(ii) supplies electrical equipment that is not capable of causing an overload current and the conductor has no branch circuits or socket-outlets connected between the origin of the conductor and the electrical equipment; or

(iii) is provided for installations of telecommunications, control, signalling and the like.

NOTES:

1 A heating appliance is an example of equipment not capable of causing an overload current.

2 Examples of omission of overload protection are shown at Figures 2.6 and 2.7.

2.5.4 Protection against short-circuit current

NOTE: The requirements of this Clause only take into account cases of short-circuit anticipated between conductors belonging to the same circuit.

2.5.4.1 *Determination of prospective short-circuit current*

The prospective short-circuit current at every relevant point of the electrical installation shall be determined either by calculation or by measurement.

* **2.5.4.2** *Characteristics of short-circuit protective devices*

Short-circuit protective devices shall meet the following conditions:

(a) The breaking capacity shall be not less than the prospective short-circuit current at the point where the devices are installed.

Exception: A device having a lower breaking capacity is permitted if another protective device having the necessary breaking capacity is installed on the supply side. In this case, the characteristics of the devices shall be coordinated so that the energy let through by these two devices does not exceed that which can be withstood without damage by the device on the load side and the conductors protected by those devices.

NOTE: In certain cases, other characteristics may need to be taken into account, such as dynamic stresses and arcing energy, for the device on the load side. Details of the characteristics needing coordination should be obtained from the manufacturers of the devices concerned.

(b) All currents caused by a short-circuit occurring at any point of a circuit shall be interrupted before the temperature of the conductors reaches the permissible limit.

For short-circuits of duration up to 5 s, the time in which a given short-circuit current will raise the conductors from the highest permissible temperature in normal duty to the maximum permissible short-circuit temperature may, as an approximation, be calculated from the following equation:

$$t = \frac{K^2 S^2}{I^2} \qquad \ldots 2.4$$

where

t = duration, in seconds

K = factor dependent on the material of the conductor, the insulation and the initial and the final temperatures

S = cross-sectional area of the conductor, in mm^2

I = effective short-circuit current, in amps (r.m.s)

NOTES:

1 Values of K for conductors in various conditions of service are given in the AS/NZS 3008.1 series, e.g.—

For PVC insulated copper conductors of cross-sectional area not more than 300 mm^2, K = 111 for 75°C initial conductor temperature.

2 For very short duration (<0.1 s) where asymmetry of the current is of importance and for current limiting devices, K^2S^2 should be greater than the value of the let-through energy (I^2t) stated by the manufacturer of the protective device.

3 The nominal current of the short-circuit protective device may be greater than the current-carrying capacity of the cable.

4 Other methods of calculation are permissible.

2.5.4.3 *Position of devices for short-circuit protection*

In accordance with Clause 2.5.1.3, a device providing protection against short-circuit shall be installed at the origin of every circuit and at each point where a reduction occurs in the current-carrying capacity of the conductors.

Exception: In accordance with the conditions set out in Clauses 2.5.4.4 and 2.5.4.5, a short-circuit protective device may be located in another position or may be omitted.

NOTE: Such devices may be circuit-breakers with a short-circuit release or HRC fuses.

* **2.5.4.4** *Alternative position of short-circuit protective device*

2.5.4.4.1 *General*

A device providing protection against short-circuit current may be placed at another point in the circuit under the conditions of Clauses 2.5.4.4.2 or 2.5.4.4.3.

* **2.5.4.4.2** *Condition 1*

The part of the conductor between the point of reduction of cross-sectional area or other change and the position of the protective device shall be such that—

(a) its length does not exceed three metres; and

(b) it is protected mechanically or otherwise so that the risk of short-circuit is reduced to a minimum; and

compartments and relies, for its effectiveness, on compartment access doors being closed during a fault. It is not designed to prevent the initiation of a fault during maintenance and is also not designed to provide switching operator or maintenance personnel protection if any covers are not properly fixed in place.

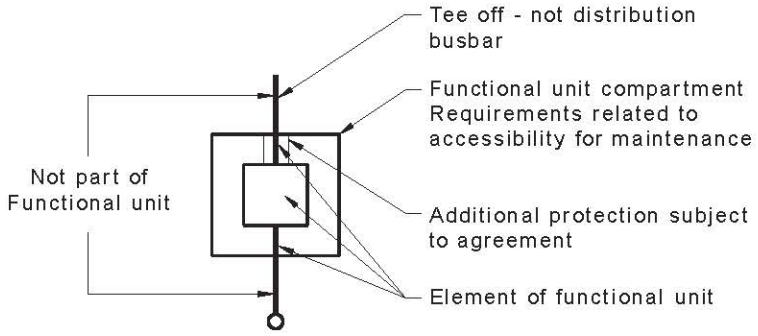


FIGURE 2.11 PARTS OF FUNCTIONAL UNITS

2.5.5.3 *Limitation of the harmful effects of a switchboard internal arcing fault*

Protective devices shall be provided to limit, as far as practicable, the harmful effects of a switchboard internal arcing fault by automatic disconnection.

