

Standard for Safety

UL 1075

ISBN 1-55989-405-9

● Gas-Fired Cooking Appliances for Recreational Vehicles



Underwriters Laboratories Inc.®

Standard



Documents

Document Sharing Hub

Northbrook, Illinois • (708) 272-8800
 Melville, New York • (516) 271-6200
 Santa Clara, California • (408) 985-2400
 Research Triangle Park,
 North Carolina • (919) 549-1400



Underwriters Laboratories Inc.®

Underwriters Laboratories Inc., founded in 1894, is chartered as a not-for-profit organization without capital stock, under the laws of the State of Delaware, to establish, maintain, and operate laboratories for the examination and testing of devices, systems and materials to determine their relation to hazards to life and property, and to ascertain, define and publish standards, classifications and specifications for materials, devices, products, equipment, constructions, methods, and systems affecting such hazards.

UL Standards for Safety are developed under a procedure which provides for participation and comment from the affected public as well as industry. The procedure takes into consideration a survey of known existing standards and the needs and opinions of a wide variety of interests concerned with the subject matter of the standard. Thus manufacturers, consumers, individuals associated with consumer-oriented organizations, academicians, government officials, industrial and commercial users, inspection authorities, insurance interests and others provide input to UL in the formulating of UL Standards for Safety, to keep them consonant with social and technological advances.

A not-for-profit organization
 dedicated to public safety and
 committed to quality service



Underwriters Laboratories Inc.®

An independent, not-for-profit organization testing for public safety

May 10, 1993

Standard for

Gas-Fired Cooking Appliances for Recreational Vehicles

UL 1075, Second Edition

Accompanying this transmittal notice is a copy of the second edition of UL 1075.

THIS EDITION OF THE STANDARD IS NOW IN EFFECT.

Revised and/or additional pages may be issued from time to time.

Subscribers to UL's services in the area covered by this standard will receive these revised and/or additional pages automatically. Others may receive such pages by subscribing to UL's subscription service for revisions. See UL's CATALOG OF STANDARDS FOR SAFETY for a description of the revision subscription service, the cost of the service for this standard, and ordering information.

MAY 10, 1993

1

UL 1075

Standard for

Gas-Fired Cooking Appliances for Recreational Vehicles

First Edition — February, 1976

Second Edition

May 10, 1993

Revisions of this standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest published set of revision pages.

ISBN 1-55989-405-9

COPYRIGHT © 1976, 1993 UNDERWRITERS LABORATORIES INC.

UL's Standards for Safety are copyrighted to protect UL's publication rights, not to restrict their use in product design or evaluation. See paragraph E of the Foreword.

(1 – 05/10/93 – 05/10/93)

CONTENTS**FOREWORD****INTRODUCTION**

1 Scope	5
2 General	5
3 Glossary	6
4 Instructions	8

CONSTRUCTION

5 Assembly	9
6 Accessibility	12
7 Materials	13
8 Casings and Cooking Surfaces	13
9 Radiation Shields	14
10 Oven Chambers	14
11 Flues and Flue Deflectors	14
12 Filters	15
13 Burners and Pilots	15
14 Burner Controls	17
15 Piping, Tubing, and Fittings	19
16 Enclosures	21
17 Field Wiring Connections	25
18 Internal Wiring and Wiring Methods	29
19 Separation of Circuits	31
20 Bonding for Grounding	32

ELECTRICAL COMPONENTS

21 Mounting of Electrical Components	34
22 Insulating Material	35
23 Lampholders	35
24 Receptacles	36
25 Switches	36

SPACINGS

26 General	36
------------------	----

PROTECTION OF USERS AND SERVICE PERSONNEL

27 General	37
------------------	----

PERFORMANCE

28 General	41
29 Instrumentation	42
30 Test Installation	45
31 Initial Test Conditions	50
32 Gas Burner Operation	51

33	Combustion	52
34	Automatic Pilot Operation	53
35	Temperature Tests	54
36	Temperature Test — Combustibles	54
37	Abnormal Operation — Stalled-Fan Temperature Test	58
38	Temperature Test — Surface and Handles	59
39	Ignition of Flammable Fabric and Related Hazards	64
40	Broiler Operation	70
41	Draft Hoods	70
42	Gas Leakage Test	72
43	Electrical Input Test	72
44	Resistance to Moisture Test	72
45	Dielectric Withstand Test	73

MANUFACTURING AND PRODUCTION TESTS

46	General	73
47	Production Line Dielectric Withstand Test	74
48	Production Line Grounding Continuity Test	74

MARKING

49	General	74
----	---------------	----

APPENDIX A

	Standards for Components	A1
--	--------------------------------	----

FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

INTRODUCTION

1 Scope

1.1 These requirements apply to gas-fired cooking appliances for use in recreational vehicles. Cooking appliances include ranges and built-in units as defined herein.

1.2 Appliances for use in recreational vehicles, covered by these requirements, are for permanent connection to a regulated gas supply. These shall be:

- a) For use with liquefied petroleum gases only, or
- b) For use with natural gas convertible for use with liquefied petroleum gases.

1.3 Appliances covered by these requirements shall have:

- a) Total fuel input ratings not exceeding 39,000 Btu per hour (41 MJ per hour).
- b) Maximum volume of 6 cubic feet (0.17 m³).
- c) Maximum weight of 80 pounds (36.3 kg).

For the determination of volume, splash guards, vent extensions, integral spacers, handles, and knobs may be removed or discounted. For the determination of weight, easily removable parts such as burner grates, oven trays, boiler racks, etc., may be removed.

1.4 Requirements for the installation and use of gas-fired cooking appliances are included in the Standard for Recreational Vehicles, NFPA 501C, ANSI-A119.2.

1.5 A product that contains features, characteristics, components, materials, or systems new or different from those in use when the standard was developed, and that involves a risk of fire, electric shock, or injury to persons, shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the level of safety for the user of the product as originally anticipated by the intent of this standard.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

2.1.2 A component need not comply with a specific requirement that:

- a) Involves a feature or characteristic not needed in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

2.1.3 A component shall be used in accordance with its recognized rating established for the intended conditions of use.

2.1.4 Specific components are recognized as being incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions for which they have been recognized.

