3) Thirty-five hundred volts plus twice the rated voltage of the appliance for a double-insulated appliance rated other than a nominal 120 volts.

34.2 Grass shears are to be mounted so that the blade is tilted downward at a 30 degree angle. Pruners are to be mounted so that the blade is tilted upward at a 30 degree angle. A spray of water is to be directed onto the blade and the portion of the motor case nearest the blade for 4 hours. This spray is not to strike the enclosure on the side of the motor away from the blade. The appliance is to be operating during and 5 seconds after the spray is removed before being subjected to the tests required by 34.1.

34.3 A shredder or shredder-bagger, supported in the normal operating position, is to be subjected for 1 hour to a downward spray of water onto the top and sides, applied to the appliance at an angle of 45 degrees from the vertical and in the direction most likely to cause water to enter. The appliance is not to be operated during exposure to the water spray, but is to be operated for 5 seconds without load before being subjected to the tests required by 34.1.

34.4 The water spray test apparatus is to consist of three spray heads mounted in a water supply pipe rack as illustrated in Figure 34.1. Spray heads are to be constructed in accordance with the details specified in Figure 34.2. The water pressure for all tests is to be maintained at 5 psi (34 kPa) at each spray head. The distance between the center nozzle and the appliance is to be approximately 5 feet (1.5 m). The spray is to be directed at an angle of 45 degrees to the vertical toward the louvers or other openings nearest current-carrying parts.

34.5 Before the test is started, the resistivity of the water is to be 3500 ohm-centimeters ±6 percent when measured at 25°C (77°F). At the conclusion of the test, the resistivity of the water is not to be less than 3200 ohm-centimeters nor more than 3800 ohm-centimeters when measured at 25°C (77°F).

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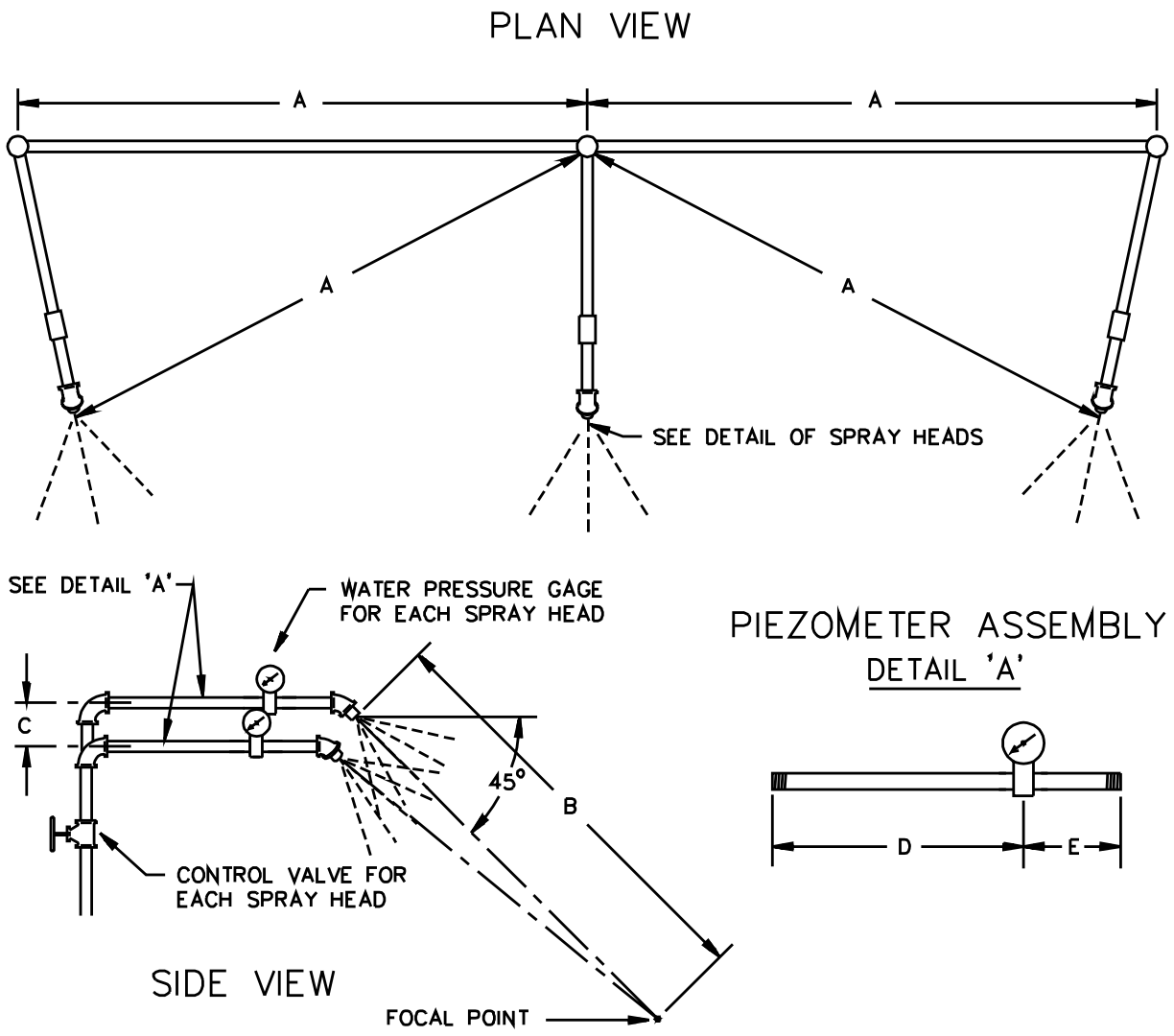
Figure 34.1

