*Exception No. 2: Compliance with 28.4 is not required for a pilot or indicator light that is wired across the power supply circuit to indicate that the heater is still connected even though the switching device is off.*

28.5 With respect to 28.4, 28.6, and 28.15, for a 120-volt rated cord-connected heater having a two-prong unpolarized attachment plug, both sides of the supply circuit are to be considered as being ungrounded.

28.6 A switching device as described in 28.4, including one that does not have a marked on or off position, shall comply with the requirement in 28.4 unless;

a) There is no uninsulated live part exposed to unintentional contact when the switching device is open, or

b) The fact that such part is live is definitely apparent, such as a visibly-glowing open coil heating element.

28.7 With respect to 28.3 and 28.4, a removable knob, button, or pointer on a switching device that includes an indicated off position shall be keyed to its operating shaft so that it can be installed only in the intended position and it shall be secured in accordance with 28.8.

28.8 A removable knob, button, or pointer mentioned in 28.7 that is attached to its operating shaft by friction and not additionally secured by mechanical means, such as a set screw, shall not separate from the intended position on its operating shaft by application of a force of 3 pounds (13.34 N) applied for 1 minute as a straight pull in line with the shaft.

28.9 A switch or other means of control intended to provide for the use of a limited number of elements at one time shall be so located or of such a type that the user cannot readily change the connections to provide for the use of more elements than intended.

28.10 A switch that controls a medium-base lampholder or other than a pilot or indicating light shall be rated for use with tungsten-filament lamps.

28.11 A cord-connected heater shall be provided with means other than the cord and plug arrangement to manually interrupt all heating elements. This means may be either a manual on-off switch or included as an off position on a temperature regulating control or an operation selector switch. The switch or control used shall comply with 28.1 – 28.10. If included as an off position on a temperature regulating control or on an operation selector switch, the construction shall also comply with 28.12. See also 13.6.1.

28.12 With respect to 28.11, if the off position is included as part of a temperature operating control or an operation selector switch, the off position shall be mechanically defined, such as by a detent feature or as an extreme position against a mechanical stop.

28.13 A manually operable motor-control switch shall be provided in a heater intended for connection to the power-supply circuit by flexible cord and an attachment plug and employing a motor rated at more than 1/3 horsepower (249 W output).

28.14 A manually operable switch on a heater intended for permanent connection to the power supply shall be of such type or shall be so located or guarded that unintentional operation is unlikely, unless the heater is so controlled thermostatically that it will not involve a risk of fire under any operating condition.

28.15 A switch on a cord-connected heater that controls an open (uncovered) heating element or an isolated metal-clad element is a grounded heater shall be such that, in the off position, it will disconnect the element from all conductors of the supply circuit, unless the guard is such that it complies with one of the following:

a) No opening in the guard will permit passage of a rod having a diameter of 3/8 inch (9.5 mm).

b) No opening in the guard will permit passage of a rod having a diameter of 3/4 inch (19.1 mm) and no uninsulated live part or isolated metal-clad element is less than 4 inches (102 mm) from the nearest point on the guard at any opening which will permit the entrance of a rod having a diameter of 3/8 inch (9.5 mm).

28.16 The requirement in 28.15 applies to a through-cord switch and to a plug with switch comprising a part of a cord set provided with the heater or of a power-supply cord.

28.17 A through-cord switch used on the power supply cord of a cord-connected floor-supported heater shall not be located where there is a likelihood of the switch resting upon the floor and being stepped on.

28.18 A through-cord switch used on a cord-connected heater intended for wall- or ceiling-mounting shall be located on the power-supply cord so that it does not contact the floor when the heater is installed as intended.

28.19 A switch employed in a heater to de-energize the heating elements in the event the heater is tipped over shall function before the heater has tipped in any direction beyond the angle of critical balance if compliance with the requirements in 41.5.1 – 41.5.3 is dependent on operation of the switch. The angle of critical balance is the minimum angle through which a heater must be tipped to cause it to tip over due solely to the force of gravity.

