

Differences Between UL 6500, 2nd Edition and UL 1270, 1409, 1410, 1492

This compilation covers requirements in effect on 12/19/00.

| <u>1270</u> | <u>1409</u> | <u>1410</u> | <u>1492</u> | <u>Clause</u> | <u>Difference</u> |
|-------------|-------------|-------------|-------------|---------------|--|
| X | X | X | X | 1.1 | Scope |
| X | X | X | X | 4.1.4 | Normal temperature test done with apparatus placed in a wood box unless instruction manual provides specific instructions. Manufacturers will have to submit instruction manuals for evaluation and may have to submit samples for retesting |
| X | X | X | X | 4.1.6 | Pink noise signal used instead of 1 Khz for input and temperature tests. No retesting is contemplated as this requirement is similar to previous requirements. |
| X | X | X | X | 4.2.1 | Under normal operating conditions, the mains voltage can range between 90 - 110% of rated voltage. Previous test results will be evaluated to determine if retesting is necessary. |
| X | X | X | | 4.2.4 | Input power and normal temperature test is done at 1/8 maximum power. This is an increase. Previous test results will be evaluated to determine if retesting is necessary. |
| X | X | X | X | 4.3 | Potential of fire hazard is defined as > 35 V open circuit or > 200 ma at any load. Previous test results will be evaluated to determine if retesting is necessary |
| X | X | X | X | 4.3 | Fault conditions are applied only once per fault unless there is doubt about the test results. No retest is contemplated as this is less stringent than previous requirements |
| X | X | X | X | 4.3.1 | Under fault conditions, creepage and clearance distances not complying with Clause 13 may be short circuited. Manufacturers will have to submit samples for reevaluation and/or retesting. |

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| X | X | X | X | 4.3.2 | Under fault conditions, insulation not complying with Clause 10.3 may be short circuited. Manufacturers will have to submit samples for reevaluation and/or retesting. |
| X | X | X | X | 4.3.4 | Under fault testing, any circuit component may be short or open circuited. Exceptions are described in 4.3.4. No retesting is contemplated as this requirement is similar to previous requirements. |
| X | X | X | X | 4.3.5 | Under fault testing, an audio amplifier may be set to its maximum attainable output power using the most unfavorable load impedance. Manufacturers will have to submit samples for retesting. |
| X | X | X | | 4.3.9 | Under fault testing, mains socket outlets are loaded to 110% of the rating of the socket configuration. For most socket outlets this would be 110%(15 A)=16.5 A. Manufacturers will have to submit samples for retesting |
| X | X | X | X | 4.3.10 | Under fault testing, ventilation openings are blocked. Manufacturers will have to submit samples for retesting. |
| X | X | X | X | 4.3.11 | Under fault testing, user replaceable batteries may be inserted with reversed polarity. The circuit schematic will be evaluated to see if retesting is necessary. |
| X | X | X | X | 5 | Permanence of required markings is tested by rubbing with a solvent and with water. Manufacturers will have to submit samples for retesting |
| X | X | X | X | 5.1 | Double insulation symbol is required for Class II apparatus. Manufacturers will have to submit artwork of the new rating label |
| X | X | X | X | 5.1 (m) | Equipment that is sold with a rack must be marked to identify the individual components of the system which was evaluated. Manufacturers will have to submit a sample of the tag or label for evaluation. |

