UL 791

STANDARD FOR SAFETY

Residential Incinerators

UL Standard for Safety for Residential Incinerators, UL 791

Fifth Edition, Dated November 10, 2006

Summary of Topics

This revision to UL 791 dated February 25, 2021 includes the addition of requirements for gas-fired incinerating toilets; 4.24A and Section 49A

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated August 16, 2019, September 18, 2020 and December 18, 2020.

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Standard for Residential Incinerators

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November 10, 2006

This UL Standard for Safety consists of the Fifth Edition including revisions through February 25, 2021.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements apply to direct-fed incinerators, including those of the gas and electric ignition types, designed primarily for use in one-and two-family dwellings for the burning of ordinary combustible waste materials and garbage incidental to domestic occupancy and having a firebox or charging compartment of not over 5 cubic feet capacity.

1.2 Incinerators of this type may also be employed in other occupancies including commercial establishments and institutions where the refuse is of a character for which the incinerator is designed and is not excessive in amount. They are not intended for use in spaces in which flammable vapor or gases may be present.

1.3 Incinerators covered by these requirements are the factory-made type not requiring field construction, and are designed for inside use. These requirements do not cover an incinerator that requires the use of a brick or masonry wall, etc., which forms a part of the building structure, or requires masonry work at the site to complete the incineration chamber.

1.4 *Deleted*

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 Components

2.1 A component of a domestic-type incinerator shall comply with the requirements for that component, except that such requirements may be modified if appropriate for the particular application.

3 Units of Measurement

3.1 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.

4 Glossary

4.1 AIR SHUTTER – An adjustable device for varying the size of the air inlet or inlets.

4.2 APPLIANCE FLUE – The flue passages within the appliance.

4.3 ASH – The solid residue remaining after combustion or incineration has been completed.

4.4 ASH PIT DOOR – A door below the grate level used for removing ash or other noncombustibles from the appliance.

4.5 BAFFLE – An object placed in an appliance to direct or retard the flow of air or flue gases.

4.6 BASE – The main supporting frame or structure of an assembly.

4.7 BODY – The principal structure of the appliance including the supporting frame, and which gives strength and rigidity to the assembly.

4.8 BURNER – A device for the final conveyance of a fuel or a mixture of fuel and air to the combustion zone.

4.9 BUSHEL – Dry bushel, 1.24 cubic feet.

4.10 CHIMNEY, FACTORY-BUILT – Those chimneys of the factory-made type intended for use with gas, liquid, and solid-fuel fired low-heat appliances and domestic-type incinerators. These chimneys may be used also where Type B gas vents are permitted.

4.11 CHIMNEY, MASONRY – A vertical masonry or reinforced concrete shaft containing one or more flues or vents.

4.12 COMBUSTIBLE CONSTRUCTION – As pertaining to materials adjacent to or in contact with the incinerator and its flue pipe, shall mean materials made of or surfaced with wood, compressed paper, plant fibers, or other material that will ignite and burn. Such material shall be considered as combustible even though flame-proofed, fire-retardant treated, or plastered. Gypsum or other wallboards that are surfaced with combustible material are classified as combustible.

4.13 CASING – An enclosure forming the outside of the appliance, no parts of which are likely to be subjected to intense heat.

4.14 COMBUSTION – As used herein, the rapid oxidation of combustibles (fuel and waste material) accompanied by the production of heat, or heat and light. Complete combustion is possible only in the presence of an adequate supply of oxygen.

4.15 COMBUSTION CHAMBER – The portion of an incinerator within which incineration occurs.

4.16 CONTROL – A device designed to regulate the fuel, air, or electrical supply to the controlled equipment. It may be automatic, semiautomatic, or manual.

4.17 DAMPER – A valve or plate for regulating draft or flow of flue gases. A damper is generally considered as being located on the downstream side of the combustion chamber, usually in a flue passage of the appliance or in the flue pipe.

4.18 DRAFT REGULATOR – A device which functions to maintain a desired draft in the appliance by automatically reducing the chimney draft to the desired value.

4.19 ELECTRICAL CIRCUITS –

a) 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.

b) LOW-VOLTAGE CIRCUIT – A circuit involving a potential of not more than 30 volts 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.

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 as described in item b of this paragraph.

c) SAFETY CONTROL CIRCUIT– A circuit involving one or more safety controls, in which failure due to grounding, opening, or shorting of any part of the circuit can cause unsafe operation of the controlled equipment or can introduce a direct fire or life hazard.

4.20 FLUE – A conduit or passageway, vertical or nearly so, for conveying flue gases to the outer air.

4.21 FLUE COLLAR – That portion of an appliance designed for attachment of the flue pipe.

4.22 FLUE GASES – Combustion products and excess air.

4.23 FLUE PIPE – The conduit connecting the incinerator with the chimney.

4.24 INCINERATOR – An appliance used to reduce refuse material to ash and which is of the factory-made sold and installed as a package.

4.24A ISOLATED COMBUSTION SYSTEM – Combustion system designed and installed so all air supplied for combustion, the combustion system of the appliance, and all products of combustion are completely isolated from the living space.

4.25 LINING – Those interior surfaces of an incinerator which are exposed to waste material during use of the appliance.

4.26 MANIFOLD – The conduit of an appliance which supplies gas to the individual burners.

4.27 MIXER – The combination of mixer head, mixer throat, and mixer tube for a gas burner.

4.28 ORIFICE – The opening in a cap, spud, or other device whereby the flow of gas is limited and through which the gas is discharged to a burner.

4.29 ORIFICE CAP (HOOD) – A movable fitting having an orifice which permits adjustment of the flow of gas by the changing of its position with respect to a fixed needle or other device.

4.30 ORIFICE SPUD – A removable plug or cap containing an orifice and which permits adjustment of the flow of gas either by substitution of a spud with a different sized orifice or by the motion of a needle with respect to it.

4.31 PILOT – A small flame which is utilized to ignite the fuel at the main burner or burners.

4.32 PILOT, AUTOMATIC – Consists of an automatic pilot device and pilot burner securely assembled in fixed functional relationship.

4.33 PILOT DEVICE, AUTOMATIC – A device employed with gas-burning equipment which will either automatically shut off the gas supply to the burner being served, or automatically actuate electrically or otherwise a gas-shutoff device when the pilot flame is extinguished. The pilot burner may or may not be constructed integrally with the device.

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

4.35 PRIMARY AIR – The air introduced into a burner and which mixes with the fuel before it reaches the ignition zone.

4.36 READILY ACCESSIBLE – Capable of being reached easily and quickly for operation, adjustment, and inspection.

4.37 REGULATOR, GAS-PRESSURE – A device for controlling and maintaining a uniform gas-supply pressure.

4.38 SECONDARY AIR – The air externally supplied to the flame at or beyond the point of ignition.

4.39 SMOKE PIPE – See 4.23, Flue Pipe.

4.40 VALVE CONTROL – An automatically or manually operated device consisting essentially of a valve for controlling the fuel supply to a burner.

a) METERING (REGULATING) VALVE – A control valve for regulating burner input.

b) SAFETY SHUTOFF VALVE – An automatic control valve of the on and off type, without any bypass to the burner, that is actuated by a safety control or by an emergency device.

4.41 VALVE MANUAL MAIN SHUTOFF – A manually operated valve for the purpose of completely turning on or shutting off the fuel supply to a burner except to a gas pilot which is provided with an independent shutoff valve.

5 Installation and Operating Instructions

5.1 A copy of the installation and operating instructions intended to accompany each domestic-type incinerator or component, or equivalent information, is to be used as a guide in the examination and test of the domestic-type incinerator or component. For this purpose a printed edition is not required.

5.2 The instructions should include such directions and information as deemed by the manufacturer to be adequate for attaining proper and safe installation, maintenance, and use of the incinerator.

CONSTRUCTION

6 Assembly

6.1 An incinerator shall be a complete, factory-made, self-contained, free-standing unit not requiring field construction for its installation.

6.2 Each incinerator shall include all the essential components necessary for its normal function when installed as intended.

6.3 The various parts shall be constructed and assembled in accordance with these requirements in a manner to insure strength, rigidity, and durability.

