type	Test gas	Gas consumption (% of nominal gas consumption)
Natural gas	N	120
Propane	X	113
Butane	Y	113
Universal LP Gas	Y	125
TLP gas	T	120
Town gas	D	120

The specified overload conditions shall be obtained by adjusting the inlet pressure with the appliance regulator at its nominal setting. If the overload condition cannot be obtained with a maximum inlet pressure of 3.0 kPa then the appliance regulator shall be rendered inoperative.

4.2.2 CO/CO₂ ratio and O₂ limits for any independent burner — Overload

An appliance which incorporates a non-adjustable regulator that delivers gas only in response to the operation of an electronic control and mechanical combustion-air supply, when tested in accordance with Test Method B.13, shall satisfy the following:

- (a) CO/CO₂ ratio of the combustion products shall not exceed 0.02 after 10 min at all limiting conditions specified in Table 4.2.2.
- (b) O₂ levels in the combustion products shall not be lower than 3.5 % at all limiting conditions specified in Table 4.2.2, except for universal LP Gas the O₂ level shall not be lower than 1.0 %

Table 4.2.2 — Limiting conditions — Overload		
Appliance gas type	Test gas	Appliance inlet pressure, kPa
Natural gas	N	5.0
Propane	X	7.0
Butane	Y	7.0
Universal LP Gas	Y	7.0
TLP gas	T	3.0
Town gas	D	3.0

4.3 CO/CO₂ ratio limits — Permanent pilots

When tested in accordance with Test Method B.12, the CO/CO₂ ratio of the combustion products of a permanent pilot of an appliance operating at the test conditions specified in Table 4.3 shall not exceed 0.02 after 10 min.

Table 4.3 — Limiting conditions — Pilot overload		
Appliance gas type	Test gas	Appliance inlet pressure, kPa
Natural gas	N	3.0
Propane	X	3.5
Butane	Y	3.5
Universal LP Gas	Y	3.5
TLP gas	T	2.5
Town gas	D	2.5

4.4 CO/CO₂ ratio limits for any independent surface combustion burner — Underload

When tested in accordance with Test Method B.14, the CO/CO₂ ratio of the combustion products of any independent surface combustion burner of an appliance operating at the test conditions specified in Table 4.4 shall not exceed 0.02 after 10 min.

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Table 4.4 — Limiting conditions — Surface combustion burners			
Appliance gas type	Test gas	Appliance inlet pressure, kPa	Limiting condition
Natural gas	N	0.75	The lowest operating setting to which the burner control can be set
Propane	X	2.00	
Butane	Y	2.00	
Universal LP Gas	Y	2.00	
TLP gas	T	0.50	
Town gas	D	0.50	

4.5 Flame characteristics at maximum and minimum limiting conditions

When tested in accordance with Test Method B.15, an appliance burner shall exhibit no flame abnormality, or safety shut down shall occur, at maximum and minimum limiting conditions specified in Table 4.5. Whether the appliance is hot or at ambient temperature.

An open flued appliance fitted with a draught diverter or similar device shall conform when—

- (a) the flue connection of the appliance is closed;
- (b) a downdraught having a velocity head of up to 7.5 Pa is applied to the flue connection for 1 min; and
- (c) an updraught having a velocity head of up to 7.5 Pa is applied to the flue connection for 1 min.

An open flued appliance not fitted with a draught diverter or similar device shall conform if a back-pressure of 140 Pa is applied to the flue connection and shall shut down safely if the flue is blocked.

Table 4.5 — Limiting conditions — Flame abnormalities				
Appliance gas type	Minimum condition		Maximum condition	
	Test gas	Test point pressure, kPa	Test gas	Test point pressure, kPa
Natural gas	N	0.75 × Pt	N	1.40 × Pt
Propane	X, Z	0.75 × Pt	X, Z	1.25 × Pt
Butane	Y	0.75 × Pt	Y	1.25 × Pt
Universal LP Gas	X, Z	0.75 × Pt	Y, Z	1.25 × Pt
TLP gas	T	0.75 × Pt	T	1.25 × Pt
Town gas	D	0.75 × Pt	D	1.40 × Pt

Pt = nominal test point pressure (kPa)

4.6 Burner ignition at maximum and minimum limiting conditions

When the normal lighting procedure is followed and the appliance is tested in accordance with Test Method B.16, all burners shall ignite completely and quietly within 5 s for all gases, irrespective of types of ignition, at maximum and minimum limiting conditions, specified in Table 4.6 when the appliance is hot and at ambient temperature. The time shall be measured from the first flow of gas.

In the case of mains ignition systems a voltage equivalent to both 85 % and 110 % of the nominal supply voltage shall be applied to the appliance.

In the case of battery-operated ignition systems a voltage equivalent to 80 % and 100 % of the nominal voltage for each battery shall be applied to the supply contacts of the battery holder.

Five successive ignition tests shall be applied. Satisfactory ignition shall occur in all five tests.

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Table 4.6 — Limiting conditions — Burner ignition				
Appliance gas type	Minimum condition		Maximum condition	
	Test gas	Test point pressure, kPa	Test gas	Test point pressure, kPa
Natural gas	N	0.75 × Pt	N	1.40 × Pt
Propane	X	0.75 × Pt	X	1.25 × Pt
Butane	Y	0.75 × Pt	Y	1.25 × Pt
Universal LP Gas	X	0.75 × Pt	Y	1.25 × Pt
TLP gas	T	0.75 × Pt	T	1.25 × Pt
Town gas	D	0.75 × Pt	D	1.40 × Pt
Pt = nominal test point pressure (kPa)				

4.7 Delayed ignition at maximum and minimum limiting conditions

When tested in accordance with Test Method B.17, and the ignition of a manually ignited burner has been delayed for 5 s, the burner shall at both maximum and minimum limiting conditions, specified in [Table 4.7](#), whether the appliance is hot or at ambient temperature—

- (a) ignite completely;
- (b) remain alight;
- (c) not light back;
- (d) not burn outside the appliance;
- (e) not extinguish any other burner at any setting; and
- (f) not damage the appliance.

NOTE As this is a safety test under abnormal operation, explosive noise and flame roll-out may be acceptable provided—

- (i) there is no damage to the appliance;
- (ii) the burner does not light back; and
- (iii) there is no danger to persons or adjacent property.

Table 4.7 — Limiting conditions — Delayed ignition				
Appliance gas type	Minimum condition		Maximum condition	
	Test gas	Test point pressure kPa	Test gas	Test point pressure kPa
Natural gas	N	0.75 × Pt	N	1.40 × Pt
Propane	X	0.75 × Pt	X	1.25 × Pt
Butane	Y	0.75 × Pt	Y	1.25 × Pt
Universal LP Gas	X	0.75 × Pt	Y	1.25 × Pt
TLP gas	T	0.75 × Pt	T	1.25 × Pt
Town gas	D	0.75 × Pt	D	1.40 × Pt
Pt = nominal test point pressure (kPa)				

4.8 Unburnt gas release from burner system

When tested in accordance with Test Method B.18, unburnt gases shall not spill from any part of an aerated burner except for the burner ports.

The limit conditions specified in [Table 4.8](#) shall be used.

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Table 4.8 — Limiting conditions — Unburnt gases		
Appliance gas type	Test gas	Test point pressure kPa
Natural gas	N	0.75 × Pt
Propane	X	0.75 × Pt
Butane	Y	0.75 × Pt
Universal LP Gas	X	0.75 × Pt
TLP gas	T	0.75 × Pt
Town gas	D	0.75 × Pt

Pt = nominal test point pressure (kPa)

4.9 Burner interference at ignition or during combustion

Where there is a possibility that the operation of any burner may interfere with the ignition or combustion of any other burner, including pilots, then the tests required in [Section 4](#) shall be repeated under the most critical conditions with such interference conditions operating.

5 Performance specifications

5.1 Combustion air supply

5.1.1 Combustion air supply and equipment

Combustion air supply equipment shall be supplied with the appliance and shall be correctly sized and arranged to ensure an air flow adequate for all operating conditions unless a permanent marking is present to inform the user to not operate it at that setting.

5.1.2 Combustion air flow proving

Combustion air flow proving devices shall be interlocked to cause lockout or prevent an ignition attempt unless the devices are in the “no flow” condition prior to the start-up of their respective supply fans.

5.1.3 Prevention of combustion air back-flow

Where air at pressure is pre-mixed with the fuel gas, effective means shall ensure air does not pass back into the gas line.

5.1.4 Proving of means of mechanical air supply

Where combustion air is supplied mechanically, provision shall be made to prove that the means for supplying the air is operating.

5.1.5 Burner shut down following air supply failure

In the case of failure of the means for supplying the combustion air, the gas to the burner(s) requiring the air shall be shut off.

5.1.6 Obstruction of air inlets on appliances with fan assisted combustion systems

When tested in accordance with Test Method B.19, for appliances with fan assisted combustion systems the CO/CO₂ ratio of the combustion products shall not exceed 0.02 as the combustion air flow inlets into the appliance are progressively blocked until lockout occurs.

5.2 Flue operation

5.2.1 Spillage of combustion products — Flued appliances

When tested in accordance with Test Method B.20, there shall be no leakage or spillage of combustion products from a flued appliance other than the flue terminal, 5 min after ignition when the appliance is operated at nominal gas consumption.

5.2.2 Performance with downdraught, updraught and blocked flue

When tested in accordance with Test Method B.21, the CO/CO₂ ratio of the combustion products of a flued appliance shall not exceed 0.02.

During testing, the appliance is operated at nominal gas consumption. In the case of appliances with turndown or modulating controls, the appliance shall also be tested at the lowest setting and sufficient intermediate points which characterize the appliance performance.

5.3 Burner operation

5.3.1 Burner flames — Stability to draught and changing setting

When tested in accordance with Test Method B.22, a burner set at turndown and subjected to a 5 km/h draught, shall completely reignite when the draught is removed.

5.3.2 Burner stability when changing setting

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(iii) 80 °C for glass, ceramic and similar surfaces; and

(iv) 100 °C for plastics.

(b) For other appliances—

(i) 80 °C for metals;

(ii) 95 °C for vitreous enamelled steel, glass and similar surfaces;

(iii) 100 °C for plastics.

NOTE 1 Working surfaces include the following:

- (a) Pan supports.
- (b) Cooking surfaces.
- (c) Barbecue covers.
- (d) Lids.
- (e) Grease channels.
- (f) Splash/grease shields.

NOTE 2 Surfaces likely to be accidentally touched include the following:

- (a) Control panel fascias.
- (b) Side panels.
- (c) Panels adjacent to door handles.
- (d) Parts of doors that are accessible when the door is closed.

5.5.5 Temperature limits — Appliance safety

5.5.5.1 Controls and safety devices

Corrected temperatures of controls and safety devices shall not exceed the maximum continuous service temperature specified by the component manufacturer.

5.5.5.2 Components containing non-metallic diaphragms

Temperatures of components containing non-metallic diaphragms shall not exceed 45 °C above ambient, unless specified for use at higher temperatures and so marked permanently.

5.5.5.3 Components containing zinc based alloys

Where failure of a zinc based alloy may affect the safe operation of the appliance, the temperature of the alloy shall not exceed 50 °C above ambient.

5.5.5.4 Main gas and pilot lines susceptible to sulphide attack

Main gas and pilot lines of materials susceptible to sulphide attack, e.g. copper, shall not exceed 50 °C above ambient, unless internally tinned.

5.5.5.5 Flexible hoses

Corrected temperatures of flexible hoses shall not exceed the maximum temperature for that class of hose.

5.5.5.6 Joints sealed with jointing materials

Corrected temperatures of joints sealed with jointing materials shall not exceed the maximum temperature recommended by the manufacturers of the materials, under the conditions of use.

5.5.5.7 Glass components

Corrected temperatures of glass components shall not exceed the maximum temperature specified by the manufacturer of the glass.

5.5.5.8 Electrical wiring

Corrected temperatures of electrical wiring shall not exceed the maximum temperature specified for the wiring.

5.5.5.9 Wooden components

The temperature of wooden components shall not exceed 65 °C above ambient.

5.5.5.10 Grease collection tray or container

Where a grease collection tray or container is incorporated, temperatures shall not exceed 220 °C above ambient.

5.5.5.11 Gas cylinder temperature

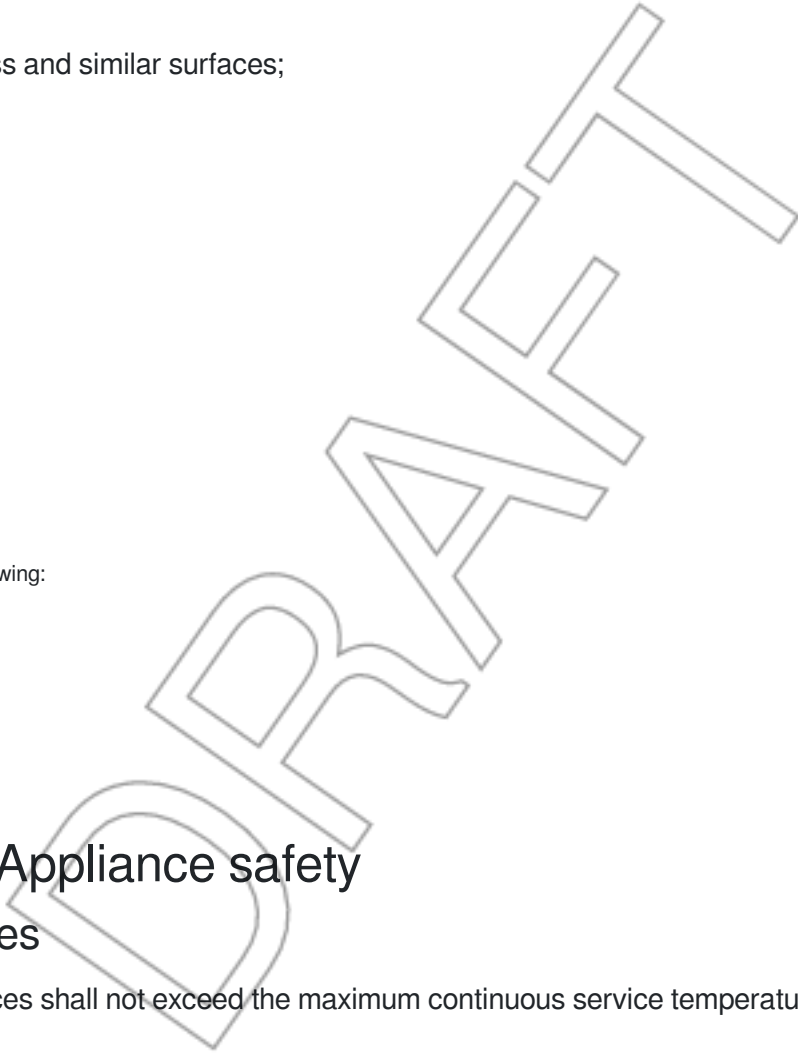
For mobile serving appliances the temperature of the LP Gas cylinder shall not exceed 35 °C above ambient.

5.5.6 Temperature limits — Zero rear clearance installation

When the appliance is tested in accordance with Test Method B.27, the temperatures of adjacent surfaces shall not exceed 200 °C.

NOTE 1 Clearance channels or spacers may be fixed to the appliance to ensure conformance to this requirement. Where this is the case, any channels or spacers are a permanent component of the appliance.

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10.3.3 Impingement of flame on shelves or cooking utensils

Ovens shall be designed so as to prevent the accidental placement of oven shelves or cooking utensils in a position where they may be impinged upon or directly heated by a burner flame.

10.4 Strength — Applied load

10.4.1 Appliance

When tested in accordance with Test Method B.36, oven units shall support, without breakage or damage for a period of 15 min, a load of 180 kg uniformly applied to the top.

10.4.2 Oven shelves

When tested in accordance with Test Method B.37, each oven shelf shall support 100 kg/m² of its area with the load distributed evenly over a central strip two thirds of the width and the full depth of the shelf, both when it is in position and when it is half withdrawn.

10.4.3 Drop down doors

When tested in accordance with Test Method B.38, drop down doors on ovens, when open, shall be capable of sustaining without breakage or permanent deformation a loading equivalent to a mass of 90 kg evenly distributed over the inner surface for a period of 15 min. When installed according to manufacturer's instructions the appliance shall not tilt under these conditions.

10.4.4 Side hinged doors

When tested in accordance with Test Method B.39, side hinged doors on ovens, when open, shall be capable of sustaining without breakage or permanent deformation a loading equivalent to a mass of 25 kg applied within 25 mm of the outer top edge of the door for a period of 15 min. When installed according to manufacturer's instructions the appliance shall not tilt under these conditions.

11 Specific requirements — Boiling water units

11.1 Temperature hazards and heat resistance

The appliance shall conform to [Clauses 5.5](#) and [5.6](#) when tested in accordance with Test Method B.26.

11.2 Integral cold water feed tanks

Integral cold water feed tanks and fittings shall conform to the following:

- (a) The overflow from a cold water feed tank shall be so located that with the water in the feed tank adjusted to the correct water level there shall be no discharge from the overflow during the initial heating of the appliance from cold.
- (b) The cold water tank shall be supplied with an adequate and securely fastened dust and vermin-proof cover.

11.3 Drain valves

Drain valves shall be—

- (a) fitted to every boiling water unit;
- (b) of smooth bore and capable of being easily cleaned; and
- (c) so designed that it is impossible to withdraw the valve stem completely in the normal operation of the valve.

11.4 Provision for the collection of corrosion products

Adequate provision shall be made for the collection, removal and disposal of flue corrosion products.

12 Specific requirements — Atmospheric steamers

12.1 Temperature hazards and heat resistance

The appliance shall conform to [Clauses 5.5](#) and [5.6](#) when tested in accordance with Test Method B.26.

12.2 Steam generator

Where the steam generator cannot be easily removed, it shall be provided with a drain valve of at least 13 mm bore, capable of completely draining the pan. The outlet of the valve shall be so positioned that there is room under it for a container of adequate capacity.

12.3 Appliance strength — Applied load

When tested in accordance with Test Method B.40, atmospheric steamers shall support, without breakage or apparent damage for a period of 15 min, a load of 50 kg.

