

Table 41.1 Continued

Materials and component parts	°C	(°F)
Thermocouple method	65	(117)
Resistance method	85	(153)
9. Class A insulation systems on coil windings of d-c and universal motors ^a :		
a) In open motors:		
Thermocouple method	65	(117)
Resistance method	75	(135)
b) In totally enclosed motors:		
Thermocouple method	70	(126)
Resistance method	80	(144)
10. Class A insulation systems on coil windings of a-c motors (not including universal motors) and on vibrator coils – thermocouple or resistance method ^a		
a) In open motors and on vibrator coils	75	(135)
b) In totally enclosed motors	80	(144)
11. Class 130 insulation systems on windings of relays, solenoids, or the like:		
Thermocouple method ^a	85	(153)
Resistance method	105	(189)
12. Class B insulation systems on coil windings of d-c and universal motors ^a		
a) In open motors:		
Thermocouple method	85	(153)
Resistance method	95	(171)
b) In totally enclosed motors:		
Thermocouple method	90	(162)
Resistance method	100	(180)
13. Class B insulation systems on coil winding of a-c motors (not including universal motors) and on vibrator coils – thermocouple or resistance method ^a		
a) In open motors and on vibrator coils	95	(171)
b) In totally enclosed motors	100	(180)
14. Phenolic composition used as electrical insulation or where deterioration would result in a risk of fire, electric shock, or injury to persons ^b	125	(225)
15. Points on surface supporting a cord-connected appliance other than wall-mounted or under-cabinet	100	(180)
16. Points on adjacent surfaces of test corner for counter-top appliances	100	(180)
17. Flatiron or appliance plug face	175	(315)
18. Insulated wire or cord	25°C less than its temperature rating ^c	(77°F less than its temperature rating ^c)
19. Sealing compound	d	d
a) Copper tinned or bare strands:		
1) Less than 0.015 inch (0.38 mm) in diameter	125	(225)
2) 0.015 inch (0.38 mm) diameter and larger	175	(315)
b) Nickel, gold or silver platings, or combinations of those platings over copper conductors	225	(405)

Table 41.1 Continued on Next Page

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Table 41.1 Continued

Materials and component parts	°C	(°F)
20. Termination of copper conductor and pressure terminal connector without being nickel-coated or otherwise acceptably protected	125	(225)
<p>^a See 41.1.12 and 41.1.13.</p> <p>^b The limitation on phenolic composition does not apply to a compound which has been investigated and found to have special heat-resistant properties.</p> <p>^c Inside an appliance, the temperature rise on a wire or cord may be greater than the specified maximum rise, provided that the insulation on each individual conductor is protected by supplementary insulation (such as braid, wrap, tape, or close-fitting tubing) which is appropriate for the temperature and the type of insulation involved.</p> <p>^d Unless a thermosetting material, the maximum sealing compound temperature, when corrected to a 25°C (77°F) ambient temperature, is 15°C (27°F) less than the softening point of the compound as determined by the Test Method for Softening Point by Ring-and-Ball Apparatus, ASTM E28.</p> <p>^e Maximum temperature shall not exceed the temperature specified in Table 42.1, unless appliance is marked "CAUTION – Hot Surface" and temperature rise does not exceed 100°C (180°F). Such marking shall be in letters not less than 3/32 inch (2.4 mm) high, see 67.22.</p>		

41.1.2 Initial temperature transients may be in excess of the temperature limits specified in [Table 41.1](#) and [41.1.3](#), if the duration and extent of the excursion do not result in risk of fire or electric shock.

41.1.3 Temperatures are to be measured during preheat modes. Temperature rises not exceeding those specified in [Table 41.1](#), by more than 20 percent are acceptable.

41.1.4 All values in [Table 41.1](#), are based on an assumed ambient (room) temperature of 25°C (77°F), but a test may be conducted at any ambient temperature within the range of 10 – 40°C (50 – 104°F). However, if the operation of an automatic thermal control during the test limits the temperatures under observation, no temperature higher than 25°C (77°F) plus the specified maximum rise is acceptable.

41.1.5 During intended operation, the temperature of the fat, oil, or grease in the drip pan or equivalent part of a grill-type broiler shall be less than the flash point of the fat.