6.4 Parts of an incinerator shall not crack, warp, or sustain other damage likely to permit passage of flame or emission of gases or sparks to the exterior when tested in accordance with these requirements.

6.5 An incinerator shall be constructed to avoid the fouling or clogging of an ignition assembly by ashes or drippings.

6.6 An incinerator shall be designed to prevent flames, gases, burning particles, or sparks being expelled into the room.

6.7 An incinerator shall be so constructed that glowing or heated particles cannot fall to the floor even when the ash pan is removed.

6.8 The casing of an incinerator for installation on combustible flooring shall completely close the bottom or be constructed to provide a solid partition below the combustion-chamber ash compartment assembly. The ash compartment assembly is considered to include the floor of the ash compartment.

6.9 Openings in the casing above the solid bottom or partition required by 6.8 shall be at least 1/2 inch above such bottom or partition and at least 2 inches above the floor level.

6.10 Unless the space underneath the bottom or partition required by 6.8 is totally enclosed by the casing and floor, or the incinerator is on not more than four legs which are not more than 2 inches wide on any side, so as to provide a clear space not less than 4 inches high above the floor beneath the incinerator, the temperature on such bottom or partition shall not exceed 90° F (32.2° C) above room temperature when the incinerator is tested in accordance with these requirements.

6.11 Electrical devices, fittings, piping, safety controls, tubing, valves, and similar components employed in the assembly of an incinerator shall conform to the requirements for the product.

6.12 Screws used to attach parts which are detached for normal care of the appliance shall be capable of holding upon the application of the torque indicated in Table 6.1 after removal and replacement.

Table 6.1
Maximum torque requirements for screws

Screw size	Torque, pound-inches
No. 8	20
No. 10	25
1/4 inch	100
5/16 inch	200
3/8 inch	350
7/16 inch	550
1/2 inch	800
9/16 inch	1200

7 Enclosure

7.1 An incinerator shall be constructed of suitable materials of sufficient strength and durability to ensure safe and reliable service of the parts and of the assembly for an extended period of service.

7.2 An incinerator shall be built to allow cleaning of surfaces in contact with combustion products without major dismantling of the incinerator or removal of parts.

7.3 The removal of access panels, burners, ignitors, etc. specifically designed to permit ready removal and replacement for servicing, and the detachment of the flue pipe are not considered major dismantling as referred to in 7.2.

7.4 Sufficient and reasonable accessibility shall be afforded for cleaning, inspection, repair, and replacement of all burners, controls, and safety devices.

7.5 The disposition of removable parts in the assembly shall be such that their restoration, following removal for cleaning, will not necessitate realignment to secure their proper relationship with other parts of the assembly.

7.6 Any exposed part of edges which reasonably might be brought in contact with the hand during normal adjustment or usage shall be smooth and rounded.

7.7 Electrically conductive heat-insulating material shall not make contact with uninsulated live parts of the appliance.

7.8 Some types of mineral wool thermal insulation contain conductive impurities in the form of slag which makes its use hazardous where it is in contact with uninsulated live parts.

8 Internal Wiring

8.1 The wiring of all circuits included in the incinerator assembly shall be furnished by the manufacturer with the incinerator.

8.2 Suitably insulated conductors having adequate current capacity for the service shall be used. A conductor shall be not smaller than 18 AWG.

9 Wiring Methods

9.1 All electrical circuits to which connections are to be made in the field shall terminate in a suitable box or enclosure in which connections to the circuit can be made. The box or enclosure shall permit the proper connection of metal-clad cable or conduit and shall not require that it be moved for normal servicing of the incinerator.

9.2 Electrical insulation shall not contact waste material or products of combustion.

9.3 An incinerator shall be constructed so that the enclosure, frame, and similar noncurrent carrying parts of all high-voltage electrical equipment is bonded adequately to the means provided for connecting the metal-clad cable or conduit of the supply circuit. An insulated conductor provided for such purpose shall be finished to show a green color.

9.4 Some types of insulated conductors recognized as suitable are indicated in Table 9.1.

Table 9.1
Maximum temperature rises for some items

(The inclusion of a temperature limit for an item in this table is not indicative of the acceptability of the item if it does not otherwise conform to these requirements.)		
Items	**Maximum rise above room temperature**	
	Degrees C	**Degrees F**
Surfaces of test enclosure (wall opposite incinerator sides, floor structures, and the like)	50	90
Surfaces of incinerator parts at points of zero clearance to test structure	50	90
Flue gases,[g]	739	1330
Carbon steel sheet and cast iron	683	1230

Table 9.1 Continued on Next Page

Table 9.1 Continued

(The inclusion of a temperature limit for an item in this table is not indicative of the acceptability of the item if it does not otherwise conform to these requirements.)		
Items	**Maximum rise above room temperature**	
	Degrees C	**Degrees F**
Aluminum alloys		
1100 (2S)	239	430
3003 (3S)	294	530
2014, 2017, 2024, 5052,[b]	350	630
Aluminum-coated steel,[c]	767	1380
Stainless Steel		
Types 302, 303, 304, 316, 321, 347	878	1580
Type 309	1072	1930
Type 310	1128	2030
Type 405	795	1430
Types 403, 410, 416	683	1230
Type 430	822	1480
Type 446	1072	1930
Galvanized steel,[d]	350	630
Carbon steel, coated with Type A19 ceramic	683	1230
Conductors of field-wired circuits connected to incinerator and surfaces on which they may bear	35	63
Factory wiring		
Wire code,[e]		
Types R, RF, FF, RW, RU	35	63
Types RH, RFH, FFH	50	90
Types T, TF, TFF, TW	35	63
Type TA	65	117
Wire miscellaneous		
Teflon, 200 C rating	175	315
Teflon, 250 C rating	225	405
GTO cable	35	63
Other types of insulation wires	See Note f	
Appliance wiring material		
Thermoplastic, 80°C rating	55	99
Thermoplastic, 90°C rating	65	117
Thermoplastic, 105°C rating	80	144
Silicone, 200°C rating	175	315
Electrical insulation material		
Class A (105) insulation on coil windings		
In open motors		
Thermocouple method	65	117
Resistance method	75	135

Table 9.1 Continued on Next Page

Table 9.1 Continued

(The inclusion of a temperature limit for an item in this table is not indicative of the acceptability of the item if it does not otherwise conform to these requirements.)		
Items	**Maximum rise above room temperature**	
	Degrees C	**Degrees F**
In totally enclosed motors		
Thermocouple method	70	126
Resistance method	80	144
In other coils		
Thermocouple method	65	117
Resistance method	85	153
Class B (130) insulation	85	153
Class C insulation	Not specified as determined by test	
Class H (180) insulation		
Varnished-cloth insulation	60	108
Phenolic composition employed as electrical insulation or as a part to which damage would result in risk of fire, electric shock, or injury to persons,[e]	125	225
Fiber employed as electrical insulation	65	117
Class 130 transformer enclosure	60	108
Sealing compounds	Maximum temperature 15°C (27°F) less than melting point	
Capacitors – Electrolytic type	40	72
Other types	65	117
Power and ignition transformer enclosure	64	117

[a] The specified maximum temperature rises apply to parts whose failure may cause a risk of fire, electric shock, or injury to persons.

[b] These and other alloys containing magnesium are not to be used when the reflectivity of the material is utilized to reduce risk of fire.

[c] When the reflectivity of aluminum-coated steel is utilized to reduce risk of fire, the maximum allowable temperature rise is 461°C (830°F).

[d] The specified maximum temperature rises apply when the galvanizing is required as a protective coating or the reflectivity of the surface is utilized to reduce risk of fire.

[e] The limitations on rubber and thermoplastic insulation and on phenolic composition do not apply to compounds which have been investigated and recognized as having heat-resistant properties. Thermoplastics are in no case to attain temperature at which the material begins to flow.

[f] For standard insulated conductors other than those mentioned, reference should be made to the National Electrical Code; and the maximum allowable temperature rise is 25°C (77°F) less than the recognized temperature limit of the wire in question where temperature rises are specified.

[g] A rise in flue-gas temperature exceeding 739°C (1330°F), but not in excess of 906°C (1630°F), if observed for any single period of 2 minutes or less, may be permitted.