28.20 The disconnecting means of a fixed electric room heater shall have an ampere rating not less than 125 percent of the total load of the motors and the heaters and shall simultaneously disconnect the heater, motor controller(s), and supplementary overcurrent protective devices from all ungrounded conductors.

## 29 Automatic Controls and Control Circuits

### 29.1 General

29.1.1 A control circuit shall comply with the requirements for separation of circuits, 15.4.1 – 15.5.2.

29.1.2 If an auxiliary control device (thermostat or combination thermostat and control switch) in a fixed heater has a marked off position, it shall disconnect the element or elements it controls from all ungrounded conductors of the power-supply circuit when placed in that position (that is, when not cycling). See 29.1.3 and 29.1.4.

29.1.3 An auxiliary control device as described in 29.1.2, except that it does not have a marked off position, shall comply with the requirement in 29.1.2 unless:

a) There is no uninsulated live part exposed to unintentional contact when the control device has opened the circuit, or

b) The fact that such part is live is definitely apparent, such as a visibly-glowing open coil heating element if the heating element meets the criteria of Exception No. 1 to 13.6.1.

29.1.4 An auxiliary control device (thermostat or combination thermostat and control switch) in a cord-connected heater that controls an open (uncovered) heating element or an isolated metal-clad element in a grounded heater shall be such that, in the off position, it will disconnect the element from all conductors of the supply circuit, unless the guard is such that it complies with one of the following:

a) No opening in the guard will permit passage of a rod having a diameter of 3/8 inch (9.5 mm).

b) No opening in the guard will permit passage of a rod having a diameter of 3/4 inch (19.1 mm) and no uninsulated live part or isolated metal-clad element is less than 4 inches (102 mm) from the nearest point on the guard at any opening that will permit the entrance of a rod having a diameter of 3/8 inch (9.5 mm).

29.1.5 An auxiliary control is considered to be one that is intended primarily for time, temperature, pressure regulation, and the like under conditions of intended operation, and not for protection against overload or excess temperature conditions resulting from abnormal operation.

29.1.6 A safety control or a temperature-limiting control – one designed to prevent unintended operation of a heater – shall be operative whenever the heater is connected to its power supply and shall interrupt power to all heating elements. See 29.1.7. If there are any exposed live parts in a permanently connected heater, the operation of such a control shall disconnect the element or elements that it controls from all ungrounded conductors of the supply circuit. In a cord-connected heater, the operation of such a control shall comply with the requirement in 29.1.2. If the power to all elements is not interrupted, the power shall be interrupted to the number of the heating elements necessary so that the temperature rises specified in Table 36.1 are not exceeded during abnormal tests.

29.1.7 With respect to 29.1.6, for heaters employing open-type heating elements or series-connected sheathed heating elements, a temperature limiting control shall interrupt power to all ungrounded supply conductors if the thermal cutoff or the limiting control contacts in one side of the supply circuit could be rendered ineffective by faults such as shorting of the heating element or its connecting wire to metal parts that are or may become grounded. In determining the likelihood of occurrence of such a fault, conditions, such as sagging or breakage of an open-type heating element and breakage or loosening of the connection of a lead wire to a heating element, are to be considered. For a 120-volt cord-connected heater with an unpolarized plug, both sides of the supply circuit are to be considered as being ungrounded. More than one temperature-limiting control or thermal cutoff or combinations thereof may be used to comply with this requirement.

29.1.8 A contactor actuated by a limit control shall comply with the requirement for a limit control if it is a part of the limit-control circuit.

29.1.9 If a thermostat (or combination thermostat and control switch) has a marked position as described in 29.1.10, it shall not function as a thermostat – that is, it shall not respond to temperature changes – while the actuating member is in that position.

29.1.10 The requirement in 29.1.9 applies to a thermostat (or combination thermostat and control switch) that is marked:

a) With an off position, or

b) With another wording (such as no heat, cold, or the like) that conveys the same meaning as the word off.