2.2 Units of measurement

2.2.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

2.2.2 Unless otherwise indicated, all voltage and current values mentioned in this standard are root-mean-square (rms).

2.2.3 The term "appliance" as used in this standard refers to any product covered by this standard.

2.3 Undated references

2.3.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

3 Glossary

3.1 For the purpose of this standard, the following definitions apply.

3.2 **APPLIANCE FLUE** — The flue passages within an appliance.

3.3 **BURNER, GAS** — A device for the final conveyance of the gas or a mixture of gas and air, to the combustion zone.

3.4 **BURNER HEAD, GAS** — That portion of a burner beyond the outlet end of the mixer tube which contains the ports.

3.5 **COMBUSTIBLE MATERIAL** — Material made of or surfaced with wood, compressed paper, plant fibers, or other material that will ignite and burn, as applied to materials adjacent to or in contact with heat-producing appliances, chimney connectors and vent connectors, steam and hot water pipes, and warm air ducts. Such material shall be considered as combustible even though flameproofed, fire-retardant treated, or plastered.

3.6 **COMBUSTION DETECTOR** — That part of a primary safety control which is responsive directly to flame properties.

3.7 **CONTINUOUS-CLEANING OVEN** — One which utilizes a chemical composition in conjunction with the surface coating of the interior walls or insert panels of the oven to produce a chemical decomposition of food soilage within the oven at normal oven baking temperatures.

3.8 CONTROLS, TEMPERATURE:

a) **COMBINATION TEMPERATURE-REGULATING AND-LIMITING CONTROL** — A control which functions to regulate the temperature of the appliance under normal conditions of use, intended to prevent a fire hazard which might result from conditions of abnormal operation.

b) **TEMPERATURE-LIMITING CONTROL** — A control intended to function under abnormal temperature conditions.

- c) **TEMPERATURE-REGULATING CONTROL** — A control intended to regulate the temperature of the appliance under normal conditions of use.

3.9 ELECTRICAL CIRCUITS:

- a) **DIRECT CURRENT (dc) CIRCUIT** — A circuit obtained from one or more storage batteries or a rectified alternating current (ac) source.
- b) **HIGH-VOLTAGE CIRCUIT** — A circuit involving a potential of not more than 600 volts and having circuit characteristics in excess of those of a low-voltage circuit.
- c) **LOW-VOLTAGE CIRCUIT** — A circuit involving a potential of not more than 30 volts ac (42.4 peak) or dc and supplied by a primary battery or by a standard Class 2 transformer or other suitable transforming device, or by a suitable combination of transformer and fixed impedance having output characteristics in compliance with what is required for a Class 2 transformer, or is limited to a maximum of 100 volt-amperes. A circuit derived from a source of supply classified as a high-voltage circuit, by connecting resistance in series with the supply circuit as a means of limiting the voltage and current, is not considered to be a low voltage circuit.
- d) **SAFETY CONTROL CIRCUIT** — A circuit involving one or more safety circuits.

3.10 **FLASHBACK** — Momentary ignition of a fuel-air mixture in the vicinity of the air-gas mixer plate, which may be followed by ignition of the gas at the orifice.

3.11 **FLUE COLLAR** — That portion of an appliance designed for attachment of the chimney or vent connector.

3.12 **GAS VENT** — The piping and fittings for conveying flue gases of vented appliances to the atmosphere.

3.13 **MANIFOLD** — The conduit of an appliance which supplies gas to be individual burner.

3.14 **MIXER, GAS** — The combination of mixer head, mixer throat, and mixer tube.

- a) **MIXER HEAD** — That portion of an injection-type burner, usually enlarged, into which primary air flows to mix with the gas stream.
- b) **MIXER THROAT** — That portion of the mixer which has the smallest cross-sectional area and which lies between the mixer head and the mixer tube.
- c) **MIXER TUBE** — That portion of the mixer which lies between the throat and the burner head.

3.15 **MIXER FACE, GAS** — The air inlet end of the mixer head.

3.16 **PILOT, CONTINUOUS** — A pilot that burns without turn-down throughout the entire time the burner assembly is in service, whether the main burner is firing or not.

3.17 **PIPING** — The word piping, as used in this Standard, refers to either pipe, tubing or both.

- a) **PIPE** — Refers to rigid metal pipe.
- b) **TUBING** — Refers to semirigid metal tubing.

3.18 PORT — Any opening in a burner head through which fuel or an air-fuel mixture is discharged for ignition.

3.19 PURGE — To introduce air into the combustion chamber and the appliance flue passages in such volume and manner as to completely replace the air or gas-air mixture contained therein.

3.20 RANGE — A self-contained cooking appliance having a top section and an oven section. It may have a broiler section. Ranges are further classified as follows. Note that references to floor include any built-up surface above the main floor of the recreational vehicle.

a) **FREESTANDING** — One that is floor-mounted and installed with unobstructed clearances between the sides and back of the range and adjacent vertical walls.

b) **FRAMED-IN** — One that is floor-mounted or counter-mounted and having integral trim parts to close the spaces between the top and front surfaces of the range and the counter.

3.21 READILY ACCESSIBLE — Capable of being reached easily and quickly for operation, adjustment, and inspection.

3.22 RESPONSE TIME — FLAME FAILURE — The interval between the occurrence of flame extinguishment and de-energization of the safety shut-off means.

3.23 SAFETY SHUT-DOWN — The action of shutting of all fuel and ignition energy to the appliance by means of a safety control(s) such that restart cannot be accomplished without manual reset.

3.24 STRUCTURE — Refers to the counter, walls, partitions, or other enclosures above the floor level of the recreational vehicle. Such structures are assumed to be made of combustible materials.

