The single colour green shall not be used to identify any live conductor except—

(i) at the discretion of the approvals authority where the conductor forms portion of complex wiring of equipment; or

(ii) where it is specified by an individual Approval and Test Specification.

23.7 Use of d-type fuse-bases In appliances intended to be permanently connected to fixed wiring, the bottom contact of D-type fuse-bases shall be directly connected to the terminal intended for the phase conductor of the supply.

23.8 Use of aluminium conductors Aluminium conductors shall not be used for internal wiring.

NOTES:

1 The introduction of suitable international tests to judge whether aluminium wires can be allowed is under consideration.

201 Windings of motors, transformers, and the like are not considered as internal wiring, provided that they are terminated at the component.

Compliance with the requirements of Clauses 23.6 to 23.8 is checked by inspection.

23.9 Use of lead-tin soldering Stranded conductors shall not be consolidated by lead-tin soldering where they are subject to contact pressure, unless the clamping means is so designed that there is no risk of bad contact due to cold flow of the solder.

NOTES:

1 Consolidation of stranded conductors by lead-tin soldering is allowed if spring terminals are used; securing the clamping screws alone is not considered adequate.

2 Soldering of the tip of a stranded conductor is allowed.

24 COMPONENTS

24.1 General Components shall comply with the safety requirements specified in the relevant particular Standard as far as they reasonably apply.

If components are marked with their operating characteristics, the conditions under which they are used in the appliance shall be in accordance with these markings, unless a specific exception is made.

Capacitors shall be marked with their rated voltage, and their rated capacitance in microfarads.

The testing of components which have to comply with relevant particular Standards is, in general, carried out separately, according to the relevant Standard as follows:

If the component is marked and used in accordance with its marking, it is tested in accordance with its marking, the number of samples being that required by the relevant Standard.

Where no Standard exists for the relevant component or where the component is not marked, or is used not in accordance with its marking, the component is tested under the conditions occurring in the appliance, the number of samples being, in general, that required by a similar Standard.

For capacitors connected in series with a motor winding, it is verified that, when the appliance is operated at a voltage equal to 1.1 times rated voltage and under minimum load, the voltage across the capacitor does not exceed 1.1 times the rated voltage of the capacitor.

Switches not marked with individual ratings are tested under the conditions occurring in the appliance as follows.

The currents and their corresponding power factors occurring in the switch during operation in accordance with conditions of adequate heat discharge or under normal load or both of the appliance, are measured.

The switch may then be tested separately in accordance with AS 3133 (NZS/AS 3133). The current and power factor measured under conditions of adequate heat discharge or normal load or both being used for the testing purposes.

NOTES:

1 Components incorporated in the appliance are subjected to all the tests of this Standard as part of the appliance.

2 Compliance with the Standard for the relevant component does not necessarily ensure compliance with the requirements of this Standard.

3 A specific exception with regard to the testing of switches and thermostats is made in Footnote (c) to Table 2.

201 The endurance test of Clause 10.7 of AS 3161 (NZS/AS 3161) is not carried out on automatic controls which operate under the conditions of Clause 11 if the appliance meets all the requirements of this Standard when the controls are short-circuited.

24.2 Prohibited components Appliances shall not be fitted with—

(a) switches or automatic controls in flexible cables or cords;

(b) devices which, in the event of a fault in the appliance, cause the interruption of the supply by applying a short-circuit; or

(c) thermal cutouts which can be reset by a soldering operation.

Socket-outlets for supplying other appliances shall not be permitted except in the following circumstances:

(i) Where the equipment is basically providing a switching or control function.

(ii) Where there is little likelihood of cascading of similar appliances which could result in circuit overloading and extension of fault conditions.

24.3 Switches Switches intended to disconnect the appliance from the supply and directly connected to the supply terminals of stationary appliances shall disconnect all active poles.

This requirement does not apply to appliances which are accompanied by an instruction sheet as specified in Clause 7.12 or are provided with a power supply cord and a plug.

If a single-phase Class I appliance with heating elements, which is intended to be permanently connected to fixed wiring, is provided with single-pole switches or single-pole protection devices intended to disconnect the heating element from the supply, these shall be connected, inside the appliance, in the active conductor supplying the heating elements.