The arcing fault current between phases, or between phase and earth, is deemed to be in the range of 30% to 60% of the prospective short-circuit current.

Protection shall be initiated, i.e. pick up at a current less than 30% of the three-phase prospective fault level.

To minimize damage to the switchboard, the interrupting time shall not exceed the value obtained from the following equation.

The general damage limit is given by the following:

$$\text{Clearing time } t = \frac{k_e \times I_r}{I_f^{1.5}} \quad \ldots 2.5$$

where

t = clearing time, in seconds

I_f = 30% of the prospective fault current

I_r = current rating of the switchboard

k_e = 250 constant, based on acceptable volume damage

Example:

The maximum arcing fault clearing time at a customer's 800 A-rated main switchboard with a prospective fault current at the switchboard of 16.67 kA.

Therefore—

I_f = *30% of 16.67 kA = 5 kA*

$$t = \frac{250 \times 800}{5000^{1.5}} = 0.57\ s$$

i.e. the protective device settings are set to clear an arcing fault of 5 kA in less than 0.57 s.

NOTE: Overcurrent protective devices should be set to as low an initiation current as possible while still maintaining the correct function of the installation, e.g. set higher than motor-starting currents.

Earth fault protective devices shall have a maximum setting of 1200 A.

The settings of protective devices shall be verified by inspection [see Clause 8.2.2(c)(ii)].

NOTE: The electricity distributor should be consulted for discrimination requirements between installation protective devices and the electricity distributor's service protective devices. The curves and settings of service protective devices will be required.

Where arc detectors are used, immunity to extraneous light sources that may cause operation of the protection is necessary. Arc detectors do not obviate requirements for discrimination.

2.5.6 Coordination of overload and short-circuit protective devices

2.5.6.1 *Protection afforded by one device*

An overload protective device that complies with Clause 2.5.3 and has a breaking capacity not less than the value of the prospective short-circuit current at its point of installation may be deemed to protect the conductor on the load side of that point against short-circuit currents and overload currents.

NOTE: This consideration may not be valid for short-circuit currents lower than the prospective value, or for certain types of circuit-breakers, especially non-current-limiting types. Its validity should be checked, in accordance with the requirements of Clause 2.5.4.2.

* #### 2.5.6.2 *Protection afforded by separate devices*

The requirements of Clauses 2.5.3 and 2.5.4 apply respectively to the overload protective device and to the short-circuit protective device.

The characteristics of the devices shall be coordinated so that the energy let through by the short-circuit protective device does not exceed that which can be withstood without damage by the overload protective device in accordance with Clause 2.5.4.5(a).

The selection of protective devices shall be verified by inspection [see Clause 8.2.2(c)(ii)].

2.5.7 Reliability of supply

2.5.7.1 *General*

The electrical installation shall be designed to provide a reliable supply by dividing the electrical installation into appropriate circuits and selecting protective devices with appropriate discrimination (selectivity) so that in the event of a fault occurring, the loss of supply resulting from operation of a protective device is minimized.

The selection and setting of protective devices shall be verified by inspection [see Clause 8.2.2(c)(ii)].

2.5.7.2 *Coordination of protective devices*

* **2.5.7.2.1** *General*

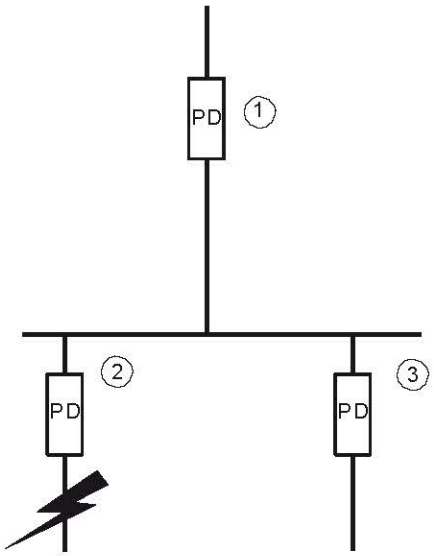
Coordination of protective devices requires consideration of both discrimination (selectivity) and backup (cascading) protection.

Discrimination (selectivity) between protective devices depends on the operating characteristics of two or more protective devices such that the protective device for the downstream circuit shall operate for a given fault current while the protective device(s) for the upstream circuit shall not operate.