13 Specific requirements — Stockpots and brat pans

13.1 Temperature hazards and heat resistance

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- ### 14.2.2 Provision of oil drain valve

14.2.3 Design of drain valve

14.2.4 Provision of shut off for each cooking vessel

14.2.5 Provision of automatic temperature control

14.2.6 Maximum temperature

14.2.7 Automatic filtration systems

14.2.8 Provision of over-temperature cut-out device

14.2.9 Pressure relief device

14.2.10 Copper and copper bearing alloys

14.3 Performance of fryers

14.3.1 Temperature control

14.3.2 Over-temperature cut-out

When tested in accordance with Test Method B.45, the over-temperature device shall shut off the gas when the cooking oil temperature in the fryer is greater than the maximum thermostat setting +20 °C and less than 246 °C.

14.4 Markings

14.4.1 Marking of normal working liquid level

The normal working liquid level shall be permanently marked in the cooking vessel.

14.4.2 Warning regarding correct level of cooking oil

The following marking shall be located on the outside of the appliance in a position where it can be easily read by the operator when the appliance is being used in the installed position.

CAUTION NEVER ALLOW BURNER TO OPERATE WITH THE FRYER EMPTY. LIGHT ONLY WITH LIQUID AT OPERATING OIL LEVEL MARK.

14.4.3 Marking of drain valve

The drain valve of a fryer shall be suitably marked with the word "Drain".

14.5 Appliance strength — Applied load

When tested in accordance with Test Method B.46, fryers shall support without breakage or apparent damage, for a period of 15 min, a load of 50 kg.

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15 Specific requirements — Food warmers including bains marie

15.1 Temperature hazards and heat resistance

The appliance shall conform to [Clauses 5.5](#) and [5.6](#) when tested in accordance with Test Method B.26.

15.2 Design of food warmers and bains marie

15.2.1 Nominal working temperature

The nominal working temperature for all food warmers shall be at least 80 °C.

15.2.2 Heating performance

15.2.2.1 Time to reach temperature — Wet bains marie

When tested in accordance with Test Method B.47, the time required to heat the water in the bain marie well from 15 °C to 80 °C shall not exceed 60 min.

15.2.2.2 Temperature maintenance — Wet bains marie

When tested in accordance with Test Method B.47, a fitted container type bain marie, filled with water to the manufacturer's recommended level in the case of a wet type, shall be capable of maintaining water in open containers at a temperature exceeding 80 °C.

15.2.2.3 Temperature control — Food warmers and bains marie

When tested in accordance with Test Method B.48, thermostats fitted to food warmers and to bains marie shall be capable of controlling the average temperature to within 5 °C of the temperature setting.

15.2.2.4 Temperature maintenance — Dry bain marie

When tested in accordance with Test Method B.49, it shall be possible for food in the containers of a dry heat bain marie to be maintained at a temperature not less than 70 °C without overheating or scorching.

15.2.2.5 Time to reach temperature — Hot-press

When tested in accordance with Test Method B.50, the temperature of a hot-press shall rise at least 60 °C in 45 min.

15.2.2.6 Temperature maintenance and variation — Food warmer

When tested in accordance with Test Method B.51, the temperature of a food warmer at any test point shall not be less than 70 °C and shall not differ by more than ± 10 °C from the mean within the food warmer. If the top is heated, the temperature at any test point on the top shall not differ by more than ± 10 °C from the mean.

15.2.3 Resistance to boiling dry — Wet bain marie

When tested in accordance with Test Method B.47, a wet bain marie, filled to the level recommended by the manufacturer shall not have boiled dry 2 h after lighting, with the gas valve full-on, and the thermostat, if variable, turned to its maximum setting.

15.3 Strength — Applied load

15.3.1 Appliance

When tested in accordance with Test Method B.52, food warmers and bains marie shall support without breakage, displacement or apparent damage, for a period of 15 min, a load of 100 kg/m² applied evenly over each shelf and over the top if it is flat. Water compartments and containers of wet food warmers and bains marie shall be filled with water.

15.3.2 Food containers

When tested in accordance with Test Method B.52, food warmers and bains marie shall support without breakage or apparent damage a load of 34 kg placed evenly and in turn on each 1.0 m² of the top supporting the food containers.

16 Specific requirements — Pasta/noodle cookers and rethermalizers

16.1 Temperature hazards and heat resistance

The appliance shall conform to [Clauses 5.5](#) and [5.6](#) when tested in accordance with Test Method B.26.

16.2 Drain valve

Each vessel shall be equipped with a drain valve that where not concealed shall be protected against inadvertent operation.

Drain valves shall be—

- (a) of smooth bore and capable of being easily cleaned; and
- (b) durably marked with the word “Drain”.

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16.3.1 Marking of normal water level

16.3.2 Caution regarding water level

CAUTION NEVER ALLOW BURNER TO OPERATE WITH THE APPLIANCE EMPTY. LIGHT ONLY WITH LIQUID AT OPERATING WATER LEVEL MARK.

16.4 Appliance strength — Applied load

17 Specific requirements — High temperature cookers

17.1 Temperature hazards and heat resistance

17.1.1 General

NOTE For appliances with a top access lid, the lid is considered to be a working surface, and any handle attached is required to conform to [Clause 5.5](#).

17.1.2 Maximum temperature

Where a thermostat is fitted, the maximum setting shall not exceed 400 °C.

17.2 Design for use

17.2.1 Provision of over-temperature cut-out device

The appliance shall be equipped with an over-temperature cut-out device which shall operate independently and override all other control devices.

17.2.2 Design of over-temperature cut-out device

The over-temperature cut-out device shall—

- (a) be of the fail safe type; and
- (b) cause a non-volatile lockout.

17.3 Drain valves

Where drain valves are used, they shall—

- (a) be of smooth bore and capable of being easily cleaned; and
- (b) where not concealed, be protected against inadvertent operation.

17.4 Markings

The manufacturer's recommended maximum load in kg shall be permanently marked on the appliance.

17.5 Strength and stability

17.5.1 Stability

When tested in accordance with Test Method B.53, the appliance shall not tip over on a level surface when loaded in any arrangement within the manufacturer's maximum rated load.

17.5.2 Appliance strength — Applied load

When tested in accordance with Test Method B.53, the appliance shall support the manufacturer's maximum rated load +20 % distributed evenly over the hanging rack or support without breakage or damage for a period of 15 min.

17.5.3 Drop down loading doors

When tested in accordance with Test Method B.38, any drop down loading doors while in the open position, shall be capable of sustaining without breakage or permanent deformation a loading equivalent to a mass of 90 kg evenly distributed over the inner surface for a period of 15 min. When installed according to manufacturer's instructions the appliance shall not tilt under these conditions.

17.5.4 Side hinged loading doors

When tested in accordance with Test Method B.39, any side hinged loading doors while in the open position, shall be capable of sustaining without breakage or permanent deformation a loading equivalent to a mass of 25 kg applied within 25 mm of the outer top edge of the door

18.2.10.3 Ventilation of cylinder compartments

The cylinder compartment shall have permanent openings ventilating directly to the outside of the appliance and consisting of one of the following:

- (a) Perforations, uniformly distributed over the height of the enclosure and with a total free area of not less than 25 % of the sidewall area.
- (b) Separate openings at high and low level, such that—
 - (i) the total free area at high level is not less than 20 000 mm² and is within 125 mm of the top of the cylinder compartment; and
 - (ii) the total free area at low level is not less than 20 000 mm², and—
 - (A) at least 25 % of the required area is within 15 mm of the base of the cylinder compartment;
 - (B) the total required area is within 125 mm of the base of the cylinder compartment; and
 - (C) the openings cannot be obstructed by the cylinder.

18.2.10.4 Separation of cylinder compartment

The cylinder compartment shall be permanently separated from any ignition source within the appliance combustion area to prevent the ignition of escaping gas within the cylinder compartment. The cylinder compartment shall incorporate an external door with means to secure the door in the closed position.

18.2.10.5 Risk of ignition

A cylinder compartment shall not contain any potential sources of ignition.

18.2.10.6 Accessibility of cylinder valve

The cylinder valve shall be readily accessible for manual operation.

A door in the cylinder compartment to gain access to the cylinder valve is acceptable provided it is non-locking and can be opened or removed without the use of tools.

18.2.10.7 Protection from spillover

Means shall be provided to prevent spillover from a vessel on any burner from directly contacting the cylinder or regulator where these are located underneath a burner.

18.2.10.8 Testing of cylinder connection

The appliance shall be designed such that the cylinder connection can be tested for soundness when the cylinder is inside the enclosure.

18.3 Performance requirements

18.3.1 CO/CO₂ ratio limits

When tested in accordance with Test Method B.54, the CO/CO₂ ratio of the combustion products shall not exceed 0.01, 15 min after ignition.

18.3.2 Containment of hot liquids

When the appliance is moving at a speed of 5 km/h and stopped suddenly in accordance with Test Method B.55, no liquids shall spill beyond the periphery of the appliance.

18.4 Strength and stability

18.4.1 Appliance

When tested in accordance with Test Method B.56, the appliance shall support the load specified in [Table 18.4.1](#), distributed evenly and without damage.

Table 18.4.1 — Body loading	
Weight of appliance kg	Load applied kg
Up to 10	10
10 to 35	25
Over 35	50

18.4.2 Stability

When tested in accordance with Test Method B.57, an appliance, shall not tip over when it is inclined up to an angle of 15° in any direction. An appliance shall conform whether the cylinder is in place, full, empty, or absent, as well the water bath full and empty. An appliance with features such as doors, lids, or hoods shall conform whether open or closed.

18.5 Markings

The following permanent markings are required in addition to [Clause 2.8](#), and shall be clear and readily accessible:

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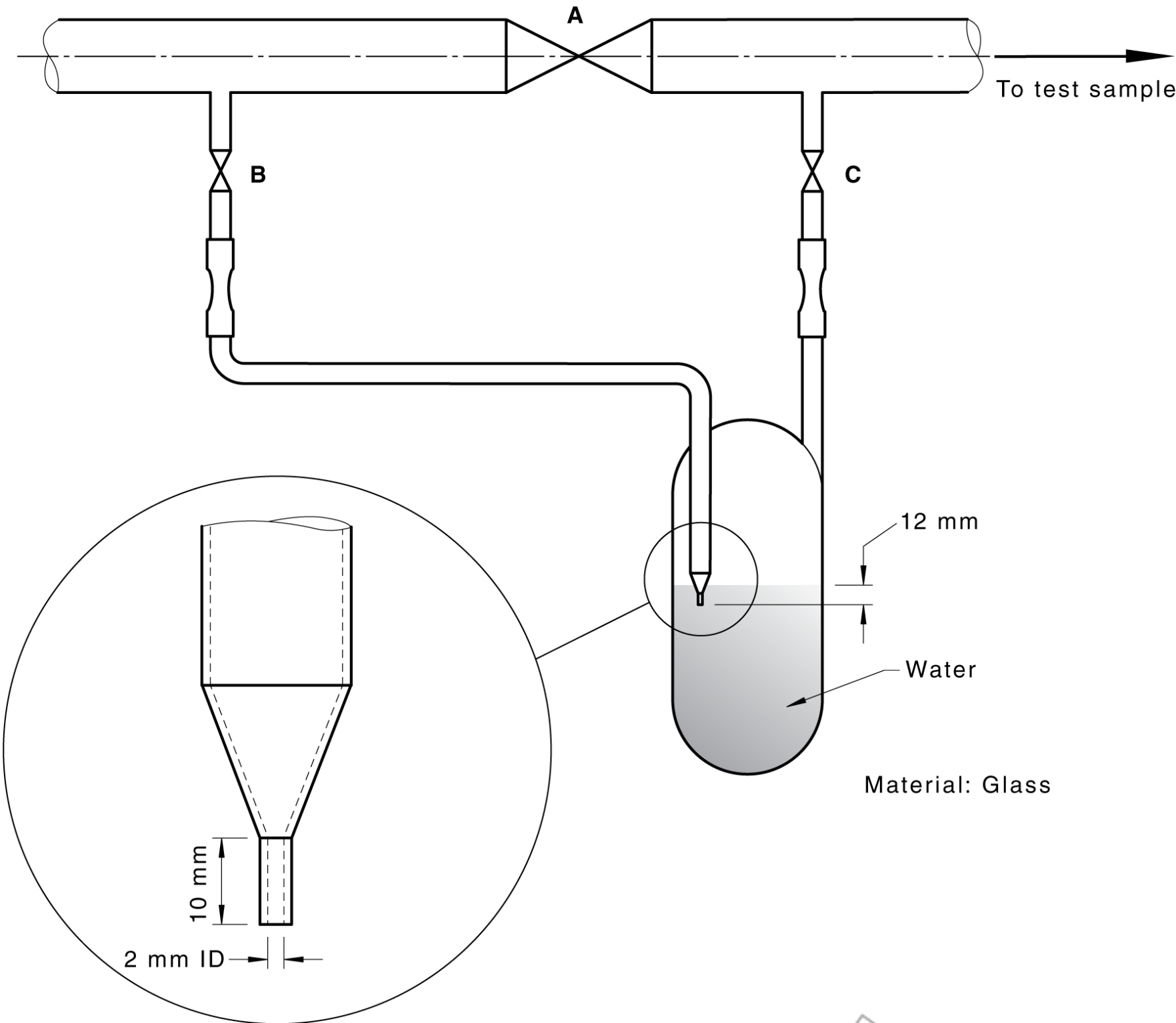
- (a) Isolation valve identification marking adjacent to the isolation valve.
- (b) The ignition procedure for all burners.
- (c) The shut down procedure.
- (d) Instructions for the change of cylinders.
- (e) Instructions to close the cylinder valve after use.
- (f) The warning: “USE ONLY IN A WELL VENTILATED AREA”.
- (g) The warning not to use oil in the water vessel.
- (h) The warning: “FOR CYLINDER EXCHANGE, DISCONNECT THE CYLINDER ONLY. DO NOT DISCONNECT HOSE FROM THE APPLIANCE”.

Appendix A

(normative)

Figures A.1 to A.9

Figure	Description
A.1	Bubble leak detector
A.2	Dew plate
A.3	Flue gas sampling hood — Rectangular
A.4	Flue gas sampling hood — Circular
A.5	Hood for boiling burners for vessels larger than 200 mm diameter
A.6	Flue gas sampling hood and vessel for open burner combustion tests
A.7	Flue gas sampling hood probe
A.8	Standard test vessel specifications
A.9	Test apparatus ignition at reduced pilot test

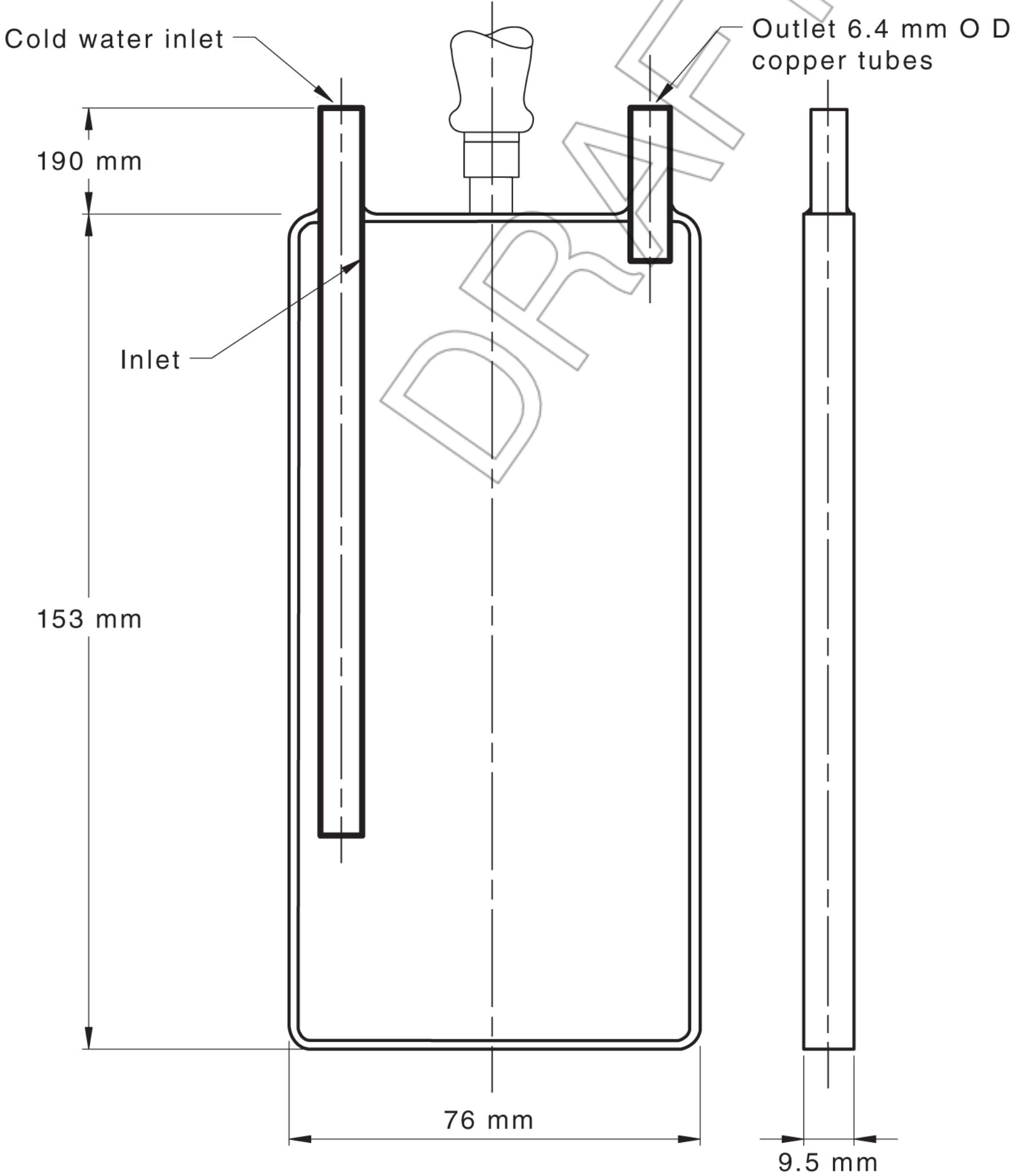


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Figure A.1 — Bubble leak detector

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Recommended general design



Material: 1.20 mm chrome plated copper or brass.