Any switch incorporated in an appliance shall be a Category 1, 2 or 3 switch as indicated in the individual Approval and Test Specification.

A Category 1 switch shall comply with the relevant requirements of AS 3133 (NZS/AS 3133) and its 'OFF' position shall be marked in accordance with Clause 7.10 herein.

A Category 2 switch shall comply with the relevant requirements of AS 3133 (NZS/AS 3133) and its 'OFF' position need not be marked.

A Category 3 switch shall satisfy the test requirements of Clauses 13.2, 13.3 and 13.4 of AS 3133 (NZS/AS 3133) and its 'OFF' position need not be marked. In addition, it shall be subjected to 50 operations of making and breaking the normal load current at the maximum rated voltage and power factor of the circuit it controls, in accordance with Clause 13.5.5 and Table 2 of AS 3133 (NZS/AS 3133), except that, where appropriate for

circuits including motors, the test current and power factor shall be the equivalent current and power factor of the circuit which the switch controls, with the rotors locked. The rate of operation shall be in accordance with Clause 13.10 of AS 3133 (NZS/AS 3133).

In addition, where Category 1 and 2 switches control circuits containing motors, these switches shall be subjected to a further 50 operations. The test current and power factor shall be equivalent to the current and power factor of the circuit with rotors locked, and the rate of operation shall be in accordance with Clause 13.10 of AS 3133 (NZS/AS 3133).

At the completion of this test the switch shall be inspected and shall be in such condition that it is still capable of normal operation.

A Category 1 switch shall be used when—

(a) the appliance is intended for connection to the supply by a plug and flexible cord;

(b) notwithstanding Clause 8, it is not usual or possible to guard live parts completely against personal contact, because of the intended use and generally accepted practice with any particular equipment; and

(c) the equipment is of a type which is usually left connected to the socket-outlet indefinitely, and has not been provided with a means to indicate whether it is energized or not.

NOTES:

201 The specification of a particular category of switch in an individual Standard does not necessarily preclude the use of a switch with a lower category number.

202 Typical examples of appliances to which conditions (a) to (c) could apply include automatic toasters.

203 A Category 3 switch, tested to the above requirements, would not automatically qualify for an 'M' rating in accordance with AS 3133 (NZS/AS 3133).

Compliance with the requirements of Clauses 24.2 and 24.3 is checked by inspection.

24.4 Sockets The following shall not be interchangeable with plug and socket-outlets complying with Figure 2.1 of AS/NZS 3112, nor with Group 3 appliance couplers complying with AS 3109.1.

(a) Plug-in elements.

(b) Group 2 appliance couplers complying with AS 3109.1.

(c) Connectors and appliance inlets for extra-low voltage circuits.

24.5 Connecting devices used for intermediate connections Plugs and socket-outlets and other connecting devices on flexible cables or cords, used for an intermediate connection between different parts of an appliance, shall not be interchangeable with plugs and socket-outlets complying with Figure 2.1 or Figure E1 of AS/NZS 3112, or with Group 3 appliance couplers complying with AS 3109.1, if direct supply of these parts from the mains could cause danger to persons or surroundings, or damage to the appliance.

Compliance with the requirements of Clauses 24.4 and 24.5 is checked by inspection and by manual test.

NOTE 201: Socket-outlets which are not accessible to the user, and are used for intermediate connection, are not considered to be general purpose outlets.

24.6 Lampholders Lampholders shall be used only for the connection of lamps.

24.7 Series resistors of glow-discharge lamps For glow-discharge lamps with E10 caps used as indicator lamps, the series resistors shall be incorporated in the appliance.

24.8 Thermal cutouts Capacitors shall not be connected between the contacts of a thermal cutout.

24.9 Switch required for mobile motor-operated appliances Motor-operated appliances which are moved while in operation shall be fitted with a switch in their supply circuit.

24.10 Mercury switches Mercury switches shall be so mounted that the mercury capsule cannot fall out of position or be damaged by its clamping means and they shall be so arranged that, should the capsule break, liquid or vaporous mercury cannot be released so as to contaminate the surroundings.

Compliance with the requirements of Clauses 24.6 to 24.10 is checked by inspection.