Rain-test spray-head piping



Item	mm	inch
A	710	28
B	1400	55
C	55	2–1/4
D	230	9
E	75	3

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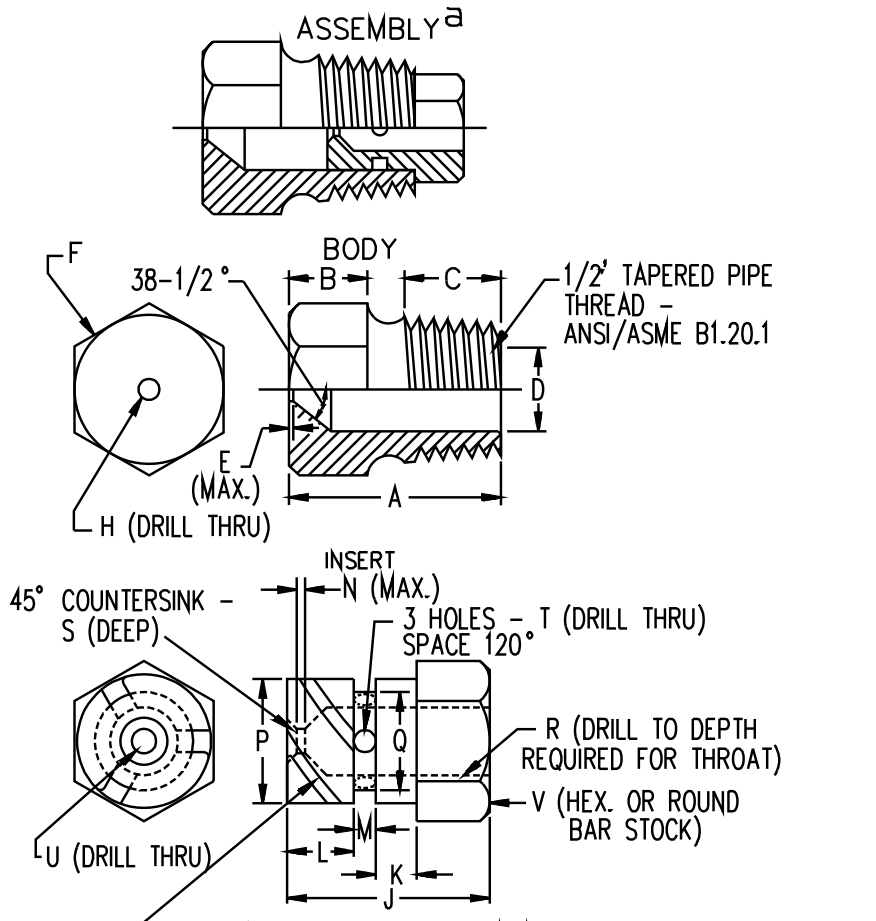
Figure 34.2