41.1.6 A gasket that is depended upon to prevent the entrance of water into an appliance during cleaning shall not become hard or brittle, shall not crack, and shall show no other signs of deterioration as a result of an accelerated-aging test in which the gasket is subjected to elevated temperatures.

41.1.7 The temperature to which the gasket is subjected during the test, as well as the duration of the test, is to be determined in accordance with the material of the gasket, the temperature to which it is subjected during operation, and other conditions of the particular application. Usually the appliance is to be operated dry and for a period of 240 hours.

41.1.8 Following the accelerated aging, the sample is to be immersed, tested, and examined for the entrance of water.

41.1.9 Temperatures are to be measured by thermocouples consisting of wires no larger than 24 AWG (0.21 mm²) and no smaller than 30 AWG (0.05 mm²), except that a coil temperature may be determined by the change-of-resistance method if the coil is inaccessible for mounting thermocouples. When thermocouples are used in determining temperatures in electrical equipment, it is standard practice to employ thermocouples consisting of 30 AWG iron and constantan wire and a potentiometer-type instrument, and such equipment is to be used whenever referee temperature measurements by thermocouples are necessary. The thermocouple wire is to conform with the requirements for Special Tolerances thermocouples as listed in the Tolerances on Initial Values of EMF versus Temperature tables in the Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized

Thermocouples, ANSI/ASTM E230/E230M. The thermocouples and related instruments are to be accurate and calibrated in accordance with good laboratory practice.

41.1.9.1 If the magnetic field of an induction heating appliance unduly influences the results, the temperature rises can be determined using non-iron type thermocouple or using platinum resistances with twisted connecting wires or any equivalent means.

41.1.10 For tests that are to be continued until constant temperatures are attained, thermal equilibrium is considered to exist only if three successive readings indicate no change when taken at the conclusion of each of three consecutive equal intervals of time, the duration of each interval being whichever of the following is longer:

- a) 5 minutes; or
- b) 10 percent of the total test time elapsed previous to the start of the first interval.

41.1.11 A thermocouple junction and adjacent thermocouple lead wire are to be securely held in good thermal contact with the surface of the material whose temperature is being measured. In most cases, good thermal contact will result from securely taping or cementing the thermocouple in place but, if a metal surface is involved, brazing or soldering the thermocouple to the metal may be necessary.

41.1.12 Usually, the temperature of a coil or winding is to be measured by means of thermocouples mounted on the outside of the coil wrap. If the coil is inaccessible for mounting thermocouples (for example, a coil immersed in sealing compound) or if the coil wrap includes thermal insulation, or more than 1/32 inch (0.8 mm) of cotton, paper, rayon, or similar insulation, the change-of-resistance method is to be used. For the thermocouple-measured temperature of a coil of an alternating-current motor (other than a universal motor) the thermocouple is to be mounted on the integrally applied insulation of the conductor.

41.1.13 At a point on the surface of a coil where the temperature is affected by an external source of heat, the temperature rise measured by means of a thermocouple may be higher – by the amount specified in [Table 41.2](#) – than the maximum indicated in [Table 41.1](#), provided that the temperature rise measured by the change-of-resistance method does not exceed the values indicated in [Table 41.1](#). If the coil wrap does not exceed its temperature limitation by radiation from an external source, the temperature of the coil may be measured by means of a thermocouple on the integral insulation of the coil conductors.

Table 41.2
Additional thermocouple temperature rise

Item in Table 41.1	Additional thermocouple rise	
	°C	(°F)
Item 8	15	(27)
Item 10(a)	5	(9)
Item 12(a)	20	(36)
Item 13(a)	10	(18)

41.1.14 To determine whether an appliance complies with the requirements in [41.1.1](#), the appliance is to be operated continuously until constant temperatures have been reached. The test voltage is to be the highest of the following:

- a) The marked voltage rating; or

b) The highest voltage of the applicable range of voltages specified in [66.1](#), if the marked voltage is within one of the voltage ranges indicated in [66.1](#).

41.1.15 Unless a particular voltage or other test condition is specified in [41.2.1.1](#) – [41.2.7.1](#), the test voltage specified in [41.1.14](#), is to be increased, if necessary, to cause the wattage input to the appliance to be equal to the wattage rating marked on the appliance.