Figure A.2 — Dew plate

Dimensions in millimetres

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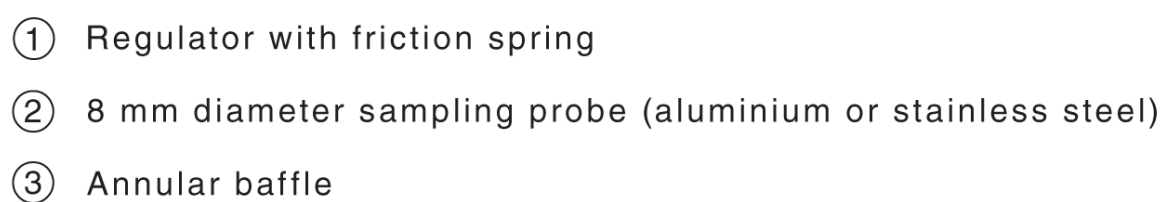


Figure A.3 — Flue gas sampling hood — Rectangular

Dimensions in millimetres

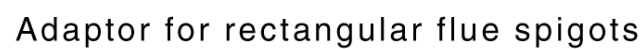
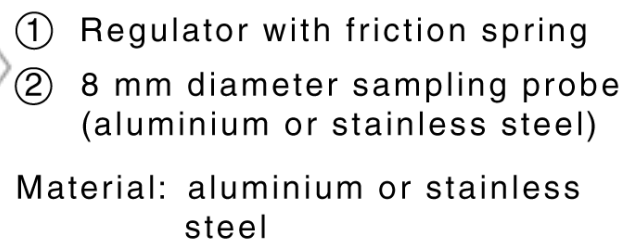


Figure A.4 — Flue gas sampling hood — Circular

Dimensions in millimetres

Regulator with friction spring

Ø8 ID sampling tube
(stainless steel)

Steam vent

Annular ring

Ø6 mm ID tubes

Pot lid

Annular pot lids

Base of vessel

Ø127

76

102

Ø178

140

330

127

143 crs

Ø195

Ø230

Ø315

Ø395

Ø508

"a"

Key

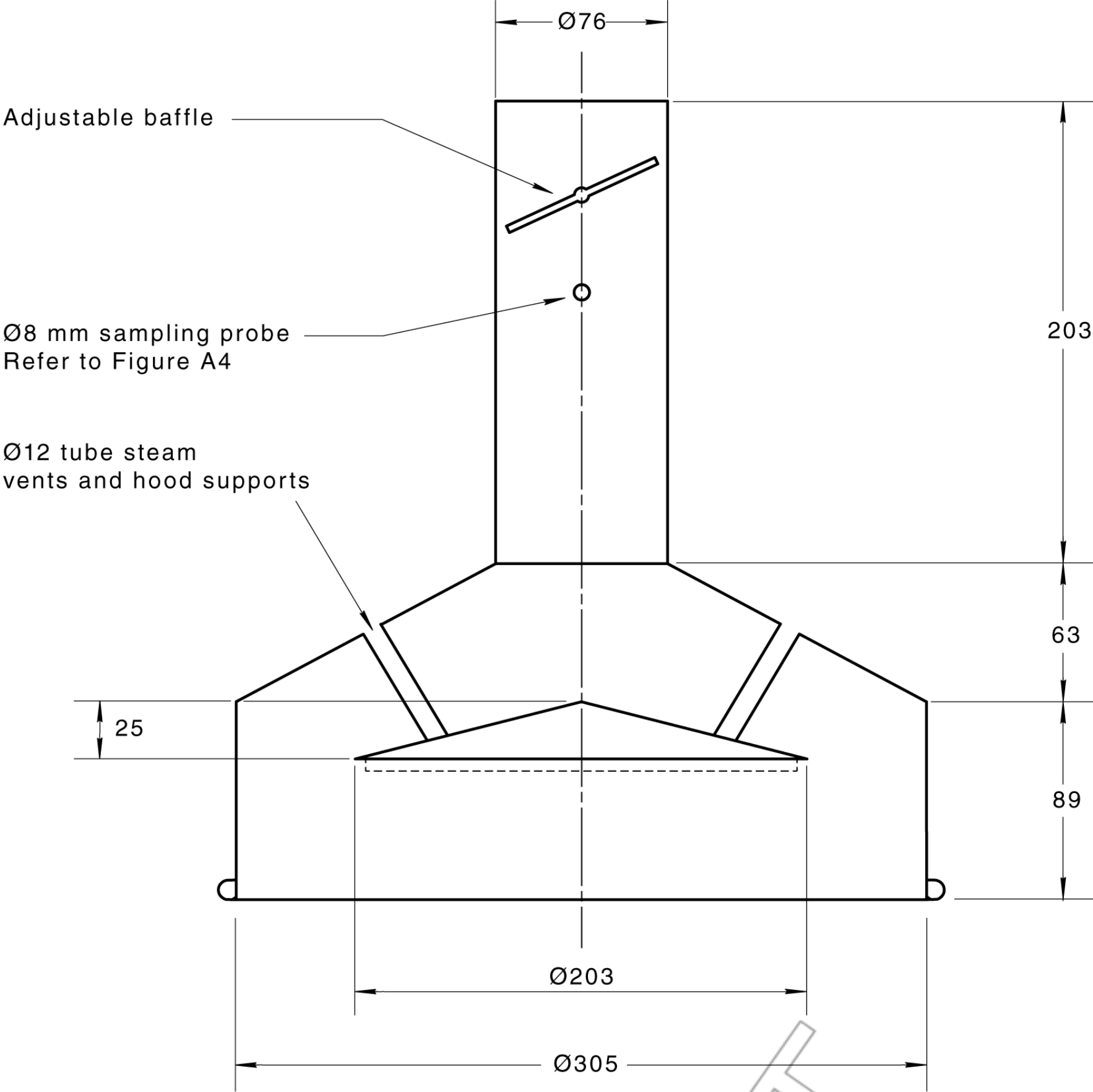
Dimension "a"	Vessel size (diameter)
77	195
92	230
127	315
377	395
Material: aluminium or stainless steel	

Figure A.5 — Hood for boiling burners for vessels larger than 200 mm diameter

Dimensions in millimetres

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Material: Aluminium or stainless steel

Material:	
Vessel	aluminium or stainless steel
Hood	aluminium or stainless steel

Figure A.6 — Flue gas sampling hood and vessel for open burner combustion tests

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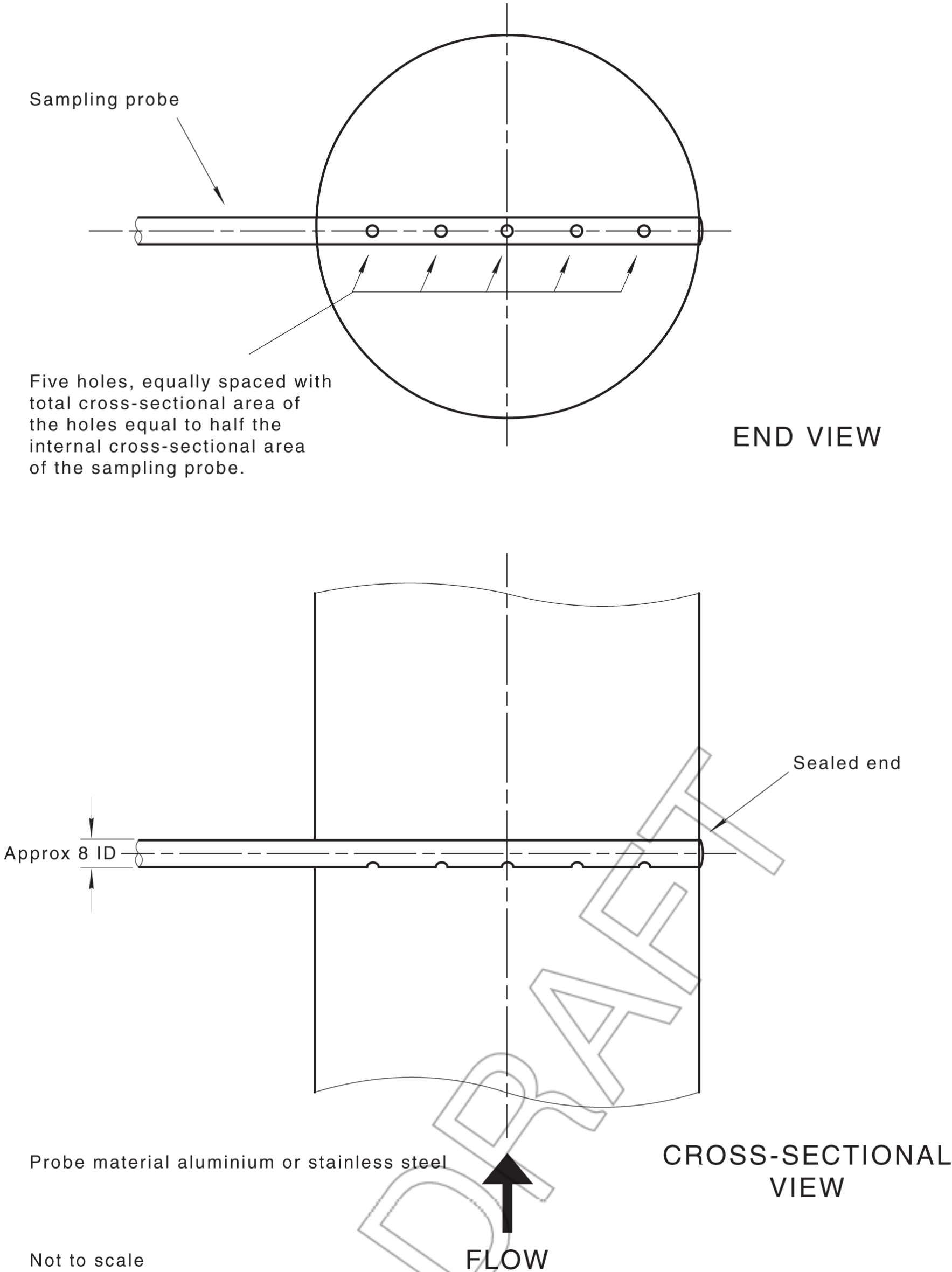


Figure A.7 — Flue gas sampling hood probe

Table A.8 — Standard test vessel specifications			
Burner	Vessel		
Gas consumption MJ/h	Diameter mm	Height mm	Water depth mm
0 to 12	195	140	85 ± 10
Over 12 and up to 15	230	155	100 ± 10
Over 15 and up to 20	315	190	125 ± 10
Over 20	395	440	325 ± 10

Appendix B

(normative)

Test methods

B.1 Gas leakage test (MOT 3.3.1)

B.1.1 Scope

This method sets out the procedure to assess the gas leakage of an appliance.

B.1.2 Principle

The appliance is connected to a supply of air at the appropriate pressure and any leakage is observed and measured. The tests are carried out at ambient temperature and a pressure of 1.5 times rated working pressure or 14 kPa, whichever is the greater upstream of the appliance.

B.1.3 Apparatus

The following apparatus shall be used:

- (a) Leak detector capable of measuring 1 mL/min with an accuracy of ± 0.3 mL/min, e.g. bubble leak detector (see [Figure A.1](#)), electronic leak detector.
- (b) Pressure gauge with an appropriate range and an accuracy of $\pm 5\%$.
- (c) Suitable timing device.

B.1.4 Materials

The following materials shall be used:

- (a) A supply of air at the appropriate pressure.
- (b) Suitable materials to seal injectors.

B.1.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.
- (c) Check the leak detector and its fittings for gas tightness. If using a bubble leak detector, adjust to the correct water level.

B.1.6 Procedure

The procedure shall be as follows:

- (a) Seal all injectors, including pilot injectors.
- (b) Connect the leak detector to the inlet gas connection of the appliance.
- (c) Connect a pressure gauge to the pressure test point.
- (d) Close all control valves on the appliance and supply air at the required pressure to the inlet of the leak detector.
- (e) Open the pressure regulator and any safety shut off valve by heating the actuating element or by other means, to simulate the appliance being in operation.
- (f) Allow approximately 1 min for pressures to stabilize.
- (g) Check and record the test point pressure.
- (h) If using a bubble leak detector, ensure valve “A” is closed and valves “B” and “C” are opened so that the air is directed through the dip tube (see [Figure A.1](#)).
- (i) Measure the leakage rate.

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- (j) If the pressure measured at the appliance test point in Step (g) was less than the greater of 1.5 times the appliance rated working pressure or 14.0 kPa, repeat Steps (e) to (i) using the appropriate pressure at both the inlet and manifold of the appliance.
- (k) Systematically check for leakage up to and including each injector by opening each control valve in turn and sealing the injector orifice, including the pilot line.

B.1.7 Test report

All relevant observations shall be reported, including the maximum measured leakage rate.

B.2 Gas consumption (MOT 3.4)

B.2.1 Scope

This method sets out the procedure to determine the gas consumption of a burner or a set of burners of an appliance (or pilot).

B.2.2 Principle

The appliance is supplied with the appropriate gas and the test point pressure is carefully set to the nominal value. The gas rate to all burners is measured accurately 15 min after ignition.

It is necessary to obtain heating value, dry relative density of the gas, the gas temperature and to note whether the gas is dry or saturated when passing through the gas meter, so that the correct gas consumption can be calculated.

B.2.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Suitable timing device.

B.2.4 Materials

Supply of appropriate test gas at normal test gas pressure (see [Clause 3.1](#)).

B.2.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.
- (c) Ensure that the meter is nominally at room temperature.

B.2.6 Procedure

The procedure shall be as follows:

- (a) Turn on the gas fully to the burner, ignite the gas and if necessary set the test point pressure to the nominal value. Operate the burners for 15 min.
- (b) Measure the total gas rate (Q_m) within the next 2 min.
- (c) Calculate the determined gas consumption, R , using the following equation:

$$R = Q_m \times \frac{(P_a + p)}{P_s} \times W_r \times \left[D_t \times \frac{T_s}{T_m} \frac{(P_s + h)}{(P_a + h)} \right]^{1/2} \times \left[1 - \frac{P_w}{(P_a + h)} \times \left(1 - \frac{D_w}{D_t} \right) \right]^{1/2}$$

where

R	=	determined gas consumption (MJ/h)
Q_m	=	measured total gas rate (m ³ /h)
p	=	measured meter inlet gauge pressure (kPa)
P_s	=	standard absolute pressure (barometer) (101.325 kPa)
P_a	=	measured absolute ambient pressure (barometer) (kPa)
W_r	=	Wobbe index of reference gas (see Table B.2.6) (MJ/m ³)
W_t	=	measured test gas relative density (dry) (air = 1.000)
T_s	=	standard absolute temperature (288.15 K)
t	=	measured meter temperature (°C)
T_m	=	meter absolute temperature (273.15 + t)K
P_w	=	water vapour absolute pressure (partial pressure) at t (kPa) (see Appendix C)
h	=	measured injector gauge pressure (nominal test point pressure) (kPa)
D_w	=	water vapour relative density (0.622)

NOTE 1 For pilots, the effect of h is deemed to be negligible and its value is taken to be 0 kPa.

NOTE 2 The last term in the square brackets equals unity (1) for NG, TG and all dry gases.

Table B.2.6 — Wobbe index values (dry basis)	
Appliance gas type	Wobbe index (W_r) MJ/m ³
TG	26.0
TLP	23.8
Natural gas	50.0
Propane	76.9
Butane	87.2
Universal LP Gas	76.9

- (d) Where there is more than one independent burner, repeat Steps (a) to (c) for each independent burner in turn, including pilots.
- (e) Repeat Steps (a) to (c), with all burners turned on fully.

B.2.7 Test report

All relevant observations shall be reported, including the following:

- (a) The nominal gas consumption for each burner or pilot and gas type.
- (b) The determined gas consumption for each burner or pilot and gas type.
- (c) The percentage variation between the nominal and determined gas consumption of each burner or pilot and gas type.
- (d) The sum of the nominal gas consumption of all burners.
- (e) The total gas consumption of all burners operating together.
- (f) The percentage variation between the total gas consumption for all burners operating together and the sum of the nominal gas consumption of all burners for each gas type.

B.3 Gas pressure regulator test (MOT 3.5)

B.3.1 Scope

This method sets out the procedure to assess the performance of a gas pressure regulator.

B.3.2 Method

A test point pressure reference setting is established, then the test point pressure is measured while the appliance inlet pressure is varied through the range specified.

B.3.3 Apparatus

Equipment specified in [Appendix D](#) shall be used.

B.3.4 Materials

Supply of appropriate test gas shall be used (see [Clause 3.1](#)).

B.3.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.
- (c) Identify and note the location of the manufacturer’s specified pressure test point(s).

B.3.6 Procedure

The procedure shall be as follows:

- (a) Light all burners or as stated in the manufacturer’s instructions.
- (b) Adjust appliance inlet pressure to the minimum shown in [Table 3.5](#).
- (c) For regulators that are intended to be adjusted, set regulator outlet pressure to the nominal test point pressure while maintaining the correct appliance inlet pressure.
- (d) Turn off burners to stabilize regulator, then turn burners on again and note test point pressure.
- (e) If necessary, repeat Steps (c) and (d) until the test point pressure can be reproduced within ± 5 % of nominal test point pressure.
- (f) If unable to obtain test point pressure within ± 5 % of nominal test point pressure, then discontinue test.

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- (g) Turn on all burners.
- (h) Increase the inlet gas pressure gradually to the maximum shown in [Table 3.5](#) and record the test point pressure and inlet pressure at intervals no greater than 0.5 kPa.
- (i) Decrease the inlet gas pressure gradually to the minimum shown in [Table 3.5](#) and record the test point pressure and inlet pressure at intervals no greater than 0.5 kPa.
- (j) In the case of open burners, turn off all burners except the smallest, set this burner at turndown and repeat Steps (h) and (i).

B.3.7 Test report

All relevant observations shall be reported including at least the following:

- (a) The maximum variation of the test point pressure and corresponding inlet pressure(s).
- (b) The position of the pressure test point (e.g. on regulator, on gas manifold etc.).
- (c) The commissioning procedure followed.

B.4 Burner ignition — Pilot light back and blocked aeration (MOT [3.6.2.1/3.6.2.2/3.6.2.4](#))

B.4.1 Scope

This method sets out the procedure to assess the safe operation of an aerated pilot.

B.4.2 Principle

The pilot is tested to determine if it can be operated in the light back condition. If so, it is then checked if ignition of the main burner is achieved or if the safety shut off valve closes.

The test is then repeated with the primary air opening closed.

B.4.3 Apparatus

Equipment as specified in [Appendix D](#) shall be used.

B.4.4 Materials

Supply of appropriate test gas (see [Clause 3.1](#)) at normal test gas pressure.

B.4.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.