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| X | X | X | X | 5.1 | AC & DC input ratings must be denoted by a symbol. Manufacturers will have to submit artwork of the new rating label |
| X | X | X | X | 5.2(d) | <p>Amplifiers with an audio output power greater than 10 W measured at 1/8 non-clipped output power, must have a marking near the output terminals stating “Class 2 wiring”.</p> <p>Amplifiers with a maximum non-clipped output voltage greater than 300 V RMS must have a marking near the output terminals stating “Class 1 wiring”.</p> <p>Amplifiers with a maximum non-clipped output voltage greater than 120 V RMS but less than 300 V RMS must have a marking near the output terminals stating “Class 3 wiring”.</p> <p>Manufacturers will have to submit samples for testing and an evaluation of the proper markings.</p> |
| X | X | X | X | 5.4 | “Important Safeguards” section of the user’s instruction manual must be verbatim as written in the standard. Manufacturers may have to submit a draft of the revised instruction manual. |
| X | X | X | X | 7.1.1 (Table 2) | Under normal temperature test, allowable maximum temperatures are different. Previous test data will be evaluated to determine if the temperatures are acceptable. |
| X | X | X | X | 7.2 | Softening temperature rating of plastics used to support parts conductively connected to the mains must be 150 C minimum. Components that comply with the requirements of the relevant UL standard are exempted. Manufacturers will have to submit documentation concerning the insulating material and/or samples for evaluation. Parts affected will be evaluated to determine if they comply. |

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|-------------|-------------|-------------|-------------|---------------|--|
| X | X | X | X | 8.6 | Class II apparatus must have double or reinforced insulation between hazardous live voltages and accessible parts. Manufacturers will have to submit samples for evaluation. |
| X | X | | X | 8.6 | Capacitors and RC units, used to bridge double insulation must be suitable for double protection (see 14.2.1 (b)). Manufacturers will have to submit documentation, specifying components used in line to chassis or line to antenna configuration. |
| X | X | X | X | 8.9 | Internal wire insulation between hazardous live and accessible parts must be 0.4 mm minimum if made of PVC. Manufacturers will have to submit samples for evaluation. |
| X | X | X | X | 9.1.1 | Definition of hazardous live voltage is 35V peak (24.7 V RMS) or 60 VDC. Test data will be evaluated to determine if retesting is necessary. |
| X | X | X | X | 9.1.1 | Leakage current (touch current) is measured in MIU. No retesting is contemplated as this requirement is similar to previous requirements. |
| X | X | X | X | 9.1.1 | Allowable touch current is: 1.5 MIU for Class I commercial audio apparatus designed for rack mounting or stationary use 0.75 MIU for permanently connected apparatus 0.5 MIU for all other apparatus No retest is contemplated as this is less stringent than previous requirements. |
| X | X | X | X | 9.1.1 | Accessibility for Class II apparatus is judged with both the jointed test finger (Fig 14) and test probe 13 of IEC 61032. No retesting is contemplated as this requirement is similar to previous requirements. |
| X | X | X | X | 9.1.1 | Accessibility in the as received condition and after the impact test of 12.1.3 is determined by applying a 20 N force to the test finger. Manufacturers will have to submit samples for retesting |

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| X | X | X | X | 9.1.3 | Accessibility through top openings is judged by a 4 X 100 mm test pin. No retesting is contemplated as this requirement is less stringent than previous requirements. |
| X | X | X | X | 9.1.4 | Accessibility within a 25 mm radius of terminals is judged with Test Probe 16 of IEC 61032. Manufacturers will have to submit samples for retesting |
| X | X | X | X | 9.1.4 | Accessibility through the centers of terminals are judged with Test Probe D of IEC 61032. Manufacturers will have to submit samples for retesting. |
| X | X | X | X | 9.1.6 | Stored electric charge after mains plug withdrawal - the plug contacts shall not be live two seconds after withdrawal. The circuit schematic will be evaluated to determine if retesting is necessary. |
| X | X | X | X | 9.1.7 | Mechanical strength of enclosures is tested with: a) Test Probe 11 of IEC 61032 b) Test Hook described in Fig 4 c) 30 mm dia hemisphere This is in addition to the tests described in Clause 12. Manufacturers will have to submit samples for retesting. |
| X | X | X | X | 10.1 | Surge test is applied between mains and external terminals. The test consists of 50 discharges from a 1 nf capacitor. No retesting is contemplated as this requirement is similar to previous requirements. |
| X | X | X | X | 10.2 | Humidity treatment consists of 48 hr at 93 (+2,-3)% at 30 (+0,-2) C. No retesting is contemplated as this requirement is similar to previous requirements. |