41.1.16 If an appliance employs a motor in addition to a heating element, the voltage applied to an integrally connected motor is to be the test voltage as specified in [41.1.14](#). A motor supplied from a separate circuit is to be connected to a test voltage derived from its marked rated voltage in accordance with [41.1.14](#).

41.1.17 In conducting a test to determine whether an appliance complies with the temperature requirements, it is to be mounted or supported as in service and tested under conditions approximating those of intended operation, except as otherwise noted. Temperatures are to be observed on nearby surfaces, on the supporting surface, at points of support, on attachment plugs, and at other points as may be necessary, including building wiring which may be located adjacent to or behind a permanently installed appliance.

41.1.18 A counter-type appliance is to be tested in a test corner with the appliance located 4 inches (100 mm) away from the side and rear walls of the test corner. The 4 inch (100 mm) spacing is to be measured from the outer-most extremity of the appliance. The test corner is to consist of dull black-painted fir plywood not less than 3/8 inch (9.5 mm) thick, having such width and height that the walls extend no less than 2 feet (0.61 m) beyond the physical limits of the appliance. The vertical walls are to meet at a right angle.

Exception No. 1: Front- or side-loaded appliances (such as a toaster-oven, broiler, and convection oven) and other appliances (such as a table stove, food warmer, and food tray), which by virtue of their size, usual loading and unloading procedures, or intended usage are not likely to be moved from a counter resting location prior or during use, are to be located with the back of the appliance placed directly against one wall of the corner, and with 4 inches (102 mm) maintained from the side of the appliance to the other corner wall.

Exception No. 2: An appliance intended for outdoor use only is not required to be tested in a test corner.

41.1.19 A cord-connected wall or under-cabinet mounted appliance is to be mounted on one wall or cabinet bottom of a test corner consisting of dull black-painted fir plywood not less than 3/8 inch (9.5 mm) thick, having such a width and height that the walls extend not less than 2 feet (0.61 m) beyond the physical limits of the appliance. The vertical walls are to meet at a right angle. Unless marked as described in [67.13](#), the appliance is to be placed as close to the corner wall as the construction will permit, and an under-cabinet appliance is to be in contact with the rear wall while a wall-mounted appliance is to be in contact with either the cabinet bottom or the counter, whichever results in the highest temperature. The cabinet bottom is to be 12 inches (305 mm) deep, located 16 inches (406 mm) above the counter top. The surface beneath the unit is to be softwood covered with a double layer of white tissue paper.

41.1.20 Thermocouples are to be mounted on wood surfaces using the method illustrated in [Figure 41.1](#) or the equivalent. Starting in the corner, thermocouples are to be placed every 3 inches (76 mm) on each surface ([Figure 41.2](#)) so that a minimum area of 18 inches by 18 inches (457 mm by 457 mm) is covered by the thermocouples on each surface.