3.25 UNIT, BUILT-IN — A cooking appliance designed to be recessed into, placed upon, or attached to the structure of the recreational vehicle, but not installed directly on the vehicle floor. Built-in units are further defined as follows:

a) **TOP OR SURFACE UNIT** — A unit designed for installation in or on a counter top and equipped with top burners.

b) **OVEN UNIT** — A unit designed for installation in a cabinet, wall, or partition, or for installation on a counter. It may be a separate oven, equipped with a broiler that uses the oven burner, or the oven may serve as a broiler with a burner in the upper portion of the oven.

c) A combination of (a) and (b), or any other cooking appliance designed for similar installation, excluding ranges.

3.26 VALVE, SAFETY SHUTOFF — A valve that is automatically closed by the safety control system of the appliance.

3.27 VENT CONNECTOR — The pipe which connects a gas appliance to a gas vent or chimney.

4 Instructions

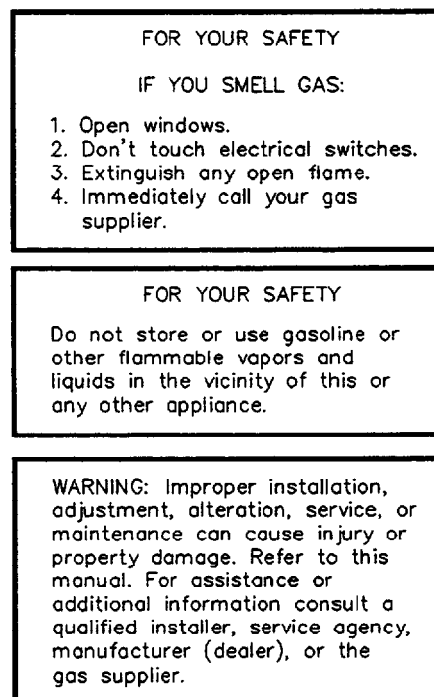
4.1 A copy of the manufacturer's operating and installation instructions is to be furnished with each appliance. These instructions are to be used as a guide in the examination and testing of the appliance. For this purpose, a printed edition is not required.

4.2 The instructions and drawings shall include such directions and information as deemed by the manufacturer to be adequate for attaining intended and safe installation and maintenance.

4.3 The instructions shall be marked with directions to the installer to leave them with the appliance and to the consumer to retain them for future reference.

4.4 The instructions shall have the front cover or, in the absence of a cover, the first page bear the following statements, or the equivalent; however, no equivalent word shall be used for the word "WARNING," and the phrase "FOR YOUR SAFETY." The statements shall be boxed as shown in Figure 4.1. The wording "FOR YOUR SAFETY," "WARNING," and "IF YOU SMELL GAS" shall be in uppercase letters not less than 1/8 inch (3.2 mm) high.

Figure 4.1
Warning marking



S3689

CONSTRUCTION

5 Assembly

5.1 An appliance shall be assembled as a unit and shall include all of the components necessary for its normal function when used as intended.

5.2 An appliance shall be so formed and assembled that it will have the strength and rigidity necessary to resist the abuses to which it may be subjected, without increasing the fire or accident hazard due to total or partial collapse; the resulting reduction of spacings, loosening, or displacement of parts; or other serious defects.

5.3 Framed-in ranges and built-in units shall prevent products of combustion, cooking vapors, and spillovers from discharging into concealed spaces of the structure or inaccessible spaces of the appliance.

5.4 The interior bottoms of the range, casing, and oven sections shall be constructed so as to be liquid-tight with upturned flanges at least 1/2 inch (12.7 mm) high on all sides, except that a liquid-tight construction is not required on a side where spillovers will not drain into a concealed space of the structure or appliance.

5.5 The flue system of a framed-in range shall terminate at the counter top surface, and the flue system of a built-in oven shall terminate at the structure front wall, except on appliances that are to be connected to a gas vent. See 5.6.

5.6 A range or built-in unit may be provided with a flue collar to permit venting to the outside. A built-in unit may be constructed so that, with the flue collar closed, all products of combustion and cooking vapors are discharged into the living space.

5.7 A built-in unit constructed for optional venting shall be provided with an integral draft diverter that receives ventilation air, see 5.9, and shall be furnished with the parts necessary to seal the flue collar when it is not used.

5.8 The flue system of a framed-in range and a built-in unit shall convey all products of combustion and cooking vapors through the outlet openings, or through the venting system if the appliance is so constructed, when tested under these requirements.

5.9 A framed-in range and a built-in unit shall be constructed so that when installed as intended, air for combustion and ventilation is obtained from outside of the counter cavity or structure. This may be accomplished by fixed air openings into the appliance, through ducts which are integral parts of the appliance, or through passages which are formed between exterior surfaces of the appliance and the structure, provided the cross-sectional area of such passages is assured by integral spacers on the appliance. The minimum dimension of an air opening, duct, or passage shall be 1/4 inch (6.4 mm). See 5.10.

5.10 Fixed air openings and openings into ducts and passages shall be located or guarded by integral spacers to prevent blockage of the openings by the panel of the structure on which the appliance is mounted. The openings shall not be partially blocked by irregular edges of the cutout in the structure.

5.11 An oven or broiler section shall be constructed to prevent the partial or total blockage of all openings intended for combustion air and products of combustion by cooking utensils during normal use of the appliance.

5.12 Compliance with 5.11 for an oven is to be determined by placing a square baking pan, 10 by 10 by 2 inch (254 by 254 by 50.8 mm) size, in any position allowed by the oven grille and racks. Compliance with 5.11 for a boiler is to be determined by moving a shallow square broiling pan approximately the width of the section, to any position allowed by the construction of the broiler section.

5.13 The appliance shall have provision for its attachment to a mounting surface or structure at the time of installation. Holes shall be provided for mounting screws.

5.14 The construction of a range shall provide for maintaining the minimum clearance between the back of the range and a vertical wall. A framed-in range shall also be constructed to maintain the minimum clearance at the sides. A framed-in range and a built-in unit shall be provided with integral spacers to maintain the necessary clearance from edges of openings cut into a counter or vertical wall to the

casing or body of the appliance. The construction of a built-in unit shall provide for maintaining the minimum clearance between the bottom, sides, back, and top of the unit and concealed surfaces of the structure in which the unit is to be installed. Spacers are not required where the appliance is to be installed flush with the casing, trim pieces, and other mounting parts (zero clearance).