Rain-test spray head



Item	inch	mm	Item	inch	mm
A	1-7/32	31.0	N	1/32	0.80
B	7/16	11.0	P	.575	14.61
C	9/16	14.0		.576	14.63
D	.578	14.68	Q	.453	11.51
	.580	14.73		.454	11.53
E	1/64	0.40	R	1/4	6.35
F	c	c	S	1/32	0.80
G	.06	1.52	T	(No. 35)[b]	2.80
H	(No.9)[b]	5.0	U	(No. 40)[b]	2.50
J	23/32	18.3	V	5/8	16.0
K	5/32	3.97	W	0.06	1.52
L	1/4	6.35			
M	3/32	2.38			

[a] Nylon Rain-Test Spray Heads are available from Underwriters Laboratories

[b] ANSI B94.11M Drill Size

[c] Optional - To serve as a wrench grip.

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35 Abnormal Operation Tests

35.1 Component short- and open-circuit test

35.1.1 An appliance having a semiconductor of one or more semiconductor junctions, a capacitor, or a combination of both shall be subjected to the tests specified in 35.1.2 – 35.1.4, As a result of the test, the semiconductor shall not involve a risk of fire, electric shock, or injury to persons when either the semiconductor junction or the capacitor is short- or open-circuited.

35.1.2 The appliance is to be connected to a grounded supply of rated frequency and maximum rated voltage operating at no load with the short- or open-circuited condition introduced. Only one abnormal condition is to be simulated at a time.

35.1.3 If the appliance is provided with a momentary-contact switch having no provision for being locked on and if there is indication of malfunction of the appliance, such as emission of smoke, inability of the appliance to operate in the intended manner, or other indication, the test is to be discontinued when the malfunction becomes evident. Otherwise, the test is to be continued until ultimate results occur. Exposed dead metal parts of the appliance are to be connected to ground through a 3-ampere fuse. The results are unacceptable if the fuse opens during the test.

35.1.4 During the tests described in 35.1.2, the appliance is to be connected in series with a nontime-delay fuse of the maximum current rating that can be accommodated by the fuse-holder of the branch circuit to which the appliance could be properly connected. Opening of the fuse before a risk of fire, electric shock, or injury to persons results is an acceptable conclusion of a test.

35.2 Capacitor overvoltage test

35.2.1 In a test to determine if a capacitor as described in 20.1(d), is acceptable, several samples of the capacitor, mounted in the usual manner and with cotton placed around openings in the enclosure, are to be subjected to such overvoltage as to cause breakdown. If the cotton ignites upon breakdown of the capacitor, the results are unacceptable.

36 Handle Tests

36.1 If the insulating material used for a handle, as specified in 8.2, overlies dead metal, the material shall be conditioned as specified in 36.2 – 36.4. As a result of the test, the material shall not:

a) Show holes, cracks, distortion, or other evidence of unacceptable deterioration after being conditioned as described in 36.2; and

b) Break, crack, rupture, or show other adverse effects after the appliance has been subjected to the impacts described in 36.3. The impact test is to be conducted on the samples that have been conditioned as described in 36.2.

36.2 For the conditioning specified in 36.1, the appliance is to be kept for 7 hours in an air-circulating oven at a temperature that is 10° C (18° F) higher than the temperature attained by the handle under conditions of normal operation, but at not less than 70°C (158°F).