B.4.6 Procedure

The procedure shall be as follows:

- (a) Attempt to establish a light back condition at the pilot. If a light back condition cannot be established then skip to Step (e).
- (b) Supply gas to the main burner.
- (c) Observe that main burner ignites promptly, safely and without undue noise or that pilot causes the safety shut off valve to close.
- (d) Turn off main burner and pilot.
- (e) Close the pilot primary air opening and attempt to relight pilot. If the pilot cannot be established then skip to Step (g).
- (f) Repeat Steps (b) and (c).

B.4.7 Test report

Report on the main burner ignition observations (promptness, safety and noise), the operation of the safety shut off valve and all other relevant observations when—

- (a) the pilot is operated in a light back condition; and
- (b) the pilot primary air opening is closed.

B.5 Ignition at reduced pilot rate test (MOT [3.6.2.3/3.6.3.4](#))

B.5.1 Scope

This method sets out the procedure to assess the safe operation of a pilot operating at a reduced gas rate.

B.5.2 Principle

The pilot is adjusted to just keep the flame safeguard system open. At this setting the ignition of the main burner is observed when tested at nominal gas consumption and at any other rate at which it can be operated automatically.

B.5.3 Apparatus

Equipment as specified in [Figure A.9](#) and [Appendix D](#) shall be used.

B.5.4 Materials

Supply of appropriate test gas (see [Clause 3.1](#)) at normal test gas pressure.

B.5.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.

B.5.6 Procedure

The procedure shall be as follows:

- (a) Light the gas at both pilot and main burners.
- (b) Set burner test point pressure(s) to the nominal value(s).
- (c) Turn off the main burner.
- (d) Reduce the gas rate to the pilot from the full rate in small steps. At each reduction, light the main burners, then turn off gas to main burner.
- (e) Continue to reduce the gas rate to the pilot in small steps until either—
 - (i) ignition of the main burner is unsatisfactory; or
 - (ii) the flame safeguard system shuts off the gas supply.
- (f) Repeat steps (d) and (e) with the main burner reduced to the lowest rate at which it can be controlled automatically.
- (g) Repeat the procedure with the appliance in the hot condition.

B.5.7 Test report

Report on the main burner ignition observations (promptness, safety and noise), ignition reliability and all other relevant observations when—

- (a) the pilot is operated at a rate just sufficient to keep the flame safeguard open;
- (b) all pilot flame ports, other than the one activating the flame safeguard sensor, are blocked (if applicable); and
- (c) the main burner is reduced to the lowest rate at which it can be controlled automatically.

B.6 Holding time of thermoelectric flame safeguard test (MOT [3.6.2.6](#))

B.6.1 Scope

This method sets out the procedure to determine the time taken for a thermoelectric flame safeguard system to hold open.

B.6.2 Principle

The burner actuating the flame safeguard system is lit from a cold start. The manual reset control is released after the specified delay and the pilot flame observed to determine if the flame safeguard valve is held open.

B.6.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Suitable timing device.

B.6.4 Materials

Supply of appropriate test gas (see [Clause 3.1](#)) at normal test gas pressure.

B.6.5 Preparation of apparatus

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The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.

B.6.6 Procedure

The procedure shall be as follows:

- (a) Light the gas in accordance with manufacturer's instructions.
- (b) Start the timing device simultaneously with flame establishment.
- (c) Release the flame safeguard manual reset control at 60 s.
- (d) Note whether the flame remains alight.
- (e) Where applicable, turn on the main burner gas control, and check for satisfactory ignition.

B.6.7 Test report

All relevant observations shall be reported, including whether the flame safeguard holds open.

B.7 Flame tracking at ignition test (MOT [3.6.2.7](#))

B.7.1 Scope

This method sets out the procedure to determine satisfactory flame tracking of a burner when an ignition source is applied in the normal manner.

B.7.2 Principle

The burner is observed for completeness of flame tracking at maximum and turndown gas consumption.

B.7.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Source of ignition, unless one is integral with the appliance.

B.7.4 Materials

The following apparatus shall be used:

- (a) Supply of appropriate test gas (see [Clause 3.1](#)) at normal test gas pressure.
- (b) Supply of cold water, where required.

B.7.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.

B.7.6 Procedure

The procedure shall be as follows:

- (a) Set the burner control to the maximum position for ignition.
- (b) Light the gas in the normal manner.
- (c) Observe the burner for complete flame tracking across all burner ports.
- (d) Turn off the burner and allow sufficient time for complete flame extinction.
- (e) Repeat four times.
- (f) Where the burner can be ignited at turndown, set the burner control to turndown position and repeat Steps (b) to (e).

B.7.7 Test report

All relevant observations shall be reported, including whether complete flame tracking occurs across all burner ports.

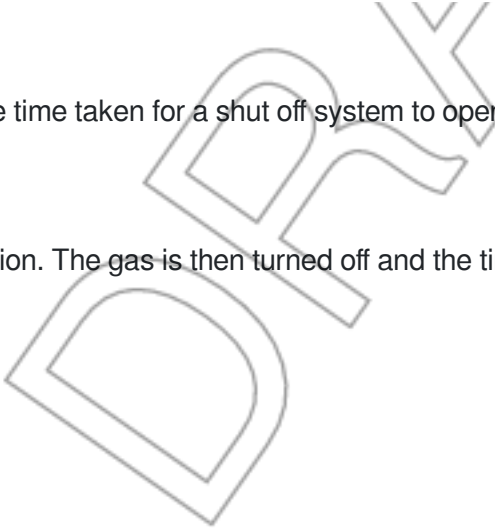
B.8 Shut off time for safety shut off system test (MOT [3.6.2.14](#))

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B.8.1 Scope

This method sets out the procedure to determine the time taken for a shut off system to operate after flame failure.

B.8.2 Principle

The appliance is operated at nominal gas consumption. The gas is then turned off and the time taken for the gas valve to close is determined.

B.8.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Two-way valve.
- (c) Suitable timing device.
- (d) Air flow meter of adequate capacity.

B.8.4 Materials

The following apparatus shall be used:

- (a) Supply of appropriate test gas (see [Clause 3.1](#)) at normal test gas pressure.
- (b) Air at normal test gas pressure.

B.8.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.
- (c) Connect the two-way valve to the appliance inlet with one inlet connected to the gas supply and the other to the air supply.
- (d) Connect the air flow meter into the air supply.

B.8.6 Procedure

The procedure shall be as follows:

- (a) With the appliance at room temperature, light the gas.
- (b) For appliances that use flame rectification for flame supervision, operate for 10 min.
- (c) For all other appliances, operate for 1 h or until thermal equilibrium is reached.
- (d) Turn two-way valve from gas supply to air supply.
- (e) Observe actuating flame and start the timing device at the instant the flame extinguishes.
- (f) Stop the timing device at cessation of flow of air as indicated by flow meter.

B.8.7 Test report

All relevant observations shall be reported, including the time taken for the safety shut off system to operate.

B.9 Ignition gas flow rate (delayed ignition) test (MOT [3.6.3.1/3.6.4.2](#))

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B.9.1 Scope

This method sets out the procedure to assess the safety of delayed main burner ignition.

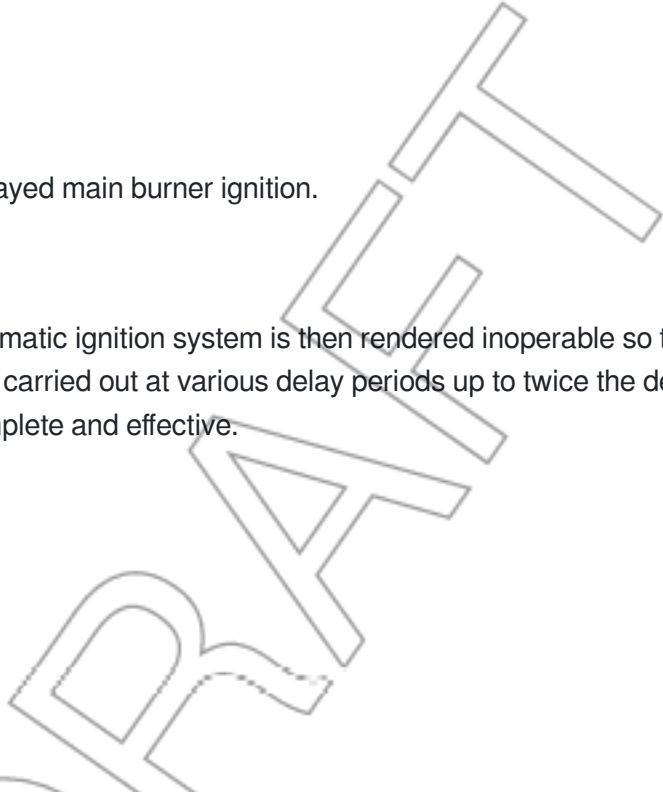
B.9.2 Principle

The normal start flame establishment period is timed. The automatic ignition system is then rendered inoperable so that the start gas flow and spark initiation are under manual control. Ignition tests are carried out at various delay periods up to twice the determined start flame establishment period and it is observed whether ignition is complete and effective.

B.9.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Suitable timing device.



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- (a) Turn off the gas and activate the appliance. Count the number of ignition attempts and note the time delay between attempts, or if any purge function is provided.
- (b) Re-apply gas to the appliance.
- (c) Reset the appliance, and deactivate the ignition source. Activate the appliance and allow it to attempt ignition. During the second ignition attempt, reactivate the ignition source at the igniter test activation time. Observe the operation of the appliance and burner ignition.
- (d) If applicable, allow the heat exchanger to cool to a temperature of 5 °C or less.
- (e) Repeat Steps (c) and (d) enabling the ignition source during the third ignition attempt for systems with more than two ignition attempts, otherwise go to Step (i).
- (f) Repeat Steps (c) and (d) enabling the ignition source during the fourth ignition attempt for systems with more than three ignition attempts, otherwise go to Step (i).
- (g) Repeat Steps (c) and (d) enabling the ignition source during the fifth ignition attempt for systems with more than four ignition attempts, otherwise go to Step (i).
- (h) Repeat Steps (c) and (d) enabling the ignition source during the sixth ignition attempt for systems with more than five ignition attempts, otherwise go to Step (i).
- (i) Activate the appliance and time the period until a new ignition attempt is made.

B.10.7 Test report

All relevant observations shall be reported, including the following:

- (a) The total number of reignition attempts prior to lockout.
- (b) The time delay between ignition attempts, or any purge function.
- (c) The time delay between safety shut down and the next ignition attempt.
- (d) Burner ignition safety and noise.

B.11 Determination of CO/CO₂ ratio for independent burners — Overload (MOT 4.2)

B.11.1 Scope

This method sets out the procedure to determine the ratio of carbon monoxide to carbon dioxide (CO/CO₂) in the combustion products of the appliance under test.

B.11.2 Principle

The appliance is operated under specified conditions of fuel gas and level of overload. A representative sample of the combustion products is analysed for the CO and CO₂ concentration after a specified period of operation. From the results obtained, the CO/CO₂ ratio is calculated.

B.11.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Carbon monoxide analyser, calibrated to give accurate and reproducible results.
- (c) Carbon dioxide analyser, calibrated to give accurate and reproducible results.
- (d) Sampling apparatus (probe or hood, as appropriate, see [Figures A.3, A.4, A.5, A.6 and A.7](#)) known to not affect the representativeness of the sampled gases under prevailing conditions.
- (e) Sampling lines and conditioner (if used) known to be inert to CO and CO₂.
- (f) Suitable timing device.

B.11.4 Materials

B.11.4.1 General

The following materials shall be used:

- (a) Supply of appropriate test gas (see [Clause 3.1](#)).
- (b) Where necessary, a supply of cold water.

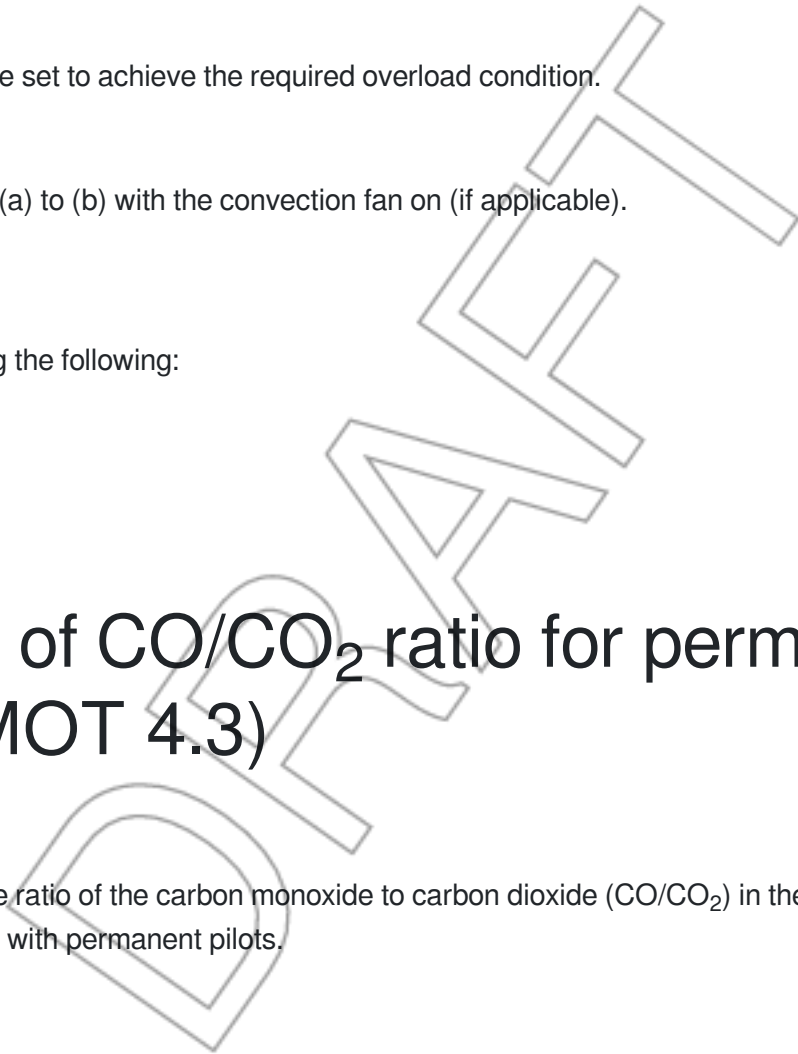
B.11.4.2 Additional materials for barbecues

A perforated sheet metal plate of 25 % free area to cover the entire open type grill area.

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B.11.5 Preparation of apparatus

B.11.5.1 General

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Where required, add water or the cooking medium (in this case only water is to be used) to the level specified by the manufacturer.
- (c) Set up test equipment.
- (d) Identify and note the location of the manufacturer’s specified pressure test point(s).
- (e) Adjust the appliance in an attempt to achieve the overload gas rate as specified in [Table 4.2.1](#). and corrected in accordance with [Appendix C](#).

The specified overload conditions shall be obtained by adjusting the inlet pressure with the appliance regulator at its nominal setting. If the overload condition cannot be obtained with a maximum inlet pressure of 3.0 kPa then the appliance regulator shall be rendered inoperative.

- (f) Operate the appliance without further adjustment for 10 min from a cold start and measure the gas rate within the next 2 min. If the overload gas rate is not achieved repeat Step (e).
- (g) In the case of an open top burner, place over the burner a vessel as specified in [Table A.8](#). The water is boiling during combustion analysis.
- (h) Turn off the burner and allow appliance to cool.
- (i) Place the appropriate sampling hood above the flueway outlet, or in the case of an open burner, place the appropriate sampling hood on the vessel, or other appropriate device in a position to obtain a satisfactory sample of the combustion products.
- (j) For an oven with a convection fan, turn off the fan if the burner can be operated with the fan off.

B.11.5.2 Additional preparation of apparatus for barbecues

In the case of open type barbecues, lay the perforated sheet metal plate of 25 % free area centrally on the grill.

B.11.6 Procedure

The procedure shall be as follows:

- (a) Light the burner(s) and ensure the controls are set to achieve the required overload condition.
- (b) Determine CO and CO₂ 10 min after ignition.
- (c) Allow the appliance to cool and repeat Steps (a) to (b) with the convection fan on (if applicable).

B.11.7 Test report

All relevant observations shall be reported, including the following:

- (a) The recorded CO and CO₂ values.
- (b) The calculated CO/CO₂ ratio.
- (c) The overload gas consumption rate.

B.12 Determination of CO/CO₂ ratio for permanent pilots — Overload (MOT 4.3)

B.12.1 Scope

This method sets out the procedure to determine the ratio of the carbon monoxide to carbon dioxide (CO/CO₂) in the combustion products produced by the operating pilots of appliances fitted with permanent pilots.

B.12.2 Principle

The appliance is operated under specified conditions of fuel gas and level of overload. A representative sample of the combustion products is analysed for the CO and CO₂ concentration after a specified period of operation. From the results obtained, the CO/CO₂ ratio is calculated.

B.12.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Carbon monoxide analyser, calibrated to give accurate and reproducible results.
- (c) Carbon dioxide analyser, calibrated to give accurate and reproducible results.
- (d) Sampling apparatus known to not affect the representativeness of the sampled gases under prevailing conditions.

- (e) Sampling lines and conditioner (if used) known to be inert to CO and CO₂.
- (f) Suitable timing device.

B.12.4 Materials

Supply of appropriate test gas (see [Clause 3.1](#)).

B.12.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.
- (c) Light the pilot burner.
- (d) Adjust the appliance inlet pressure in accordance with [Table 4.3](#).
- (e) Turn off the pilot burner and allow it to cool.
- (f) Set the sampling device in place.

B.12.6 Procedure

The procedure shall be as follows:

- (a) Light the pilot.
- (b) Determine CO and CO₂ 10 min after ignition.

B.12.7 Test report

All relevant observations shall be reported, including the following:

- (a) The recorded CO and CO₂ values.
- (b) The calculated CO/CO₂ ratio.

B.13 Determination of CO/CO₂ ratio and O₂ levels — Appliances for which [Clause 4.2.1](#) is not applicable (MOT [4.2.2](#))

B.13.1 Scope

This method sets out the procedure to determine the ratio of carbon monoxide to carbon dioxide (CO/CO₂) and O₂ levels in the combustion products.

B.13.2 Principle

The appliance is operated on specified fuel gas under specified voltage. A representative sample of the combustion products is analysed for the CO, CO₂ and O₂ concentration after a specified period of operation. From the results obtained, the CO/CO₂ ratio is calculated. The appliance is also operated under certain limiting condition to ascertain its flame characteristics and safe ignition.