9.5 Electrical wiring to a part which must be moved for normal servicing shall be arranged so that the part may be moved without breaking spliced wire connections or disconnecting conduit. Conductors to be disconnected from terminals of such part shall terminate in eyelets or connectors. When the wiring to a part which functions also as an access plate or cover is not readily detachable, the assembly shall include provision for support of that part by means other than the wiring when the part is moved for servicing. Any allowable movement of such part shall not unduly twist, bend, or pull the wiring.

9.6 Conductors shall be enclosed within conduit, electrical metallic tubing, other suitable metal raceway or electrical enclosure, or metal-clad cable, except as permitted by 9.7.

9.7 When within the casing or similar compartment, factory wiring involving a potential of not more than 300 volts between parts attached to the same assembly with a predetermined fixed relationship one to the other may be done with Type SJO or SJT cord or appliance wiring material having neoprene, thermoplastic, or equally durable insulation of equivalent thickness, provided:

a) The compartment is normally closed, including a solid bottom furnished as part of the incinerator.

b) No openings are located on other than vertical surfaces.

c) Openings in vertical surfaces are louvered and will not permit the entrance of a rod having a diameter of 33/64 inch.

d) Permitted louvered openings are at least 2 inches above the bottom of the compartment.

e) High-voltage parts so connected are electrically bonded adequately one to the other and in accordance with 36.2.

9.8 Splices in wiring shall be located only in accessible junction boxes. Splices shall be made mechanically secure, soldered, and suitably insulated with tape; or suitable wire connectors may be employed.

9.9 At all points where conduit or metal-clad cable terminates, the conductors shall be protected from abrasion unless the design of the boxes or fittings is such as to afford such protection. In addition, in the case of metal-clad cable, an insulating bushing or its equivalent shall be provided between the conductors and the cable. The connector or clamp by which metal-clad cable is fastened to boxes or enclosures shall be of such design that the insulating bushing or its equivalent will be visible for inspection.

9.10 The design of a wireway shall be such that the interconnection of sections and fittings will provide a rigid mechanical assembly and ensure adequate electrical conductivity. The interior of the wireway shall be free from burrs, and sharp corners or edges which might cause injury to the insulation on wires. Screws and bolts, however, used, shall not project into the wireway unless sharp ends and threaded sections, other than the threaded sections of machine screws or bolts which do not project into the wireway more than 1/32 inch, are covered or otherwise prevented from coming in contact with wires.

9.11 Unless supplied with insulation suitable for the highest voltage involved, factory-wired insulated conductors of circuits of one voltage shall be separated by barriers or shall be segregated from conductors of circuits of another voltage; and shall, in any case, be so separated or segregated from uninsulated current carrying parts connected to circuits of another voltage.

9.12 Segregation of insulated conductors may be accomplished by clamping, routing, or equivalent means which ensures permanent separation as stipulated in 9.11.

9.13 Holes in metal walls through which insulated wires not enclosed in conduit pass shall be provided with smoothly rounded bushings or shall have smooth, rounded surfaces, to prevent abrasion of the insulation. Bushings shall be phenolic, porcelain, or hard fiber.

9.14 A hole in porcelain, phenolic composition, or other suitable nonconducting material and having a smoothly rounded surface is considered to be the equivalent of a bushing.

9.15 Ceramic materials and some molded compositions are acceptable generally for insulating bushings; but bushings of wood or so-called hotmolded shellac and tar compositions are not acceptable.

9.16 A fiber bushing shall be not less than 1/16 inch in thickness, with a minus tolerance of 1/64 inch for manufacturing variations, shall be so formed and secured in place that it will not be affected adversely by

conditions of ordinary moisture, and shall not be employed where it will be subjected to a temperature higher than 90°C (194°F) under normal operating conditions.

9.17 To provide an acceptable unbushed opening in sheet metal usually requires rolling and/or extrusion of the metal around the opening, or the insertion of an acceptable grommet.

10 Field-Wiring Connections

10.1 The box or enclosure in which field installed conductors are to be connected as indicated in 9.1 shall be so located that the temperature of conductors within the box or surfaces of the box likely to be in contact with the conductors will not exceed that specified for Type R wire in Table 9.1 when the incinerator is tested as specified in the Capacity Charge – Maximum Air Supply Test, Section 42; Capacity Charge – Normal Air Supply Test, Section 43; and Continuous Charge Test, Section 44.

10.2 The size of the junction box in which field-installed conductors are to be connected by splicing shall be not less than that indicated in Table 10.1. A conductor passing through the box is counted as one conductor, and each conductor terminating in the box is also counted as one conductor. A field-furnished conductor for high-voltage circuits is considered to be not smaller than 14 AWG.

Table 10.1
Size of junction boxes

Size of conductors		Free space within box for each conductor,	
AWG	(mm^2)	cubic inches	(cm^3)
16 or smaller	(1.3 or less)	1.5	(24.6)
14	(2.1)	2.0	(32.8)
12	(3.3)	2.25	(36.9)
10	(5.3)	2.5	(41.0)
8	(8.4)	3.0	(49.2)

10.3 Conductors intended for connection to a grounded neutral line shall be identified (i.e., finished a white or gray color). All other conductors shall be finished in colors other than white or gray. A terminal for connection of a grounded conductor shall be identified by a metallic-plated coating substantially white in color and shall be readily distinguishable from other terminals, or it shall be clearly identified in some other manner, such as on an attached diagram.

10.4 Field-installed conductors of a circuit shall be segregated or separated by barriers from field-installed and factory- installed conductors connected to a circuit of another voltage unless the conductors of both circuits are or will be insulated for the maximum voltage of either circuit.

10.5 Field-installed conductors of a low-voltage circuit shall be segregated or separated by barriers from uninsulated live parts to be connected to a high-voltage circuit and from any safety-control circuit wiring terminals and any other uninsulated live parts whose short-circuiting or grounding may result in operation of the assembly that could cause risk of fire, electric shock, and injury to persons.

11 Ash Compartment

11.1 An incinerator shall be provided with a removable ash pan which has a volume capacity of not less than 20 percent of the volume capacity of the incineration chamber.

11.2 The depth of the pan shall be not less than 3 inches (76 mm) for incinerators having less than two bushel capacity and be not less than 4 inches (102 mm) for those having a capacity of two bushels or more.

11.3 The door of an ash compartment shall be self-closing or the incinerator shall be tested in accordance with these requirements with the closing means or door in the open position.

12 Body

12.1 A body shall consist of noncombustible material and be strong and durable. See 6.4.

13 Capacity

13.1 The capacity of the incinerator shall be the volume of the incinerator chamber as measured from the grates to within 1 inch (25.4 mm) of the top of the chamber or to the bottom of any opening not protected from refuse, whichever is the lesser value. The manufacturer's capacity rating shall not exceed this volume by more than 5 percent.

14 Casing

14.1 The outer casing or jacket shall be made of steel or other acceptable material, reinforced or formed if necessary, so that it is not likely to be damaged through handling in shipment, installation, and use. The minimum acceptable thickness, with a minus tolerance of zero, including coatings, for sheet metal casings is 0.021 inch (0.53 mm), and if deterioration of the casing may cause risk of fire and injury to persons, the casing shall be protected against corrosion.

15 Charging Door

15.1 A door shall fit tightly so that no leakage occurs when the incinerator is tested as specified in the Capacity Charge – Maximum Air Supply Test, Section 42; Capacity Charge – Normal Air Supply Test, Section 43; and the Continuous Charge Test, Section 44.

16 Combustion Chamber

16.1 A combustion chamber shall be constructed of cast-iron, sheet steel, or other suitable material. Sheet metal, if used, shall be such as to ensure strength, rigidity, durability, resistance to corrosion, and other physical properties equivalent to AISI, C1010 hot-rolled sheet steel having a minimum thickness, with a minus tolerance of zero, including coatings, of 0.053 inch.

16.2 Sheet steel and refractory combustion chamber liners shall be adequately held in place and be replaceable with like material.

16.3 A joint in metal surfaces of a combustion chamber or flue passage shall be strong and tight as attained by being welded, lock-seamed, riveted, bolted, etc. A joint shall not depend primarily on cement for tightness.

16.4 Refractory liners which are not within a complete metal liner shall be constructed to provide suitable protective interlocking or overlapping of the segments to avoid deterioration at joints.