29.1.11 A thermostat that does not reclose (remains open) when cooled to a temperature of minus 35°C (minus 31°F) is acceptable with respect to the requirement in 29.1.9.

### 29.2 Terminals and actuating members of safety devices

29.2.1 The terminals of a safety device within the enclosure of a heater shall be so located or further enclosed that they will be protected against unintentional short-circuiting or damage.

29.2.2 The bulb, capillary tubing, or other sensing element of a thermostat or limit switch that is depended upon to prevent the risk of fire or electric shock during operation of the heater shall be so located or guarded as to be protected from physical damage during installation and use of the heater.

29.2.3 In connection with the requirement in 29.2.2, particular attention is to be paid to a heater that, when being installed, requires partial disassembly or permits rearrangement of internal parts.

## 30 Spacings

30.1 Except as noted in 30.2 and 30.3, the spacings in a heater shall be in accordance with Table 30.1 and Table 30.2.

30.2 The spacings specified in Table 30.1 and Table 30.2 do not apply to the inherent spacings of a component part such as a snap switch or motor, of a heater. Such spacings are judged under the requirements for the component in question.

**Table 30.1**
**Minimum acceptable spacings at field-wiring terminals [a,b]**

| Parts involved | Potential involved | Through air | | Over the surface | |
|---|---|---|---|---|---|
| | | Inch | (mm) | Inch | (mm) |
| Between live parts of opposite polarity; and between a live part and a noncurrent carrying metal part, other than the enclosure, which may be grounded | 0 – 250 volts | 1/4 | (6/4) | 3/8 | (9.5) |
| | 251 – 600 | 3/8 | (9.5) | 1/2[c] | (12.7[c]) |
| Between a live part and the enclosure | 0 – 600 | 1/2 | (12.7) | 1/2 | (12.7) |

[a] The spacings do not apply to connecting straps or busses extending away from wiring terminals. Such spacings are to be judged under Table 30.2.

[b] Applies to the sum of the spacings involved where an isolated noncurrent carrying part is interposed.

[c] A spacing of not less than 3/8 inch (9.5 mm), through air and over the surface, is acceptable at wiring terminals in a wring compartment or terminal box if the compartment or box is integral with a motor.

**Table 30.2**
**Minimum acceptable spacings through air or over the surface at points other than field-wiring terminals or inside motors[a]**

| Parts involved | Potential involved, Volts | Inch | Millimeters |
|---|---|---|---|
| A. Between uninsulated live parts of opposite polarity; and between a rigidly mounted uninsulated live part other than an open-type heating element (see below) and a noncurrent-carrying metal part that either is exposed for persons to contact or may be grounded. | 0 – 250 | 1/16 | (1.6) |
| | 251 – 600 | 1/4[b,c] | (6.4[b,c]) |
| B. Between an open-type heating element and a noncurrent-carrying metal part that either is exposed for persons to contact or may be grounded, except for a limit control sensing element and its supports located above the heating elements[d,e,f] | 0 – 600 | 1/2 | (12.7) |

[a] If an uninsulated live part is not rigidly supported, or if a movable noncurrent-carrying metal part is in proximity to an uninsulated live part, the construction shall be such that at least the minimum acceptable spacing of 1/16 inch (1.6 mm) is maintained under all