Backup (cascading) depends on the characteristics of each of the two devices as well as the behaviour of the two devices when operating in series. This includes the energy let through when sharing the fault as well as the peak current withstand of the downstream device.

NOTE: Manufacturer's instructions/data should be used where available.

Figure 2.12 provides a generic overview of discrimination (selectivity) between protective devices.



NOTES:

1 Discrimination (selectivity) is achieved when PD 1 remains intact while PD 2 clears a fault on the load side. Thus supply is maintained to PD 3 and the remainder of the electrical installation.

2 For examples and detailed requirements of compliant time-current curves, see Figures 2.13 to 2.18.

3 Discrimination (selectivity) need not apply where protective devices are in series on the same circuits such as in UPS connected supplies.

FIGURE 2.12 DISCRIMINATION/SELECTIVITY BETWEEN PROTECTIVE DEVICES—GENERAL

* **2.5.7.2.2** *Safety service circuit discrimination (selectivity)*

A fault current up to the level of an arcing fault current—

(a) on one safety service circuit shall not result in loss of supply to other safety service circuits; and

(b) on the general electrical installation shall not result in loss of supply to safety services.

Discrimination (selectivity) shall be provided between protective devices up to the level of an arcing fault current, which is deemed to be in the range of 30% to 60% of the prospective short-circuit current in accordance with Clause 7.2.3.5.

NOTE: An example of protective devices and the arcing fault current is shown in Figure 2.13.

* **2.5.7.2.3** *General supply circuit discrimination (selectivity)*

In accordance with Clause 2.5.7.1, to minimize loss of supply, discrimination (selectivity) shall be arranged between protective devices for outgoing circuits and the upstream protective device.

Discrimination is achieved using a discrimination study, the ratios shown below or manufacturer's data and tables. Circuit-breakers with curves shown in AS/NZS IEC 60947.2:2015 Figure K.1, current limiting and reflex tripping circuit-breakers may require special consideration.

Discrimination need not apply above the arcing fault current I_{arc} which is deemed to be in the range of 30% to 60% of the prospective short-circuit current.

Discrimination need not apply where protective devices are in series on the same circuit such as in UPS connected supplies.

Refer to Figure 2.13.

Downstream devices shall be selected to discriminate (provide selectivity) with upstream devices, using time-current curves, in accordance with the following:

(a) *Circuit-breakers* Two circuit-breakers, connected such that C_2 is the downstream device and C_1 the upstream device, shall be selected:

(i) For ratings of C_2 greater than or equal to 800 A, discrimination shall be provided by a coordination study using manufacturer's data.

NOTE: Curve references are found in AS/NZS IEC 60947.2:2015, Figure K.1.

Allowance for tolerances on settings may be required. Refer to Figure 2.14.

(ii) For ratings of C_2 greater than 250 A, and less than 800 A, discrimination shall be provided between overload curves.

Discrimination is deemed to be achieved if the overload setting of $C_1 \geq 1.5 \times C_2$, e.g. C_1 1000 A with C_2 630 A.

Refer to Figure 2.15.

(iii) For ratings of C_2 less than 250 A, discrimination is deemed to be achieved if $C_1 \geq 1.5 \times C_2$, e.g. C_1 MCB marked C63 with MCB C_2 marked C40 (i.e. both C curves).

NOTES:

1 I_{SD} is not available on MCBs and only available on some MCCBs with electronic trip units.

2 Where a circuit-breaker is installed for load limiting purposes, such as on submains, reliability of supply is not required.

(b) *Fuses* Two fuses connected such that F_2 is the downstream device and F_1 the upstream device shall be selected such that the characteristics of the devices provide discrimination (selectivity) on overload (see Figure 2.17).

Discrimination (selectivity) between HRC fuses is deemed to be achieved—

(i) For overload when $F_1 \geq 1.6 \times F_2$, e.g. 16 A with 10 A; and

(ii) For short-circuit when $F_1 \geq 2 \times F_2$, e.g. 20 A with 10 A.

NOTE: Overload curves are those for times >0.01 s. Short-circuit data is based on the total I^2t of $F_2 \leq$ pre-arcing I^2t of F_1.

(c) *Fuse and circuit-breaker* A fuse and a circuit-breaker connected such that C_2 is the downstream device and F_1 the upstream device shall be selected such that the characteristics of the devices provide discrimination (selectivity) between the overload curve and the instantaneous setting or short delay setting (I_{SD}) of C_2 and the time-current curve of F_1.

Back up fuses are not required to discriminate.

For service fuses refer Note 5.

NOTES:

1 A coordination study requires the calculation of the prospective short-circuit currents, and comparison of the operating time of various protective devices, taking into consideration the actual current seen by each protective device. Manufacturer's data should be used to assess coordination (discrimination and back up) in the short-circuit area (above the short delay or Instantaneous setting of the protective devices).