16.5 A baffle in a flue-gas passage, or otherwise exposed to combustion products, shall be constructed and disposed in a manner to provide for reasonable life and shall be secured in position. It shall be made of material not lighter than that required for the combustion chamber.

17 Combustion Regulation

17.1 Means provided for regulating or retarding combustion to prevent the development of excessive temperatures during tests in accordance with these requirements shall not become ineffective when:

a) A filter is blocked, or

b) Any fixed opening having a dimension of 1/4 inch or less, or an area of 1/4 square inch or less is blocked.

17.2 An automatically operated damper or air shutter provided for regulating or retarding combustion to prevent the development of excessive temperatures during tests in accordance with these requirements shall be constructed and disposed in a manner assuring reliable operation throughout the life of the incinerator and shall be enclosed or guarded to avoid accidental interference with its operation.

17.3 An automatically operated damper or shutter shall be made of material having corrosion resistance and durability equivalent to stainless steel of 0.012 inch minimum thickness.

17.4 Bearings shall be of a type not requiring lubrication by the user, and any wear anticipated shall not affect the reliable operation of the device. Such devices shall be provided as an essential or integral part of the incinerator assembly and be protected in their function from the effects of accumulation of fly-ash, soot, or waste materials associated with the use of the incinerator.

18 Damper

18.1 A damper located in a passage for combustion products shall not close off more than 80 percent of the internal cross-sectional area of the passage.

19 Disposal of Combustion Products

19.1 An incinerator shall be designed to discharge all the products of combustion through the flue collar.

20 Draft Hood

20.1 A draft hood shall not be provided for an incinerator.

21 Flue Collar

21.1 Flue collars shall be made of cast-iron; or sheet steel having a minimum thickness, with a minus tolerance of zero, including coatings, of 0.031 inch.

21.2 Blocking or stoppage of the flue opening from within shall not occur when the incinerator is normally filled.

21.3 A flue collar shall permit the secure attachment of flue pipe of integral inch diameter, but in no case one less than 3 inches in diameter. The insertion of a stove pipe onto or into the flue collar shall not block any passages necessary for the safe use of the incinerator.

21.4 The flue collar shall have a hole not less than 7/32 inch in diameter placed in the wall of the collar into which a bolt or other flue pipe fastener may be inserted.

22 Grates

22.1 Grates shall be made of cast-iron or equivalent material.

23 Insulation, Thermal

23.1 Thermal insulation employed in spaces not communicating with the flue-gas passages of the incinerator shall be noncombustible; that is, having a fire hazard classification of zero as determined in accordance with the Standard for Fire Tests of Building Construction and Materials, UL 263.

23.2 Unclassified thermal insulation may be employed if compliance with the following conditions is demonstrated when the incinerator is tested in accordance with these requirements:

a) The products resulting from the combustion or volatilization of the combustible material are discharged through the flue-gas passages without noticeable effects,

b) The insulating materials retain sufficient mechanical strength to remain in their intended position, and

c) The thermal conductivity of the insulating materials is not increased.

23.3 Thermal insulation shall not show evidence of softening, melting, change in mechanical structure, or other evidence of failure when the incinerator is tested in accordance with these requirements.

23.4 Thermal insulation shall be adequately protected against contact with waste materials and products of combustion.

23.5 Thermal insulation, which is not adequately self-supporting, shall be securely applied to solid surfaces in a manner to prevent sagging. An adhesive or cement for attaching such material shall retain its adhesive qualities at any temperature the adhesive may attain when the incinerator is tested in accordance with these requirements and at 0°F (minus 17.8°C).

24 Radiation Shields

24.1 A radiation shield shall be rigid and durable. It shall be securely attached in a manner to ensure maintenance of proper spacing. A radiation shield shall be protected against corrosion if deterioration of its surfaces would result in excessive temperatures when the incinerator is tested in accordance with these requirements. The protective finish, when required, shall not be damaged by heat during the tests.

ELECTRICAL COMPONENTS

25 General

25.1 Attachment plugs or separable connectors shall not be used in circuits when the breaking or making of the circuit by such devices may allow unsafe operation of the appliance.

26 Electrical Enclosures

26.1 Uninsulated live parts shall be enclosed, guarded, or located to prevent contact with waste material or accidental contact by persons during normal usage of the incinerator. This applies also to such parts located in a compartment, including an ash pit, into which access is required for normal care of the equipment, such as resetting controls, lubrication, cleaning, etc.

26.2 A cover or access panel of an enclosure for uninsulated live parts shall be provided with means for firmly securing it in place.

26.3 An enclosure for uninsulated live parts shall have no openings which are not closed when the incinerator is installed; except that an enclosure for parts other than a fuse or thermal cutout may have openings, in surfaces other than its bottom, as needed for ventilation or for the device to function. Such openings shall conform to 6.9 and shall prevent the entrance of a rod of the diameter specified herein. The diameter of the rod is to be equivalent to the distance measured from a straight edge placed across the outer face of the opening to be checked to the nearest uninsulated live part within the enclosure, but the diameter of the rod shall be not larger than 33/64 inch.

26.4 Terminals of a low-voltage safety device within a compartment or cavity to which factory wiring is connected need not be otherwise enclosed if such terminals are recessed and located so that the terminals are shielded from accidental shorting or damage.

27 Heating Elements

27.1 A heating element shall be supported in a substantial and reliable manner so that it will not twist, slide, or drop out of position. It shall be protected against mechanical injury.

27.2 An element employing insulating material which is liable to be affected adversely by moisture under the conditions of normal use shall have an acceptable insulation resistance when tested in accordance with these requirements.

27.3 Metal-clad heating elements constructed in compliance with 27.4 are not considered as affected by moisture.

27.4 The external metal covering of the element shall be nickel, stainless steel, or other material suitable for the temperatures involved.

SPACINGS

28 General

28.1 The spacings in a device, such as a control, thermostat, receptacle, snap switch, etc., supplied as part of an incinerator, other than a device in a safety control circuit, shall be not less than the minimum spacings required for the class of device in question, or not less than the spacings required for temperature-indicating and -regulating equipment, whichever are smaller. In a device which is part of a safety control circuit, except a snap switch, spacings shall comply with the requirements for safety controls in the Standard for Temperature-Indicating and -Regulating Equipment, UL 873. Compliance with the Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, and/or the applicable Part 2 standard from the UL 60730 series fulfills these requirements.

28.2 A heating element rated at 250 volts or less shall provide a spacing through air and over the surface of insulating material of not less than 1/16 inch, except as noted in 28.1, between uninsulated live parts of opposite polarity, and between any rigidly mounted uninsulated live part and metal other than the enclosure.

28.3 At closed-in points only of heating elements, such as the screw-and-washer construction of an insulated terminal mounted in metal, a spacing of 3/64 inch is acceptable.

28.4 The electrical clearance resulting from the assembly of parts into a complete equipment, including clearance to grounded metal or enclosure, shall comply with the spacing requirements of the Standard for Temperature-Indicating and -Regulating Equipment, UL 873. Compliance with the Standard for Automatic

Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, and/or the applicable Part 2 standard from the UL 60730 series fulfills these requirements.

GAS EQUIPMENT

29 Burners

29.1 Burners shall be so constructed or protected to minimize the fouling or clogging of ports or primary air openings, or both, by accumulation of ashes or by drippings from grates while in service.

29.2 In the application of 29.1, it is assumed that reasonable diligence will be exercised to prevent the ash receptacle from becoming completely filled with ashes.

29.3 Burners shall be so secured that they will not twist, slide, or drop out of position, and shall not be bolted or locked from within the incinerator.

29.4 Main burners and integral pilots of main burners shall be easily removable and replaceable from the front of the incinerator without disconnecting threaded joints in the gas supply line, other than those of the union type, and without disturbing or removing the charge. This shall be accomplished without the use of special tools or requiring tool manipulation within the burner compartment.

29.5 Ports shall be machined or otherwise accurately made.

29.6 Where more than two rows of ports are used, the burner head shall be a single casting or of welded, brazed, or screw-joint construction. Where not more than two rows of ports are used, the burner head shall be either as prescribed above or made of pipe, the weight of which shall be at least that of standard wrought-iron pipe.