Figure 41.1

Method of mounting thermocouple

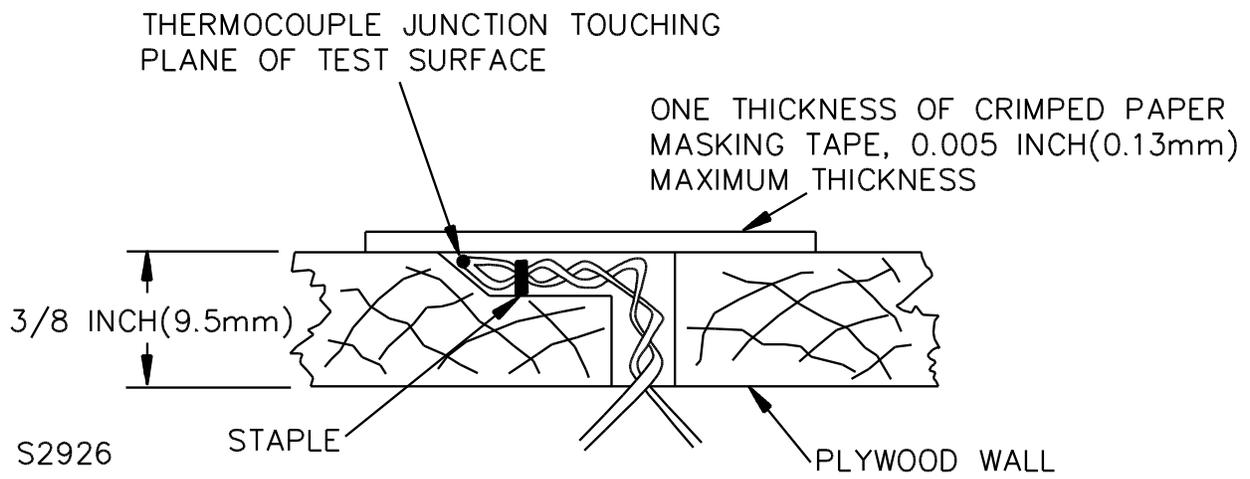
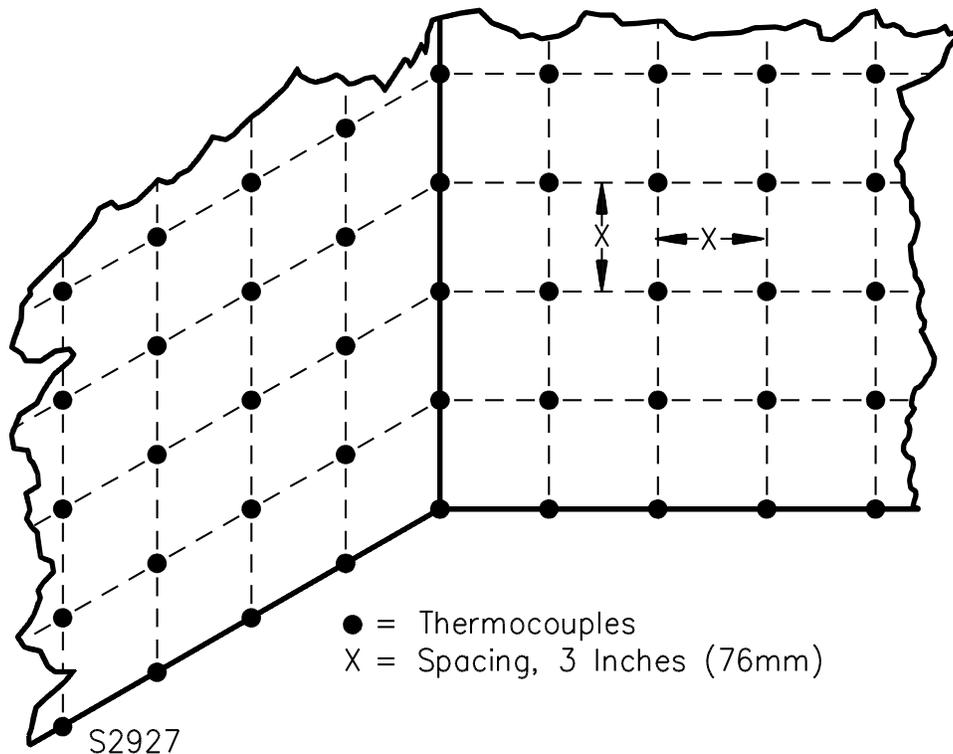


Figure 41.2
Thermocouple spacings



41.1.21 An appliance intended to be permanently connected to the power supply is to be supported in the intended manner on black-painted wood not less than 3/8 inch (9.5 mm) thick and is to be located in a corner (vertical walls meeting at a right angle) formed by two black-painted, vertical sheets of 3/8 inch (9.5 mm) plywood having such width and height that they extend not less than 2 feet (0.61 m) beyond the physical limits of the appliance. The appliance is to be located as close to both walls of the corner as its construction permits, and it is to be placed relative to the walls so that maximum heating of the walls occurs, except that it may be spaced away from the walls to preclude the wall temperatures from rising more than 65°C (117°F) if the appliance is marked as described in [67.13](#). For wall-mounted or under-cabinet mounted appliances intended to be permanently connected to the power supply, mounting is to be as specified in [41.1.19](#).

41.1.22 Unless otherwise indicated in the description of the test for a specific appliance, a cord-connected appliance is to be supported on two layers of white tissue paper on a softwood surface.