2 Detailed requirements for coordination (selectivity and back up) as well as symbols, figures and examples are given in relevant Standards as follows: MCCBs and ACBs—AS/NZS IEC 60947.2, MCBs—AS/NZS 60898.

3 If devices are to be installed above their rated short-circuit capacity, the backup protection (cascading) requirements for circuit-breaker or fuse selection needs to be determined from manufacturer's data. Discrimination (selectivity), when backup protection of a circuit-breaker is applied, is limited (partial) and the value needs to be obtained from the manufacturer.

4 Refer to Clause 2.5.5 for other requirements for ≥800 A main switchboards.

5 The electricity distributor should be consulted for discrimination requirements between installation protective devices and the electricity distributor's service protective devices. The curves and settings of service protective devices will be required. For example, a 100 A service fuse will discriminate with a 32 A MCB.

6 Discrimination requirements are not retrospective.

7 The following terms are used in Figures 2.13 to 2.18:

I_{PSC} = prospective short-circuit current (see Clause 1.4.43)

I_{arc} = deemed maximum arcing fault current (= 60% I_{PSC})

I_i = instantaneous setting

I_{SD} = short delay setting

0.01 s = the limit of fuse time-current.

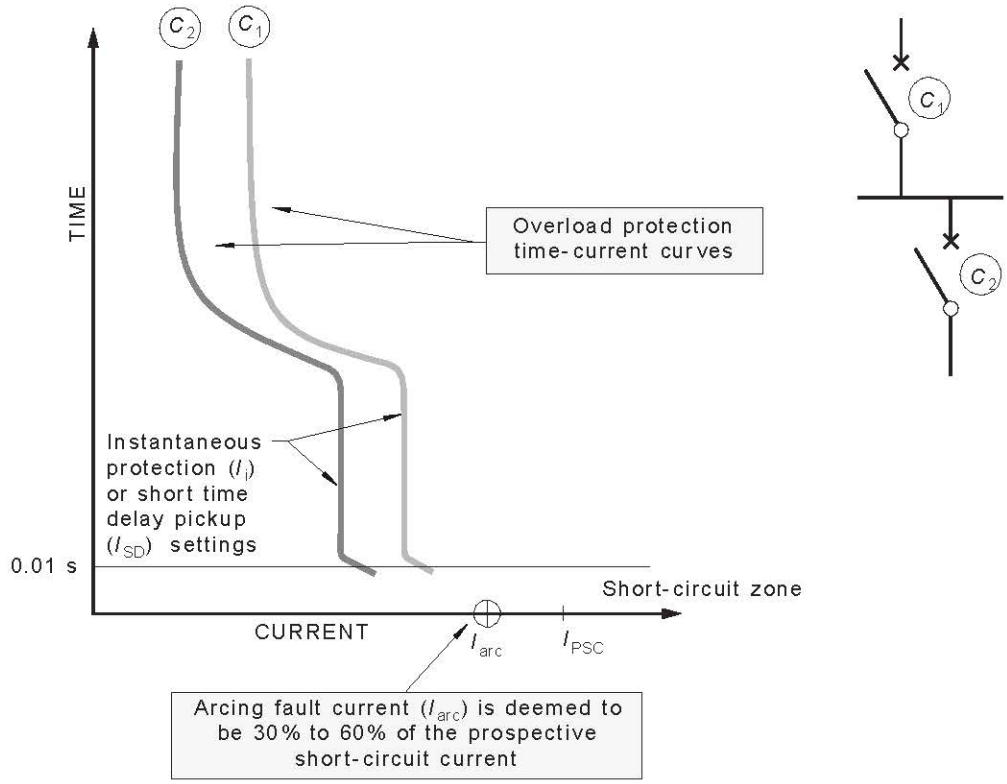


FIGURE 2.13 CIRCUIT-BREAKER CURVES—GENERAL EXPLANATION, SETTINGS AND ZONES

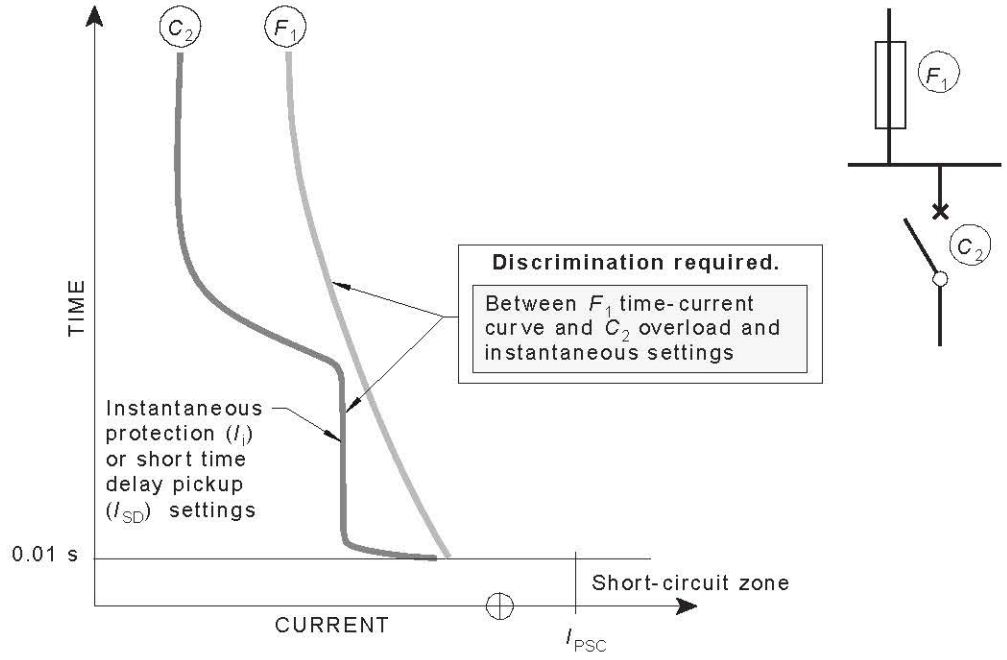


FIGURE 2.18 FUSE AND CIRCUIT-BREAKER CURVES
WITH DISCRIMINATION REQUIREMENTS

2.6 ADDITIONAL PROTECTION BY RESIDUAL CURRENT DEVICES

2.6.1 General

The use of fixed setting RCDs with a rated operating residual current not exceeding 30 mA is recognized as providing additional protection in areas where excessive earth leakage current in the event of failure of other measures of protection or carelessness by users could present a significant risk of electric shock.

NOTE: The use of RCDs is intended only to augment other measures of basic protection.

RCDs do not provide protection against faults between live conductors, nor do they provide protection against voltages imported into the electrical installation earthing system through the supply system neutral conductor.

The use of such devices is not recognized as a sole means of protection and does not obviate the need to apply the protective measures specified in Clause 2.4.

Additional protection shall be provided, where required by Clause 2.6.3, to automatically disconnect the supply when an earth leakage current reaches a predetermined value.

NOTES:

1 The requirements in these rules are for RCDs with a maximum sensitivity of 30 mA (can be either 10 mA or 30 mA).