29.7 Joints between mixer throats and flame zones shall not depend primarily on seaming or cement for tightness, but shall be securely screwed, bolted, welded, brazed, or of an equally rigid and gas-tight construction.

30 Primary Air Control

30.1 When primary air control means are provided, they shall be so designed that the flow of primary air can be controlled to provide proper flame characteristics on all gases.

30.2 Air shutters, when used, shall make a close fit with mixer faces and shall be provided with not to exceed two air openings, each of which approximates a circular opening near point of closure. When shutters are fully closed, there shall be no uncovered openings.

30.3 Primary air adjustment means shall be so attached that they will not change position by the action of gravity when the means for locking the adjustment is loosened.

30.4 Air shutters, when used, shall be constructed of a rust resisting material or have a rust resisting finish, except where the type of material or construction employed will prevent sticking or corroding in position.

30.5 Cast-iron shutters are considered as complying with the above requirement.

30.6 Sheet metal air shutters shall be of a thickness not less than 0.031 inch, and if the thickness is less than 0.053 inch, they shall have the outer edge turned at right angles, or be otherwise reinforced. The above thicknesses are minimum, with a minus tolerance of zero, including coatings.

31 Orifices and Orifice Fittings

31.1 Fixed orifices shall be provided on main burners of incinerators intended for use with liquefied petroleum gas.

31.2 Each orifice fitting shall be accessible for adjustment or replacement of the orifice hood or spud.

31.3 Orifice fittings shall be rigidly secured to prevent misalignment with the burner mixer.

31.4 Orifice spuds and orifice spud holders shall be made of metals having a melting point of not less than 1200°F (649°C).

32 Pilots

32.1 Pilots shall be correctly and securely supported in such a manner that their position relative to the main burner is fixed, and so placed that they can be easily seen and safely lighted with a paper match not more than 1-1/2 inches long, held by the fingers, without disturbing or removing the charge.

32.2 Pilots shall be so protected as to minimize fouling by ashes or by drippings from grates while in service.

32.3 Pilot assemblies not constituted as a fixed part of, or removable with the main burner, shall be easily removable and replaceable without removing the main burner, other controls or accessories, or breaking or disturbing any gas connection other than union-type connections in gas supply lines, and without disturbing or removing the charge. This shall be accomplished without the use of special tools or requiring tool manipulation within the burner compartment. For integral pilots and main burners, see 29.4.

32.4 Pilot lines shall be connected to vertical main gas supply lines or to the side or top of horizontal lines ahead of all controls, except gas-pressure regulators, and shall be susceptible to independent control.

32.5 Means shall be provided to prevent incorrect assembly or reversible mounting of any pilot in relation to the burner being served.

32.6 Pilot burners and burner tips shall be so constructed and made of such material that they will not crack, craze, corrode, or carbonize to such an extent as to interfere with proper functioning of the pilot.

32.7 All pilots shall have a fixed orifice or other means for limiting the flow of gas to the pilot, independent of the shutoff valve. The maximum rate obtainable by such means shall not exceed 3,000 Btu per pilot per hour at normal test pressures for all test gases.

33 Automatic Pilot Devices

33.1 Automatic pilot shall comply with the requirements for the product.

33.2 Every incinerator furnished with means for automatic ignition of the gas at the main burner shall be equipped with a device which will automatically shut off the main gas supply in the event the means of ignition becomes inoperative, or the means for keeping the valve of the device open becomes inoperative, or both.

33.3 All incinerators for use with gases having a specific gravity greater than 1.0 shall be equipped with an automatic pilot which will shut off the gas supply to all main burners and pilot burners in case the means of ignition becomes ineffective. Main burners of the normally constant-operating type, which embody no

separate pilot, shall be construed as complying with this requirement if the main burner incorporates a complete automatic shutoff device.

33.4 Incinerators equipped with timing devices to automatically control the turning on or turning off of gas to the main burner(s) shall be equipped with a device which will prevent the escape of unburned gas from such burners under any conditions of operations.

34 Pilot Filters

34.1 Pilot filters shall be provided for all constant-burning gas pilots and main burners having a rating not in excess of 3,000 Btu per hour.

34.2 Manufacturer's specified capacities of pilot filters shall be not less than the rated capacities of the burners with which they are used.

34.3 Pilot filters shall be installed on the upstream side of and as close to the accessory or accessories which they are designed to protect as is practical.

35 Gas Valves

35.1 A separate valve shall be supplied to control the gas to each separate main burner and pilot.

35.2 Where the valve is exposed to view, lever or tee handles shall be at right angles to the line of flow when in the OFF position, and parallel when in the ON position. Where this cannot be done or where confusion is likely to occur, the ON and OFF positions shall be clearly indicated.

35.3 Pilot valves shall be easily distinguished from other valves.

35.4 Adjustment screws for regulating the gas admitted to the burners or to a pilot shall be concealed, protected, or enclosed.

35.5 Burner and pilot valves shall be readily accessible for lubrication, inspection, or test.

35.6 All valves controlling the gas to a main burner shall rotate in a clockwise direction to close.

35.7 Lubricants used on all valves shall be resistant to the action of liquefied petroleum gases.

36 Gas Supply Lines

36.1 Gas supply lines shall be of iron or steel pipe or of steel, aluminum, or copper tubing of suitable wall thickness.

36.2 Piping tapped for gas valves, pilots, or other branch supply lines shall be of such wall thickness as to provide a continuous run of not less than 3-1/2 American Standard tapered pipe threads and shall be supported to prevent turning or displacement in the normal handling of the appliance.

36.3 Ends of piping and tubing shall be carefully cleaned and reamed to remove obstructions and burrs. Bent supply piping shall have the bends smoothly made and shall reveal no imperfections occasioned by the bending process.

36.4 Compounds used on threaded joints of gas piping on incinerators shall be resistant to the action of liquefied petroleum gases.

36.5 Threaded unions used in gas lines shall be of the metal-to-metal seat type.

36.6 Aluminum tubing shall not be acceptable for use where the tubing passes through ashes or through insulating material of other than neutral reaction unless the tubing is adequately protected.

36.7 Aluminum tubing shall not be exposed to drip, condensate, or to temperatures in excess of 700°F (371°C).

36.8 Copper tubing shall be internally tinned or equivalently treated when used on incinerators designed for use with manufactured gas.

36.9 Steel tubing shall be protected from corrosion.

37 Gas-Pressure Regulators

37.1 Gas-pressure regulators, if provided, shall comply with the requirements for the product.

37.2 If a gas-pressure regulator is supplied, a 1/8 inch iron pipe size pressure tapping shall be provided downstream from the appliance regulator.

37.3 The pressure regulator, if provided, shall be installed in such a location that it will not be exposed to temperatures above 150°F (66°C) or to temperatures in excess of those specified by the manufacturer when tested in accordance with these requirements, and in such a manner that pressure adjustment may be made from the front or top of the incinerator.

PERFORMANCE

38 General

38.1 An incinerator shall meet the applicable requirements when tested as described herein. A type not described specifically herein shall be tested in accordance with the intent of these requirements. If any indications are observed during the tests prescribed that an incinerator will not continue to meet the requirements in normal usage so as to assure continued safe performance, such supplementary tests shall be conducted as deemed necessary to assure safe service.

38.2 An incinerator is tested normally as suitable for installation on combustible floors and with clearances to combustible walls and ceilings as indicated in Figure 38.1 and Figure 38.2. At the option of the manufacturer, an incinerator may be tested as suitable for installation on noncombustible floors only.