**Table 30.2 Continued on Next Page**

**Table 30.2 Continued**

| Parts involved | Potential involved, Volts | Inch | Millimeters |
|---|---|---|---|
| operating conditions and under all normal conditions of handling. In applying this table, a sheath of an isolated metal-clad element in a heater with provisions for grounding is considered to be an uninsulated live part.<br>[b] Film-coated insulated wire is considered to be an uninsulated live part. However, a spacing of not less than 3/32 inch (2.4 mm) over the surface and through air is acceptable between a noncurrent-carrying metal part and film-coated insulated wire rigidly supported and held in place on a motor coil.<br>[c] A spacing of 1/16 inch (1.6 mm) is permissible at the heating element support and terminals only (see note d) in a heater rated for 300 volts or less.<br>[d] These spacing requirements apply to an open-type heating element such as a ribbon type or a coiled type at locations other than the element supports and its terminal connections. At each element support and within 1/2 inch (12.7 mm) of the support, measured from the outer edge of the support point along the heater element, and at the terminal connections, the spacings specified in item A apply provided the element supports are constructed such that sagging of the heating element due to loss of its tension will not result in reduction of the minimum spacings as specified in item A.<br>[e] For the limit control sensing element and its supports located above the heating element, the spacing requirements in item A apply. A limit control sensing element and its supports are considered to be above the heating element if any sag in the heating element due to gravity would result in an increased spacing between the heating element and the limit control sensing element or its supports.<br>[f] Less than a 1/2-inch spacing between the open-type heating element and a noncurrent carrying metal part, but not less than the spacing specified in item A, is acceptable if the design of the heating element and its supports is such that sagging or movement of the heating element, to reduce the spacing to less than specified in item A, is not likely to occur. | | | |

30.3 At closed-in points only, such as the screw-and-washer construction of an insulated terminal mounted in metal, a spacing of 3/64 inch (1.2 mm) is acceptable in a heater rated at 250 volts or less. Within a thermostat, except at contacts, the spacing between uninsulated live parts on opposite sides of the contacts is not to be less than 1/32 inch (0.8 mm) through air and 3/64 inch (1.2 mm) over the surface of insulating material, and the construction is to be such that the spacings will be maintained permanently.

30.4 The spacings within a motor connected across a portion of a resistance element or in series with a reactor or an autotransformer shall be acceptable for the full rated voltage of the heater.

30.5 Except as indicated in 30.6, an insulating lining or barrier of fiber or similar material employed where spacings would otherwise be less than the required values shall not be less than 1/32 inch (0.8 mm) thick and shall be so located or of such material that it will not be affected adversely by arcing; except that fiber not less than 1/64 inch (0.4 mm) thick may be used in conjunction with an air spacing of not less than 50 percent of the spacing required for air alone.

30.6 Insulating material having a thickness less than that specified in 30.5 may be used if, upon investigation, it is found to be acceptable for the application.

30.7 Unless protected from physical abuse during assembly and operation of the heater, a barrier of mica shall be at least 0.01 inch (0.25 mm) thick.

## 31 Grounding

31.1 In a heater intended for permanent connection to the power-supply circuit, all exposed dead metal parts and all dead metal parts inside the enclosure that are exposed to contact during any servicing operation (including maintenance and repair) and that are likely to become energized shall be electrically connected to the equipment-grounding terminal or lead and be conductively connected to the point of attachment of the wiring system.

31.2 In a heater intended for permanent connection to the power supply by means other than a metal-enclosed wiring system (such as nonmetallic-sheathed cable):

a) An equipment-grounding terminal or lead shall be provided (see 13.1.25 and 13.1.28), and

b) All exposed noncurrent-carrying metal parts and all noncurrent-carrying metal parts inside the enclosure that are exposed to contact during any servicing operation (including maintenance and repair) and that are likely to become energized shall be conductively connected to such terminal or lead.

31.3 The resistance of the grounding path between a dead metal part and the equipment-grounding terminal and point of attachment of the wiring system shall not be more than 0.1 ohm.

31.4 With reference to 31.3, the resistance may be determined by any convenient method except that when referee measurements are necessary, either a direct or alternating current at a potential of not more than 12 volts, and equal to the current rating of the maximum-current-rated branch-circuit overcurrent-protective device that may be employed with the heater is to be passed from the equipment grounding terminal or the point of attachment of the wiring system or the grounded blade of the attachment plug to the dead metal part, and the resulting drop in potential in volts divided by the current in amperes passing between the two points is to be calculated to obtain the resistance.

31.5 A cord-connected heater intended for operation on a circuit involving a potential of more than 150 volts to ground shall have provision for grounding, in accordance with 31.6 (except as indicated in 31.9), of all exposed noncurrent-carrying parts, and all noncurrent-carrying metal parts exposed during any servicing operation (including maintenance and repair), that are likely to be energized.