2 RCDs with a sensitivity of 30 mA are designed to operate before fibrillation of the heart occurs.

3 RCDs with a sensitivity of 10 mA are designed to operate before muscular contraction, or inability to let go occurs. Muscular contraction can result in inability to breathe. Infants may be more prone to this risk.

2.6.2 Selection and arrangement of devices

2.6.2.1 *General*

Any device for the provision of additional protection shall be capable of interrupting the part of the circuit protected by the device when an earth leakage current is above a predetermined value.

The load current rating of an RCD shall be not less than the greater of the following:

(a) The maximum demand of the portion of the electrical installation being protected by the device.

or

(b) The highest current rating of any overload protective device on the portion of the electrical installation being protected.

No earthing or protective bonding conductor shall pass through the magnetic circuit of an RCD.

RCDs shall be so selected, and the electrical circuits so subdivided, that any earth leakage current that may be expected to occur during normal operation of the connected load or loads will be unlikely to cause unnecessary tripping of the device.

NOTES:

1 To avoid unwanted tripping because of leakage currents and transient disturbances, care should be taken to ensure that the sum of the leakage currents of electrical equipment on the load side of an RCD is significantly less than its rated residual current. RCDs may operate at any value of residual current in excess of 50% of the rated residual current.

The loading of the circuit should be such that the leakage current does not exceed one-third of the rated residual current.

2 To avoid excessive leakage current causing unwanted tripping where socket-outlets are protected by one RCD having a rated residual current not greater than 30 mA, consideration should be given to the number of socket-outlets protected and the nature of electrical equipment likely to be connected to the socket-outlets.

2.6.2.2 *Types of RCD*

2.6.2.2.1 *General*

* RCDs shall be fixed setting RCDs complying with AS/NZS 3190, AS/NZS 61008.1, AS/NZS 61009.1, or IEC 62423 and intended for use in electrical installations.

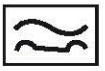
NOTES:

The following Notes apply to both Australia and New Zealand:

1 Common types of RCDs and their applications are described as follows:

(a) Type AC RCD (marked with the  symbol), for which tripping is ensured for residual sinusoidal alternating currents.

This is the general type used in Australia but is not used in New Zealand.