5.15 Compliance with 5.14 shall be determined in accordance with the following:

- a) Freestanding Range — At least one spacer shall be provided at or near the level of the cooking top to maintain the minimum clearance between the back of the range and a vertical wall.
- b) Framed-In Range and Built-In Unit — At least one integral spacer shall be provided on each mounting surface to maintain the clearance to the edges of the opening cut in the counter or vertical wall, assuming a 3/4 inch (19.1 mm) thick counter or wall.
- c) At least one integral spacer shall be provided on each side and all other enclosed surfaces, as applicable, to maintain the clearance to any wall, partition, or concealed construction. The spacers shall be in addition to those required by (b) above. The requirement for the spacers on the sides of a framed-in range may be waived if:
 - 1) When the range is installed, the casing or body of the range clears each side of the minimum opening required to be cut in the top and front surfaces of the counter by not less than 1/4 inch (6.4 mm), and
 - 2) The manufacturer's recommended clearance as measured from the sides of the range to the vertical walls below the counter level is that obtained when such walls are located flush with the edge of the opening cut in the counter.
- d) The adequacy of the size and location of the spacers provided shall be judged on the basis that the surfaces of the structure in or upon which the appliance may be installed are constructed true and plumb.
- e) Spacers shall be of such size, number, and location so as to maintain the required clearance when the appliance is installed in an opening greater in size than the minimum required and then shifted or otherwise moved.

5.16 Integral spacers shall have the necessary strength and provide the necessary bearing surface to maintain the required minimum clearances from surfaces and edges of the structure. A spacer shall be constructed of steel not less than 0.032 inch (0.81 mm) (No. 20 MSG) thick, unless equivalent strength and rigidity are obtained by the inherent design. A spacer shall be attached by welding, riveting, or equally permanent means.

5.17 Integral spacers shall provide not less than 1/4 inch (6.4 mm) clearance from the appliance to the surface or edge of the structure, except that on a built-in unit intended to be dropped into an opening cut into the counter top surface, the spacers may provide 1/8 inch (3.2 mm) clearance when a minimum of two spacers are employed on each edge or surface of the appliance. The use of 1/8 inch spacers does not apply to units having any dimension greater than 24 inches (610 mm) in the plan view, and greater than 6 inches (152 mm) in the side view, such dimensions being measured on that portion of the unit which is recessed below the counter surface.

5.18 Gas lines of the appliance, constructed of semirigid metallic tubing, shall be formed without crimping at angle bends. Tubing shall be arranged and, where deemed necessary, secured to the appliance to avoid sharp edges. A gas line subject to movement from vibration shall be secured between the fixed ends of the gas line.

5.19 Gas line tubing, if located external to the appliance casing, shall be arranged and secured to avoid damage during normal installation of the appliance, unless the tubing is located within a vertical plane projected vertically downward from integral spacers or projections on the appliance which establish the clearance between the structure and the appliance. Tubing shall not be located on the exposed bottom surface of the appliance.

5.20 A radiation shield or baffle employed to prevent excessive temperature shall be assembled as part of the appliance, as part of a subassembly that must be attached to the appliance for its normal operation, or be constructed so that the appliance cannot be assembled for operation without first attaching a required shield or baffle in its proper position.

5.21 An appliance shall be such that, for any normal installation, the alteration or removal of a baffle, insulation, or a radiation shield needed to prevent unsafe temperatures is not required.

5.22 Parts, when adjustable or movable, shall be provided with suitable locking devices to prevent accidental shifting.

5.23 Screws or bolts used to attach parts which are detached for normal care or servicing of the appliance shall be capable of holding upon the application of the torques indicated in Table 5.1 after removal and replacement.

Table 5.1
Torque requirements for screws

Screw size	(mm)	Torque, pound-inches (N • m)	
No. 8	(4.2)	20	(2.3)
No. 10	(4.8)	25	(2.8)
1/4 inch	(6.4)	100	(11.3)
5/16 inch	(7.9)	200	(22.6)
3/8 inch	(9.5)	350	(39.6)
7/16 inch	(11.1)	550	(62.2)
1/2 inch	(12.7)	800	(90.4)
9/16 inch	(14.3)	1200	(136.0)

5.24 An appliance shall afford convenient operation by the user of those parts requiring attention or manipulation in normal usage.

5.25 Any exposed part which might reasonably be brought into contact with the hand during normal use and care of the appliance shall be smooth and rounded. Examples of such parts are screw tips and threads, sharp points and sheared edges on sheet metal, etc.

6 Accessibility

6.1 An appliance shall allow cleaning of all surfaces and parts subject to spillovers and collection of cooking vapors without requiring major dismantling of the appliance or removal of parts required by 5.20 to be factory assembled. See 6.2.

6.2 The removal of access panels, burners, caps, plugs, etc., specifically intended to permit convenient removal and replacement is not considered to be major dismantling.

6.3 Accessibility shall be provided for cleaning, inspection, removal, and replacement of all burners, pilots, pilot flame sensors of the thermocouple type, lighter tubes, and operating controls from the front (normal use) side of the appliance when the appliance is installed as intended.

6.4 Burner orifices shall be readily accessible and removable, as defined in 6.3, if the appliance is intended for field conversion to another gas fuel by changing orifices.

6.5 The disposition of parts in the assembly removed for normal care and servicing shall be such that their restoration, following removal, will not necessitate realignment to secure their proper relationship with other parts of the assembly.

7 Materials

7.1 Fuel-confining parts or operating parts, the failure of which will allow unsafe leakage of fuel, unsafe operation, or prevent a safety device from functioning, shall be of sufficient strength, durability, and resistance to fire to assure safe and reliable service of the parts in the assembly. Such parts shall be made of metal having a melting point (solidus temperature) of not less than 950°F (510°C) and a tensile strength of not less than 10,000 pounds per square inch (psig) (69 MPa) at 400°F (204°C). Furthermore, parts shall not sag, distort, melt, or show leakage of fuel during any of the tests specified herein. Pipe shall be made of iron, steel, copper, or brass.