24.11 Class I appliances with heating elements For Class I appliances with heating elements, which are intended for use unattended, but not intended to be permanently connected to fixed wiring, any thermal cutout, protecting against over-heating of an element, shall disconnect all poles, unless a temperature-sensing device is connected, inside the appliance, in each conductor supplying the heating element.

Compliance is checked by inspection.

NOTE: This requirement may be met by inserting a thermostat in one conductor and a thermal cutout or thermal link in the other conductor.

24.201 Electronic regulating devices and switches Electronic thermostats and electronic switches without a mechanical switch in the main circuit may not provide a reliable off-state. Therefore, the circuit on the load side shall be considered to be live.

25 SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS

25.1 Means of connection Appliances, other than those provided with pins intended to be introduced into fixed socket-outlets, shall be provided with one of the following means of connection to the supply:

(a) A set of terminals for permanent connection to fixed wiring.

(b) An appliance inlet.

(c) A power supply cord.

Appliances shall not be provided with more than one means of connection to the supply, with the exception that stationary appliances for multiple supply intended to be permanently connected to fixed wiring may be provided with more than one set of terminals, provided that the relevant circuits are adequately insulated from one another.

Compliance is checked by inspection and, for appliances of multiple supply, by the following test:

A voltage of 1250 V, of substantially sine-wave form and having a frequency of 50 Hz, is consecutively applied, for 1 min, between each set of terminals or supply leads, connected together, and all other terminals or supply leads connected together, any switches in the circuit being in the most unfavourable position.

During this test, no flashover or breakdown shall occur.

NOTES:

1 A multiple supply is, for example, required for day and night supply at different tariffs.

2 This test may be combined with that of Clause 16.4.

25.2 Provision of connection facility Fixed appliances intended to be permanently connected to fixed wiring shall allow the connection of the supply wires after the appliance has been fixed to its support, and shall be provided with cable entries, conduit entries, knockouts or glands, which allow the connection of the appropriate types of cable or conduit.

Conduit entries, cable entries and knockouts shall be so designed or located that the introduction of the conduit or cable does not affect the protection against electric shock, or reduce creepage distances and clearances below the values specified in Clause 29.1.

Appliances not intended to be permanently connected to fixed wiring, other than those provided with pins intended to be introduced into fixed socket-outlets, shall be provided with—

(a) a power supply cord; or

(b) an appliance inlet.

Appliances with degrees of protection IPX1 to IPX8 of AS 1939 shall not be provided with an appliance inlet.

NOTE: If a fixed appliance is so designed that certain parts can be removed to promote easy installation, the first requirement is considered to be met if it is possible to connect the supply wires without difficulty after a part of the appliance has been fixed to its support, provided that removable parts can then be easily reassembled to the part which has been fixed in position, without risk of incorrect assembly or damage to the wiring and without exposing the wiring to stress during the assembly, which may cause damage to the terminations or to the insulation of the wires.

Compliance is checked by inspection, by measurement and by an installation test.

25.3 Appliance inlets Appliance inlets shall—

(a) be so located or enclosed that live parts are not accessible during insertion or removal of the connector;

(b) be so placed that the connector can be inserted without difficulty;

(c) be so placed that, after insertion of the connector, the appliance is not supported by the connector for any position of normal use on a flat surface; and

(d) not be an appliance inlet for cold conditions if the appliance has external metal parts the temperature rise of which exceeds 75°C during the test of Clause 11, unless the design of the appliance is such that the power supply cord is not likely to touch such metal parts in normal use.

Compliance is checked by inspection and, with regard to Item (a) by means of the standard test finger shown in Figure 1, for appliance inlets other than those standardized in AS 3109.1.

NOTE: Appliances provided with appliance inlets, complying with AS 3109.1, are considered to comply with Item (a) above.

25.4 Power supply cord assembly Power supply cords shall be assembled with the appliance by one of the following methods:

(a) Type X attachment.

(b) Type Y attachment.

(c) Type Z attachment, if specifically allowed in the particular standard.

Compliance is checked by inspection and, if necessary, by manual test.

If the use of power supply cords of special construction is necessary, Type X attachment shall not be used.