(b) Type A RCD (marked with the  symbol), for which tripping is ensured—

(i) as for Type AC; and

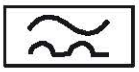
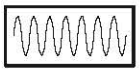
(ii) for residual pulsating direct currents.

(c) Type I RCD, for which tripping is ensured—

(i) as for Type A; and

(ii) with rated residual alternating current not exceeding 10 mA with an interrupting time not exceeding 40 ms at rated residual current.

RCDs with rated residual currents not exceeding 10 mA but with an interrupting time exceeding 40 ms but not exceeding 300 ms at rated residual current are treated as Type A devices and marked 'General Type, Not for Patient Areas' in accordance with AS/NZS 3190, AS/NZS 61008.1 and AS/NZS 61009.1.

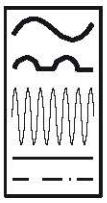
(d) Type F RCD, (F signifying frequency; marked with the symbols shown on right),   for which tripping is ensured—

(i) as for Type A;

(ii) for composite residual currents, whether suddenly applied or slowly rising intended for circuit supplied between phase and neutral or phase and earthed middle conductor; and

(iii) for residual pulsating direct currents superimposed on smooth direct current.

Type F RCDs are intended for the protection of circuits carrying high frequency leakage currents such as those associated with frequency converters and electronic ballasts.

(e) Type B RCD (marked with the  symbol), for which tripping is ensured—

(i) as for Type A;

(ii) for residual sinusoidal alternating currents up to 1000 Hz;

(iii) for residual alternating currents or pulsating direct currents superimposed on a smooth direct current of 0.4 times the rated residual current (I_{dn}); and

(iv) for residual direct currents that may result from rectifying circuits.

(f) Type S RCD (S signifying selectivity and marked with the S symbol), a specially designed RCD for which tripping is ensured after a predetermined operating time delay corresponding to a given value of residual current.

2 The waveform of a fault current to earth can affect the operation of an RCD and should be taken into account for the selection of the type of RCD. Users should consult the RCD manufacturer for correct selection. IEC 60755 Annex B contains a useful diagram of the likely form of the fault currents generated from circuits utilizing a variety of semiconductor devices and the selection of appropriate RCD types.

2.6.2.2.2 *Australia only* A

In Australia, the following provisions apply:

(a) RCDs can have any number of poles but shall interrupt all active and neutral conductors in the following applications:

(i) RCDs used as leakage protection devices in medical treatment areas in accordance with AS/NZS 3003.

(ii) RCDs incorporated into a socket-outlet (SRCDs) for alterations complying with Clause 2.6.3.2.5(a).

(iii) RCDs located beside a socket-outlet and specifically intended for the protection of that socket-outlet for alterations complying with Clause 2.6.3.2.5(a).

(b) RCDs shall be of the type for which tripping is ensured for residual sinusoidal alternating current.

2.6.2.2.3 *New Zealand only* NZ

In New Zealand, RCDs required by this Standard shall—

(a) interrupt all live (active and neutral) conductors; and

(b) be of a type for which tripping is ensured for residual alternating current and residual pulsating direct current.

2.6.2.3 *Protection against initiation of fire*

Although it is not a requirement of this Standard to provide additional protection against the initiation of fire caused by current leakage across insulation, a Type S RCD with a rated residual current in the range 100 mA to 300 mA may be used as a main switch in a domestic electrical installation, in addition to the requirements of Clause 2.6.3.

NOTE: Protection is not afforded to separated circuits typically used for extra-low voltage (ELV) lighting or against the initiation of fire from equipment operating at elevated temperatures.

2.6.2.4 *Arrangement*

Where additional protection of final subcircuits is required, in accordance with Clause 2.6.3, the final subcircuits shall be arranged as follows:

(a) In all electrical installations where—

(i) the number of RCDs installed exceeds one; and

(ii) more than one lighting circuit is installed,

lighting circuits shall be distributed between RCDs.

(b) In residential installations—

(i) not more than three final subcircuits shall be protected by any one RCD; and

(ii) where there is more than one final subcircuit,

a minimum of two RCDs shall be installed.

NOTE: These arrangements are intended to minimize the impact of the operation of a single RCD.

2.6.3 Additional protection by residual current devices

* #### 2.6.3.1 *General*

The requirements of this Clause for the installation of RCDs are in addition to the RCD requirements for electrical installations as specified in—

(a) other Australian and New Zealand Standards, e.g. AS/NZS 3001, AS/NZS 3002, AS/NZS 3003, AS/NZS 3004 series and AS/NZS 3012;

(b) other Sections of this Standard, e.g.—

(i) Section 3 for protection against mechanical damage;

(ii) Section 6 for baths, showers and other water containers; and

(iii) Section 7 for special electrical installations; and

(c) the requirements and regulations of legislation, such as work health and safety legislation.