7.2 All formed steel parts of an appliance, except as specified herein, shall be protected from corrosion by painting, plating, ceramic coating, or shall be constructed of corrosion resistant material.

8 Casings and Cooking Surfaces

8.1 The outer casing or jacket shall be made of steel or equivalent material, reinforced to formed if necessary, so that it is not likely to be damaged through handling in shipment, installation, and use. Sheet metal casings shall be made of steel having a minimum thickness of 0.020 inch (0.51 mm) (No. 24 MSG) if uncoated, or 0.023 inch (0.58 mm) (No. 24 GSG) if galvanized, or of nonferrous sheet metal having an average thickness of not less than 0.029 inch (0.74 mm).

8.2 The casing of an appliance shall be completely closed at the bottom, or the appliance shall be provided with a radiation barrier below the burners. See 5.4.

8.3 The casing shall be provided with an opening for the installation of a gas supply line. The edges of the opening against which the connected supply line is likely to bear, including any internal parts of the appliance, shall be free of sharp edges.

8.4 With reference to 8.3, protection of sharp edges may be provided by hemming or forming the edges of the opening, or by providing a grommet of metal or other material having the necessary aging properties, temperature and strength characteristics, and durability for the purpose.

8.5 The top cooking surface of an appliance, if not permanently hinged, shall be constructed so that the top can be replaced only in the correct position with respect to the burners and air openings.

8.6 The top cooking surface shall be constructed of material having strength and durability equivalent to sheet steel of 0.032 inch (0.81 mm) (No. 20 MSG) thick. The surface shall be protected against corrosion and deterioration from cleaning by fired-on porcelain coating, plating, or equivalent means.

8.7 The top of an appliance may be provided with a solid hinged cover. On a range, the cover shall not block openings for flue products and ventilation air necessary for the safe operation of the oven section.

9 Radiation Shields

9.1 A radiation shield or liner shall be constructed, formed, and supported to ensure proper positioning and to prevent distortion or sagging in service. A shield or liner shall be protected against corrosion if its deterioration may cause excessive temperature when the appliance is tested in accordance with these requirements. A finish intended to provide the required resistance to corrosion shall not be damaged by heat when the appliance is tested under these requirements.

9.2 Thermal insulation shall be of metallic or mineral base material.

9.3 Thermal insulation which is not self-supporting shall be mechanically secured to solid metal surfaces to prevent sagging or displacement. Insulation in blanket or batt form is acceptable if the insulation is compressed between stationary metal surfaces of the appliance, such as between oven walls and casing.

10 Oven Chambers

10.1 The liner and inner bottom panel of an oven, if exposed to products of combustion, cooking vapors, and spillovers, shall be made of steel having a minimum thickness of 0.020 inch (0.51 mm) (No. 24 MSG). The surfaces exposed to products of combustion shall have a fired-on porcelain coating or other equivalent surface finish which has been determined to be suitable with regard to corrosion resistance, temperature, durability, and the effects of spillage.

10.2 A catalytic material used in conjunction with the enamel coating on oven interiors, liners, doors, etc., shall be evaluated to determine the toxicity hazard of the material at the temperatures which may be encountered within the oven.

10.3 An integral passage shall be porcelain-coated or protected in accordance with the requirements of 10.1 or shall be made of steel having a minimum thickness of 0.026 inch (0.66 mm) (No. 22 MSG).

10.4 All joints and seams, including the joint between the oven and flue passage, shall be tight to prevent leakage. Compliance with this requirement shall be determined by placing a fuming or smoking material, such as titanium tetrachloride, in an unenclosed sample of the oven and flue assembly. There shall be no evidence of smoke escaping from any joint or seam.

10.5 An oven door shall be provided with an operating handle. The oven door shall be hinged and fit against the oven front frame without gaps at the edges, except that an intentional space which serves as a ventilation opening into the oven shall be maintained by stops, spacers, or equivalent means.

10.6 A glass panel used in an oven door assembly shall be tempered glass having a minimum thickness of 1/8 inch (3.2 mm). A glass panel shall not show evidence of cracking during any of the tests conducted on the appliance.

10.7 Flame spreaders or baffles directly exposed to oven burner flames shall be made of a material having resistance to corrosion equivalent to AISI C1010 hot-rolled sheet steel having a minimum thickness of 0.042 inch (1.07 mm) (No. 18 MSG).

11 Flues and Flue Deflectors

11.1 A flue passage that is not an integral part of the oven chamber, and a flue deflector, shall be constructed of steel having a minimum thickness of 0.026 inch (0.66 mm) (No. 22 MSG) or equivalent material.

11.2 The flue deflector of a freestanding range shall be provided with integral spacers designed to maintain the clearance necessary between the flue deflector and the adjacent wall of the structure.

11.3 The outlet opening of a flue deflector, or its position with respect to the counter top surface, shall prevent its closure restriction of its openings by an essentially flat-bottomed cooking utensil(s) placed on the top of the appliance.

11.4 A single-wall flue deflector of a framed-in range or a built-in unit shall be enclosed for its entire length by metal equivalent in thickness and corrosion resistance to that required for the casing of the appliance as specified in 8.1.

12 Filters

12.1 Each filter employed in a ventilating hood shall be a Class 1 or a Class 2 filter and shall be readily removable for cleaning or replacement. See 49.1(h).

12.2 A Class 1 filter is one which, when clean, does not contribute fuel when attacked by flame, and which emits only negligible amounts of smoke. A Class 2 filter is one which, when clean, burns moderately when attacked by flame, emits moderate amounts of smoke, or both.

12.3 A range or oven which includes a fan and integral duct assembly for removal of grease-laden air shall be constructed so that cleaning of the fan and internal surfaces of the duct can be accomplished without the necessity of completely removing the range or oven from its installed position.

13 Burners and Pilots

13.1 The burners of a top section range may be match-lighted, or the burners as a group may be equipped with a standing (continuous) pilot together with a lighter assembly or an automatic pilot device together with a lighter assembly. The burners of ovens and broilers shall comply with 14.5.

