

New Requirements for Power Supply Cords for use on Electric Fans and Electric Room Heaters

Understanding Potential Revisions to UL 62

Background

UL 507, the Standard for Safety of Electric Fans, was revised to include four additional mechanical test requirements for cords used on these products. The effective date for these requirements is September 2010. Similar requirements have been added to UL 1278, the Standard for Safety of Movable and Wall- or Ceiling-Hung Electric Room Heaters, and UL 1042, the Standard for Safety of Electric Baseboard Heating Equipment, with an effective date of February 2011.

In response to the revisions of cord requirements in the end product standards for electric fans and electric room heaters, a new set of test requirements for “-R” cords has been proposed for UL 62, the Standard for Safety of Flexible Cords and Cables. These proposed test requirements will be optional for flexible cords currently certified under category ZJCZ and so no mandatory file review will be required.

A proposal for these revised requirements is now being considered by the UL 62 Standards Technical Panel. If these proposed requirements are published in UL 62, compliant cords will be identified by the suffix “-R” after the type designation, e.g., SPT-2-R or SJT-R.

Proposed test requirements for cords carrying a “-R” designation

The summary below explains the new requirements for flexible cords intended for use as power supply cords on cord-connected portable appliances covered by UL 507, UL 1278 and UL 1042. UL is providing this information in advance of publication of a revised version of UL 62 so that cord manufacturers are aware of these potential requirements and can prepare accordingly.

1. Abrasion test

The test equipment requirements are described in clause 7.9.2 of UL 2556, Standard for Wire and Cable Test Methods:

- Five cord specimens of 40 inches long will be tested
- Grade ½ (medium) emery cloth is used as the abrasive surface
- A force of 3.3 ± 0.1 N is applied to the end of all specimens
- The table will be stopped every 800 cycles and the cords shifted slightly to one side to a fresh section of emery cloth

Acceptance criteria: After 5,000 cycles of abrasion, none of the five specimens will have exposed copper conductors or shield (in the case of shielded constructions).

2. Mandrel pinching test

- Five cord specimens of unspecified length will be tested. Typically, these specimens will be 30 inches long, based on UL’s test equipment
- The cord is pinched between a flat steel surface and the corner of a steel mandrel. Figure 1 illustrates this test setup
- The head of a compression testing machine will move toward the bed at a rate of 0.20 ± 0.05 in/min.

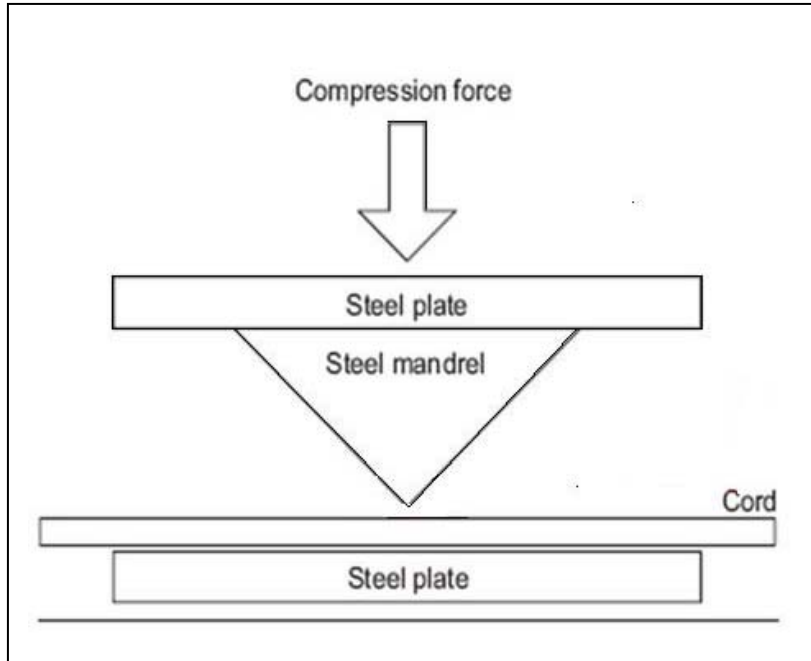


Figure 1: Set-up for Mandrel Pinching Test

Acceptance criteria: After an application of 2254 N, there will be no contact on any of the five specimens between:

- One or more circuit conductors and the flat horizontal surface
- One or more circuit conductors and the mandrel
- One or more circuit conductors and the grounding conductor or
- Any two circuit conductors