NOTE: In New Zealand, attention is drawn to the requirements of NZECP 55 for wiring and fittings located near conductive thermal insulation. NZ

* #### 2.6.3.2 *Installation requirements—Australia only* A

2.6.3.2.1 *General*

RCD installation requirements, for Australia only, shall comply with Clauses 2.6.3.2.2 to 2.6.3.2.6.

Exceptions: These requirements need not apply to the following:

1 Final subcircuits supplied at ELV in accordance with Clause 7.5.

2 Final subcircuits supplied from a separated supply in accordance with Clause 7.4.

* **2.6.3.2.2** *Domestic and residential installations—Australia only* **A**

Additional protection by RCDs with a maximum rated residual current of 30 mA shall be provided for all final subcircuits in domestic and residential electrical installations.

Where protection of final subcircuits is required, RCDs shall be installed at the switchboard at which the final subcircuit originates.

These installations include but are not limited to—

(a) individual domestic electrical installations;

(b) residential areas of electrical installations;

(c) multiple residential electrical installations that are provided for common use; or

(d) external lighting installations in common areas of multiple residential electrical installations.

Exception: RCD protection need not apply to repairs undertaken in accordance with Clause 2.6.3.2.6.

* **2.6.3.2.3** *Non-domestic and non-residential installations—Australia only* **A**

2.6.3.2.3.1 *Types of installations*

These installations include, but are not limited to—

(a) individual commercial or industrial electrical installations;

(b) multiple commercial or industrial electrical installations that are provided for common use;

(c) external lighting installations in common areas of multiple commercial or industrial electrical installations; or

(d) commercial or industrial portions of mixed installations.

2.6.3.2.3.2 *Location of RCD protection*

Where protection of final subcircuits is required, RCDs shall be installed at the switchboard at which the final subcircuit originates.

Exception: Where the wiring system is installed with additional mechanical protection as required by Clause 3.9.4, the RCD protection specifically intended for the protection of that socket-outlet can be installed at, or adjacent to, the socket-outlet (e.g. factory).

2.6.3.2.3.3 *Requirements for additional protection*

Additional protection by RCDs with a maximum rated residual current of 30 mA shall be provided for final subcircuits with a rating not exceeding 32 A supplying—

(a) socket-outlets;

(b) lighting;

(c) direct connected hand-held electrical equipment, e.g. directly connected tools; and

(d) direct connected electrical equipment that represents an increased risk of electric shock.

Factors that may represent an increased risk of electric shock include but are not limited to—

(i) external influences (refer Clause 1.5.14); and

(ii) type of electrical installation and processes being conducted (e.g. workshops and particular industrial activities).

NOTE: For all other final subcircuits with a rating not exceeding 32 A for direct connected equipment, additional protection by RCDs with a maximum rated residual current of 30 mA should be considered.

Exceptions: These requirements need not apply to the following:

1 Repairs in accordance with Clause 2.6.3.2.6.

2 Situations where the disconnection of a circuit by an RCD could cause a danger greater than earth leakage current (e.g. traffic signals).

3 Final subcircuits installed for the connection of specific items of equipment, provided that the connected equipment is designed, constructed and installed in such a manner that is not likely to present a significant risk of electric shock and—

(i) is required by the owner or operator to perform a function that is essential to the performance of the installation and that function would be adversely affected by a loss of supply caused by the RCD operation; or

(ii) may cause spurious nuisance tripping through high leakage current being generated in the normal operation of the equipment (e.g. VSDs).

In addition where the specific item of equipment is connected by a plug and socket-outlet, that socket-outlet is—

— located in a position that is not likely to be accessed for general use; and

— clearly marked to indicate the restricted use of that socket-outlet and that RCD protection is not provided for that socket-outlet.

4 Where other methods of protection are applied, e.g. a separated supply in accordance with Clause 7.4.

* **2.6.3.2.4** *Home care installations—Australia only* **A**

RCD requirements for medical electrical equipment in home care medical installations shall comply with AS/NZS 3003.

* NOTES:

1 Some of these installations require a Type I RCD, with a maximum rated residual current of 10 mA.

2 See Appendix M for further information on continuity of supply.

* **2.6.3.2.5** *Alterations to installations and replacement of switchboards—Australia only* **A**

Additional protection by RCDs shall be provided in existing electrical installations where alterations or a switchboard replacement is completed.

The following provisions shall apply:

(a) *Alterations* RCD protection shall be provided as required by Clause 2.6.3.2.2, 2.6.3.2.3 or 2.6.3.2.4, as applicable, where any alteration to an existing final subcircuit is undertaken.