B.13.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Carbon monoxide analyser, calibrated to give accurate and reproducible results.
- (c) Carbon dioxide analyser, calibrated to give accurate and reproducible results.
- (d) Oxygen analyser, calibrated to give accurate and reproducible results.
- (e) Sampling apparatus known to not affect the representativeness of the sampled gases under prevailing conditions.
- (f) Sampling lines and conditioner (if used) known to be inert to CO and CO₂.

B.13.4 Materials

Supply of appropriate test gas (see [Clause 3.1](#)).

B.13.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.

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- (c) Where required, add water or the cooking medium (in this case only water is to be used) to the level specified in the instructions.
- (d) Place an appropriate sample in a position to obtain a satisfactory sample of the combustion products.

B.13.6 Procedure

The procedure shall be as follows:

- Connect to the test gas.
- Operate the appliance for 10 min under nominal conditions (i.e. maximum setting, normal test pressure). Determine the CO, CO₂ and O₂, and the actual gas consumption (see [Appendix C](#)) by the use of specified apparatus.
- Repeat Step (b) for the minimum gas rate setting.
- Turn off the burner and allow appliance to cool.

B.13.7 Test report

All relevant observations shall be reported, including the following:

- The recorded CO, CO₂ and O₂ values.
- The calculated CO/CO₂ ratios
- The gas consumption rates.
- The flame characteristics.
- The conditions, if any, under which the safety shut down operated.
- Ignition characteristics.

B.14 Determination of CO/CO₂ ratio for independent surface combustion burners — Underload test (MOT 4.4)

B.14.1 Scope

This method sets out the procedure to determine the ratio of the carbon monoxide to carbon dioxide (CO/CO₂) in the combustion products of surface combustion burners.

B.14.2 Principle

The appliance is operated under specified conditions of fuel gas and level of underload. A representative sample of the combustion products is analysed for the CO and CO₂ concentration after a specified period of operation. From the results obtained, the CO/CO₂ ratio is calculated.

B.14.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Carbon monoxide analyser, calibrated to give accurate and reproducible results.
- (c) Carbon dioxide analyser, calibrated to give accurate and reproducible results.
- (d) Sampling apparatus known to not affect the representativeness of the sampled gases under prevailing conditions.
- (e) Sampling lines and conditioner (if used) known to be inert to CO and CO₂.
- (f) Suitable timing device.

B.14.4 Materials

Supply of appropriate test gas (see [Clause 3.1](#)).

B.14.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.
- (c) Light all appliance burners.
- (d) Adjust the appliance inlet pressure in accordance with [Table 4.4](#).
- (e) Turn off the appliance and allow it to cool.
- (f) Set the sampling device in place.

B.14.6 Procedure

The procedure shall be as follows:

- Light the surface combustion burner.
- Adjust the burner to its minimum setting.
- Determine CO and CO₂ 10 min after ignition.

B.14.7 Test report

All relevant observations shall be reported, including the following:

- The recorded CO and CO₂ values.
- The calculated CO/CO₂ ratio.

B.15 Flame characteristics at maximum and minimum limiting conditions (MOT 4.5)

B.15.1 Scope

This method sets out the procedure to assess flame characteristics at minimum and maximum limiting conditions of appliance burners.

B.15.2 Principle

The appliance is tested at minimum and maximum limiting conditions at both ambient and hot conditions, with all appropriate test gases. Burner flames are observed for any abnormalities.

Open burners shall be tested with and without a vessel in place.

B.15.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Suitable timing device.
- (c) Means of observing the burner flames (mirror or glass panel) if necessary.
- (d) For open flued appliances, updraught and downdraught apparatus.
- (e) Standard test vessel, where applicable.

B.15.4 Materials

Supply of appropriate test gas specified in accordance with [Table 4.5](#), at pressures to satisfy the limiting conditions shall be used.

B.15.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.
- (c) Where required, add water or cooking medium (in this case only water is to be used) to the level specified in the manufacturer's instructions.
- (d) Operate the appliance and adjust to the appropriate liming conditions.
- (e) Turn off the appliance and allow it to cool.
- (f) For an oven with a convection fan, turn off the fan if the burner can be operated with the fan off.

B.15.6 Procedure

B.15.6.1 All burners

The procedure shall be as follows:

- (a) Turn on water, if applicable.
- (b) Light the burner and check that the test point pressure is at the appropriate level as shown in [Table 4.5](#).
- (c) Observe the burner and appliance operation for any abnormality.
- (d) Repeat the procedure with each test gas and under each limiting condition.
- (e) In the case of open burners, place standard test vessel containing specified quantity of water over the open burner (see [Table A.8](#)) and repeat Steps (b) to (d).

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with a velocity head starting at zero and gradually increasing over 5 min to 140 Pa.

Under each limiting condition.

(a) to (d) with the convection fan on (if necessary).

Tests, without a draught diverter

Check for any abnormality while proceeding as follows:

1. With the velocity head at 140 Pa for 5 min.

Under each limiting condition.

(a) to (c) with the convection fan on (if necessary).

2. With the velocity head at 140 Pa, check for the following, at each limiting condition:

2.1. Draught measurement.

2.2. Draught measurement with the draught diverter locked flue, downdraught and updraught (where applicable).

2.3. Draught measurement with the draught diverter locked flue, downdraught and updraught (where applicable).

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at 140 Pa for 5 min.

under each limiting condition.

(a) to (c) with the convection fan on (if necessary)

g the following, at each limiting condition:

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locked flue and back pressure (where applicable).

shut down operated.

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- (b) Set up test equipment.
- (c) Where required, add water or cooking medium (in this case only water is to be used) to the level specified in the manufacturer's instructions.
- (d) In the case of mains ignition systems a voltage equivalent to both 85 % and 110 % of the nominal supply voltage is applied to the appliance.
- (e) For battery-operated ignition systems remove batteries and apply a power source equivalent to 80 % of the nominal voltage to the supply contacts of the battery holder.
- (f) Operate the appliance and adjust to the appropriate limiting condition.

B.16.6 Procedure

The procedure shall be as follows:

- (a) Initially test with the appliance in ambient condition.
- (b) Turn on water, if applicable.
- (c) Purge the gas line to the control valve.
- (d) Turn on gas control valve and start the timing device at the same time.
- (e) Operate the ignition system in accordance with the manufacturer's instructions.
- (f) Test five times allowing 1 min between tests.
- (g) Repeat the procedure with the appliance in the hot condition.

B.16.7 Test report

All relevant observations shall be reported, including the following, at each limiting condition:

- (a) The number of times ignition was effective.
- (b) Average time for ignition.
- (c) Ignition characteristics.

B.17 Delayed ignition at maximum and minimum limiting conditions (MOT 4.7)

B.17.1 Scope

This method sets out the procedure to assess the safety of delayed ignition of any manually ignited burners (other than pilots) at minimum and maximum limiting conditions.

B.17.2 Principle

The normal lighting procedure is carried out with a delay and the burner is observed for safety and completeness of ignition at both ambient and hot conditions, with all appropriate test gases.

Open burners shall be tested with and without a vessel in place.

B.17.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Suitable timing device.

B.17.4 Materials

Supply of appropriate test gas specified in accordance with [Table 4.7](#), at pressures to satisfy the limiting conditions shall be used.

B.17.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.

B.17.6 Procedure

The procedure shall be as follows:

- (a) Initially test with the appliance in ambient condition.

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- (b) Without lighting the appliance, adjust the manifold pressure until the test point pressure is at the appropriate proportion of nominal test point pressure as shown in [Table 4.7](#).
- CAUTION ENSURE THAT THE APPLIANCE IS ADEQUATELY PURGED OF GAS BEFORE ATTEMPTING ANY LIGHTING OF THE APPLIANCE.**
- (c) Darken the room, turn on gas control and start the timing device at the same time.
- (d) After 5 s, apply source of ignition.
- (e) Repeat the test in each limiting condition.
- (f) Repeat the procedure with the appliance in the hot condition.

B.17.7 Test report

All relevant observations shall be reported, including the following, at each limiting condition:

- (a) The effect on other burners (other burners extinguished).
- (b) The effect on the appliance (damage, carbon deposits).
- (c) The extent of any flame roll-out from the appliance perimeter and flue.
- (d) Ignition characteristics (complete ignition, remaining alight, light back, noise).

B.18 Unburnt gas release from burner system (MOT 4.8)

B.18.1 Scope

This method sets out the procedure to determine if unburnt gas can be released to the atmosphere from any part of the burner system other than the burner ports.

B.18.2 Principle

This test is performed by applying a high voltage spark to the primary air ports and to any potential release points of the burner system other than the burner ports. Any ignition of release gas is reported.

Open burners shall be tested with and without a vessel in place.

B.18.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Suitable device for producing a continuous series of high voltage sparks.

B.18.4 Materials

Supply of appropriate test gas specified in accordance with [Table 4.8](#), at pressures to satisfy the limiting conditions shall be used.

B.18.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.

B.18.6 Procedure

The procedure shall be as follows:

- (a) Operate the appliance.
- (b) Adjust to any limiting conditions as specified in [Table 4.8](#).
- (c) Using the high voltage spark generator, scan the primary air ports and potential release points of the burner system.
- (d) Readjust gas control to minimum setting that will support a flame on the burner ports.
- (e) Repeat Step (c).

B.18.7 Test report

All relevant observations shall be reported, including any observations on the ignition of released gas at primary air ports or any part of the burner system up to the burner ports, at any limiting condition.

B.19 Combustion air supply test (MOT 5.1.6)

B.19.1 Scope

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The following materials shall be used:

- Supply of appropriate test gas (see [Clause 3.1](#)) at normal test gas pressure.
- Supply of cold water for dew plate (if used).

B.20.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.
- (c) Fit the appropriate flue. Seal the points between the appliance flue spigot and the flue, or if applicable, between the flue spigot and the flue elbow and between the flue elbow and the flue.

B.20.6 Procedure

The procedure shall be as follows:

- (a) Operate the appliance in accordance with manufacturer's instructions.
- (b) Five minutes after ignition, check the unit for combustion product spillage by use of a dew plate or carbon dioxide and monoxide analysis. If sampling combustion products, note the background level of carbon dioxide in the ambient air.
- (c) Position sampling probe or dew plate at all locations where leakage or spillage of combustion products might occur, such as the following:
 - (i) Draught diverter relief openings.
 - (ii) Spigots.
 - (iii) Flue connection.
 - (iv) Base of flue product collection hoods.
 - (v) Ensure that the sample probe does not interfere with the normal operation of the appliance.
- (d) If partial disassembly is required to access the sample point locations, ensure that the operation of the appliance is not altered so as to cause spillage/leakage. Check that the appliance is correctly reassembled before proceeding with further testing.
- (e) Repeat Steps (a) to (c) with the appliance fan at each speed (if applicable).

B.20.7 Test report

All relevant observations shall be reported, including at least the following:

- Any spillage detected.
- Location of any spillage detected.
- The method used.

B.21 Performance with updraught, downdraught and blocked flue tests (MOT 5.2.2)

B.21.1 Scope

This method sets out the procedure to determine the ratio of carbon monoxide to carbon dioxide (CO/CO₂) in the combustion products of an open flued appliance when the flue is subjected to downdraught, updraught and flue blockage.

B.21.2 Principle

The flue gases are sampled and analysed for CO and CO₂ under conditions of updraught, downdraught and flue blockage. The CO/CO₂ ratio is then calculated.

B.21.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Carbon monoxide analyser, calibrated to give accurate and reproducible results.
- (c) Carbon dioxide analyser, calibrated to give accurate and reproducible results.
- (d) Sampling apparatus known to not affect the representativeness of the sampled gases under prevailing conditions.
- (e) Micro manometer accurate to ± 0.5 Pa or better and ranging to at least 20 Pa or an anemometer accurate to ± 0.2 m/s or better and ranging up to at least 6 m/s, or other suitable means to measure updraught and downdraught velocity.
- (f) A draught machine capable of applying up and downdraughts of 10 Pa for appliances with atmospheric burners and up to 15 Pa downdraught and 20 Pa updraught for appliances with fan-assisted combustion systems.
- (g) Suitable timing device.
- (h) 0.6 m of appropriate flue.

B.21.4 Materials

Supply of appropriate test gas (see [Clause 3.1](#)) at normal test gas pressure.

B.21.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.
- (c) Attach 0.6 m of appropriate flue.
- (d) Attach the means to measure downdraught or updraught to the flue.
- (e) Place flue gas sampling probe into the appliance primary flue outlet.

B.21.6 Procedure

B.21.6.1 Open flued appliances with a draught diverter or alternative system

The procedure shall be as follows:

- (a) Begin continuous sampling of the flue gases and recording of CO/CO₂.
- (b) Operate the appliance in accordance with manufacturer's instructions on the highest setting with normal test gas pressure at appliance inlet.
- (c) Block off the secondary flue outlet.
- (d) At 10 min after ignition, measure the CO and CO₂.
- (e) Unblock the secondary flue.
- (f) With the appliance in the hot condition apply a downdraught with a velocity head starting at zero and gradually increasing over 5 min to 7.5 Pa (3.5 m/s). Maintain the downdraught for a further 5 min.
- (g) With the appliance in the hot condition apply an updraught with a velocity head starting at zero and gradually increasing over 5 min to 7.5 Pa (3.5 m/s). Maintain the updraught for a further 5 min.
- (h) For appliances with a turndown setting, repeat Steps (f) and (g) at the low setting.

B.21.6.2 Open flued appliances without a draught diverter or similar device

The procedure shall be as follows:

- (a) Begin continuous sampling of the flue gases and recording of CO/CO₂.
- (b) Operate the appliance in accordance with manufacturer's instructions on the highest setting with normal test gas pressure at appliance inlet.
- (c) Wait until 10 min after ignition.
- (d) Block off the flue progressively until lockout occurs.
- (e) Unblock the flue, reset the appliance and determine the velocity head in the flue with the appliance in operation.
- (f) With the appliance in the hot condition apply an updraught with a velocity head starting at zero and gradually increasing over 5 min to 7.5 Pa (3.5 m/s) in excess of that measured in Step (e). Maintain the updraught for a further 5 min.
- (g) For appliances with a turndown setting, repeat Steps (c) to (f) at the low setting.

B.21.7 Test report

All relevant observations shall be reported, including at least the following:

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ance is located centrally in the area of 1.0 m².

appliance to a horizontal draught of 5 km/h for periods of 1 min

.

e main burner.

m full-on to turndown setting.

g at least the following:

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the main burner.

from full-on to turndown setting.

g at least the following:

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The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) A calibrated draught machine capable of delivering a 5 km/h draught over an area of 1.0 m².
- (c) Suitable timing device.

B.23.4 Materials

Supply of appropriate test gas (see [Clause 3.1](#)) at normal test gas pressure.

B.23.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.

B.23.6 Procedure

The procedure shall be as follows:

- (a) Connect to appropriate gas.
- (b) Light the pilot(s).
- (c) Place the draught machine so that the appliance is located centrally in the area of 1.0 m².
- (d) Turn on the draught machine and subject the appliance to a horizontal draught of 5 km/h for periods of 1 min directed from the front, sides and intermediate points at 15° intervals.
- (e) Turn off the draught machine and turn the pilot on and off five times in the normal manner.

B.23.7 Test report

All relevant observations shall be reported, including at least the following:

- (a) The ignition of the pilot(s).
- (b) The stability subject to draught.
- (c) The stability with the pilot switching on and off.

B.24 Effect of appliance door operation on flame stability test (MOT [5.3.4](#))

B.24.1 Scope

This method sets out the procedure to determine the effect of the opening and closing of any associated door(s) on the appliance burners.

B.24.2 Principle

The appliance is operated at turndown gas consumption. The effect of normally opening and closing the appliance doors on the burner flames is observed.

B.24.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Standard test vessels in accordance with [Table A.8](#), where applicable.

B.24.4 Materials

Supply of appropriate test gas (see [Clause 3.1](#)) at normal test gas pressure.

B.24.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.

B.24.6 Procedure

The procedure shall be as follows:

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- (a) Light the burner(s) and adjust to turndown gas consumption. Open burners are tested with a standard test vessel placed centrally over the burner.
- (b) Open and close the appliance door(s) and observe whether the burner flames extinguish. In addition, allow the appliance doors to close by self-closing action through their full arc of travel.
- (c) For open burners the test is repeated with no standard vessels in position.

B.24.7 Test report

All relevant observations shall be reported, including at least the flame response to opening and closing doors.

B.25 Blocked condensate drain test (MOT 5.4.3)

B.25.1 Scope

This method sets out the procedure to assess the safety of an appliance with a blocked condensate drain.

B.25.2 Principle

The appliance is checked for safe operation under conditions that simulate the accumulation of condensate within the appliance as the result of a blocked drain outlet.

B.25.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in Appendix D.
- (b) Flue gas sampling hood (see Figures A.3, A.4, A.5, A.6 and A.7) or other device of stainless steel or aluminium.
- (c) Carbon monoxide analyser, calibrated to give accurate and reproducible results.
- (d) Carbon dioxide analyser, calibrated to give accurate and reproducible results.
- (e) Suitably sized funnel, hose and beaker for pouring water into the appliance via the condensate drain outlet.
- (f) Suitable timing device.

B.25.4 Materials

Supply of appropriate test gas (see Clause 3.1) at normal test gas pressure shall be used.

B.25.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with Clause 3.2.
- (b) Set up test equipment.
- (c) Connect a suitable hose and funnel to the condensate drain opening of the appliance.
- (d) Place appropriate sampling hood or averaging probe in a suitable position to collect flue gas samples from the flue outlet of the appliance.
- (e) Elevate the hose and funnel sufficiently so that the water will flow smoothly into the appliance (against the pressure developed by the appliance combustion fan) without causing pressure pulses which may disturb the normal function of the combustion airflow proving device.

B.25.6 Procedure

The procedure shall be as follows:

- (a) Operate the appliance in accordance with the manufacturer's instructions and adjust it to operate at the maximum heating capacity/test point pressure.
- (b) Continuously monitor the CO and CO₂ and observe the flame for evidence of abnormality. When equilibrium is reached record the CO and CO₂ values.
- (c) Gradually pour water into the appliance (through the appliance drain opening) at a rate which will not disturb the normal function of the combustion airflow proving device and is sufficiently slow to permit continuous observation of the flame and monitoring of the CO/CO₂ values. Periodically assess the external cabinet of the appliance for evidence of temperature hazards by touch. If necessary attach and monitor thermocouples on the surface of the appliance in areas of potential temperature hazard.
- (d) Continue to pour water into the appliance and observe the flame and record the CO/CO₂ and surface temperature until the appliance shuts down or reaches an equilibrium condition.
- (e) Immediately following shut down, and without draining any water from the appliance, attempt to restart the appliance by cycling the appliance thermostat. Observe the appliance for any ignition hazards.
- (f) If applicable, manually reset any limiting device and again attempt to restart the appliance while observing the appliance for ignition hazards. If necessary, remove a small quantity of water to permit the appliance to restart.