13.2 The arrangement of the oven and broiler sections shall permit the pilot and burner flames to be readily observed.

13.3 A burner shall be secured so that the assembly will not twist, slide, drop out, or be jarred out of the intended mounting position. Mounting means shall resist loosening due to vibration.

13.4 A burner assembly (including the head, body, and mixer tube) in a concealed location, such as an oven or broiler section, shall be constructed of metal having a melting point (solidus temperature) above 1450°F (788°C).

13.5 A burner assembly (including burner head and body) in an exposed location, such as a top section, shall be constructed of metal having a melting point (solidus temperature) above 950°F (510°C), and shall show no evidence of leakage, deformation, melting, cracking, or thermal stresses following any of the tests conducted on the appliance.

13.6 The supporting means for the top section burners shall be of rigid construction, shall maintain the burner at the correct distance below the cooking surface, and shall center the burner in the bowl opening of the top cover.

13.7 Burner ports shall be machined or otherwise accurately made to assure uniformity of size and shape of the openings.

13.8 A mixer tube for any burner shall comply with 13.4. If constructed of steel, the material thickness shall not be less than 0.020 inch (0.51 mm) (No. 24 MSG) if plated or porcelain-coated, otherwise not less than 0.032 inch (0.81 mm) (NO. 20 MSG) provided the mixer tube has corrosion protection equivalent to plating or painting.

13.9 A pilot burner and a burner tip shall be constructed of material that complies with 13.4 and shall not show evidence of melting, cracking, or thermal stresses following any of the tests conducted on the appliance.

13.10 Joints in burners and mixer tubes shall be essentially gastight, such as obtained by continuous welding, brazing, bolted and gasketed construction, etc., and shall not depend on the use of cement or friction for tightness. The design of a gasketed joint shall permit the tightening of the assembly screws or bolts. A screw shall not project directly into a gas or gas-air passage.

13.11 A gasket material used in the assembly of a burner or mixer tube shall be asbestos fiber or the equivalent. An asbestos gasket shall have an integral metallic backing on one side. A gasket shall be protected from direct spillovers.

13.12 A pilot and any flame sensor mounted on the pilot shall be securely supported in a fixed relationship to each other and to the burner. The position of the pilot with respect to the burner shall not depend on a single attachment, unless the assembly has additional means to maintain the correct position of the pilot if the primary attachment means is slightly loosened or the pilot assembly is removed. See 6.5.

13.13 A pilot assembly used with an indirect-type oven control system which employs two tubing connections shall be such that neither the pilot tubing connections or the pilot orifices are interchangeable.

13.14 A primary air shutter shall be constructed of steel not less than 0.032 inch (0.81 mm) (No. 20 MSG) and be protected against corrosion.

13.15 An air shutter assembly that depends on a clamping action to maintain the adjustment shall not loosen during any of the tests conducted on the appliance.

13.16 Main and pilot burners, except as indicated in 13.22, shall be provided with fixed orifices. Main burner orifices shall be sized for the rated burner input when fired at normal pressure. Pilot orifices shall be of a flow-limiting type, see 14.6. An orifice shall be positively secured in its orifice holder.

13.17 Burner and pilot orifices and orifice holders shall be constructed of metal having a melting point (solidus temperature) greater than 800°F (427°C). Yellow brass is acceptable for this purpose.

13.18 The assembly of a burner shall be such as to assure that a mixer tube is positively aligned with its orifice, and that the mixer tube is spaced the correct distance from the shoulder of the orifice.

13.19 A burner manifold shall be constructed of standard weight steel pipe, or steel tubing having a wall thickness not less than 0.035 inch (0.89 mm), but in no case less than a thickness necessary for engagement 3-1/2 threads of control valves and fittings. Steel tubing shall be protected against corrosion by plating or painting on all surfaces.

13.20 The flash tubes of a lighter assembly shall be constructed of steel not less than 0.020 inch (0.51 mm) (No. 24 MSG). The flame tips of a lighter assembly shall be constructed of stainless steel or aluminum.

13.21 The assembly of the parts of a lighter assembly shall assure that they remain fixed in position and resist loosening due to vibration and cleaning of the burner compartment.

13.22 The burners, excluding pilots, of an appliance designed for conversion in the field from one gas fuel type to another type shall be equipped with double coaxial orifices or equivalent means to accomplish the change without adding or deleting parts. The pilots of a convertible appliance shall be capable of conversion by turning the selector of a control device, without adding or deleting parts. The pilot control device shall be marked to indicate the type of a gas used in each position of the conversion device.

14 Burner Controls

14.1 A safety control shall be accessible for servicing or replacement.

14.2 A safety control with an integral pilot sensor need not be accessible when the appliance is installed, except as described in 6.3.

14.3 A safety control and any sensing element shall be rigidly supported and secured in position and shall be accessible for inspection.

14.4 There shall be no provision on the appliance permitting any safety control to be rendered ineffective or to allow the firing of any burner without the protection of all of the required safety controls.

14.5 The burners of oven and broiler sections of an appliance shall be provided with an automatic pilot device.

14.6 Except as specified below, the input to a pilot shall not exceed 175 Btu (184 kJ) per hour. The pilot of a complete shutoff type automatic pilot may have an input greater than 175 Btu (184 kJ) per hour. The pilot(s) of an oven control system that includes a heater (cycling) pilot and a continuous pilot may have a total input of not more than 600 Btu (630 kJ) per hour, provided no gas can be discharged from the heater pilot except when the oven control is turned to the ON position, and the input to the continuous pilot does not exceed 175 Btu (184 kJ) per hour.