36.3 With reference to 36.1 (b), a hand-supported appliance is to be dropped twice on each handle through a distance of 3 feet (0.91 m) to strike a concrete surface. Each handle of a ground-supported appliance is to be subjected to two impacts of 5 foot-pounds (6.8 J). See 36.4. In the tests, two different samples may be used, one for each set of drops or impacts.

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36.4 The impact specified in 36.3, is to be applied by dropping a steel sphere, 2 inches (51 mm) in diameter and weighing 1.18 pounds (0.54 kg), through a vertical distance of 51 inches (1.29 m).

37 Brush Cap Test

37.1 A brush cap of a hand-supported appliance shall be subjected to the test specified in 37.2. As a result of the test, the brush cap shall withstand the test without cracking or breaking.

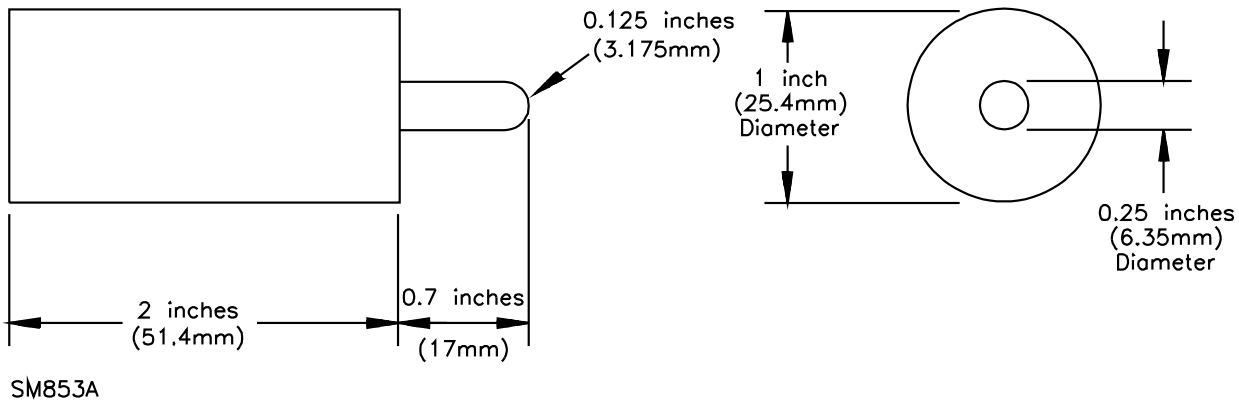
37.2 The appliance is to be dropped through a distance of 3 feet (0.91 m) to strike a concrete surface, except that if the brush cap is located so that it cannot strike the surface when the test is being conducted, it is to be subjected to an impact of 1 foot-pound (1.36 J).

37.3 A brush cap of a ground-supported appliance shall be subjected to the test specified in 37.4. As a result of the test, the brush cap shall withstand the test without cracking, breaking, or exposing live parts.

37.4 An impact of 1 foot-pound (1.36 J) is to be applied to the brush cap through the hardened steel rod shown in Figure 37.1 with a diameter of 1/4 inch (6.4 mm), held in contact with the brush cap by any convenient means.

Figure 37.1

Impact rod



38 Attachment Plug Test

38.1 An attachment plug provided with an appliance shall be tested as spcified in 38.2 and 38.3. As a result of the test, the test probe shall not contact any blade of the attachment plug while the plug is conductively connected to the connector of the extension cord.

Exception: The probe may contact the grounding blade of a 3-conductor grounding plug.