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- (g) If applicable, drain the water from the appliance and repeat Steps (a) to (f) with the appliance controls adjusted to the minimum gas rate setting and or any other discrete operating condition in between as deemed necessary by the certification body.

B.25.7 Test report

All relevant observations shall be reported, including the following:

- (a) The recorded CO and CO₂ values.
- (b) The maximum CO/CO₂ ratio.
- (c) The recorded temperatures.
- (d) The flame ignition characteristics.

B.26 Temperature hazards test (MOT 5.5.1)

B.26.1 Scope

This method sets out the procedure to determine the temperature of the appliance and its surrounds during operation.

B.26.2 Principle

The appliance is operated under specified conditions and the temperatures of specified parts of the appliance and the surroundings are measured.

B.26.3 Apparatus

B.26.3.1 General

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Adequately sized area with ambient temperature between 10 °C and 35 °C, and not varying by more than 4 °C during the test.
- (c) A test rig consisting of a wooden floor with detachable side and back walls. The rear wall shall be approximately 2 m high and the side wall shall be adjustable for height. When tested with the manufacturer's clearances, the rear and side panels shall be 25 mm thick wood walls, the floor being hardwood. Holes of 8 mm diameter shall be drilled from the back of the panels at no more than 75 mm centres on a grid pattern. These holes shall be flat bottomed. 0.51 mm diameter (24 AWG) thermocouples are placed in the holes and bent at right angles to lie as flat as possible on the bottom of the holes. The point at which the wires first make electrical contact to form the junction shall be at least 4 mm from the bend. Each thermocouple shall be held in place to within 1.5 mm of the front surface by an electrically insulating cement. The thermocouples shall have an accuracy of ± 2 °C or better.

Bench surface and overhead test boards shall be fitted with thermocouples as above. If there are direct points of contact with the test boards, ensure that adequate thermocouples are fitted at these locations.

For built-in appliances an enclosure shall be constructed to fit the appliance as tightly as possible and fitted with thermocouples as described above.

Any appliance whose design is not compatible with the test rig, including a mobile appliance, shall be tested in a modified test rig as deemed necessary.

- (d) Thermocouples with an accuracy of ± 2 °C or better shall be used on the appliance surfaces.
- (e) A temperature recorder with an accuracy of ± 2 °C.
- (f) Ambient temperature recorder with an accuracy of ± 2 °C.
- (g) Contact thermometer with an accuracy of ± 2 °C.
- (h) Suitable timing device.

B.26.3.2 Additional apparatus for boiling tables — Open and closed top, Chinese cooking tables

Appropriate standard test vessels as per [Table A.8](#).

B.26.3.3 Additional apparatus for fryers

A water cooled heat exchanger which, when immersed in the cooking oil, is capable of removing heat at a sufficient rate to maintain the cooking oil temperature at 180 ± 5 °C while the burner(s) are operating at nominal gas consumption.

B.26.4 Materials

B.26.4.1 General

The following materials shall be used:

- (a) Supply of available gas (see [Clause 3.1](#)) at normal test gas pressure.
- (b) Where necessary, a supply of cold water.

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B.26.4.2 Additional materials for barbecues

A perforated sheet metal plate of 25 % free area to cover the entire open grill area (for open grill type only).

B.26.4.3 Additional materials for fryers

Cooking oil as specified by the manufacturer.

B.26.4.4 Additional materials for mobile serving trolleys

Full fuel container(s) as specified by the manufacturer

B.26.5 Preparation of apparatus

B.26.5.1 General

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#) in the test rig. In the case of built-in appliances, these shall be installed as tightly as physically possible in a normal enclosure regardless of the clearances specified. Any clearances required shall be guaranteed by the fitting of clearance channels or spacers.
- (b) Set up test equipment.
- (c) Where required, the overhead test boards shall be installed above the appliance at the minimum height and maximum projection, if specified in the manufacturer's instructions.
- (d) Where required, add water or the cooking medium to the level specified in the instructions.

B.26.5.2 Additional preparation of apparatus for barbecues

In the case of open type barbecues, lay the perforated sheet metal plate of 25 % free area centrally on the grill.

B.26.5.3 Additional preparation of apparatus for fryers

- (a) Place a temperature measuring device 25 mm below the surface of the cooking oil in the centre of each pan. Install a water cooled heat exchanger in each pan.
- (b) Adjust the cooking oil to the normal working level.

B.26.6 Procedure — Appliance operation

B.26.6.1 Boiling tables — Open and closed top, Chinese cooking tables

The procedure shall be as follows:

- (a) Turn on gas and light burners, and operate the appliance at nominal gas consumption.
- (b) Place an open vessel containing 60 ± 10 mm of water on each open burner. These vessels shall be—
 - (i) standard test vessel(s) size (see [Table A.8](#)); or
 - (ii) wok(s); or
 - (iii) special purpose vessel(s) specified or supplied by the manufacturer; or
 - (iv) rectangular pan(s), when in position, that does not protrude over the edges and covers at least 85 % of the area of the section of a solid enclosed top burner.
- (c) Bring water to the boil and turn the burners down to simmer for the duration of the test. In the case of a wok maintain at full boil.
- (d) Top up water in vessels as necessary to maintain a depth of 60 ± 10 mm.
- (e) Operate the appliance for not less than 2 h, until thermal equilibrium is reached.

B.26.6.2 Salamanders, grillers and toasters

The procedure shall be as follows:

- (a) Turn on the gas and light the burners.
- (b) Fill the grill tray to a quarter of its depth with water and operate the appliance at nominal gas consumption.
- (c) Top up the water in the grill tray as necessary to maintain the required depth.
- (d) Operate the appliance for not less than 2 h, until thermal equilibrium is reached.

B.26.6.3 Solid grill plates and griddles

The procedure shall be as follows:

- (a) Turn on the gas and light the burners.
- (b) Adjust the gas consumption to maintain the temperature of the plate at 200 ± 6 °C.
- (c) Operate the appliance for not less than 2 h, until thermal equilibrium is reached.

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until thermal equilibrium is reached, with the following conditions:

at full rate.

ction of appliance, as specified in [B.26.6.2](#).

facturer with different configuration options of open grill and solid
um size specified.

ce at the maximum cooking condition specified by the manufact

facturer for both open and covered/hooded cooking, successive
ons specified in Items (i), (ii), (iii) and (iv).

erating temperature, whichever is higher.

until thermal equilibrium is reached.

stockpots, brat pans, atmospheric s

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cookers

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Illeys

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- temperatures are being checked.
and at the sides of the appliance.
ck walls.
ed to be handled.
to be accidentally touched.
of surfaces of functional components (e.g. valves, thermostats,
temperature values as follows:
- | Location | Temperature (°C) |
|---------------------|------------------|
| Above ambient | 70 |
| Under the appliance | 70 |
| During the test | 70 |

where

t_m = measured temperature rise above ambient ($^{\circ}\text{C}$)

- (g) Measure the temperatures of any LP Gas cylinders.
- (h) Record the maximum temperatures attained during the test.

B.26.7 Test report

All relevant observations shall be reported, including the following:

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B.27 Temperature hazards — Zero clearance test (MOT 5.5.6)

B.27.1 Scope

This method sets out the procedure to determine the temperature of rear surfaces adjacent to a commercial catering gas appliance during operation.

B.27.2 Principle

The appliance is operated under specified conditions and the temperatures of specified parts of the appliance and the surroundings are measured.

B.27.3 Apparatus

B.27.3.1 General

The following apparatus shall be used:

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- (b) Adequately sized area with ambient temperature between 10 °C and 35 °C, and not varying by more than 4 °C during the test.
- (c) A test rig consisting of a wooden floor with detachable side and back walls. The rear wall shall be approximately 2 m high and the side wall shall be adjustable for height. When tested with the manufacturer's clearances, the rear shall be 25 mm thick wood walls, the floor being hardwood. Holes of 8 mm diameter shall be drilled from the back of the panels at no more than 75 mm centres on a grid pattern. These holes shall be flat bottomed. 0.51 mm diameter (24 AWG) thermocouples are placed in the holes and bent at right angles to lie as flat as possible on the bottom of the holes. The point at which the wires first make electrical contact to form the junction shall be at least 4 mm from the bend. Each thermocouple shall be held in place to within 1.5 mm of the front surface by an electrically insulating cement. The thermocouples shall have an accuracy of ± 2 °C or better.

The apparatus may be modified for improved longevity due to the elevated temperatures, with any and all such modifications required to be reported along with the test results.

NOTE The maximum temperature imposed on the rear surface is typically above the installed appliance, due to heated products of combustion impinging on the surface after they are discharged from the appliance flueway terminal(s).

Any appliance whose design is not compatible with the test rig, including a mobile appliance, shall be tested in a modified test rig as deemed necessary.

- (d) Thermocouples with an accuracy of ± 2 °C or better shall be used on the appliance surfaces.
- (e) A temperature recorder with an accuracy of ± 2 °C.
- (f) Ambient temperature recorder with an accuracy of ± 2 °C.
- (g) Contact thermometer with an accuracy of ± 2 °C.
- (h) Suitable timing device.

B.27.3.2 Additional apparatus for boiling tables — Open and closed top, Chinese cooking tables

Appropriate standard test vessels as per [Table A.8](#).

B.27.3.3 Additional apparatus for fryers

A water cooled heat exchanger which, when immersed in the cooking oil, is capable of removing heat at a sufficient rate to maintain the cooking oil temperature at 180 ± 5 °C while the burner(s) is operating at nominal gas consumption.

B.27.4 Materials

B.27.4.1 General

The following materials shall be used:

- (a) Supply of available gas (see [Clause 3.1](#)) at normal test gas pressure.
- (b) Where necessary, a supply of cold water.

B.27.4.2 Additional materials for barbecues

A perforated sheet metal plate of 25 % free area to cover the entire open grill area (for open grill type only).

B.27.4.3 Additional materials for fryers

Cooking oil as specified by the manufacturer.

B.27.4.4 Additional materials for mobile serving trolleys

Full fuel container(s) as specified by the manufacturer

B.27.5 Preparation of apparatus

B.27.5.1 General

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#) in the test rig, except that built-in appliances shall be installed as tightly as physically possible in a normal enclosure regardless of the clearances specified. Any clearances required shall be guaranteed by the fitting of clearance channels or spacers. Any such clearance channels or spacers shall be permanent components of the appliance.
- (b) Set up test equipment.
- (c) Where required, the overhead test boards shall be installed above the appliance at the minimum height and maximum projection, if specified in the manufacturer's instructions.
- (d) Where required, add water or the cooking medium to the level specified in the instructions.

B.27.5.2 Additional preparation of apparatus for barbecues

In the case of open type barbecues, lay the perforated sheet metal plate of 25 % free area centrally on the grill.

B.27.5.3 Additional preparation of apparatus for fryers

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open and closed to

The procedure shall be as follows:

- ### B.27.6.2 Salamanders, grillers and toasters

- Turn on the gas and light the burners.
- Fill the grill tray to a quarter of its depth with water and operate the appliance at nominal gas consumption.
- Top up the water in the grill tray as necessary to maintain the required depth.
- Operate the appliance for not less than 2 h, until thermal equilibrium is reached.

B.27.6.3 Solid grill plates and griddles

- Turn on the gas and light the burners.
- Adjust the gas consumption to maintain the temperature of the plate at 200 ± 6 °C.
- Operate the appliance for not less than 2 h, until thermal equilibrium is reached.

B.27.6.4 Barbecues

- (a) Turn on the gas and light the burners.
- (b) Operate the appliance for not less than 2 h, until thermal equilibrium is reached, with the following conditions:
 - (i) An open flame grill section of appliance at full rate.
 - (ii) An enclosed flame solid griddle plate section of appliance, as per [B.26.6.3](#).
 - (iii) For an appliance specified by the manufacturer with different configuration options of open grill and solid griddle plate sections, each option shall be tested at its maximum size specified.
 - (iv) A covered/hooded cooking type appliance at the maximum cooking condition specified by the manufacturer.
 - (v) For an appliance specified by the manufacturer for both open and covered/hooded cooking, successive tests shall be conducted in accordance with the operating conditions specified in Items (i), (ii), (iii) and (iv).

B.27.6.5 Ovens

- Turn on the gas and light the burners.
- Set the thermostat to 260 °C or maximum operating temperature, whichever is higher.
- Operate the appliance for not less than 2 h, until thermal equilibrium is reached.

B.27.6.6 Boiling water units, stockpots, brat pans, atmospheric steamers and pasta cookers

(a) Fill with water to the normal operating level.

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- (b) Turn on the gas and light the burners.
- (c) Operate the appliance for not less than 2 h, until thermal equilibrium is reached.

B.27.6.7 Fryers

The procedure shall be as follows:

- (a) Confirm cooking oil is at the normal operating level with the heat exchanger in position.
- (b) Light the gas and set the thermostat to maximum temperature setting.
- (c) Start a small flow of water through the heat exchanger(s) and increase the flow when the temperature of the cooking oil approaches 180 °C.
- (d) By adjusting the water flow and if necessary the depth of immersion of the heat exchanger, maintain the cooking oil temperature at 180 ± 5 °C throughout the test.
- (e) Operate the appliance for not less than 2 h, until thermal equilibrium is reached.

B.27.6.8 Food warmers and bains marie

The procedure shall be as follows:

- (a) Turn on gas and light the burners.
- (b) Operate the appliance for not less than 2 h, until thermal equilibrium is reached at the gas consumption required to maintain 82 ± 6 °C.

B.27.6.9 High temperature cookers

The procedure shall be as follows:

- (a) Turn on the gas and light the burner(s).
- (b) Operate the appliance for not less than 2 h until thermal equilibrium is reached with the thermostat (if fitted) set to maximum.

B.27.6.10 Procedure — Temperature measurements

The procedure shall be as follows:

- (a) The appliance shall be kept operating while temperatures are being checked.
- (b) Measure the temperature of the rear surface.
- (c) Record the maximum temperatures attained during the test.

B.27.7 Test report

All relevant observations shall be reported, including the following:

- (a) The nature of any special installation conditions indicated by a permanent marking on the appliance, otherwise the statement “No special conditions”.
- (b) The maximum and minimum ambient temperature during the test period.
- (c) The highest recorded temperature rise above ambient on the rear surfaces when installed with zero rear clearances.
- (d) When applicable, record details of any appliance clearance channels or spacers.
- (e) The relative position of the maximum readings, the location of the thermocouple array to the installed appliance position.
- (f) Any and all modifications made to the standard temperature hazard apparatus (boards).

B.28 Heat resistance (MOT 5.6.1)

B.28.1 Scope

This test method sets out the procedure to assess the heat resistance of the appliance when subjected temperature hazard testing.

B.28.2 Principle

The appliance is examined for damage after the completion of temperature hazard testing as required in [Clause B.26](#) in order to confirm that when installed and operated as will be expected, appliances are not damaged.

B.28.3 Test report

All relevant observations shall be reported, including at least the following:

- (a) Any structural damage or permanent distortion.
- (b) Operation of controls, thermostats, etc.
- (c) Any refractory deterioration.
- (d) Flue passages restriction or expansion or movement.

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- (e) Burners distortion or deterioration.
- (f) Wiring insulation scorching or melting.
- (g) Any doors, shelves and other movable fittings function.
- (h) Where applicable, leakage of cooking fluid or water out of the vessel, and/or through attached components.
- (i) Where applicable, closed tops distortion.

B.29 Heat resistance — Light back condition (MOT 5.6.2)

B.29.1 Scope

This test sets out the procedure to access the heat resistance of the burner(s) when subjected to light back conditions.

B.29.2 Method

Each burner is tested to establish if it can be operated in the light back condition.

If the light back condition can be established, the burner is allowed to operate in this condition for 1 h at the maximum gas rate at which the light back condition can be maintained but at no more than the nominal gas rate.

B.29.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Suitable timing device.

B.29.4 Materials

The following materials shall be used:

- (a) Supply of available test gas (see [Clause 3.1](#)).
- (b) Supply of cold water, if applicable.

B.29.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Install the appliance in accordance with [Clause 3.2](#).
- (b) Set up test equipment.

B.29.6 Procedure

The procedure shall be as follows:

- (a) Operate the appliance in accordance with the manufacturer's instructions.
- (b) Ascertain if a light back condition can be established, at any achievable gas rate, by applying and removing an ignition source at the burner injector. If a light back condition cannot be established initially, allow the burner to operate normally for 15 min and repeat the light back test.
- (c) If a light back condition is established allow the burner to operate in this condition for a period of 1 h at the maximum gas rate at which the light back condition can be maintained but at no more than the nominal gas rate.
- (d) Allow the burner to cool and examine all components for evidence of melting or distortion.

B.29.7 Test report

All relevant observations shall be reported, including at least the conditions including any sign of melting or distortion of all burner components.

B.30 Electrical supply variation test (MOT 5.7)

B.30.1 Scope

This test sets out the process to assess the safety of the appliance when subjected to electrical supply variations.

B.30.2 Method

The electricity supply to the appliance is varied and the appliance operation is observed.

B.30.3 Apparatus

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- The following apparatus shall be used:
- (a) Means to supply an AC voltage variable between 85 % and 110 % of rated voltage of the appliance.
 - (b) A voltmeter with an accuracy of $\pm 1 \%$.

B.30.4 Materials

- The following materials shall be used:
- (a) Supply of available test gas (see [Clause 3.1](#)).
 - (b) Supply of cold water, if applicable.

B.30.5 Preparation of apparatus

- The apparatus shall be prepared as follows:
- (a) For an appliance with a fan, connect a switch in the fan circuit or other mechanical device so that the fan can be stopped without stopping supply of electricity to other components.
 - (b) Install the appliance in accordance with [Clause 3.2](#).
 - (c) Set up test equipment.
 - (d) Set the transformer output voltage to the nominal value.
 - (e) Operate the appliance and check for normal performance.