Type X attachment shall not be used for flat twin tinsel cords, unless they are a specially prepared cord.

25.5 Fitting of plugs Plugs shall not be fitted with more than one flexible cord.

Power supply cords of single-phase portable appliances having a rated current not exceeding 20 A shall be provided with an appropriate plug complying with AS/NZS 3112.

Any appliance with a current rating above 10 A but not exceeding 20 A, which is intended for connection by flexible cord and plug to a socket-outlet, shall have a prominent and durable notice affixed adjacent to the power supply cord inlet opening of the appliance to indicate that it must be connected only to a socket-outlet of appropriate current rating.

Compliance is checked by inspection.

25.6 Power supply cord general requirements Power supply cords shall—

(a) comply with AS 3191 (NZS/AS 3191);

(b) have a length of not less than—

(i) 0.9 m for tabletop or bench-mounted appliances; or

(ii) 1.8 m for other appliances; and

(c) be not lighter than—

(i) if elastomer insulated, ordinary duty sheathed flexible cord; or

(ii) if polyvinyl chloride insulated—

(A) for appliances having a mass not exceeding 3 kg, light duty sheathed flexible cord; or

(B) for appliances having a mass exceeding 3 kg, ordinary duty sheathed flexible cord; or

(iii) braided flexible cord, if specifically allowed in the particular Standard; or

(iv) flat twin tinsel cord, if specifically allowed in the particular Standard.

Polyvinyl chloride insulated flexible cords shall not be used for appliances having external metal parts, the temperature rise of which exceeds 75°C during the tests of Clause 11, unless the design of the appliance is such that the power supply cord is not likely to touch such metal parts in normal use or, for Type X attachment having a specially prepared cord and Type Y and Type Z attachments, the power supply cord is appropriate for higher temperatures.

For Class I appliances, the power supply cord shall be provided with a green or green/yellow core, which is connected to the internal earthing terminal of the appliance and to the earthing contact of the plug.

Conductors of power supply cords shall not be consolidated by lead-tin soldering where they are subject to contact pressure, unless the clamping means is so designed that there is no risk of a bad contact due to cold flow of the solder.

Power supply cords shall not be exposed to sharp points within, or cutting edges of, the surface of the appliance.

Power supply cords shall have a nominal cross-sectional area not less than those shown in Table 10.

The length of the power supply cord shall be measured from the body of the equipment at the point where the cord or appliance connector enters the body, irrespective of the length of any cord protector, to the centre of the live pins on the face of the plug.

Compliance is checked by inspection and by measurement.

NOTE: The requirement concerning the consolidation of the conductors of power supply cords may be met by using spring terminals. Securing the clamping screws alone is not considered adequate.

25.7 Moulding-on of cord For Type Z attachment, moulding together the enclosure of the appliance and the power supply cord shall not affect the insulation of the cord.

Compliance is checked by inspection.

NOTES: See Clause 25.4, Item (d).

TABLE 10

MINIMUM NOMINAL CROSS-SECTIONAL AREA OF POWER SUPPLY CABLES AND CORDS

1		2
Rated current of appliance A		**Nominal cross-sectional area mm^2**
	≤0.2	Tinsel cord*
>0.2	≤3	0.5†
>3	≤7.5	0.75
>7.5	≤10	1
>10	≤16	1.5
>16	≤25	2.5
>25	≤32	4
>32	≤40	6
>40	≤63	10

* This type of cord is only allowed if specifically stated in the relevant particular Standard and if the length of the power supply cord measured between the point where the cord, or cord guard, enters the appliance, and the entry to the plug, does not exceed 2 m. There is no cross-sectional area specified for tinsel flexible cords (see AS 1125 for constructional details).

† This nominal cross-sectional area is only allowed for Class II appliances if the length of the power supply cord, measured between the point where the cord, or cord guard, enters the appliance, and the entry to the plug, does not exceed 2 m. (A 0.5 mm^2 three-core supply flexible cord is not permitted. See Note 2 to Table 2.17 of AS 3191 (NZS/AS 3191).

25.8 Insulation at cord entry Inlet openings shall be so designed and shaped, or shall be provided with an inlet bushing, such that the protective covering of the power supply cord can be introduced without risk of damage.