38.2 The receptacle used in the test shall comply with the requirements in UL 498, or the equivalent. The receptacle is to be connected to the extension cord of the test assembly illustrated in Figure 38.1. The plug is to be inserted in the receptacle as far as possible. The plug is then to be withdrawn not more than the distance that is necessary to permit the test probe to be inserted between the plug body and the extension cord receptacle. The test probe is to be inserted with a force of 4.1 pounds (18 N) or less, until the probe contacts one blade of the plug. While the probe is in contact with the blade, the electrical continuity is to be

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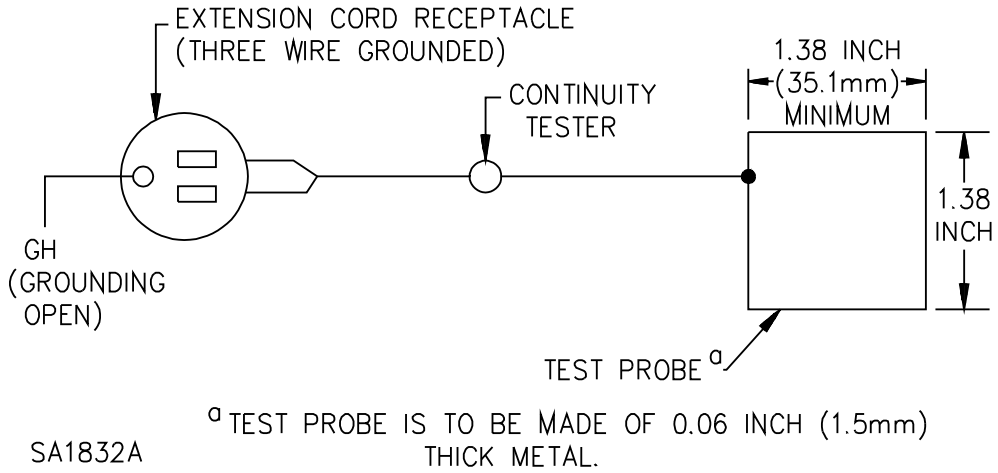
determined by an ohmmeter or similar instrument between the contacts of the extension cord receptacle and the test probe. The test is then to be repeated for the other blade of the attachment plug.

Figure 38.1

Test assembly for accessibility of attachment-plug blades



38.3 The test probe specified in 38.2, is to be made of 0.06-inch (1.5-mm) thick metal that is 1.38 inches (35 mm) wide, and not less than 1.38 inches long.

39 Strain Relief And Torque Tests

39.1 The strain-relief means provided on the power supply cord shall be subjected to the test specified in 39.2 and 39.3. As a result of the test, relief means shall withstand for 1 minute, without displacement, a pull of 35 pounds (156 N) applied to the cord, with the connections within the appliance disconnected. The strain relief is not acceptable if, at the point of disconnection of the conductors, there is such movement of the cord as to indicate that stress would have resulted on the connections.

39.2 A 35-pound (15.9-kg) weight is to be suspended from the power supply cord and supported by the appliance so that the strain-relief means will be stressed from any angle that the construction of the appliance permits.

39.3 A power supply cord shall withstand for 1 minute a torque of 50 ounce-inches (0.353 N·m) applied 1 inch (25.4 mm) from the strain relief without damage to the cord and without transmitting the torque to the terminations.

40 Cord Flexing Test

40.1 A power supply cord shall be subjected to the test specified in 40.2 – 40.5. As a result of the test, the cord shall withstand 20,000 cycles of flexing at the cord entrance to the product.

40.2 Flexing is to be performed at a rate not exceeding 10 cycles per minute, unless agreeable to those concerned.

40.3 Three samples are to be tested. Each sample is to be mounted so that the cord entrance point of the product is at the center of rotation. A 1-pound (0.40-kg) weight is to be attached to the cord between 3 feet (0.91 m) and 5 feet (1.52 m) from the cord entry point. Any additional cord beyond 5 feet is to be

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removed. Guides are to be provided 3 feet from the cord entry point to minimize bouncing or side-to-side motion of the cord. The weight is to be located so as not to interfere with the guides. When a short cord is employed, the additional length is to be obtained by using an attached cord set that the manufacturer makes available. If a cord retaining device is provided with the appliance, the device is to be removed for this test. See Figure 40.1 .