41.1.23 An automatic temperature-regulating or -limiting control or other protective device is to be shunted out of the circuit, unless the control has been shown, in accordance with [Table 60.1](#), to be rugged, reliable, and unlikely to be defeated by the user. The control is considered unlikely to be defeated if tools are required to gain access to the control, or a positive stop is incorporated in the control.

41.1.24 During the normal temperature test, a temperature-limiting device provided for overheating protection shall not operate.

41.1.25 If the construction of an appliance is such that cooking or heating of a liquid is a determining factor in the temperature attained (such as in a slow cooker or food warmer), the intended duty of an appliance is to be taken into consideration. Normal operating conditions cannot be obtained however, if certain types of appliances are operated continuously and in a dry condition. Accordingly, in determining

whether or not an appliance complies with the requirements in [41.1.1](#), actual service conditions or an approximation thereof are to be employed. Unless otherwise specifically indicated below:

- a) If the appliance is controlled by an adjustable thermostat, the thermostat is to be set to give maximum temperatures; and
- b) If the appliance is controlled by a nonadjustable thermostat, it is to be allowed to operate at whatever temperature the thermostat permits.

In each case, operation is to be continued until temperatures stabilized.

41.1.26 An appliance that may either be opened or closed in actual service is to be tested both opened and closed to determine which condition produces the higher operating temperature. In the case of an open-front tabletop broiler or the like where some cooking operation may be performed without a tray in the broiler compartment, temperatures are to be measured on the horizontal supporting surface in front of the open face of the appliance.

41.1.27 External thermal insulation, such as woven glass fiber or mineral wool, is to be removed before a heating appliance is installed in the test enclosure unless the material is bonded or permanently attached to the appliance. Rubber or other material similarly subjected to deterioration is to be removed from feet or other supports if the removal of the material is likely to result in higher temperatures being attained on the appliance.

41.1.28 Wherever cheesecloth is mentioned in connection with either a temperature test or an abnormal test, the cloth is to be bleached cheese-cloth, running 14 – 15 yd²/lb (approximately 28 – 30 m²/kg), and having what is known to the trade as a "count of 32 × 28" – that is, for any inch square, 32 threads in one direction and 28 threads in the other direction (for any centimeter square 13 threads in one direction and 11 threads in the other direction).

41.1.29 An appliance that is required to be preheated as part of the temperature or abnormal tests is to be preheated as follows:

- a) In accordance with the manufacturer's instructions marked in a readily visible location on the appliance; or
- b) If not marked, the appliance is to be operated for 15 minutes at the temperature setting specified for the cooking portion of the test.

Exception: An appliance is not to be preheated if the manufacturer's instructions specifically state that preheating of the appliance is not necessary. See [69.8](#).

41.1.30 Whenever hamburger is mentioned in connection with either a temperature or an abnormal test, each hamburger is to consist of a mixture of 75 percent lean beef and 25 percent suet by weight ground together twice in succession. A hamburger is to be 3/4 inch (19 mm) thick and have a 4 inch (102 mm) diameter before cooking. The initial hamburger temperature is to be 4.4° C (40° F). A hamburger is considered well done when a central internal temperature of 74° C (165° F) is attained on a centrally located hamburger.

41.2 Specific test condition

41.2.1 General

41.2.1.1 For most of the common types of appliances, standardized conditions for the temperature tests are given in [41.2.2.1](#) – [41.2.8.1](#).

41.2.1.2 In the case of a multi-functional appliance, such as a toaster oven/broiler, the appropriate tests for each function are to be conducted as specified in [41.2.2.1](#) – [41.2.7.1](#).

41.2.2 Electrically-equipped barbecue units and grill-type broilers

41.2.2.1 In the case of grill-type broiler, barbecue unit, or the like that is intended to burn solid fuel (see [55.2.4.2](#) and [67.8](#)) the heat source is to be a fire of charcoal briquettes as follows:

- a) In a circular fire box, a conical pile of fuel having a diameter 3/4 of that of the box, and a height 3/4 of that of the sides of the box, but not less than three briquettes high; or
- b) In a rectangular fire box, a pyramidal pile of fuel having respective width and length 3/4 of those of the box, and a height 3/4 that of the sides of the box, but not less than three briquettes high.