The insulation between the conductor and the enclosure shall consist of the insulation of the conductor and, in addition—

(a) for Class I appliances . . . . . of at least one separate insulation; and

(b) for Class II appliances . . . . . of at least two separate insulations.

A separate insulation as specified in (a) and (b) above shall consist of—

(i) the sheath if a power supply cord at least equivalent to that of a flexible cord complying with AS 3191 (NZS/AS 3191);

(ii) a lining of insulating material complying with the requirements for supplementary insulation;

(iii) a bushing of insulating material complying with the requirements for supplementary insulation, in the case of metal enclosures; or

(iv) an enclosure of insulating material, in which case two separate insulations are not necessary.

25.9 Inlet bushings Inlet bushings shall—

(a) be so shaped as to prevent damage to the power supply cord;

(b) be reliably fixed;

(c) not be removable without the aid of a tool;

(d) not, for Type X attachment, without a specially prepared cord, be integral with the power supply cord; and

(e) not be natural rubber, except if it is an integral part of the rubber sheath of the power supply cord for Type X attachment with specially prepared cord or Type Y and Type Z attachments for Class I appliances.

Compliance with the requirements of Clauses 25.8 and 25.9 is checked by inspection and by manual test.

25.10 Cord guards Appliances provided with a power supply cord and which are moved while in operation, except those having a cord reel, shall be so constructed that the cord is adequately protected against damage caused by excessive flexing where it enters the appliance.

Compliance is checked by the following test which is made on an apparatus having an oscillating member as shown in Figure 12:

The part of the appliance comprising the cord entry, the cord guard, if any, and the power supply cord, is fixed to the oscillating member so that, when the latter is at the middle of its travel, the axis of the cord where it enters the cord guard or inlet is vertical and passes through the axis of oscillation. The major axis of the section of flat cords shall be parallel to the axis of oscillation.

The cord is loaded so that the force applied is—

(a) 10 N for cords having a nominal cross-sectional area exceeding 0.75 mm^2; or

(b) 5 N for other cords.

The distance A, as shown in the figure, between the axis of oscillation and the point where the cord or cord guard enters the appliance, is so adjusted that when the oscillating member moves over its full range the cord and load make the minimum lateral movement.

The oscillating member is moved through an angle of 90° (45° on either side of the vertical), the number of flexings for Type Z attachment being 20 000 and for other attachments 10 000. The rate of flexing is 60 per minute.

NOTE: A flexing is one movement, either backwards or forwards.

After half the number of flexings specified, samples, except those with flat cords, are turned through an angle of 90°.

During the test, the rated current of the appliance is passed through the conductors, the voltage being equal to the rated voltage of the appliance. Current is not passed through the earthing conductor.

The test shall not result in—

(i) short-circuit between the conductors;

(ii) a breakage of more than 10% of the strands of any conductor;

(iii) separation of the conductor from its terminal or termination;

(iv) loosening of any cord guard;

(v) damage, within the meaning of this Standard, to the cord or any cord guard; or

(vi) broken strands of the conductors piercing the insulation so as to become accessible.

NOTES:

1 Conductors include earthing conductors.

2 A short-circuit between conductors of the cord is considered to occur if the current exceeds a value equal to twice the rated current of the appliance.

25.11 Cord anchorages Appliances provided with a power supply cord shall have cord anchorages such that the conductors are relieved from strain, including twisting, where they are connected within the appliance and that the insulation of the conductors is protected from abrasion.

Cord anchorages shall be arranged so that they are either only accessible with the aid of a tool, or so designed that the cable or cord can only be fitted with the aid of a tool.

For Type X attachment without a specially prepared cord, glands shall not be used as cord anchorages in portable appliances, unless they have provision for clamping all types and sizes of cords which might be used as the power supply cord, and production methods, such as moulded-on designs, tying the cable or cord into a knot or tying the ends with string are not allowed; labyrinths or similar means are permitted, provided that it is clear how the power supply cord is to be assembled.