Figure 38.1

Test enclosure for temperature test

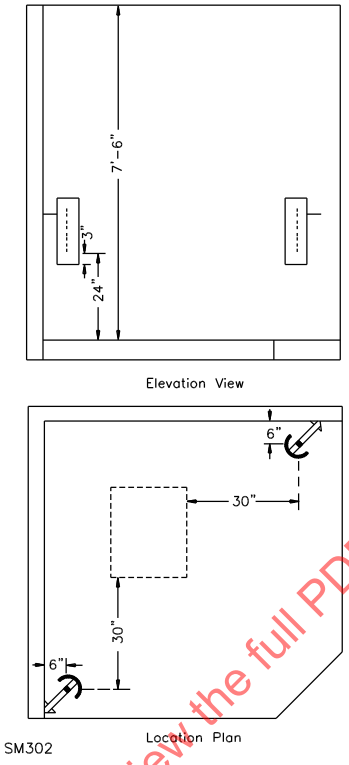
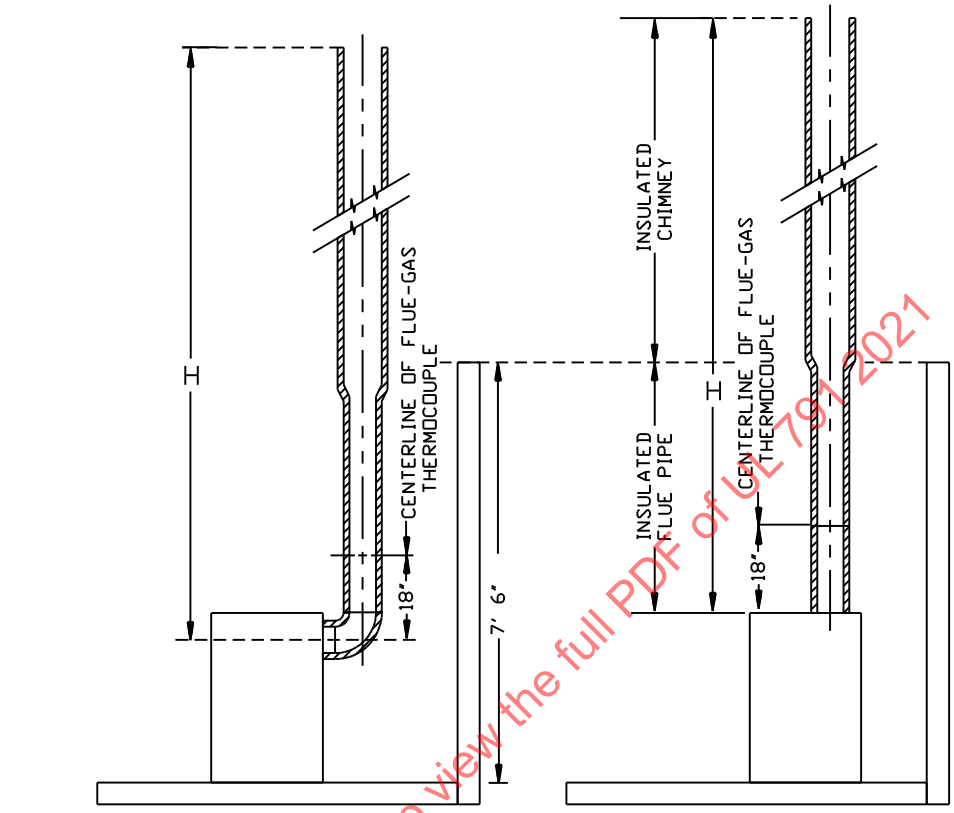


Figure 38.2

Flue pipe and chimney for incinerator tests



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Test of incinerator with horizontal flue collar

Test of incinerator with vertical flue collar

38.3 When an incinerator is tested in accordance with these requirements, no part shall attain a temperature sufficient to damage required corrosion protection, to adversely affect operation of safety controls, to impair the value of the required thermal or electrical insulation, nor to cause creeping, distortion, sagging, or similar damage when such damage to the material or part may cause the incinerator to become unsafe for use. The temperature rises at specific points shall be not greater than those specified in Table 9.1 unless otherwise indicated.

39 Test Installation Enclosure, Flue Pipe, and Chimney

39.1 An incinerator is to be placed in a partial enclosure, as illustrated by Figure 38.1 and Figure 38.2, so that the distance from one side of the incinerator to the wall and from the back of the incinerator to the wall opposite the rear of the incinerator is to be as specified by the manufacturer but not more than 12 inches (305 mm) or less than 3 inches (76.2 mm). When one side of an incinerator may create higher wall temperatures than the other, the hotter side of the incinerator is to be located directly opposite the one wall. Any adjustable damper included in the assembly of the incinerator is to be placed in the position allowing maximum temperature conditions.

39.2 The walls of the test enclosure are to be made of 1 inch (25.4 mm), (nominal thickness), tongue-and-groove boards or 3/4 inch (19.1 mm) thick plywood. Surfaces of the walls are to be painted a flat black. The floor is to be made of 1 inch (25.4 mm) soft-wood flooring covered with one thickness of building paper over which is then laid 1 inch (25.4 mm) tongue-and-grove oak flooring finished with clear varnish. All joints in the walls and floors are to be sufficiently tight or sealed to prevent air passage through them.

39.3 The incinerator is to be leveled. Any detachable leveling means are to be removed. Any nondetachable leveling means are to be adjusted to place the base of the incinerator the minimum distance obtainable above the floor.

39.4 Unless a clear space, as described in 6.10, is provided, the bottom of an incinerator above a combustible floor is to be considered as having zero clearance to the floor or to combustibles accumulating beneath the incinerator.

39.5 The incinerator is to be connected to an insulated pipe chimney as illustrated in Figure 38.2. The diameter of the flue pipe connection between the incinerator and the base of the chimney is to be the same as provided for by the flue collar. The chimney is to have an internal diameter of 8 inches (203 mm). The flue pipe and chimney are to be encased in a high-temperature insulating material at least 1 inch (25 mm) thick. The height of the chimney, item H, Figure 38.2 is to be as indicated in Table 39.1.

Table 39.1
Height of test chimney

Outdoor temperature		
Degree F	**Degree C**	**Chimney height (H)**
Below 26	-3.3	25 feet (7.62 m)
26 to 51	-3.3 – 10 C	27 feet 9 inches (8.46 m)
51 to 76	10 – 24.4 C	30 feet 6 inches (9.29 m)
76 and over	24.4 C and over	33 feet 3 inches (10.14 m)

40 Instrumentation

40.1 Draft measurement

40.1.1 Draft is to be measured by a draft gauge which may be read directly to 0.005 inch (0.13 mm) water column and which has an accuracy of ±0.0025 inch (0.064 mm). A gauge is to be checked for zero reading at the beginning and the end of each test.

40.2 Power measurement

40.2.1 The total electrical input to an incinerator is to be measured in amperes or watts.

40.2.2 An ammeter, wattmeter, or voltmeter is to have a maximum scale range of not more than 1-1/2 times the value to be measured. The smallest scale division is to be not more than 1/50 of the maximum scale range.

40.3 Temperature measurement

40.3.1 Temperatures are to be determined by means of a potentiometer and bead-type thermocouples.

40.3.2 Thermocouples are to be placed on surfaces of the test enclosure at various locations as may be required to observe maximum temperatures during tests.

40.3.3 Thermocouples are to be attached to other pertinent materials and parts, such as those mentioned in Table 8.1. Where electrical conductors are involved, temperatures are to be measured on surfaces of the conductor insulation and also on their enclosure surfaces which the conductors are likely to touch

40.3.4 Thermocouples are to be secured to wood surfaces by staples over an insulated portion of the wire and with the tip held in thermal contact with the surface by pressure-sensitive tape; except that for zero clearance, the thermocouples are to be applied to surfaces of the assembly at points of zero clearance.