31.6 On a cord-connected heater where grounding is required or provided, the power-supply cord or cord set shall include a grounding conductor which shall be:

a) Green, with or without one or more yellow stripes,

b) Connected to the grounding blade of an attachment plug of a grounding type, and

c) Connected to the enclosure of the appliance by means of a screw not likely to be removed during ordinary servicing, or by other equivalent means. Solder alone is not acceptable for making this connection. See 31.8.

31.7 If a cord-connected heater intended for operation on a circuit involving a potential of 150 volts or less to ground has provision (although not required) for grounding noncurrent-carrying metal parts by means of a conductor of the cord, a directly attached flexible cord or a cord set provided with the heater shall comply with the requirement in 31.6.

31.8 With reference to 31.6 (c), a grounding connection that is mechanically crimped before being soldered is to be tested for acceptability as a connection without the solder in place.

31.9 With reference to the requirements in 31.1 and 31.2, the sheath of an isolated metal-clad element in a heater having provision for grounding is not considered to be a noncurrent-carrying metal part (see note a to Table 32.2) and, therefore, is not to be grounded.

31.10 A cord-connected, 2-wire heater, having a voltage rating within the range of 220 to 250 volts is considered as requiring provision for grounding in accordance with 31.5, unless the marked rating on the heater is 120/240 volts or unless the heater is otherwise marked to indicate that it is to be connected only to a 120/240-volt circuit with circuit with grounded neutral.

## 32 Guarding of Heating Elements

### 32.1 General

32.1.1 Except as noted in 28.15 and 32.1.2, the heating element and any part of the element assembly (such as an element support, sheath, and the like) shall be so guarded that flammable material as well as persons will be protected against contacting it.

32.1.2 The requirement in 32.1.1 does not apply to a heater intended for mounting in a location (in a ceiling, for example) such that there is no likelihood that furniture, draperies, and the like will contact it; the need for and the acceptability of the guard on such a heater is judged on the basis of the design and construction of the heater. See 59.23.

32.1.3 The acceptability of a guard is judged with respect to its general serviceability and with respect to the shape and size or both of the openings in it, in conjunction with the distance of the guard from the heating element and the other high-temperature parts mentioned in 32.1.1. Except as noted in 32.1.5, an opening in a guard is considered to be acceptable if, with the heater in any intended operating position, the following conditions are met:

a) The shape and size of an opening are such that a test gauge in the form of a right-circular cone having a base diameter of 2-3/4 inches (69.9 mm) and an altitude of 5-1/2 inches (139.7 mm) is prevented from touching the heating element and the other high-temperature parts mentioned in 32.1.1 when the gauge is inserted, apex first, in any manner. See 32.1.4.

b) The shape and size of an opening which permits the vertically downward entrance of a bar 1/2 inch wide (12.7 mm) and 1/16 inch thick (1.6 mm) are such that a test gauge 1/16 inch (1.6 mm) thick and in the form of an isosceles triangle having a base of 2-3/4 inches (69.9 mm) and an altitude of 5-1/2 inches (139.7 mm) is prevented from touching the heating element and the other high-temperature parts mentioned in 32.1.1 when the gauge is inserted, apex first, in any manner. The testing of an opening with the triangle gauge applies also where the vertically downward insertion of the bar is prevented by the construction of the guard, the use of an additional barrier, or both, unless the vertically applied bar tends to be deflected outward – that is, away from the guard.

c) The area of an opening in a substantially vertical face of a guard is not more than 3-1/4 square inches (2100 $mm^2$) if the size and/or shape of the opening permits the entrance from any horizontal direction of a vertical rod 1/16 inch (1.6 mm) in diameter and 2-3/4 inch (69.9 mm) long.

32.1.4 The fins of a metal-clad element are considered to be element-guarding members, and need not comply with the provisions in 32.1.3(a) if the temperature of the exposed edges (outer perimeter) of the fins is not more than 280°C (536°F).