14.7 The pilot input of appliances equipped with other than automatic pilot devices of the complete shutoff type shall be determined as follows:

a) The appliance is to be connected to a source of gas for which it is intended. An appliance having provision for field conversion is to be tested with each gas for which it is intended. A suitable gas meter is to be placed in the gas line ahead of the appliance. The pressure at the inlet of the appliance is to be set at normal test pressure for the specific gas. Pilot adjustment screws are to be set for maximum flow. Only the pilot is to be lighted, and after approximately 5 minutes the input is to be measured.

b) For an appliance equipped with more than one pilot, the input is to be determined with the pilots burning individually and in combination if gas flow to one of the pilots is dependent upon another pilot being lit, such as an indirect oven control system where gas flow to the heater pilot is dependent upon the presence of flame at the continuous pilot.

14.8 An oven thermostat or temperature-regulating control shall be capable of being set to obtain an average temperature of 246°C (475°F), as measured in the oven in accordance with 29.19.

14.9 If the manufacturer's instructions indicate that a temperature greater than 246°C (475°F) is used for a cleaning operation, a continuous-cleaning oven shall be provided with a temperature-limiting control, or a combination temperature-regulating and -limiting control.

14.10 A gas-pressure regulator shall be constructed for main burner load application and for pilot load application if the appliance is so equipped. The regulator shall be installed within the casing so that when the appliance is tested as described in the Temperature Test — Combustibles, Section 36, the regulator will not be subjected to temperatures in excess of 150°F (66°C) unless the gas-pressure regulator has been investigated for use at a higher temperature. The atmospheric (vent) side of the regulator shall be connected by a steel or copper tube vent line that terminates at a continuous pilot burner or be provided with a vent limiter.

14.11 A vent limiter shall limit the flow through the vent of the regulator in accordance with the requirements for vent limiters in Gas Appliance Pressure Regulators, ANSI Z21.18-1987.

14.12 Each appliance shall be provided with a gas appliance pressure regulator. The regulator shall be leak resistant to excessive pressure in accordance with the requirements for Gas Appliance Pressure Regulators, ANSI Z21.18-1987, for a regulator marked "EP."

14.13 An appliance provided with double coaxial orifices shall be provided with a convertible gas appliance pressure regulator.

14.14 The regulator outlet pressure (manifold pressure) shall be, nominally either 4, 5, or 6 inches (102, 127, or 152 mm) water column, as specified by the manufacturer for natural gas. The regulator outlet pressure for liquefied petroleum gases shall approximate that specified by the manufacturer.

14.15 Each burner of a top section shall be controlled by a manual shutoff valve which may also serve as a regulating valve. The valve shall be of the limited-displacement type, where there is no leakage around the valve stem when, with the valve in any operating position, the knob or handle is depressed or pulled.

14.16 A top burner control shall necessitate not less than two operations, or other equivalent means, to turn On and shall necessitate only one operation to turn Off. The following will be considered to meet the intent of this requirement.

- a) A self-latching valve having a push and turn or a pull-and-turn operating sequence, or
- b) The construction of the valve includes a detent feature which has been determined to be the equivalent of a self-latching valve, i.e., a minimum of 32 inch-ounce (0.227 N • m) to turn from the OFF to ON position. Conformance with this requirement is to be determined before and after a 6000 cycle endurance test.

14.17 The centers of knobs or buttons located on the backguard of an appliance shall be at least 6 inches (152 mm) above the plane of the utensil support surface.

14.18 The range surface adjacent to each main gas burner valve shall be marked to identify the burner which the knob serves.

14.19 The oven and broiler burner valve handles shall be readily distinguishable from the top burner valve handles, and from each other, unless properly identified.

14.20 The operating handle, dial, or button of a gas valve or safety control shall be located so that it is convenient and readily accessible. When an appliance is tested in accordance with these requirements, temperatures attained on the operating means of the valve or control, including surfaces which are likely to be contacted by the user, shall not exceed the temperature limits specified in Table 37.1.

14.21 A manual shutoff valve shall close in a quarter-turn of the operating handle or lever, which shall be a part of the valve. The valve shall be factory-attached ahead of the burner and oven controls in an accessible location, or instructions for locating the valve shall be furnished with each appliance.

14.22 A gas valve or gas control located in semirigid tubing shall be independently and rigidly supported. A gas valve or control may be threaded into, or in line with, standard weight piping.

14.23 A range or oven section equipped with an indirect oven control system, see 14.7, shall not be provided with a manual shutoff valve in the gas line to a continuous pilot, unless the same valve also serves to shut off the heater or cycling pilot. A screw-type valve in an oven control that is concealed from the user is not considered to be a manual valve.

14.24 The gas-pressure regulator of an appliance intended for conversion in the field from one gas fuel to another shall comply with the following:

a) The regulator shall be capable of conversion from one regulated pressure to the other by turning, inverting, or transposing a part, without adding or deleting parts.

b) The regulator marking shall indicate the kind of gas in each position of the conversion device.

15 Piping, Tubing, and Fittings

15.1 The appliance shall have provision for the connection of a gas supply line of either rigid metal pipe or semirigid metal tubing.

15.2 The point of connection of the gas supply line shall be readily accessible for tightening pipe and fittings.

15.3 The threaded opening provided for the connection of the gas supply line shall be plugged or capped for shipment of the appliance.

15.4 An opening threaded for pipe connection shall be threaded in accordance with the Standard for Pipe Threads, ANSI B2.1.

15.5 An opening in a part such as a gas valve or manifold that is threaded for pipe connection shall be capable of withstanding, without damage or leakage, the turning effort (torque) shown in Table 15.1 exerted as if to screw the part onto a pipe or into a pipe fitting. A standard pipe fitting need not be subjected to this test.

Table 15.1
Torque requirements for pipe connections

Pipe size, ANSI B2.1 nominal inches	Torque	
	pound-inches	(N • m)
1/8	135	(15.3)
1/4	250	(28.3)
3/8	450	(50.9)
1/2	800	(90.4)

15.6 Compounds used for sealing threaded joints of gas connections within the appliance shall be resistant to the action of LP-gases.

15.7 Iron or steel gas supply pipe employed on appliances shall comply with the Standard for Wrought Steel and Wrought Iron Pipe, ANSI B36.10 (Schedule 40). If brass or copper pipe is employed, it shall be dimensionally equivalent to iron pipe. Substantial malleable iron, steel, brass, or copper pipe fittings shall be used with pipe. Unions shall be of the ground-joint type or the equivalent.