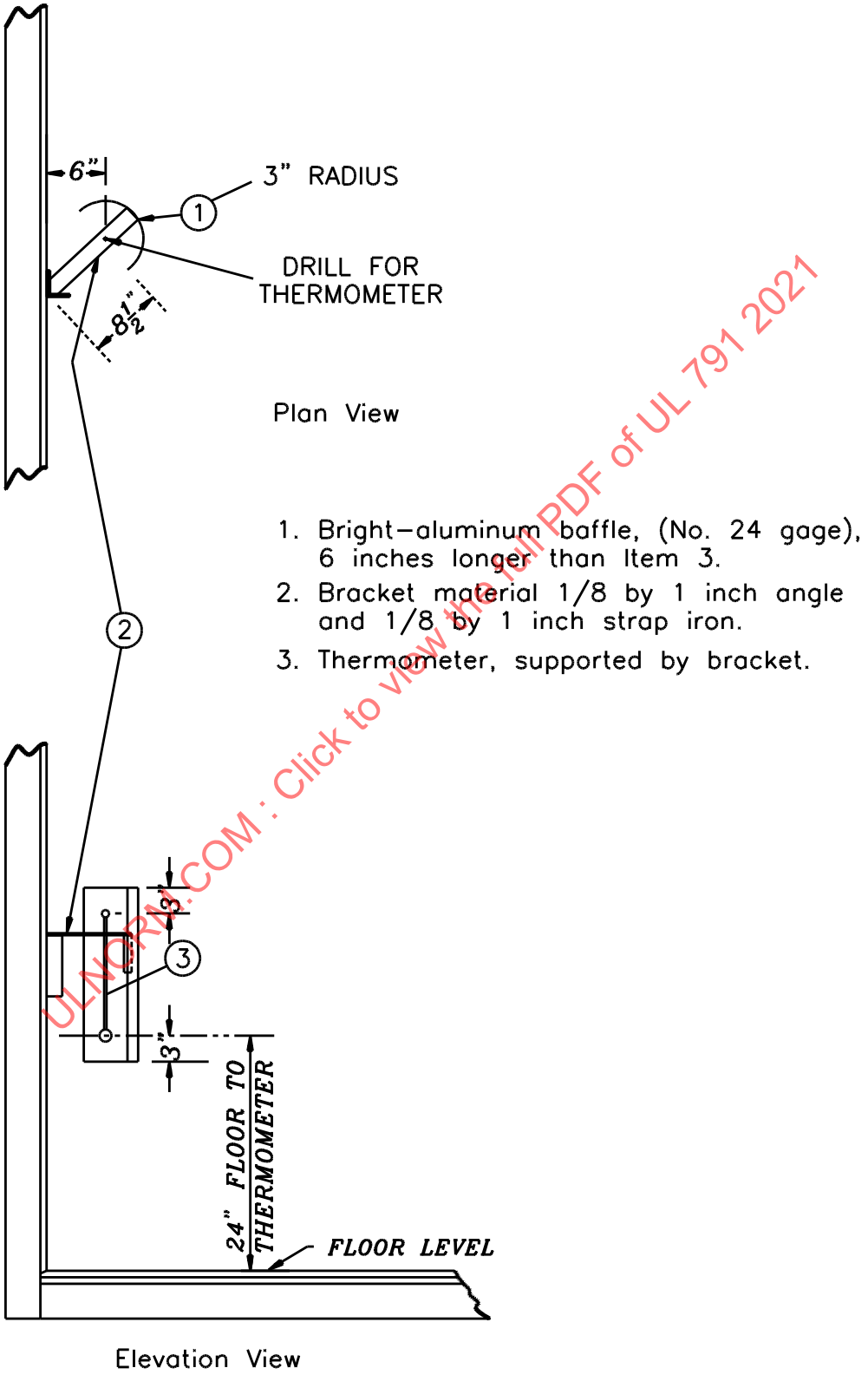
40.3.5 Thermocouples are to be attached to metal surfaces by soldering or brazing, or may secured under a screw head.

40.3.6 Thermocouples are to be attached to surfaces other than as described in 40.3.3 – 40.3.5 by being cemented or taped to the surface in a manner to secure thermal contact with the surface.

40.3.7 Room temperature is to be taken as the average of two shielded thermometers, see Figure 40.1, located as indicated by Figure 38.1.

Figure 40.1

Thermometer shield



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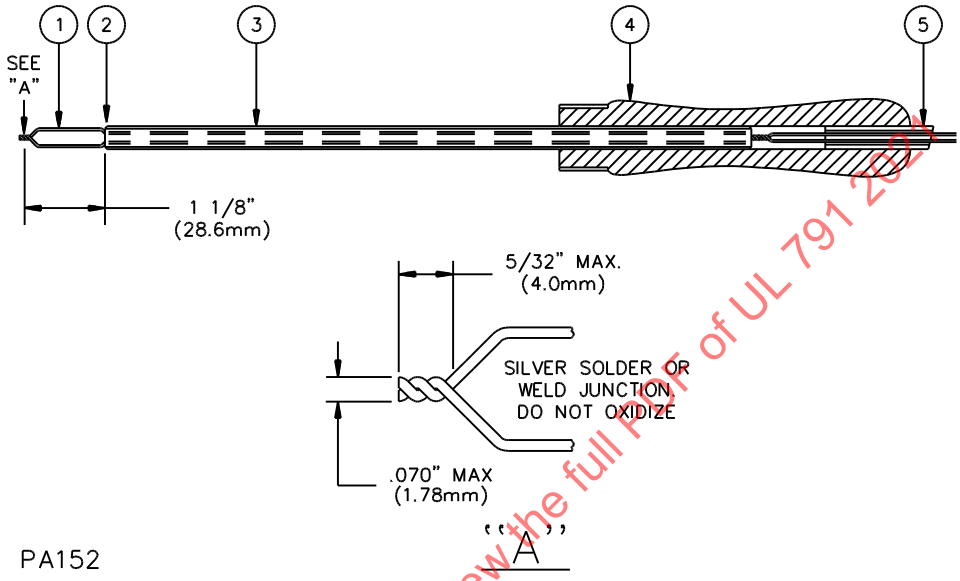
40.3.8 The flue-gas temperature is to be measured by a thermocouple such as illustrated by Figure 40.2, inserted into the flue pipe as shown by Figure 40.3, and located as shown by Figure 38.2. Flue-gas temperatures in the range exceeding 1000°F (538°C) are to be recorded at intervals of approximately 5 seconds or less. See Sections 43 – 44 and note h of Table 9.1.

Figure 40.2

Standard thermocouple for flue-gas temperature



1. 20 AWG (0.51 mm^2) iron-constantan, asbestos, or woven-glass-covered thermocouple wires extending from hot junction to potentiometer or reference junction.

2. 1 – Leeds & Northrup Standard 714B, or equal, 1/4 inch (6.4 mm) outside diameter of two-hole porcelain insulator cut to length and ends beveled on two sides.

3. 1 – 5/16 inch (7.9 mm) outside diameter by 0.032 inch (0.81 mm) wall tubing. Ream if necessary, to fit over insulator; then crimp ends over beveled ends of insulator.

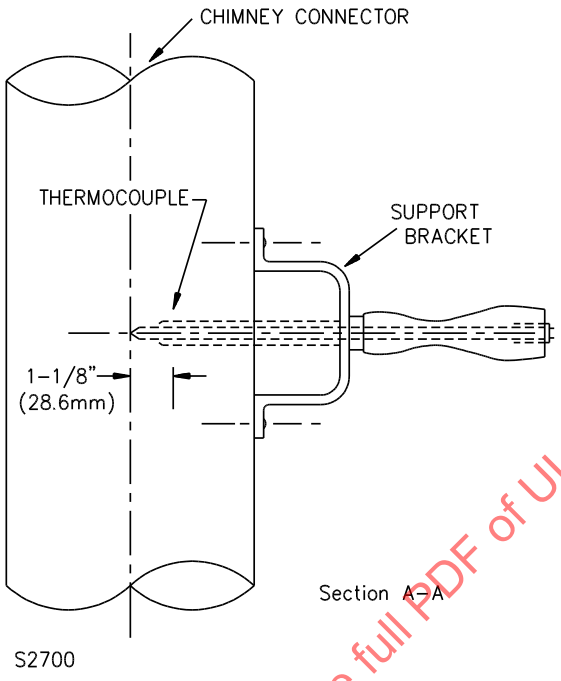
4. 1 – Small wooden handle.

5. 1 – Piece of rubber tubing, approximately 5/16 by 3/32 by 2 inches long (7.9 by 2.4 by 50.8 mm long).

6. In lieu of individual components described in Items 1, 2 and 3 above, any combination of preassembled parts of tubing, insulators and thermocouples may be used.

Figure 40.3

Flue-gas thermocouple and support bracket



1 – Thermocouple, 2 – Support bracket.

41 Initial Test Conditions

41.1 The incinerator is to be connected to a chimney of a height consistent with outdoor temperature at the time the test is conducted. See Table 39.1.

41.2 The gas rate to a gas burner, if included in the assembly of the incinerator, is to be adjusted at test pressure (see 48.1) to within ±5 percent of the manufacturer's Btu input rating. All burners are to be fired during the temperature tests.

41.3 An electric element, if the incinerator is so equipped, is to be energized at rated voltage during the temperature tests.