41.2.3 Broilers, ovens, and grills

41.2.3.1 A convection oven, broiler, grill, or a broiler/oven is to be preheated in accordance with [41.1.29](#). The cooking tray or rack is to be loaded to 75 – 80 percent of its capacity with hamburgers. A total of 3 loads of hamburgers are to be cooked until well done. A 10-second interval per hamburger is to be allowed for changing loads. On an appliance that broils only on one side, a 5-second interval per hamburger is to be allowed for turning the hamburgers at the middle of each cycle. If the appliance is marked with a temperature setting for hamburgers, the specified temperature is to be used for the test. Otherwise, the maximum temperature setting is to be used. Temperatures are to be measured continuously during each cooking cycle. A maximum of 30 seconds is to be allowed between hamburger loads for emptying a grease tray.

41.2.3.2 An oven, convection oven, or a broiler/oven is to be preheated in accordance with [41.1.29](#), and then operated while baking potatoes. The potatoes are to occupy 75 – 80 percent of the bake tray. The temperature control setting is to be adjusted to maintain an oven chamber temperature of 204°C (400°F) or the temperature setting marked in a readily visible location on the appliance, but not less than 177°C (350°F) in any case. The potatoes are to be standard baking potatoes each weighing between 0.375 – 0.625 lb (0.17 – 0.283 kg). Temperatures are to be measured continuously during the test. The test is to be terminated when the internal center temperature of a centrally located potato is 99°C (210°F).

41.2.4 Table stoves

41.2.4.1 The appliance is to be operated continuously with each heating unit covered with a shallow pan of water. The diameter of the bottom plane surface of a pan is to be equal to the outside diameter of the active part of the heating element with a plus tolerance on 1 inch (25.4 mm).

41.2.5 Toaster

41.2.5.1 A toaster, toaster oven, or toaster oven/broiler is to be operated first toasting a total of six slices of bread with one slice of bread per cycle and then toasting a total of 24 slices of bread while loaded to its maximum capacity. Between the two sets, a sufficient cool-down period is to be allowed for the appliance to return to its ambient temperature. For each of the two tests, the bread is to be toasted to a medium brown color as rapidly as the toaster will operate. The bread is to be commercially available white bread weighing approximately 25 grams. A medium brown color is to be determined by use of the toast color chart in Appendix [A](#).

41.2.6 Warming trays and food warmers

41.2.6.1 Warming trays (receive only vessels on the heated surface) and food warmers (receive food directly on the heated surface) are to be operated continuously with the thermostat set at the maximum-

heat position and with the surface empty. If the thermostat cycles, the test is to be repeated with a vessel containing water (minimum depth: 1 inch or 25 mm) placed on the heating surface over the thermostat. The vessel normally consists of a 6-inch-diameter (152-mm) shallow pan.

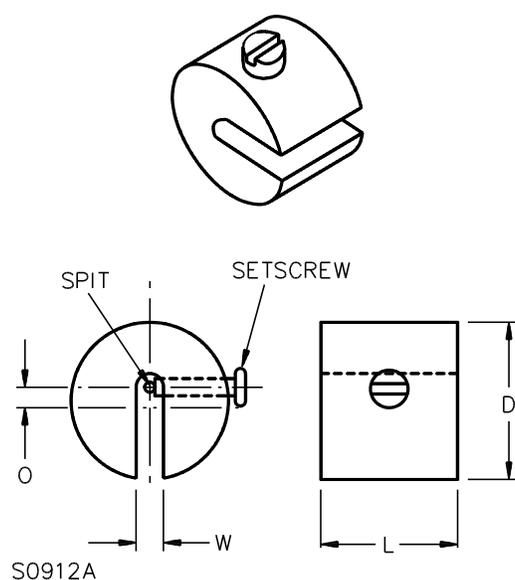
41.2.7 Rotisseries

41.2.7.1 A rotisserie is to be operated continuously until thermal equilibrium is obtained. During the test, the manufacturer's maximum recommended load, or if not specified, a 10 lb (4.5 kg) steel weight as shown in [Figure 41.3](#), is to be employed. In the case of multiple spits, each spit is to be loaded with the manufacturer's maximum recommended load or a total of 10 lb (4.5 kg) distributed equally among the spits.

