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# Table 31.1 Continued

Material and component parts	°C	(°F)	
<sup>b</sup> 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 entirely acceptable for the temperature and the type of insulation involved.			

Table 31.1 Continued on Next Page

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# Table 31.1 Continued

Material and component parts	°C	(°F)
<sup>c</sup> Unless a thermosetting material, the maximum sealing compound temperature, when corrected to a 25°C (77°F) ambient temperature is 15°C less than the softening point of the compound as determined by the Test Method for Softening Point by Ring-and-Ball Apparatus, ASTM E28.		

31.1.2 Initial temperature transients may be in excess of the temperature limits specified in Table 31.1 and 31.1.3 if the duration and extent of the excursion do not result in risk of fire or electric shock and do not unduly shorten the life of the appliance.

31.1.3 Temperatures are to be measured during preheat modes. Temperature rises not exceeding those specified in Table 31.1 by more than 20 percent are acceptable.

31.1.4 All values in Table 31.1 are based on an assumed ambient (room) temperature of  $25^{\circ}C$  ( $77^{\circ}F$ ), but a test may be conducted at any ambient temperature within the range of  $10 - 40^{\circ}C$  ( $50 - 104^{\circ}F$ ). However, if the operation of an automatic thermal control during the test limits the temperatures under observation, no temperature higher than  $25^{\circ}C$  ( $77^{\circ}F$ ) plus the specified maximum rise is acceptable.

31.1.5 In an appliance that can hold an appreciable quantity of oil, fat, or grease during the cooking operation, the maximum and average temperatures measured at the center of the cooking surface shall not be higher than 300°C (572°F), and 260°C (500°F), respectively. These temperatures are to be measured after a stabilized cycling pattern has been established. The temperature at any point on the cooking surface shall not exceed 390°C (734°F) at any time during the test.

Exception: Corn popping appliances shall comply with 31.2.5.1 – 31.2.5.3.

31.1.6 Temperatures are to be measured by thermocouples consisting of wires no larger than 24 AWG (0.21 mm<sup>2</sup>) and no smaller than 30 AWG (0.05 mm<sup>2</sup>), 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, thermocouples consisting of 30 AWG iron and constantan wire and a potentiometer-type instrument, are to be used whenever referee temperature measurements by thermocouples are necessary.

31.1.7 For tests that are to be continued until constant temperatures are attained, thermal equilibrium is to be 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.

The thermocouple wire is to conform with the requirements specified 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.

31.1.7 revised May 29, 2014

31.1.8 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 with 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.

31.1.9 To determine whether an appliance complies with the requirements in 31.1.1, the appliance is to be operated continuously until constant temperatures have been reached. The test voltage is to be the marked voltage rating or the test voltage specified 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.

31.1.10 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 normal 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.

31.1.11 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.

31.1.12 An 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 not less than 2 ft (0.61 m) beyond the physical limits of the appliance. The vertical walls are to meet at a right angle.

31.1.13 Thermocouples are to be mounted on wood surfaces using the method illustrated in Figure 31.1 or the equivalent. Starting in the corner, thermocouples are to be placed every 3 inches (76 mm) on each surface (Figure 31.2) so that a minimum area of 18 inches by 18 inches (460 mm by 460 mm) is covered by the thermocouples on each surface.





31.1.14 An automatic temperature-regulating or -limiting control or other protective device provided as a part of an appliance is to be shunted out of the circuit, unless the control has been shown in accordance with Table 48.1 to be rugged, reliable, and unlikely to be defeated by the user. The control is considered to be unlikely to be defeated if tools are required to gain access to the control, or a positive stop is incorporated in the control.

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

31.1.16 If the design of a heating appliance is such that cooking or heating of a liquid is a determining factor in the temperature attained, the intended duty of the appliance is to be taken into consideration. In determining whether an appliance complies with the requirements in 31.1.1, 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 are stabilized.