15.8 Tubing connections shall be made by means of compression or flare-type fittings with steel or brass nuts. A fitting requiring the use of a gasket to obtain a gastight joint shall not be used.

15.9 Seamless drawn aluminum or copper tubing employed in the fabrication of factory-assembled equipment shall not be less than 1/8 inch (3.2 mm) outside diameter and shall have a wall thickness not less than that shown in Table 15.2.

Table 15.2
Wall thickness – aluminum and copper tubing

Outside diameter		Wall thickness	
Inches	mm	Inches	mm
1/8	3.2	0.029	0.74
3/16	4.8	0.029	0.74
1/4	6.4	0.029	0.74
5/16	7.9	0.029	0.74
3/8	9.5	0.032	0.81
7/16	11.1	0.032	0.81
1/2	12.7	0.035	0.89

15.10 Aluminum and copper tubing shall not be acceptable for use where it passes through insulating material of other than neutral reaction unless the tubing is adequately protected from the insulation.

15.11 Steel tubing of the seamless, brazed, or welded type shall not be less than 1/8 inch (3.2 mm) outside diameter and shall have a wall thickness not less than that shown in Table 15.3.

Table 15.3
Wall thicknesses – steel tubing

Outside diameter		Wall thickness	
Inches	mm	Inches	mm
1/8	3.2	0.028	0.71
3/16	4.8	0.028	0.71
1/4	6.4	0.028	0.71
5/16	7.9	0.028	0.71
3/8	9.5	0.028	0.71
1/2	12.7	0.028	0.71

15.12 Steel tubing having a wall thickness of 0.053 inch (1.35 mm) or less shall be constructed of corrosion resistant material such as stainless steel, or shall be plated, dipped, coated, or otherwise treated to resist external corrosion.

15.13 Protective coatings of steel tubing shall provide resistance against corrosion to a degree provided by cadmium plating not less than 0.0003 inch (0.008 mm) thick and zinc plating not less than 0.0005 inch (0.013 mm) thick, except on parts where threads constitute the major portion of the area, in which case the thickness of the cadmium or zinc plating shall not be less than 0.00015 inch (0.0038 mm).

15.14 On appliances for use with natural gas, copper semirigid tubing or tubing with internal copper surfaces shall be internally tinned or equivalently treated to resist corrosion by sulphur compounds.

15.15 A 1/8-inch N.P.T. plugged tapping accessible for test gauge connection for measuring the manifold pressure under flow shall be provided at the outlet of, or downstream from, the gas pressure regulator. The plug used shall not be of the slotted head type.

Exception: A plugged tapping need not be provided if some other accessible means for such connection, such as an orifice hood on a multiple burner appliance, is incorporated in the appliance.

16 Enclosures

16.1 General

16.1.1 Electrical equipment and wiring shall be located and/or guarded so as to be protected against spillovers and the accumulation of spillage during normal operation.

16.1.2 Uninsulated live high-voltage parts shall be enclosed or guarded to prevent accidental contact by persons during normal use of the equipment. This applies also to such parts located in a compartment into which access is required for normal care of the equipment, such as resetting controls, replacing lamps, cleaning, etc.

16.1.3 Sheet metal complying with Table 16.1 is considered acceptable for the enclosure of electrical components.

16.1.4 Among the factors taken into consideration when judging the acceptability of an enclosure are:

- a) Mechanical strength,
- b) Resistance to impact,
- c) Moisture absorptive properties,
- d) Flammability,
- e) Resistance to corrosion, and
- f) Resistance to distortion at temperatures to which the enclosure may be subjected under conditions of normal or abnormal use.

For a nonmetallic enclosure or part of an enclosure, all these factors are considered with respect to thermal and chemical aging.

16.1.5 If the design and location of components and the strength and rigidity of the outer cabinet warrant, an individual enclosure thinner than specified in Table 16.1 may be employed.

16.1.6 Steel enclosures shall be protected against corrosion by painting, plating, or other equivalent means.

Table 16.1
Thickness of sheet metal

Maximum dimensions of enclosure		Minimum thickness of sheet metal in inches									
		Steel ^a						Copper, brass or aluminum ^a			
		Without supporting member			With reinforcing support ^b			Without supporting member		With reinforcing support ^b	
Length or width	Area in	Zinc-coated		Uncoated		Zinc-coated		Uncoated		Uncoated	
Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
3	76.4	0.023 (24)	0.584	0.020 (24)	0.508	0.023 (24)	0.584	0.020 (24)	0.508	0.023	0.584
8	203.2	0.029 (22)	0.740	0.026 (22)	0.660	0.023 (24)	0.584	0.020 (24)	0.508	0.036	0.910
12	304.8	0.034 (20)	0.864	0.032 (20)	0.813	0.023 (24)	0.584	0.020 (24)	0.508	0.045	1.143
18	457.2	0.045 (18)	1.143	0.042 (18)	1.067	0.034 (20)	0.864	0.032 (20)	0.813	0.058	1.473
24	609.6	0.056 (16)	1.422	0.053 (16)	1.346	0.045 (18)	1.143	0.042 (18)	1.067	0.075	1.905
48	1219.2	0.070 (14)	1.778	0.067 (14)	1.702	0.056 (16)	1.422	0.053 (16)	1.346	0.095	2.413
60	1524.0	0.097 (12)	2.464	0.093 (12)	2.362	0.056 (16)	1.422	0.053 (16)	1.346	0.122	3.099
over 60	1524.0	0.126 (10)	3.200	0.123 (10)	3.124	0.056 (16)	1.422	0.053 (16)	1.346	0.153	3.886

^a The figures in parentheses are the Manufacturer's Standard Gage number (for uncoated steel), the Galvanized Sheet Gage numbers (for zinc-coated steel) which provide the specified minimum thickness of metal.

^b Any subdivided area not provided with a reinforcing support is considered to be without support in determining minimum thicknesses.

^c Volume of enclosure not more than 12 cubic inches (196.7 cm³).