32.1.5 Openings in the guard complying only with 32.1.3(a) are acceptable for the following:

a) Except for a panel-type heater (see 32.2.1), an air heater in which the temperature of the heating element is not higher than 280°C (536°F) under conditions of intended operation, or

b) A fan-type heater in which the fan is always in operation when the heating element is on (energized) and the air current prevents clothing and the like from entering the guard.

32.1.6 If a heater is required to have a guard, and if the guard is readily removable, the heater and the guard shall be contained in the same carton as shipped from the factory. See also 59.30.

32.1.7 A heater in which the heating element is designed for operation only in an air current shall be so wired or controlled that the element can be operated only when under the cooling effect of the air stream.

A heater in which the cooling effect of the motion of a part is necessary to prevent excessive temperatures shall be so wired or controlled that the element cannot be operated without such motion.

### 32.2 Panel-type heaters

32.2.1 Except as noted in 32.2.2, a panel-type heater shall be provided with a guard that will prevent a test surface, in the form of a 6-inch square (a square 152 mm on a side) parallel to the element panel, from being brought closer than 1/2 inch (12.7 mm) to the plane of the front of the heater, excluding the guard.

32.2.2 The requirement in 32.2.1 does not apply to:

a) A heater as described in 32.1.2.

b) A heater having an element panel operating at a temperature higher than 280°C (536°F) and required by 32.1.1 and 32.1.3 to have more effective guarding.

c) A heater that will not cause glowing or flaming of the cheesecloth or the felt when subjected to a blanketing test in which one or more 1-inch-thick (25 mm) felt pads, covered with cheesecloth, are rigidly supported on a wood surface in intimate contact, as far as possible, with all external heated surfaces while the heater is operated until ultimate results are observed.

### 32.3 Floor heaters

32.3.1 A floor-insert heater shall be so constructed as to facilitate cleaning and to minimize the possibility of the accumulation of combustible dirt and litter where it might become ignited.

32.3.2 A heater intended to be installed flush with or beneath a floor shall be provided with an automatic temperature control other than a thermal cutoff. The control shall comply with the requirements in 29.1.2 – 29.2.1, 42.1 and 42.2.

32.3.3 When a floor insert heater register that is nonmetallic or has a nonmetallic coating is judged for acceptability in accordance with 7.1, 49.1, and item 18 of Table 36.1, and thermal aging, the following factors are to be taken into consideration:

a) Resistance to wear.

b) Resistance to impact.

c) Moisture-absorptive properties.

d) Combustibility.

e) Resistance to corrosion.

f) Resistance to distortion at temperatures to which the register may be subjected under conditions of intended or abnormal use.

32.3.4 There shall be no openings in wiring compartments through which objects such as nails, pin, and the like may penetrate and contact uninsulated live parts.

## PERFORMANCE

### 33 General

33.1 If a heater is intended to be shipped with the legs or base detached, the tests are to be conducted with the legs or base in place, as well as detached.

*Exception No. 1: The requirement for tests with the legs or base detached is not applicable to a heater that will not stand upright without the base or legs installed and is obviously intended for operation in the upright position, or to a heater that cannot be operated with the legs or base detached.*

*Exception No. 2: The requirement for tests with the legs or base detached is not applicable to a heater that is marked in accordance with 59.37.*

### 34 Power Input Test

34.1 The power input to a heater shall not be more than 105 percent of its marked rating.

34.2 To determine if a heater complies with the requirement in 34.1, the power input is to be measured with the heater at the temperature developed under intended operating conditions and under full-load conditions and while connected to a supply circuit of rated voltage in accordance with 36.8. If a heater employs a nonmetallic element (such as carbon), the power input is to be determined when the element is new.

### 35 Leakage Current Test

35.1 The leakage current of a cord-connected heater rated for a nominal 120-, 208-, or 240-volt supply when tested in accordance with 35.3 – 35.6 shall not be more than:

a) 0.5 milliampere for a portable heater, and

b) 0.75 milliampere for other than a portable heater employing a standard attachment plug rated 20 amperes or less.