31.1.17 An appliance such as a waffle or sandwich maker which may be either open or closed in actual service, is to be tested both open and closed to determine which condition produces the higher operating temperature.

31.1.18 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 57.1.

31.1.19 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 internal 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.

31.1.20 A deep fryer or cooker/fryer shall not overflow onto the supporting surface during this test. 31.1.20 added July 1, 2013

## 31.2 Specific test conditions

## 31.2.1 General

31.2.1.1 For most of the common types of appliances, standardized normal conditions for the temperature tests are given in 31.2.2 – 31.2.10.

#### 31.2.2 Deep fryers and cooker/fryers

31.2.2.1 The fryer is to be filled with commercially available peanut oil to the level indicated on the appliance or in the instruction manual. The fryer is to be preheated in accordance with 31.1.18 and then 3 batches of french fries are to be cooked, according to the manufacturer's instructions. Each batch is to be cooked to a medium brown color. A medium brown color is to be determined by use of the french fries color chart in Appendix B. Unloading and loading between batches is to be accomplished in 15 – 30 seconds. Each batch of french fries is to consist of the maximum load recommended. The french fries are to be made using fresh standard baking potatoes cut 3/8 - 1/2 inch (9.6 – 12.7 mm) on a side and are to be of any convenient length. See 31.1.5 for the cooking surface temperature test.

31.2.2.2 For Deep Fryers or Cooker/Fryers intended to be used with a large item foods, the appliance shall also be subjected to the test described in 31.2.2.3.

31.2.2.2 added July 1, 2013

31.2.2.3 The fryer shall be operated as described in 31.2.2.1, except a single cooking cycle shall be conducted using the largest recommended individual large item food considering weight and surface area, with the longest recommended cooking time, with any adjustable thermostat set to its maximum temperature setting. The large item food shall be refrigerated and have a maximum internal temperature of 40°F (4.4°C) and prepared in accordance with the manufacturer's instruction manual, including any specified thawing. The time to cook the large item food shall be in accordance with the manufacturer's instructions, or until well done, whichever is longer. Poultry is considered to be well done when an internal temperature of the thigh of 82°C (180°F) is attained. All other meats are considered to be well done when a central internal temperature of 171°F (77°C) is attained.

31.2.2.3 added July 1, 2013

31.2.3 Waffle bakers and sandwich grills

31.2.3.1 A waffle baker, or a combination unit, is to be preheated in accordance with 31.1.18 and then operated for 10 baking operations. Unloading and loading between operations is accomplished in 15 - 30 seconds. An adjustable temperature control is to be set at the manufacturer's recommended setting, if marked in a readily visible location, or, if not marked, at the maximum temperature setting. The waffles are to be baked to a medium brown color. A medium brown color is to be determined by the use of the waffle color chart in Appendix B. The batter is to be a commercially prepared mix.

31.2.3.2 A sandwich grill, or a combination unit, is to be preheated and then operated toasting a maximum of 10 sandwiches. An adjustable temperature control is to be set at the manufacturer's recommended setting, if marked in a readily visible location, or, if not marked, at the maximum temperature setting. For each toasting operation, the lower grill is to be filled to capacity for as many cycles as possible and the remainder of the 10 sandwiches used for the last cycle and the grill is to be closed. Unloading and loading between operations is to be accomplished in 15 - 30 seconds. Each sandwich is to consist of two slices of white bread, weighing approximately 25 g, with 2 slices of cheese [commercially available 1/2 oz (14 g) per slice processed cheese] between the bread slices. Those sides

in contact with the grills are to be coated with butter. The test is to be repeated with the grills open and using only one grill to toast sandwiches. The sandwiches are to be toasted on both sides to a medium brown color. A medium brown color is to be determined by the use of the toast color chart in Appendix B.

*Exception:* The appliance is to be operated in the open position unless the manufacturer's instructions indicate the appliance is only to be operated in the closed position.

## 31.2.4 Skillets and woks

31.2.4.1 A skillet or a wok is to be operated as set forth in 31.2.4.2. However, the method indicated in 31.2.4.3 may be used as an alternate if agreeable to those concerned.