41.2.8 Automatic bread makers

41.2.8.1 An automatic bread maker is to be operated for two complete cycles making the maximum size loaf of white bread in accordance with the manufacturers instructions. The second cycle is to begin immediately after completion of the first cycle.

Figure 41.3
Load for rotisseries



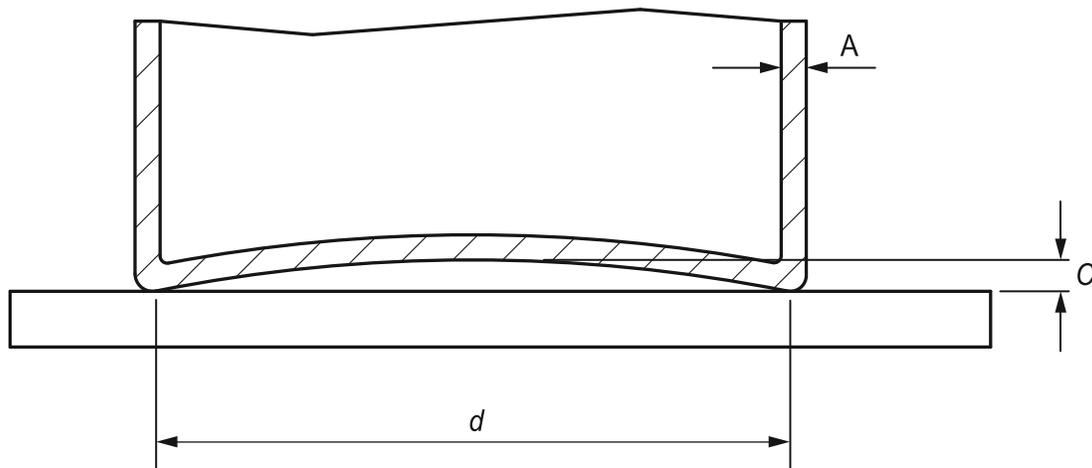
Dimension	Inches	(mm)
O	7/32	(5.6)
W	3/4	(19)
L	3-3/8 ^a	(85.7 ^a)
D	4	(102)

^a Length approximate, length varied to obtain weight specified.

41.2.9 Induction Table Stove

41.2.9.1 Induction hotplates are operated for 30 minutes with vessels, as specified in [Figure 41.4](#), containing pure cold pressed peanut oil. Controls are adjusted to their highest setting until the oil temperature reaches $180^{\circ}\text{C} \pm 4^{\circ}\text{C}$ ($356^{\circ}\text{F} \pm 39.2^{\circ}\text{F}$) and are then adjusted so that this temperature is maintained. The oil temperature is measured 1/2 inch (13 mm) above the center of the bottom of the vessel.

Figure 41.4
Vessel for testing induction table stove



su1002

Key:

A – Base and wall thickness, $2\text{ mm} \pm 0.5\text{ mm}$

C – Maximum concavity

d – Diameter of the flat area of the base

The vessel is made of low carbon steel having a maximum carbon content of 0,08 %. It is cylindrical without metallic handles or protrusions. The diameter of the flat area of the base of the vessel shall be at least the diameter of the cooking zone. The base of the vessel shall not be convex. The concavity of the base of the vessel shall not exceed 0.006 d .

41.2.10 Rice Cooker

41.2.10.1 A rice cooker is to be filled the maximum capacity of rice and water in accordance with the manufacturers instructions and is to be operated for two complete cycles of rice cooking. The cycle is considered as having ended when the thermostat automatically switches to the low or off position. The second cycle is to begin immediately after completion of the first cycle as the control allows. The temperatures are to be measured throughout the two cycles, and also when the rice cooker has subsequently operated on low heat until temperatures having become stabilized.

42 Top-Front Edge Temperatures – Convection Ovens Tests

42.1 When tested under the conditions described in this Section, the temperatures of an external top-front edge of a convection oven with a top-mounted manual control panel shall not exceed the maximum acceptable temperatures specified in [Table 42.1](#).

Exception: This requirement does not apply to an oven that is marked in accordance with [67.21](#).