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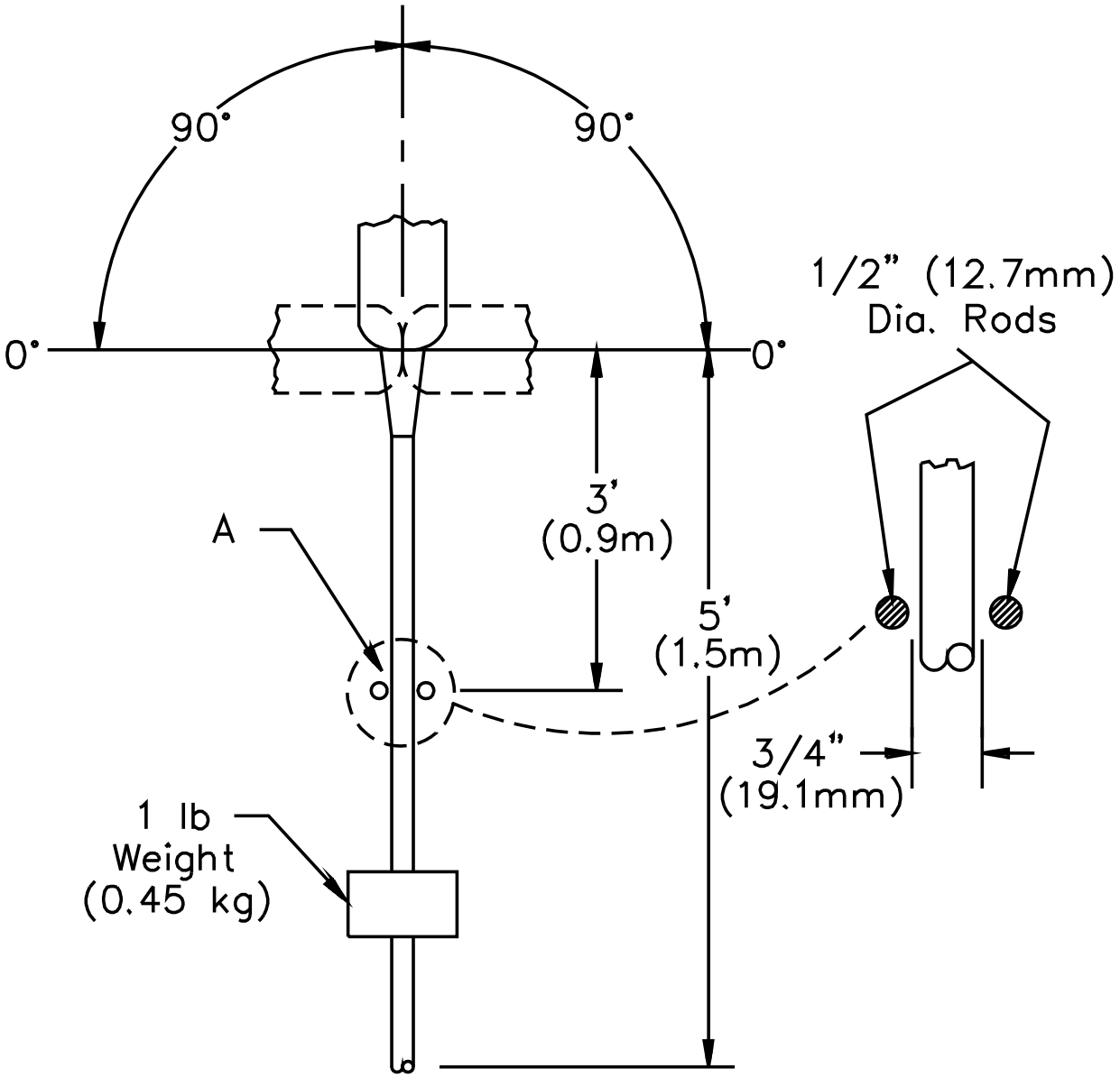
Figure 40.1

Cord flexing



A – Portions of the cord damaged by contact with the guides or attachment of the weight may be removed prior to the electrical tests.