31.2.4.2 A skillet is to be preheated according to 31.1.18 and then operated baking potatoes. The potatoes are to occupy 75 - 80 percent of the cooking surface. The temperature control setting is to be adjusted to maintain a cooking temperature of  $204^{\circ}$ C ( $400^{\circ}$ F) or the setting marked in a readily visible location on the product, but not less than  $177^{\circ}$ C ( $350^{\circ}$ F) in any case. The potatoes are to be standard baking potatoes each weighing between 3/8 - 5/8 lb (0.83 - 1.38 kg). The test is to be terminated when the internal center temperature of a centrally located potato is  $99^{\circ}$ C ( $210^{\circ}$ F).

31.2.4.3 The appliance is to be operated continuously with the thermostat set at the maximum setting until thermal equilibrium is attained. The appliance is to be filled to a depth of 1/2 inch (13 mm) with commercially available peanut oil as measured at the center of the pan. See 31.1.5 for the cooking surface temperature test.

## 31.2.5 Corn poppers

31.2.5.1 Two tests shall be made. The temperature at any point on the cooking surface shall not exceed 370°C (698°F) at any time during the tests. For these tests, thermocouples shall be soldered, peened, or welded into the cooking surface.

31.2.5.2 For the first test, the appliance is to be operated dry and empty, and with the cover in place. During this test only the cooking surface temperature is to be measured.

31.2.5.3 For the second test, the manufacturer's recommended amount of oil and popping corn shall be placed in the appliance. The oil used in this test shall be pure peanut oil. The appliance shall be operated with the cover in place until the batch of ingredients is thoroughly popped. The appliance shall be immediately emptied of the corn and oil mixture and immediately refilled with fresh ingredients. The test shall be repeated through as many operations needed to attain thermal equilibrium.

## 31.2.6 Hamburger makers

31.2.6.1 The appliance is to be preheated according to 31.1.18 and then operated continuously cooking 10 hamburgers or 5 loads of hamburgers, whichever is more. The hamburgers are to be cooked until well done following the instruction manual directions. Grease from the hamburgers is to be drained from the appliance between cycles. 15 seconds are to be allowed for draining the grease.

## 31.2.7 Donut makers

31.2.7.1 The appliance is to be preheated according to 31.1.18 and then operated continuously making 20 donuts or 5 loads of donuts, whichever is more. The batter is to be prepared in accordance with the instruction manual recipe. Any thermostat is to be set at the highest setting recommended in the manufacturer's instructions. The unload/load time is to be between 15 and 30 seconds.

## 31.2.8 Griddles and contact grills

31.2.8.1 The appliance is to be preheated according to 31.1.18 and then operated continuously cooking 2 loads of hamburgers. Each load is to fill 75 percent of the cooking surface area and is to be cooked until well done. The thermostat is to be set in accordance with the instructions marked in a readily visible location on the product, or, if not marked, at the maximum setting. Grease from the hamburgers is to be drained from the appliance between cycles. 15 seconds are to be allowed for draining the grease.

31.2.8.2 For appliances that have more than one intended cooking position, the test of 31.2.8.1 is repeated in each position. Each time starting with the appliance at ambient temperature.

31.2.8.2 added October 20, 2010

## 31.2.9 Crepe makers

31.2.9.1 The appliance is to be preheated in accordance with 31.1.18 and then operated continuously cooking 10 crepes, as quickly as practical. A commercially prepared mix, or a mix made following the instructions, is to be used. Any thermostat is to be set at the maximum setting.

# 31.2.10 Oil fondues

31.2.10.1 The oil fondue appliance is to be operated continuously, set on high, or with the thermostat set at the maximum setting, if one is provided, until thermal equilibrium is obtained. The appliance is to be filled with commercially available peanut oil to the level indicated in the instruction manual. See 31.1.5 for the cooking surface temperature test.