B.30.6 Procedure

- The procedure shall be as follows:
- (a) With the appliance in operation increase the supply voltage to 110 % in steps of 2.5 % of nominal, observing after each step for any flame abnormality or other unsafe condition. If results are satisfactory proceed to Step (b), if not, stop test and report.
 - (b) Reduce the voltage to nominal, then reduce the voltage to 85 % in steps of 2.5 % of nominal observing for any flame abnormality or other unsafe conditions. If results are satisfactory proceed to Step (c).
 - (c) Increase the voltage to nominal.
 - (d) Connect the electricity supply and operate the appliance for 5 min. Open the switch in the circuit of the fan to stop the fan only and watch for flame abnormality or safe shut down.
 - (e) Close the switch and connect the electricity supply and operate the appliance. By means of the variable transformer reduce the voltage until shut down occurs. Watch for unsafe conditions.

B.30.7 Test report

- All relevant observations shall be reported, including at least the following:
- (a) Any flame abnormality is observed.
 - (b) Any unsafe conditions created by disconnection and subsequent reconnection.
 - (c) Any unsafe conditions created by fan failure.
 - (d) The voltage at which shut down occurred and any unsafe conditions observed.

B.31 Zinc based alloy test (MOT [5.8.1](#))

B.31.1 Scope

This method sets out the procedure to assess the durability of zinc based alloys.

B.31.2 Method

Three test samples are suspended above heated water for 10 days and checked for deterioration.

B.31.3 Apparatus

- The following apparatus shall be used.
- A chamber of suitable size to enclose the test samples suspended above a quantity of water heated to a temperature of $97 \pm 2 \text{ }^{\circ}\text{C}$ such that:
- (a) The water level is maintained automatically; and
 - (b) The pressure in the chamber is maintained at atmospheric pressure via a water filled S trap.

B.31.4 Materials

Supply of cold water shall be used.

B.31.5 Preparation of apparatus

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The apparatus shall be prepared by adding a suitable amount of water to the chamber and heating it to $97 \pm 2 \text{ }^{\circ}\text{C}$.

B.31.6 Procedure

The procedure shall be as follows:

- (a) Suspend the three samples above the water.
- (b) Maintain the water temperature at $97 \pm 2 \text{ }^{\circ}\text{C}$ for 10 days.
- (c) Inspect samples for deterioration at the conclusion of Step (b).

B.31.7 Test report

All relevant observations shall be reported, including at least the condition of the samples at the conclusion of the test.

B.32 Permanent markings test (MOT 5.8.2)

B.32.1 Scope

This method sets out the procedure to assess the durability of permanent markings.

B.32.2 Principle

The legibility of all markings and labels is checked by rubbing with material soaked in water and kerosene before and after a heat soak test in an oven. The adhesion of self-adhesive labels is checked before and after the heat test and immersion in water.

B.32.3 Apparatus

The following apparatus shall be used:

- (a) Oven suitable for maintaining a temperature of $120 \pm 5 \text{ }^{\circ}\text{C}$ and $175 \pm 5 \text{ }^{\circ}\text{C}$.
- (b) Water bath.
- (c) Suitable timing device.

B.32.4 Materials

The following materials shall be used:

- (a) Water.
- (b) Kerosene.
- (c) Suitable material such as cotton or linen.
- (d) Three sets of markings and labels, affixed to suitable backing plates e.g. enamelled steel, if of the self-adhesive type.

B.32.5 Procedure

The procedure shall be as follows:

- (a) Check self-adhesive labels for good adhesion and no lifting at edges.
- (b) Rub markings for 15 s with finger pressure applied to material soaked in water and check for legibility.
- (c) Rub markings for 15 s with finger pressure applied to material soaked in kerosene and check for legibility.
- (d) Place one sample of markings and label in an oven at a temperature of $120 \text{ }^{\circ}\text{C}$ ($175 \text{ }^{\circ}\text{C}$ if the markings or label are to be in a hot zone e.g. the grill compartment or oven of a cooker) for 72 h.
- (e) Remove samples from oven, allow to cool and check for adhesion and legibility as in Steps (a) to (c).
- (f) Immerse one sample of markings and label in water for 24 h.
- (g) Remove sample from water, dry and check for adhesion and legibility as in Steps (a) to (c).

B.32.6 Test report

All relevant observations shall be reported, including the following:

- (a) The legibility of markings.
- (b) The adhesion of labels.

B.33 Strength of boiling tables (MOT 6.2)

B.33.1 Scope

This method sets out the procedure to determine if a boiling table is able to withstand a specified load.

B.33.2 Principle

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A specified weight is applied without impact to the appliance and its top elements and any breakage or damage is observed.

B.33.3 Apparatus

The following apparatus shall be used:

- (a) Weights totalling 68 kg or 140 ± 1 kg respectively.
- (b) 150 mm wooden beam.
- (c) Suitable timing device.

B.33.4 Preparation of apparatus

Set up the appliance in accordance with the manufacturer's instructions on a firm, level base.

B.33.5 Procedure

The procedure shall be as follows:

- (a) Remove the open burner grids and solid plates.
- (b) Place a 150 mm wooden beam across the two weakest members of the cross frame at their centres.
- (c) Apply a load of 140 kg without impact at the centre of the beam.
- (d) After 15 min remove weight and inspect the boiling table.
- (e) Replace the open burner grids and solid plates.
- (f) Apply a load of 68 kg evenly and without impact over an area of 225 mm in diameter at the centre of the grid in case of open boiling tables.
- (g) Apply a load of 68 kg evenly and without impact over an area of 400 mm in diameter at the centre of the top in case of closed top burners.
- (h) After 15 min remove load and inspect for any breakage or apparent damage.

B.33.6 Test report

All relevant observations shall be reported, including at least the following:

- (a) The applied weight.
- (b) Any detrimental damage or permanent deformation.

B.34 Effect of spillover on ignition systems test (MOT 6.3)

B.34.1 Scope

This method sets out the procedure to determine the effect of spillover on the pilots and ignition system of open and closed boiling tables.

B.34.2 Principle

Burners are subjected to simulated spillover conditions, then tested for complete ignition.

B.34.3 Apparatus

The following apparatus shall be used:

- (a) Standard test vessel (see [Table A.8](#)).
- (b) Graduated measuring cylinder 200 mL.

B.34.4 Materials

Available gas at normal test pressure.

B.34.5 Preparation of apparatus

Set up the appliance in accordance with [Clause 3.2](#).

B.34.6 Procedure

The procedure shall be as follows:

- (a) Place the appropriate standard vessel filled to the brim with water, over one burner and light the gas.
- (b) Before boiling point is reached (approximately 95 °C) fill vessel to the brim with extra water.
- (c) Add another 140 mL of water to the vessel in 2 to 3 s to cause overflow.

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- (d) Observe pilot for extinction.
- (e) Turn burner off and wipe up all spillage accessible without the use of tools.
- (f) Turn burner on again and check for positive ignition.
- (g) Repeat Steps (a) to (f) for all burners.

B.34.7 Test report

All relevant observations shall be reported, including the following:

- (a) If the pilots remain alight.
- (b) If the burners remain alight.
- (c) If any burner has been extinguished because of the action of a flame supervisions device.
- (d) If all burners can be reignited.

B.35 Strength test — Shelves — Salamanders and grillers (MOT 7.3)

B.35.1 Scope

This method sets out the procedure to determine if appliance shelves are able to withstand a specified load.

B.35.2 Principle

A specified weight is applied without impact to the appliance shelves and any breakage or damage is observed.

B.35.3 Apparatus

The following apparatus shall be used:

- (a) Weights totalling 50 ± 1 kg.
- (b) Suitable timing device.

B.35.4 Preparation of apparatus

Set up the appliance in accordance with the manufacturer's instructions on a firm, level base.

B.35.5 Procedure

The procedure shall be as follows:

- (a) Place shelf in full in position.
- (b) Apply the load equivalent to 50 kg/m² of shelf area over a central strip two-thirds of the width and the full depth of the shelf.
- (c) Remove the weights after 5 min.
- (d) Examine shelf for damage or distortion.
- (e) Place shelf in position withdrawn to stops.
- (f) Reapply load.
- (g) Remove the weights after 15 min.
- (h) Examine shelf for damage or distortion.

B.35.6 Test report

All relevant observations shall be reported, including at least the following:

- (a) The applied weight.
- (b) Any detrimental damage or permanent deformation.

B.36 Strength of ovens (MOT 10.4.1)

B.36.1 Scope

This method sets out the procedure to determine if an oven is able to withstand a specified load.

B.36.2 Principle

A specified weight is applied without impact to the appliance and any breakage or damage is observed.

B.36.3 Apparatus

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The following apparatus shall be used:

- (a) Weights totalling 180 ± 1 kg.
- (b) Suitable timing device.

B.36.4 Preparation of apparatus

Set up the appliance in accordance with the manufacturer's instructions on a firm, level base.

B.36.5 Procedure

The procedure shall be as follows:

- (a) Uniformly apply the load to the top of the oven without impact.
- (b) After 15 min remove weight and inspect the oven.

B.36.6 Test report

All relevant observations shall be reported, including at least the following:

- (a) The applied weight.
- (b) Any detrimental damage or permanent deformation.

B.37 Strength test — Shelves — Ovens (MOT 10.4.2)

B.37.1 Scope

This method sets out the procedure to determine if appliance shelves are able to withstand a specified load.

B.37.2 Principle

A specified weight is applied without impact to the appliance shelves and any breakage or damage is observed.

B.37.3 Apparatus

The following apparatus shall be used:

- (a) Sufficient weights to make up the specified loads.
- (b) Suitable timing device.

B.37.4 Preparation of apparatus

Set up the appliance in accordance with the manufacturer's instructions on a firm, level base.

B.37.5 Procedure

The procedure shall be as follows:

- (a) Place shelf in full in position.
- (b) Apply the load equivalent to 100 kg/m² of shelf area over a central strip two-thirds of the width and the full depth of the shelf.
- (c) Remove the weights after 5 min.
- (d) Examine shelf for damage or distortion.
- (e) Place shelf in half withdrawn position.
- (f) Reapply load.
- (g) Remove the weights after 15 min.
- (h) Examine shelf for damage or distortion.

B.37.6 Test report

All relevant observations shall be reported, including at least the following:

- (a) The applied weight.
- (b) Any detrimental damage or permanent deformation.

B.38 Strength test — Drop down doors — Ovens (MOT 10.4.3/17.5.3)

B.38.1 Scope

This method sets out the procedure to determine if appliance drop down doors are able to withstand a specified load.

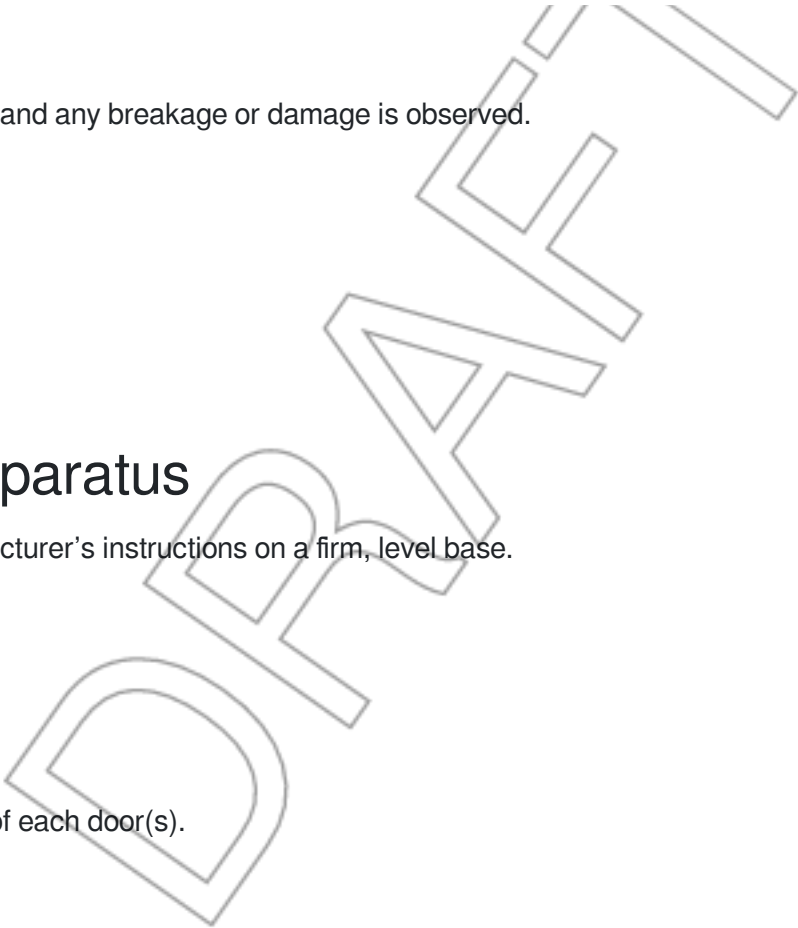
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B.38.2 Principle

A specified weight is applied to the appliance doors and any breakage or damage is observed.

B.38.3 Apparatus

The following apparatus shall be used:

- (a) Weights totalling 90 ± 1 kg.
- (b) Suitable timing device.

B.38.4 Preparation of apparatus

Set up the appliance in accordance with the manufacturer's instructions on a firm, level base.

B.38.5 Procedure

The procedure shall be as follows:

- (a) Open the drop down door(s).
- (b) Apply the load uniformly to the inner surface of each door(s).
- (c) Remove the weights after 15 min.
- (d) Examine door for damage or distortion.

B.38.6 Test report

All relevant observations shall be reported, including at least the following:

- (a) The applied weight.
- (b) Any detrimental damage or permanent deformation.

B.39 Strength test — Side hinged doors — Ovens (MOT 10.4.4/**17.5.4**)

B.39.1 Scope

This method sets out the procedure to determine if side hinged appliance doors are able to withstand a specified load.

B.39.2 Principle

A specified weight is applied to the appliance doors and any breakage or damage is observed.

B.39.3 Apparatus

The following apparatus shall be used:

- (a) Weights totalling 25 ± 1 kg.
- (b) Suitable timing device.

B.39.4 Preparation of apparatus

Set up the appliance in accordance with the manufacturer's instructions on a firm, level base.

B.39.5 Procedure

The procedure shall be as follows:

- (a) Open the door(s) 90°.
- (b) Apply the load within 25 mm of the outer top edge of the door(s).
- (c) Remove the weights after 15 min.
- (d) Examine door(s) for damage or distortion.

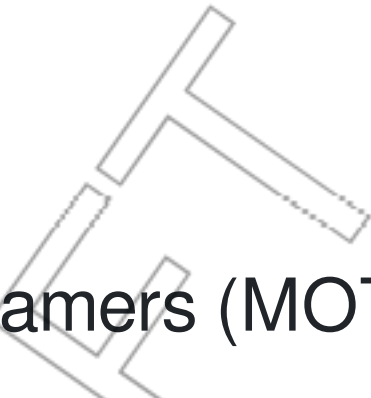
B.39.6 Test report

All relevant observations shall be reported, including at least the following:

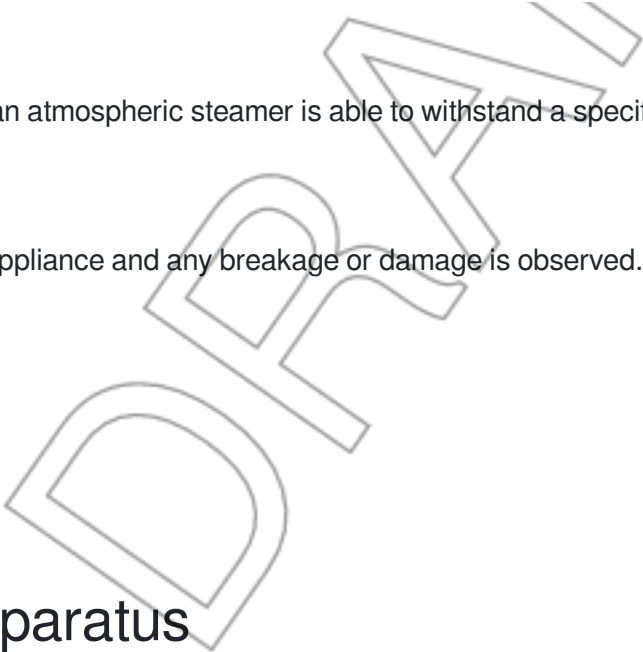
- (a) The applied weight.
- (b) Any detrimental damage or permanent deformation.

B.40 Strength of atmospheric steamers (MOT 12.3)

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B.40.1 Scope

This method sets out the procedure to determine if an atmospheric steamer is able to withstand a specified load.

B.40.2 Principle

A specified weight is applied without impact to the appliance and any breakage or damage is observed.

B.40.3 Apparatus

The following apparatus shall be used:

- (a) Weights totalling 50 ± 1 kg.
- (b) Suitable timing device.

B.40.4 Preparation of apparatus

Set up the appliance in accordance with the manufacturer's instructions on a firm, level base.

B.40.5 Procedure

The procedure shall be as follows:

- (a) Uniformly apply the load to the top of the appliance without impact.
- (b) After 15 min remove weight and inspect the steamer.

B.40.6 Test report

All relevant observations shall be reported, including at least the following:

- (a) The applied weight.
- (b) Any detrimental damage or permanent deformation.

B.41 Temperature of surfaces and cooking oil (MOT 13.1.2/14.1.2)

B.41.1 Scope

This method sets out the procedure to measure the temperature difference between the highest temperature of any appliance surface likely to come into contact with cooking oil and the cooking oil.

B.41.2 Principle

The temperature of appliance surfaces which may come in contact with cooking oil are measured when the appliance is operated under thermostatic control.

B.41.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) A temperature measuring device suitable for measuring the temperature of the cooking oil.
- (c) A temperature measuring device suitable for measuring surface temperatures.

B.41.4 Materials

The following materials shall be used:

- (a) Available gas (see [Clause 3.1](#)) at normal test gas pressure.
- (b) Supply of cooking oil.

B.41.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Set up the appliance in accordance with [Clause 3.2](#).
- (b) Fill the appliance with cooking oil to the normal working level.
- (c) Place the cooking oil temperature sensing device 25 mm below the surface of the cooking oil in the centre of the pan.

B.41.6 Procedure

The procedure shall be as follows:

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B.45.1 Scope

This method sets out the procedure to assess the operation of the over-temperature device.

B.45.2 Principle

The appliance is operated with its thermostatic control disabled and the cooking oil temperature is measured.

B.45.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) A temperature measuring device suitable for measuring the temperature of cooking oil.

B.45.4 Materials

The following materials shall be used:

- (a) Available gas (see [Clause 3.1](#)) at normal test gas pressure.
- (b) Supply of cooking oil.