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Inch	1/2	3/4	ft	3	5	lb	1
(mm)	(12.7)	(19.1)	(m)	(0.91)	(1.52)	kg	(.40)

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40.4 Starting with the cord in a vertical position and the cord entrance pointing downward, each cycle is to consist of rotating the entrance point 90 degrees to the horizontal position, rotating back 180 degrees to the opposite horizontal position, and then back to the vertical position, for a total rotation of 360 degrees. Rotation is to be smooth with no sudden starts or stops.

40.5 After flexing:

a) Each current-carrying conductor shall be capable of carrying its rated ampacity (for the size conductor) as given in the , ANSI/NFPA 70, for 2 minutes without interruption. A grounding conductor, if provided, shall be capable of carrying twice its rated ampacity for 2 minutes without interruption.

b) Following the test specified in (a), there is to be no dielectric breakdown when a potential of 1000 V plus twice the rated voltage of the product is applied for 1 minute between the individual conductors of the cord with the internal connections to the product severed and insulated, and between live parts and accessible metal parts.

41 Pressure Pad Test

41.1 To determine if the pressure pad tests described in 41.2 and 41.3, are needed, a sample of the gardening appliance is to be operated at no load for a period of 1 hour with the pad specified in 11.1.12, removed from the appliance. At the conclusion of the test, the appliance is to be carefully examined for evidence of a risk of fire or electric shock. If there is such evidence, the tests described in 41.2, and, if applicable, 41.3, are to be conducted.

41.2 To determine compliance with 11.1.12, three samples of a soft rubber, neoprene, or polyvinyl chloride pressure pad, after conditioning in a full-draft, air-circulating oven maintained at a temperature of 20°C (36°F) more than the normal operating temperature for 168 hours, shall not undergo any change in dimension that will result in the inability of the pad to hold down or maintain permanent position of an electrical part.

41.3 If a pressure pad is likely to be exposed to grease, three samples of the pad specified in 11.1.12, are to be conditioned for 18 hours in oil at a temperature of 20°C (36°F) more than the normal operating temperature. The oil to be used is IRM 902. The pads shall not undergo any change in dimension that will result in the inability of the pad to hold down or maintain permanent position of an electrical part.

42 Switch and Control Tests

42.1 General

42.1.1 A switch or other device that controls the motor of an appliance shall perform acceptably when subjected to a test consisting of 50 cycles of operation, making and breaking the locked-rotor current of the appliance. There shall not be any electrical or mechanical breakdown of the device or undue pitting or burning of the contacts. In addition, the results are not acceptable if the fuse in the grounding connection provided in accordance with 42.1.2, opens during any of the tests.

Exception No. 1: A speed changing switch that has been previously evaluated and determined to be acceptable or has been tested in accordance with 42.3.1, is not required to be subjected to this test.

Exception No. 2: A reversing switch that has been previously evaluated and determined to be acceptable or has been tested in accordance with 42.2.1, is not required to be subjected to this test.

Exception No. 3: A switch that controls an induction motor and has an acceptable horsepower rating is not required to be subjected to this test.

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Exception No. 4: A switch that is interlocked so that it will never have to break the locked-rotor current is not required to be subjected to this test.

Exception No. 5: A switch in an isolated secondary circuit limited to 100 volt-amperes or less is not required to be subjected to this test (see 42.3.3).

42.1.2 For the tests described in 42.1.3 – 42.3.2, the appliance is to be connected to a grounded power supply circuit of rated frequency and maximum rated voltage. See 32.7. During the tests, exposed dead metal parts of the appliance are to be connected to ground through a 3-ampere plug fuse, so that any single-pole, current-rupturing device will be located in the ungrounded conductor of the supply circuit. If the appliance is intended for use on direct current, or on direct current as well as on alternating current, the exposed dead metal parts of the appliance are to be connected so as to be positive with respect to any single-pole, current-rupturing control device.