3. Mandrel crushing test

- Five cord specimens will be tested. Typically, these specimens will be 40 inches long, based on UL's test equipment
- The cord is crushed between a flat steel surface and the corner of a steel mandrel. The mandrel size is identical to the mandrel used in the pinching test
- A force of 890 N will be applied to the specimens for seven hours

Acceptance criteria: After an application of 890 N for 7 hours, there shall be no contact on any of the five specimens between:

- One or more circuit conductors and the flat horizontal surface
- One or more circuit conductors and the mandrel
- One or more circuit conductors and the grounding conductor or
- Any two circuit conductors

4. Flexing test

- Six cord specimens will be tested. Typically, these specimens will be 40 inches long, based on UL's test equipment.
- The conductors will be loaded to the maximum rated current based on conductor size and cord type, not the appliance ratings (see Table 1). A voltage of 300 V will be applied between the conductors. The circuit shall be protected by a time-delay fuse.

Test current and fuse protection for “-R” cords

Conductor size, mm ² (AWG)	Load current, A		Circuit protection, A
	Service cords	Heater cords	
0.824 (18)	10	10	15
1.04 (17)	12	13	18
1.31 (16)	13	15	20
1.68 (15)	16	17	25
2.08 (14)	18	20	30

- The six assemblies will be flexed at a rate of approximately 20 cycles per minute for 3,100 cycles
- One cycle consists of a 90-degree rotation of the test assembly in one direction, a 180-degree rotation in the opposite direction and a return to the starting point.

Acceptance criteria: Upon completion of the test, the following conditions shall not occur on any of the specimens:

- Development of a short circuit
- Breakage of more than 10 percent of the strands of any conductor
- Broken strands piercing the insulation and becoming accessible
- Cracking or degradation of the cord insulation or
- Exposure of the shield on shielded constructions

Service options

Because the test requirements are not yet published in UL 62, UL cannot yet issue certifications for “-R” cords. Currently, UL’s Suzhou, China, laboratory is equipped for testing and UL wire and cable engineers are prepared to offer the following service options. These options are in addition to the expected availability of Listed “-R” cord when the revisions to UL 62 are adopted.

- **Letter Report** – Flexible cord manufacturers who submit their products to UL for certification to the “-R” cord requirements will receive a letter report that includes test results as well as details of the tested construction in an appendix. Through issuance of this report, flexible cord manufacturers can share with fan and heater manufacturers validation of their ability to comply with the “-R” flexible cord requirements. This will be accomplished without the need for an interim certification option and will not require end-product manufacturers to carry any unnecessary follow-up burdens or their associated costs. After the proposed requirements are included in UL 62 and no changes introduced that affect test performance, a customer may apply for certification of “-R” cord based on the previous test results obtained and documented in the letter report.
- **Unlisted Component Certification** – Testing can be conducted as described in the applicable end-product standard (UL 507, UL 1278 or UL 1042), as requested by end-product manufacturers. In some cases, these requirements are less stringent than those proposed in UL 62, especially for the flexing test. Flexible cords will be evaluated as unlisted components and will be required to comply with the wire and cable Follow-Up program for the basic cord type as well as the end product. The end-product manufacturer will bear responsibility for the ongoing compliance of the flexible cord with the enhanced end-product performance requirements.

FUS Procedure description

Because cord construction is critical in maintaining cord performance to the “-R” requirements, the construction of cord samples tested will be specifically documented in the description of the cord eligible to bear the “-R” suffix. These construction items include but are not limited to conductor size, conductor strand size, number of strands, lay length of conductor strands, lay of conductors, and fillers.

The material used is also critical to performance. Therefore, UL will also perform an infrared (IR) spectroscopy test on compounds. This will be checked during Follow-Up Services testing at UL to determine that the compound has not changed.

While the above-mentioned requirements are in the proposal stage for UL 62, it is anticipated that they will be published by end of 2009. In fact, makers of electric fans and room heaters have already started to make compliance with the “-R” requirements mandatory for their flexible cord suppliers. Wire and cable manufacturers should respond quickly to the change in customer needs. Being the first few able to supply “-R” cords is key to securing your market share and retaining your customers.

If you would like to submit your cords for evaluation or if you have further questions, please contact your local UL office. Contact information can be found at <http://www.ul.com/global/eng/pages/corporate/ulworldwide/>.

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