Socket-outlets added to an existing circuit shall be protected by an RCD in accordance with the requirements for new subcircuits in the part of the installation in which they are located.

Where socket-outlets are added to an existing circuit and RCD protection is required, the RCD protection need only be fitted at the commencement of the additional wiring.

Exception: Extensions to existing non-RCD-protected final subcircuits supplying lighting points only.

(b) *Switchboard replacement* Where all of the circuit protection on a switchboard is replaced, additional protection by RCDs as required by this Clause (2.6) shall be provided for the final subcircuits supplied from that switchboard.

* **2.6.3.2.6** *Repairs—Australia only* **A**

The requirements of this Clause (2.6.3) need not apply where a socket-outlet, luminaire or single item of electrical equipment that is not RCD-protected is replaced with an equivalent item in the same location.

For the purpose of this Clause, the replacement of a single socket-outlet with a multiple socket-outlet assembly is deemed to be a repair.

* **2.6.3.3** *Installation requirements—New Zealand only* **NZ**

* **2.6.3.3.1** *Residential installations—New Zealand only*

Additional protection by RCDs with a maximum rated residual current of 30 mA shall be provided for final subcircuits supplying—

(a) one or more socket-outlets; or

(b) one or more lighting points; or

(c) directly connected hand-held electrical equipment, e.g. directly connected hair dryers or tools forming part of—

(i) individual domestic electrical installations;

(ii) residential areas of other electrical installations (see Note below);

(iii) multiple residential electrical installations that are provided for common use; or

(iv) external lighting installations in common areas of multiple residential electrical installations.

Where protection of final subcircuits is required, RCDs shall be installed at the switchboard at which the final subcircuit originates.

Exceptions:

1 This requirement need not apply to a final subcircuit for which a method of fault protection other than automatic disconnection of supply is applied, e.g. a separated supply in accordance with Clause 7.4 or supply at extra low voltage in accordance with Clause 7.5.

2 This requirement need not apply to a final subcircuit supplying a socket-outlet or a connecting device specifically for the connection of a fixed or stationary electric cooking appliance, such as a range, oven or hotplate unit provided that—

(a) the socket-outlet is located in a position that is not likely to be accessed for general purposes;

(b) the socket-outlet is clearly marked to indicate the restricted purpose of the socket-outlet.

NOTES:

1 Residential electrical installations include those located in residential institutions, hotels, boarding houses, hospitals, accommodation houses, motels, hostels and the like.

2 This requirement applies to complete final subcircuits, not to additions or alterations of existing final subcircuits. Requirements for additions and alterations are in Clause 2.6.3.3.4.

* **2.6.3.3.2** *Non-residential installations—New Zealand only* NZ

In New Zealand, the following requirements apply to non-residential locations:

(a) *Education and childcare facilities*

Additional protection by an RCD with a maximum rated residual current of 30 mA shall be provided for final subcircuits supplying one or more socket-outlets having a rating not exceeding 30 A in—

(i) kindergartens;

(ii) day care centres for preschool children;

(iii) schools for children up to and including school Year 13; and

(iv) areas in tertiary education or vocational training facilities that are primarily used or intended for teaching or training.

(b) *Junior education and childcare facilities*

Additional protection by an RCD with a maximum rated residual current of 10 mA shall be provided for socket-outlets in areas within a building primarily for the purpose of teaching or caring for children in—

(i) kindergartens;

(ii) day-care centres for preschool children; and

(iii) schools for children up to and including school year eight.

NOTE: These RCDs need not be Type I as used for electrical medical devices.

(c) *Other locations*

Socket-outlets with a rating not exceeding 30 A, and supplies to directly connected hand-held equipment, installed in the following locations, shall be protected by RCDs with a maximum rated residual current of 30 mA:

(i) Outdoor locations.

(ii) Locations that have easy or unsupervised public access.

NOTE: Typical examples include public areas of train stations, airports and shopping malls.

(iii) Amusement arcades.

(iv) Sockets in damp situation zones as classified by Clauses 6.6 or 6.7.

(d) *Particular types of equipment*

Socket-outlets for and supplies to the following types of equipment shall be protected by RCDs with a maximum rated residual current of 30 mA:

(i) Children's rides.

(ii) Vending machines.

Exceptions:

1 The requirements of Items (a), (b), (c) and (d) need not apply to the following:

- *Where other methods of fault protection other than automatic disconnection of supply are applied, e.g. a separated supply in accordance with Clause 7.4 or supply at extra low voltage in accordance with Clause 7.5.*
- *Where the disconnection of a circuit by an RCD could cause a danger greater than earth leakage current.*
- *Where socket-outlets that are part of a mining operation are supplied at reduced low voltage.*