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| X | X | X | X | 10.3 (Table 3) | Insulation resistance and dielectric strength is tested on: 1) parts of different polarity connected to mains 2) between parts separated by basic or supplementary insulation 3) between parts separated by reinforced insulation Manufacturers will have to submit samples for retesting |
| X | X | X | X | 11.2 | Under fault testing, the maximum time for flaming of any part or component is 10 sec. Previous test results will be evaluated to determine if retesting is necessary. |
| X | X | X | X | 11.2 | Maximum temperatures of various parts are measured under fault conditions. Limits are specified in Table 2. Previous test results will be evaluated to determine if retesting is necessary. |
| X | X | X | X | 11.2.3 | Printed circuit foils that rupture during a fault test must comply with the conditions specified in 11.2.3. No retest is contemplated as this is less stringent than previous requirements |
| X | X | X | X | 12.1.1 | Apparatus weighing more than 7 Kg are subjected to a bump test consisting of 50 repetitions of a 5 cm drop. Manufacturers will have to submit samples for retesting. |
| X | X | X | X | 12.1.2 | Vibration test is applied to: 1) transportable apparatus used for amplification of musical instruments 2) portable apparatus 3) apparatus having a metal enclosure Manufacturers will have to submit samples for retesting. |
| | X | X | | 12.1.4 | A drop test for portable apparatus has been added. Manufacturers will have to submit samples for testing. |
| X | X | X | X | 12.5 | Antenna coaxial sockets are subjected to endurance, impact and torque tests. Manufacturers will have to submit samples for retesting. |

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| X | X | X | X | 12.8 | The pass/fail criteria for the adhesive test has been changed. If a product relies on an adhesive to secure parts, manufacturers will have to submit samples for retesting. |
| X | X | X | X | 13. | Minimum creepage and clearance distances are specified in accordance with Fig 9. Manufacturers will have to submit samples for reevaluation. |
| X | X | X | X | 14.1 | An antenna discharge path resistor is not required to be used. However, if a resistor is connected between mains and accessible parts, the following applies: Discharge path resistors are not required to be Recognized components. However, they must pass the tests described in 14.1. Note, that these tests are different from the tests for a Recognized resistor under UL 1676. Manufacturers will have to submit samples for retesting. |
| X | X | X | X | 14.2 | Across line (X capacitors) and line bypass / antenna coupling (Y capacitors) may either be Recognized components to UL 1414 or comply with the requirements of IEC 60384-14. Capacitors or RC units that are not recognized to UL 1414 must also comply with the enclosure requirements of UL 1414. No retesting is contemplated as this requirement is similar to previous requirements. |
| X | X | X | X | 14.2.5 | Certain large (>1750 mm ³) plastic enclosed capacitors must be subjected to a flammability test. Manufacturers will have to submit samples for retesting. |
| X | X | X | X | 14.3 | Transformers must comply with the construction and dielectric strength requirements specified in 14.3. Transformers that comply with UL 1411 are not necessarily acceptable. Manufacturers will have to submit samples for reevaluation.. |