B.45.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Set up the appliance in accordance with [Clause 3.2](#).
- (b) Render the thermostat inoperative by any convenient means, e.g. by removing sensing element from pan.
- (c) Fill the appliance with cooking oil to the normal working level.
- (d) Place the cooking oil temperature sensing device 25 mm below the surface of the oil in the centre of the pan.

B.45.6 Procedure

The procedure shall be as follows:

- (a) Light the appliance burners.
- (b) Set the thermostat to maximum setting.
- (c) Operate the appliance, continually monitoring cooking oil temperature until the over-temperature device shuts off the gas.
- (d) If the over-temperature device has not shut off the gas or the cooking oil temperature reaches 250 °C, stop test and report as a failure to conform to this requirement.
- (e) If the over-temperature device has shut off the gas, record oil temperature at the time of shut off.

B.45.7 Test report

All relevant observations shall be reported, including the cooking oil temperature.

B.46 Strength of fryers, pasta cooker and rethermalizers (MOT 14.5)

B.46.1 Scope

This method sets out the procedure to determine if an appliance is able to withstand a specified load.

B.46.2 Principle

A specified weight is applied without impact to the appliance and any breakage or damage is observed.

B.46.3 Apparatus

The following apparatus shall be used:

- (a) A wooden board approximately 50 mm wide by 25 mm thick and suitable length.
- (b) Weights with a total mass equal to 50 ± 1 kg less the mass of the wooden board.

B.46.4 Preparation of apparatus

Set up the appliance in accordance with the manufacturer's instructions on a firm, level base.

B.46.5 Procedure

The procedure shall be as follows:

- (a) Remove or open the lid.
- (b) Place the board centrally over the stockpot.
- (c) Uniformly apply the load to the board without impact.
- (d) After 15 min remove weight and inspect.

B.46.6 Test report

All relevant observations shall be reported, including at least the following:

- (a) The applied weight.
- (b) Any damage or permanent deformation.

B.47 Temperature control and maintenance — Wet bains marie (MOT [12.2.2.1/15.2.2.2/15.2.3](#))

B.47.1 Scope

This method sets out the procedure to assess the heating temperature of wet bains marie.

B.47.2 Principle

The appliance is operated at nominal gas consumption and the water level and temperatures are monitored.

B.47.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) A temperature measuring device suitable for water.
- (c) A suitable timing device.
- (d) Suitable water containers.
- (e) Means to heat supply water for the bain marie containers.

B.47.4 Materials

The following materials shall be used:

- (a) Available gas at normal test gas pressure.
- (b) Supply of cold water.

B.47.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Set up the appliance in accordance with [Clause 3.2](#).
- (b) Fill the well of the bain marie with water at 15 ± 1 °C to the manufacturer’s recommended level.
- (c) For fitted container type bains marie, fit the containers with lids in place. The containers are left empty. An open well type bain marie is tested without any cover.

In the absence of manufacturer’s instructions an open well type bain marie shall be filled to nominally 10 mm above the perforated plate. For a fitted container type bain marie the base of the containers shall be immersed approximately 10 mm in the water.
- (d) Install one temperature measuring device for each 0.6 mm length of the well.

B.47.6 Procedure

The procedure shall be as follows:

- (a) Record the average water temperature.
- (b) Light the appliance and start the timing device.
- (c) Set the thermostat (if fitted) to maximum.
- (d) When the average water temperature reaches 80 °C record the elapsed time.
- (e) Remove the lids of the containers, where fitted.
- (f) Measure the temperatures of the base of each fitted container or the temperature of the water of open well types.
- (g) Observe and record temperatures periodically over a period of 2 h.
- (h) Turn off the appliance at the end of 2 h, or earlier if the water in the well boils dry.

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The appliance is operated at nominal gas consumption and the temperature variation is observed.

B.50.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) A suitable temperature measuring device.
- (c) A suitable timing device.

B.50.4 Materials

Available gas at normal test gas pressure.

B.50.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Set up the appliance in accordance with [Clause 3.2](#).
- (b) Place thermocouples in suitable positions to determine the average temperature of each compartment.

B.50.6 Procedure

The procedure shall be as follows:

- (a) Adjust the thermostat to maximum setting (unless fixed) and start the timing device.
- (b) Operate the appliance at the nominal gas consumption.
- (c) Set the thermostat to minimum setting.
- (d) When the average temperature of the hot press has risen to 60 °C, stop the timing device and turn off the appliance.

B.50.7 Test report

All relevant observations shall be reported, including at least the following:

- (a) The elapsed time for the test.
- (b) The ambient temperature.
- (c) The measured temperature rise in each compartment.

B.51 Temperature maintenance and variation — Food warmers (MOT [15.2.2.6](#))

B.51.1 Scope

This method sets out the procedure to assess the heating temperature and setting accuracy of food warmers.

B.51.2 Principle

The appliance is operated to maintain a temperature in excess of 80 °C, and operating temperatures are monitored.

B.51.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Suitable temperature measuring devices.
- (c) A suitable timing device.

B.51.4 Materials

The following materials shall be used:

- (a) Available gas at normal test gas pressure.
- (b) Adequate number of 240 mm to 250 mm dinner plates.

B.51.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Set up the appliance in accordance with [Clause 3.2](#).
- (b) Position measuring devices to measure the average temperature of each compartment.

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- ## B.51.6 Procedure

- Operate the food warmer.
- Where fitted, set the thermostat to the minimum marked food storage setting.
- Allow the appliance to reach equilibrium.
- Measure the average temperature in each cabinet.
- Measure the temperature at each test point of the heated top.

B.51.7 Test report

- The average temperature of each cabinet during the test period.
- The recorded heated top temperatures during the test period.

B.52 Strength test — Shelves, food warmers and bains marie (MOT 15.3)

B.52.1 Scope

B.52.2 Principle

A specified weight is applied without impact to the appliance shelves and top and any breakage or damage is observed.

B.52.3 Apparatus

- Sufficient weights to make up the specified loads.
- Suitable timing device.

B.52.4 Materials

Supply of cold water.

B.52.5 Preparation of apparatus

Set up the appliance in accordance with the manufacturer's instructions on a firm, level base.

B.52.6 Procedure

- (a) Fill the water compartments and the food containers with the maximum possible amount of water.
- (b) Successively and evenly apply to each shelf and the top of the appliance if it is flat a load equivalent to 100 kg/m² of shelf area and top area.
- (c) Remove the water and weights after 15 min.
- (d) Place a load of 34 kg evenly, and in turn, on each square metre of the top of the serving shelf (where fitted) of the appliance.
- (e) Remove the weights after 5 min.
- (f) Examine shelf for damage or distortion.

B.52.7 Test report

All relevant observations shall be reported, including any damage, displacement or permanent deformation, and its location.

B.53 Stability and strength test — High temperature ovens (MOT 17.5.1/17.5.2)

B.53.1 Scope

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This method sets out the procedure to assess the strength and stability of an appliance and its supports when subjected to a specified load.

B.53.2 Principle

A specified weight is placed upon the appliance food supports and is observed.

B.53.3 Apparatus

The following apparatus shall be used:

- (a) Sufficient weights to make up the specified load in masses to represent the food type to be used in the appliance.
- (b) A suitable timing device.

B.53.4 Preparation of apparatus

Set up the appliance in accordance with the manufacturer's instructions on a firm, level base.

B.53.5 Procedure

The procedure shall be as follows:

- (a) Successively hang or place required weights on appliance food supports.
- (b) Observe appliance and any stabilization means for movement.
- (c) Remove the weights after 15 min.
- (d) Examine hangers and supports for damage or distortion.

B.53.6 Test report

All relevant observations shall be reported, including any tipping, damage, displacement or permanent deformation, and its location.

B.54 Determination of CO/CO₂ ratio for independent burners — Mobile serving appliance (MOT 18.3.1)

B.54.1 Scope

This method sets out the procedure to determine the ratio of carbon monoxide to carbon dioxide (CO/CO₂) in the combustion products of the appliance under test.

B.54.2 Principle

The appliance is operated. A representative sample of the combustion products is analysed for the CO and CO₂ concentration after a specified period of operation. From the results obtained the CO/CO₂ ratio is calculated.

B.54.3 Apparatus

The following apparatus shall be used:

- (a) Equipment as specified in [Appendix D](#).
- (b) Carbon monoxide analyser, calibrated to give accurate and reproducible results.
- (c) Carbon dioxide analyser, calibrated to give accurate and reproducible results.
- (d) Sampling apparatus (probe or hood, see [Figures A.3, A.4, A.5, A.6](#) and [A.7](#), as appropriate) known to not affect the representativeness of the sampled gases under prevailing conditions.
- (e) Sampling lines and conditioner (if used) known to be inert to CO and CO₂.
- (f) Suitable timing device.

B.54.4 Materials

The following materials shall be used:

- (a) Supply of appropriate test gas at normal test gas pressure (see [Clause 3.1](#)).
- (b) Where necessary, a supply of cold water.

B.54.5 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) Set up the appliance in accordance with [Clause 3.2](#).
- (b) Where required, add water to the level specified by the manufacturer.
- (c) Set up test equipment.

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- #### B.56.4 Preparation of apparatus

- (a) Inspect the appliance for any structural defect.
- (b) Place the appliance on a firm, level base.

B.56.5 Procedure

- (a) Place board in position on top of the appliance.
- (b) Apply the weight uniformly without impact for 5 min.
- (c) Examine the appliance for any permanent damage or deformation.

B.56.6 Test report

- (a) The applied weight.
- (b) Any detrimental damage or permanent deformation.

B.57 Stability test — Mobile serving appliance (MOT 18.4.2)

B.57.1 Scope

This method sets out the procedure to assess the stability on an appliance on an inclined plane.

B.57.2 Principle

The appliance is inclined at an angle to the horizontal in all directions and it is observed whether the appliance tips over.

B.57.3 Apparatus

The following apparatus shall be used:

- (a) An incident plane, set at 15° included angle to the horizontal and rotatable about an axis normal to the plane.
- (b) The gas container(s) recommended by the manufacturer.

B.57.4 Preparation of apparatus

The apparatus shall be prepared as follows:

- (a) If the appliance is fitted with a brake or stabilizer which is operated manually, this shall be engaged before the tests.
- (b) If an appliance is fitted with castors, the castors shall be placed in the position that results in the least stability.
- (c) Where required, add water to the level specified by the manufacturer.

B.57.5 Procedure

The procedure shall be as follows:

- Place the appliance in the centre of the inclined plane with any appliance lids closed.
- Fit a full self-contained LP Gas supply in the appliance.
- Rotate the inclined plane through 360°.
- Repeat Steps (a) to (c) with any attached appliance lids open.
- Repeat Steps (a) to (d) with any gas supply container empty.

NOTE The use of a wedge is permitted to avoid the appliance sliding.

B.57.6 Test report

All relevant observations shall be reported, including at least the following:

- (a) The stability of the appliance.

- (b) The stability of gas containers.
- (c) Any closure of the appliance lid.
- (d) The use of any brake.

Appendix C

(normative)

Meter volume correction factors

In this Standard, heating value and test gases are defined on a dry gas basis at metric standard conditions (MSC). Therefore, when measuring gas volumes or rates for calculation purposes, as in determining the thermal efficiency of an appliance, these should be corrected back to MSC taking cognisance of the barometric or atmospheric pressure, the gas temperature and pressure, whether the heating value of the gas at the time of testing is declared wet or dry, and whether a wet or dry gas meter is used.

NOTE If a wet gas meter is used, then a saturator upstream of the meter should also be used to ensure saturation of the gas.

The formulae to be applied for obtaining corrected gas rates or volumes (heating value on a dry basis) are as follows:

Using wet meter

$$Q = V \times \left(\frac{P_b + P_m - P_w}{101.325} \right) \times \left(\frac{288.15}{273.15 + t} \right)$$

Using dry meter

$$Q = V \times \left(\frac{P_b + P_m}{101.325} \right) \times \left(\frac{288.15}{273.15 + t} \right)$$

where

Q	=	corrected gas rate or gas volume (m^3/h or m^3)
V	=	metered gas rate or gas volume (m^3/h or m^3)
P_b	=	barometric pressure (kPa)
P_m	=	meter gauge pressure (kPa)
P_w	=	saturated water vapour pressure at meter temperature t (kPa)
t	=	meter temperature ($^{\circ}\text{C}$)

The corrected heat input to the appliance may then be obtained from:

$$H = Q \times C$$

where

H = heat input (MJ or MJ/h)
 C = dry heating value (MJ/m³)

The saturated water vapour pressure P_w at temperature t may be obtained from [Table C.1](#).

Table C.1 — Saturated water vapour pressure

t °C	P_w kPa	t °C	P_w kPa	t °C	P_w kPa
15	1.704	20	2.337	25	3.167
15.5	1.760	20.5	2.411	25.5	3.263
16	1.817	21	2.486	26	3.361
16.5	1.876	21.5	2.564	26.5	3.462
17	1.936	22	2.643	27	3.565
17.5	1.999	22.5	2.725	27.5	3.671
18	2.063	23	2.809	28	3.780
18.5	2.129	23.5	2.895	28.5	3.892
19	2.196	24	2.983	29	4.006
19.5	2.266	24.5	3.074	29.5	4.123
				30	4.244

These values for water vapour pressure are derived from the Antoine equation (for further information refer to *Lange's Handbook of Chemistry*):

$$P_w = 0.13333 \times 10^x \text{ (kPa)}$$

where

$$x = 8.10765 - \left(\frac{1750.286}{235 + t} \right)$$

Appendix D

(normative)

Pressure and gas volume test equipment

The following equipment shall be used for the control of testing pressures and the measurement of gas volume:

- (a) A wet or dry gas meter.

NOTE A graph should be provided showing the error or correction factor of the meter over a range as wide as possible.

The following also applies to the test gas meter:

- (i) A saturator shall be used with a wet test gas meter to ensure saturation of the gas.
- (ii) It is permitted to use a calibrated dry gas meter on dry gas or a calibrated flow meter for test purposes, but in case of dispute, the wet meter shall be the reference standard.
- (b) An adjustable regulator of adequate capacity fitted to the meter inlet.
- (c) Pressure gauges connected to meter inlet, appliance inlet and pressure test point, to read to the nearest 10 Pa.
- (d) A thermometer, graduated to at least 0.5 °C installed to measure the gas temperature. The meter water temperature gives a sufficiently accurate figure.
- (e) A barometer, to measure atmospheric pressure in the laboratory correct to 30 Pa.
- (f) A means of determining within 1 % the heating value of the gas being used.
- (g) A means of determining within 2 % the relative density of the gas being used.

Appendix E

(informative)

Diagrammatic representation of an operating system for automatic burners

Figure E.1 shows an example of one method of representing the operating sequence of an automatic burner system where t_n is time in seconds.

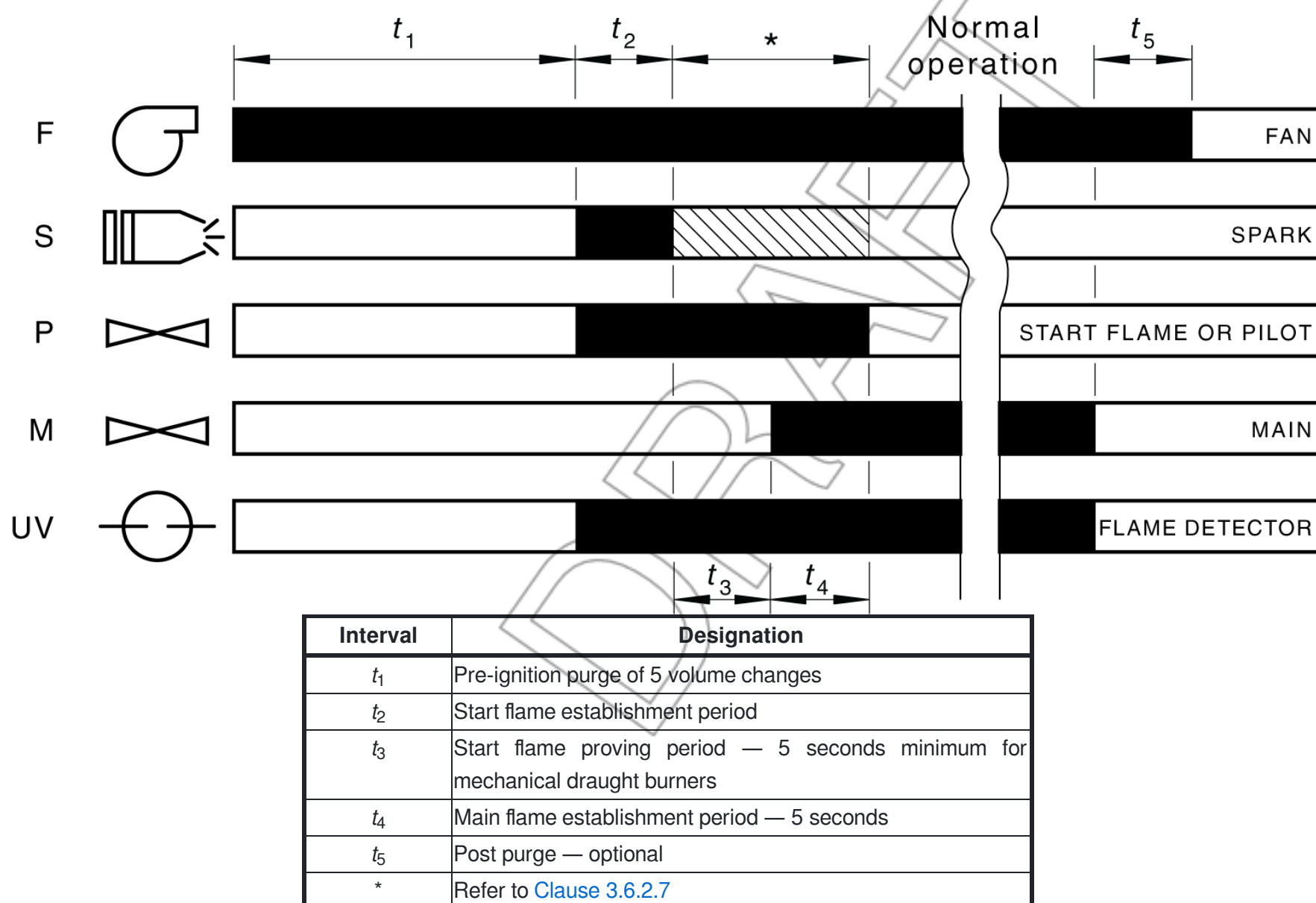


Figure E.1 — Operating sequence for automatic burners

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