42.1.3 For the test described in 42.1.1, the rotor of the motor is to be locked in position, and the device is to be operated at a rate of not more than 10 cycles per minute; and the device is to be left in the on position as briefly as possible (a faster rate of operation may be employed if agreeable to those concerned).

42.2 Reversing switch

42.2.1 A switch or other device used for reversing the motor of an appliance, unless acceptable for the application, shall be subjected to a test consisting of 25 cycles of operation as described in 42.2.2. There shall not be any:

a) Electrical or mechanical breakdown of the device;

b) Undue pitting or burning of the contacts; or

c) Emission of molten metal or flame from the enclosure of the appliance.

42.2.2 For the test specified in 42.2.1, each cycle of operation is to consist of:

a) Throwing the switch to the position in which the motor of the appliance rotates in one direction, allowing it to attain full operating speed in that direction;

b) Then, without pause in any intermediate off position unless the switch will not function otherwise, throwing the switch to the position in which rotation is reversed, allowing the motor to attain normal speed in that direction; and

c) Then reversing the rotation again by throwing the switch to the initial on position.

42.3 Speed changing switch

42.3.1 A switch or other device for changing the speed of the motor of an appliance, other than an "on-off" switch, unless acceptable for the application, shall be subjected to 50 cycles of operation as described in 42.1.2 and 42.3.2. There shall not be any:

a) Electrical or mechanical breakdown of the device;

b) Undue pitting or burning of the contacts; or

c) Emission of molten metal or flame from the enclosure of the appliance.

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42.3.2 For the test specified in 42.3.1, each cycle of operation is to consist of operating the appliance at one speed, throwing the switch to cause operation at the other speed, and then changing the setting back to the position that results in the first value of speed again.

42.3.3 Switching contacts in an isolated secondary circuit that is limited to 100 volt-amperes or less:

a) Is not required to be evaluated to determine whether it is acceptable for the application; and

b) Is not required to be subjected to the tests in 42.1.1 – 42.3.2.

43 Accelerated Aging Test

43.1 A rubber or neoprene compound forming a part that is depended upon to protect the appliance from moisture shall be subjected to the test specified in 43.2 and 43.3. As a result of the tests, the part shall have physical properties as specified in Table 43.1, after aging.

Table 43.1
Accelerated aging test

Temperature on component during temperature test			Minimum acceptable percent of unaged value for samples	
°C	(°F)	Accelerated aging procedure	Tensile strength	Elongation
60 or less	(140 or less)	Air oven aging for 70 hours at 100 ±2°C (212 ±3.6°F)	60	60
61 – 75	(142 – 167)	Air oven aging for 7 days at 100 ±2°C (212 ±3.6°F)	50	50
76 – 90	(169 – 194)	Air oven aging for 168 hours at 121.0 ±1.0°C (249.8 ±1.8°F)	50	50
91 – 105	(196 – 221)	Air oven aging for 168 hours at 136.0 ±1.0°C (276.8 ±1.8°F)	50	50

43.2 The test procedure for determining whether a part complies with the requirement in 43.1, depends upon the material of which it is composed, its size and shape, the mode of application in the appliance, and other factors. The test procedure may include visual inspection for cracks, deformation, and the like after the accelerated aging, as well as comparison of hardness, tensile strength, and elongation before and after the accelerated aging.

43.3 With reference to 43.1 and 43.2, a part made of rubber or neoprene, tested to compare its tensile strength and elongation before and after the accelerated aging, is acceptable if these properties are determined to be not less than the applicable values specified in Table 43.1.

44 Polymeric Materials Not Classed HB

44.1 Mold stress relief test

44.1.1 An appliance with a polymeric enclosure not classed HB shall be subjected to the test specified in 44.1.2 – 44.1.4. After testing, the enclosure material shall comply with all of the following conditions:

a) The material shall not soften, as determined by handling immediately after the oven conditioning;

b) The material shall not crack;

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