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| X | X | X | X | 14.5.2.2 | Fuse replacement marking is no longer required. However, the fuse rating, including the prearcing time / current characteristic is required. In addition, the fuse current rating must be in milliamps for rated currents below 1.0 Amp and in amperes for currents 1.0 Amp or greater. Manufacturers will have to submit samples of new art work for evaluation. |
| X | X | X | X | 14.2.4 | Externally mounted fuseholders must be wired so that there is no access to hazardous live parts during replacement of the fuse. No reevaluation is contemplated, as this reflects current practice. |
| X | X | X | X | 14.5.3 | PTC-s thermistors that are relied on to prevent a hazard shall be a Recognized component to UL 1434. This will apply primarily to PTC used in degaussing coil circuits. Manufacturers will have to submit documentation describing the PTC's used. |
| X | X | X | X | 14.6.1 | Permanently connected apparatus must be provided with an all poles mains switch. The switch contacts must have a minimum 3 mm gap when open. An exception is allowed if the installation instructions state that such a switch is provided in the building electrical installation. Manufacturers will have to submit documentation showing compliance. |
| X | X | X | X | 14.6.3 | Manually operated switches located in mains circuit shall have the "On" position indicated. Manufacturers will have to submit samples for reevaluation. |
| X | X | X | X | 14.6.3 | The "Off" position for manually operated mains switches shall not be indicated except for all poles switches. Manufacturers will have to submit samples for reevaluation. |
| X | X | X | X | 14.6.5 | Resisters, capacitors or RC units which bridge the contacts of mechanical switches shall comply with 14.1(a) or 14.2.2. Manufacturers will have to submit samples for reevaluation. |

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| X | X | X | X | 14.6.6 | Manual mechanical switches and relays shall comply with UL508 or IEC 61058-1 if the open circuit voltage across the contacts > 35V peak or 24 VDC and the current is 200 ma RMS or DC. Certain switches and relays used in the secondary circuit may be affected by this requirement. The circuit schematic will be evaluated to determine if changes are necessary. |
| X | X | X | X | 14.10.2 | If rechargeable batteries can be replaced by non-rechargeable batteries, special means must be provided to prevent charging of non-rechargeable batteries. Manufacturers will have to submit samples for evaluation. |
| X | X | X | X | 14.10.3 | For rechargeable batteries or lithium batteries, the battery manufacturer's permissible charge rate and discharge current cannot be exceeded under normal or fault conditions. Manufacturers will have to submit samples for retesting as well as provide the battery manufacturer's specifications. |
| X | X | X | X | 14.11 | Optocouplers shall comply with UL 1577 and have insulation thickness between input and output as specified in Clause 8. In addition, internal creepage and clearance distances shall comply with 13.1.1. Manufacturers will have to submit documentation on the components used. |
| X | X | X | X | 15.1.1 | For apparatus with socket outlets, overload protective devices must be provided to limit the total apparatus current draw (including the socket outlet) to no more than the rating of the apparatus mains plug. As the NEC specifies that plugs shall carry no more than 80% of their rating, the maximum overcurrent protector rating shall be 12 A for the standard 15 A rated plug. Manufacturers will have to submit samples for reevaluation |
| X | X | X | X | 15.2 | Supply apparatus (AC adapters) that have a 3 wire, earthed power supply cord (Class I construction) shall not have the earth connection at the output circuit. Manufacturers will have to submit samples for reevaluation. |

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|-------------|-------------|-------------|-------------|---------------|--|
| X | X | X | X | 15.2 | <p>Circuit earthing conductors may be bare or insulated. If insulated, the insulation must be green with yellow stripe.</p> <p>In addition, green/yellow wire insulation may only be used for earth connections and no where else in the circuit.</p> <p>Manufacturers will have to submit samples for reevaluation.</p> |
| X | X | X | X | 15.2 | <p>Grounding impedance test is performed using 25 A for 60 sec. The calculated impedance after 60 sec shall not exceed 0.1 ohm. Manufacturers will have to submit samples for retesting.</p> |
| X | X | X | X | 15.3.2 | <p>Apparatus with non-detachable power supply cords shall not have the supply or earth conductors directly soldered to the PWB. Manufacturers will have to submit samples for reevaluation.</p> |
| X | X | X | X | 16.1 | <p>3 wire, earthed non-detachable power supply cords shall use green with yellow stripe as the earthed conductor insulation. Manufacturers will have to submit samples for reevaluation.</p> |
| X | X | X | X | 16.5 | <p>In non-detachable , 3 wire earthed power supply cords, the earth conductor must have more slack than the supply conductors at the connection to apparatus. Manufacturers will have to submit samples for reevaluation.</p> |
| X | X | X | X | 16.5 | <p>Power supply cord strain relief test consists of 100, one sec applications of a 40 N force. Slippage from the strain relief bushing is limited to 2 mm max. Manufacturers will have to submit samples for retesting.</p> |
| X | X | X | X | 17.1 | <p>Screws that may be loosened and tightened several times during the life of the product shall be subjected to the tests described in 17.1. This applies to enclosure cover screws which may be removed for servicing the apparatus. Manufacturers will have to submit samples for retesting.</p> |