For Type X attachment without a specially prepared cord, cord anchorages shall be so designed or located that—

(a) replacement of the cord is easily possible;

(b) it is clear how the relief from strain and the prevention of twisting are to be obtained;

(c) they are suitable for the different types of cord which may be connected, unless the appliance is so designed that only one type of cord can be fitted;

(d) the cord cannot touch the clamping screws of the cord anchorages, if these screws are accessible or electrically connected to accessible metal parts;

(e) the cord is not clamped by a metal screw which bears directly on the cord;

(f) they are re-usable and inadvertent assembly of the component parts in the wrong position is not possible;

(g) screws, if any, which have to be operated when replacing the cord do not serve to fix any other component, unless, when omitted or incorrectly mounted, they render the appliance inoperative or clearly incomplete or unless the parts intended to be fastened by them cannot be removed without the aid of a tool during the replacement of the cord;

(h) for glands, the cable or cord cannot be released by overtightening the gland;

(i) for Class I appliances, they are of insulating material or are provided with an insulating lining, if an insulation fault on the cord could make accessible metal parts alive;

(j) for Class II appliances, they are of insulating material, or, if of metal, are insulated from accessible metal parts by insulation complying with the requirements for supplementary insulation; and

(k) if of metal and of the floating type, they cannot come into contact with live parts.

For Type X attachment having a specially prepared cord and Type Y and Type Z attachments, the cores of the power supply cord shall be insulated from accessible metal parts by insulation complying with the requirements for basic insulation for Class I appliances and complying with the requirements for supplementary insulation for Class II appliances.

This insulation shall consist of—

(i) a separate insulating lining fixed to the cord anchorage;

(ii) a special sleeve or grommet fixed to the cord; or

(iii) for Class I appliances, the sheath of a sheathed cord.

For Type X attachment having a specially prepared cord and Type Y attachments, cord anchorages shall be so designed that—

(A) the replacement of the power supply cord does not impair compliance with this Standard;

(B) the cord cannot touch clamping screws of the cord anchorage, if these screws are accessible or electrically connected to accessible metal parts;

(C) the cord is not clamped by a metal screw which bears directly on the cord;

(D) For Type X attachment having a specially prepared cord, knots in the cord are not used;

(E) For Type X attachment having specially prepared cord, attachments in the case of labyrinths and similar means, it is clear how the power supply cord is to be fitted; and

(F) for Type X attachment having a specially prepared cord, it is clear how the relief from strain and prevention of twisting is to be obtained.

Compliance is checked by inspection and by the following test:

For Type X attachment without a specially prepared cord, the appliance is fitted with a suitable power supply cord. The conductors are introduced into the terminals, the terminal screws, if any, being tightened just sufficiently to prevent the conductors from easily changing their position. The cord anchorage is used in the normal way, its clamping screws being tightened with a torque equal to two-thirds of that specified in Clause 28.1.

Screws of insulating material bearing directly on the cable or cord are fastened with two-thirds of the torque specified in Column 2 of Table 16, the length of the slot being taken as the nominal diameter of the screw.

Glands used as a cord anchorage are tightened with two-thirds of the torque used for the test of Clause 21.3.

The tests are made with the lightest and heaviest type of cord which is permissible and of the current rating appropriate to the appliance, unless the appliance is so designed that only one type of cord can be fitted.

For Type X attachment having a specially prepared cord and Type Y and Type Z attachments, the appliance is tested with the cord as delivered. It shall not be possible to push the cord into the appliance to such an extent that the cable or cord, or internal parts of the appliance, could be damaged.

The cord is then subjected 25 times to a pull of the value shown in Table 11. The pulls are applied in the most unfavourable direction without jerks, each time for 1 s.

Immediately afterwards, the cable or cord, other than that of an automatic cord reel, is subjected for 1 min to a torque of the value shown in Table 11.

For Type X having a specially prepared cord and Type Y and Type Z attachments any additional sleeving used for cord protection purposes shall not be totally displaced from its anchorage point when tested as follows:

The sleeving shall be tested separately after the cord anchorage test in accordance with the method specified in this Clause, however, the pull shall be 30 N and the torque test shall not be applied.

During the tests, the cord shall not be damaged.

After the tests, the cord shall not have been longitudinally displaced by more than 2 mm and the conductors shall not have moved over a distance of more than 1 mm in the terminals, nor shall there be appreciable strain at the connection.