*Exception: For a heater having a metal sheathed heating element, during the period beginning 5 seconds after energization (closure of $S_1$), the leakage current may exceed the value specified in (a) or (b) for a period not exceeding 5 minutes, but shall not exceed 2.5 milliamperes. The 5 minute period is measured during the warm-up period and again during the cool-down period from the first excursion above the value of (a) or (b) until the value is less than and remains less than the value in (a) or (b).*

35.2 Leakage current refers to all currents, including capacitively coupled currents, which may be conveyed between exposed conductive surfaces of a heater and ground or other exposed conductive surfaces of a heater.

35.3 All exposed conductive surfaces are to be tested for leakage currents. The leakage currents from the surfaces are to be measured to the grounded supply conductor individually as well as collectively where simultaneously accessible and from one surface to another where simultaneously accessible. Parts are considered to be exposed surfaces unless guarded by an enclosure considered acceptable for protection against the risk of electric shock as defined in 7.1 – 7.26. Surfaces are considered to be simultaneously accessible where they can be contacted by one or both hands of a person at the same time. These measurements do not apply to terminals operating at voltages which are considered to be nonhazardous.

35.4 If a conductive surface other than metal is used for the enclosure or part of the enclosure, the leakage current is to be measured using a metal foil with an area of 10 by 20 centimeters in contact with the surface. Where the surface is less than 10 by 20 centimeters, the metal foil is to be the same size as the surface. The metal foil is not to remain in place long enough to effect the temperature of the heater.

35.5 The measurement circuit for leakage current is to be as shown in Figure 35.1. The measurement is defined in (a) – (d) below. The meter which is actually used for a measurement need only indicate the same numerical value for a particular measurement as would the defined instrument. The meter used need not have all the attributes of the defined instrument.

a) The meter is to have an input impedance of 1500 ohms resistive shunted by a capacitance of 0.15 microfarad.

b) The meter is to indicate 1.11 times the average of the full-wave rectified composite waveform of voltage across the resistor or current through the resistor.

c) Over a frequency range of 0 to 100 kilohertz the measurement circuitry is to have a frequency response (ratio of indicated to actual value of current) equal to the ratio of the impedance of a 1500 ohm resistor shunted by 0.15 microfarad capacitor to 1500 ohms. At an indication of 0.5 or 0.75 milliampere, the measurement is to have error of not more than 5 percent.

d) Unless the meter is being used to measure leakage from one part of a heater to another, the meter is to be connected between the accessible parts and the grounded supply conductor.

35.6 A sample of the heater is to be tested for leakage current starting with the as-received condition with all switches and thermostats closed, but with its grounding conductor, if any, opened at the attachment plug. The as-received condition is without prior energization, except as may occur as part of the production line testing. The supply voltage is to be 120, 208, or 240 volts, depending upon the voltage rating of the heater. The test sequence, with reference to the measuring circuit (Figure 35.1), is to be as follows:

a) With switch S1 opened, the heater is to be connected to the measuring circuit. Leakage current is to be measured using both positions of switch S2.

b) Switch S1 is then to be closed, energizing the heater, and within a period of 5 seconds, the leakage current is to be measured using both positions of switch S2 and with the heater operated at the maximum heat setting of controls.

c) Leakage current is to be monitored until thermal stabilization under the maximum heat condition. Both positions of switch S2 are to be used. The equivalent of thermal stabilization is considered to be obtained as in any normal temperature test. If any temperature regulating control does not cycle at the maximum heating setting, it is to be adjusted until it does cycle before the final measurements at thermal stabilization are taken. Measurements are to be made with the temperature-regulating control, if any, open and closed.

d) If the heater employs a single pole switch or a control thermostat for adjusting temperatures, monitoring of leakage current is to continue until the leakage current stabilizes or decreases after the heater is turned off.