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| X | X | X | X | 17.3 | Screws securing covers of the enclosure shall be captive. Screws need not be captive if, when replaced with screws of a length 10 times the screw diameter, the creepage and clearance distances are within the limits specified in Clause 13. Manufacturers will have to submit samples for reevaluation. |
| X | X | X | X | 17.4 | Conductive parts permanently fixed together and carrying > 0.2 A across the interface, shall be secured so that loosening is prevented. This may be done with a) screws and locking devices, b) 2 screws or rivets; c) a rivet with a non-circular cross section; d) sealing compound in certain circumstances. Manufacturers may have to redesign certain parts and will have to submit samples for reevaluation. |
| X | X | X | X | 17.6 | Stranded conductors of supply cords that are connected to screw terminals shall not be pretinned with solder. Manufacturers may have to submit samples for reevaluation. |
| X | X | X | X | 17.8 | Detachable mounting brackets, legs, stands, casters or similar parts that are supplied by the apparatus manufacturer shall be delivered with the appropriate mounting screws, bolts, nuts, etc. The mounting screws, etc are not required if installation is to be done by a skilled person. Manufacturers will have to submit instruction manuals, with the assembly instructions, for reevaluation. |
| X | X | | | 19.2.1 | Apparatus weighing > 18 Kg is subjected to a horizontal force stability test. The test consists of a force of 100N or 20% of the apparatus weight, whichever is less, applied at a point between 100 cm to 150 cm above the floor. Manufacturers will have to submit samples of products, which weigh more than 18 Kg and are greater than 100 cm high, for retesting. |

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| X | X | X | X | 19.2.1 | For apparatus ≥ 25 Kg, the force is 90 N or 12% of the weight of the apparatus which ever is less. The force is applied at any point not exceeding 150 cm from the floor. Manufacturers will have to submit samples of products which weigh more than 25 Kg for retesting. |
| X | X | X | X | 20.1 20.1.1 | The definition of small parts for plastic flammability purposes is now $\leq 4g$ and $\leq 1750 \text{ mm}^3$. All parts, including electrical components shall now meet the flammability rating criteria of Clause 20 except for those parts covered by Clause 14. Manufacturers will have to submit samples for reevaluation. |
| X | X | X | X | 20.1.2 | Wiring located in a potential ignition source circuit or wiring that is in contact with wiring that is in a potential ignition source circuit, shall be rated VW-1. Potential ignition source is defined in 2.8.11. Manufacturers may have to submit samples for reevaluation if all of the wiring used is not rated VW-1. |
| X | X | X | X | 20.1.3 | Printed boards having available power > 15 W or > 50 V peak, are required to be rated V1 or better, Printed boards having available power >15 W and $> 400V$ peak are required to be rated V0. Manufacturers may have to submit samples for reevaluation. |
| X | | | | 20.2 | Enclosure material shall be rated V2 or better. If an internal fire enclosure, that meets the requirements of 20.2.1 and 20.2.2, is used, the outer enclosure need only be rated HB or better. Manufacturers of products evaluated under UL 1270 that used enclosure plastics rated HB will have to resubmit samples for mechanical strength of enclosure tests, Clause 12. |