41.4 The incinerator is to be otherwise readied for the Capacity Charge – Maximum Air Supply Test, Section 42; the Capacity Charge – Normal Air Supply Test, Section 43; and the Continuous Charge Test, Section 44; which are to be conducted in that order.

42 Capacity Charge – Maximum Air Supply Test

42.1 The ash pan is to be removed from the incinerator. Nonself-closing ash compartment doors or closures are to be opened.

42.2 A single charge representing the capacity of the incinerator is to be introduced into the combustion chamber. The charge is to consist of pine blocks, corrugated paperboard, and shredded newspaper as a mixture, with the quantities proportioned on the basis of per bushel of incinerator capacity as shown in Table 42.1.

Table 42.1
Capacity charge mixture

Quantity, pounds (kg)	Material
3 (1.4)	3/4 by 1-3/4 by 4 inch (19.1 by 44.5 by 102 mm) pine blocks
3 (1.4)	3/4 by 1-3/4 by 8 inch (19.1 by 44.5 by 203 mm) pine blocks
1/3 (0.15)	Sections corrugated paperboard
1 (0.45)	Shredded newspaper

42.3 The charge is to be ignited, allowed to burn out completely, and the incinerator allowed to cool to room temperature.

42.4 After being tested in accordance with the requirements of 41.1 – 42.3, an incinerator shall be capable of intended operation.

42.5 The kind of results indicating conformance with 42.4 include the following:

a) No part of the incinerator has become damaged or permanently distorted to an extent that it, or the incinerator, will not continue to function as intended.

b) The effectiveness of any required protective coating or finish on metal parts has not been impaired.

c) A ceramic material does not show evidence of cracking, disintegration, nor spalling to an extent that impairs the serviceability of a part or an assembly.

d) Cracks are not observable in porcelain enamel used as a required protective coating when the surface is examined under a microscope of 60 magnification.

e) The reflectivity of a surface has not been impaired when the reflectivity of such surface is utilized to reduce risk of fire.

f) Burning or scaling of metal parts is not evident by visual observation. Loosening of mill scale from hot-rolled steel parts is not considered scaling within these requirements.

g) The effectiveness of insulating material has not been reduced to the degree that could cause risk of fire and electric shock.

43 Capacity Charge – Normal Air Supply Test

43.1 The ash pan is to be placed within the incinerator in its intended position. Ash-compartment doors or closures, whether self-closing or not, are to be closed.

43.2 A single charge as described in 42.2 and Table 42.1 is to be introduced into the combustion chamber.

43.3 The charge is to be ignited, and temperatures are to be observed and recorded until equilibrium or receding temperatures are attained.

43.4 The maximum temperature rise on walls opposite the incinerator casing and on the floor under and within 3 feet (0.9 m) of an incinerator that is to be acceptable for installation on combustible floors, in flue gases, and on incinerator parts shall not exceed the values indicated for such items by Table 9.1 when the incinerator is tested as outlined in 41.1 – 41.3, 43.1 – 43.3, and in 44.1.

43.5 The limitations on the rise in flue-gas temperature are intended as an indirect determination of and limitation on the surface temperatures of combustible walls adjacent to the vent pipe or flue connectors.

44 Continuous Charge Test

44.1 A charge of shredded newspaper proportioned on the basis of 1 pound per bushel (0.45 kg per 0.035 m^3) of rated incinerator capacity is to be introduced into the incineration chamber at 8-minute intervals. Each charge is to be separated to occupy the approximate volume specified before being introduced into the chamber. Temperatures are to be recorded at the start of the seventh successive charge, and intermittent loading is to continue until equilibrium or receding temperatures are recorded, but at least eleven charges are to be consumed during the test.

44.2 The maximum temperature rises shall be in accordance with the requirements of 43.4.

45 Power Input Test

45.1 The power input to an incinerator shall be not more than 110 percent of its marked rating when connected to a supply circuit having a potential as indicated below:

Voltage rating of incinerator	Test voltage
110 –120	115
220 – 240	230

46 Dielectric Withstand Test

46.1 An incinerator shall be capable of withstanding without breakdown, for a period of 1 minute, the application of a 60 hertz (Hz) potential as indicated in 46.2 between high-voltage parts and the enclosure and exposed grounded metal parts; and between parts of high- and low-voltage circuits and different high-voltage circuits with the incinerator at the operating temperatures developed during the Capacity Charge – Maximum Air Supply Test and the Continuous Charge Test. The test potential shall be 900 volts for an incinerator rated at 250 volts or less, and twice rated voltage plus 1000 volts for an incinerator at more than 250 volts.

46.2 The test is to be made by means of a suitable testing transformer, the output voltage of which can be regulated. The applied potential is to be increased gradually from zero until the required test value is reached, and is to be held at that value for 1 minute.

47 Insulation Resistance Test

47.1 An element employing insulating material which is liable to be affected adversely by moisture under the conditions of normal use shall have an insulation resistance of not less than 50,000 ohms after exposure for 24 hours to moist air having a relative humidity of 85 ±5 percent at a temperature of 32 ±2°C (89.6 ±3.6°F).

47.2 Insulation resistance is usually measured by means of a high-resistance voltmeter using a 250 volt, direct-current circuit.

48 Gas Burner Test

48.1 For test purposes, the gas input to all burners is to be that specified by the manufacturer. Normal gas pressure is considered to be 6.0 inches water column for LP-Gas-air mixtures and for manufactured

gas, 7.0 inches for natural gas, and 11.0 inches for LP-Gas. Primary air adjustments are to be made at normal gas pressure, and no change in the adjustment is to be made for tests at other pressures.

48.2 Unless otherwise stated, each test to determine conformance with the following is to consist of a series of three tests. For LP-Gas-air mixtures, manufactured and natural gas, one test is to be made at normal pressure, one at 0.5 normal pressure, and one at 1.5 normal pressure at the inlet to the appliance or, if supplied, at the inlet to the regulator. For LP-Gas, the three tests are to be made at pressures of 11, 8, and 13 inches water column, respectively, at the inlet to the appliance, or at the outlet of a pressure regulator if provided.

48.3 When ignition is made in a normal manner, flames shall not flash outside the combustion space.

48.4 A pilot flame shall effect immediate ignition of the gas at the main burner and if a safety control is provided, even when the gas supply to the pilot is reduced to a point where the flame is just sufficient to actuate or energize the safety control.

48.5 A pilot flame shall not become extinguished when the gas to the main burner is turned on or off in a normal manner either manually or by automatic controls supplied as part of the incinerator, nor from the effects of drafts created during tests in accordance with these requirements.

48.6 A bunsen type pilot shall ignite gas at the main burner when the flame is burning at the orifice.

48.7 A pilot flame shall not flash back upon immediate ignition, nor upon 2 to 20 seconds delayed ignition.

48.8 A pilot or main burner flame shall not deposit carbon when the burner is fired for 1 hour at a test pressure of 1.5 normal or during any of the other tests prescribed in these requirements.

48.9 A main burner flame shall not flash back upon immediate ignition, 2 to 5 seconds delayed ignition, nor when the gas valve is adjusted to deliver one-fifth the normal input.

48.10 A main burner shall ignite completely and without delay, and flames shall freely ignite gas at an adjacent burner, at 0.5 normal test pressure.

48.11 A main burner shall not produce a back pressure in the mixer, causing leakage of gas through the air inlet, when consuming gas at normal pressure nor at a pressure only high enough to support combustion at the ports.

48.12 A safety control shall allow gas to be admitted to the main burner in not more than three minutes after the pilot is lighted.

48.13 A safety control shall cause the gas to be shut off in not more than 2 minutes when the pilot and main burner flames are extinguished after being fired at normal pressure for at least 30 minutes.

48.14 A hot-wire ignition system shall ignite the pilot immediately upon admission of pilot gas with a voltage equivalent to at least 85 percent of rated voltage for alternating current systems, or 80 percent of rated voltage for direct current systems, impressed on the primary circuit of the ignition system. When the voltage on the primary circuit is decreased to not less than 70 percent of rated voltage, unsafe performance shall not be obtained. Such systems shall function reliably with a voltage equivalent to 100 percent of rated voltage impressed on the primary of the ignition system.