

Australian/New Zealand Standard™

Electrical installations—Generating sets

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND
Australian/New Zealand Standard
Electrical installations—Generating sets

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out the minimum safety requirements related to the use of generating sets for the supply of electricity at voltages normally exceeding 50 V a.c. or 120 V d.c.

The Standard applies to electricity generating sets that are driven by internal combustion engines, and which are used for the supply of electrical installations in buildings or items of electrical equipment.

This Standard does not—

- (a) set out performance and constructional requirements for generating sets; or
- (b) specifically apply to specialized automatic sources of supply, e.g. no-break systems or generating sets operated by Electricity Generating entities or Electricity Distributors; or
- (c) apply to uninterruptible power supplies; or
- (d) apply to other generation systems; such as:
 - (i) Inverters.
 - (ii) Photovoltaic arrays.
 - (iii) Water or wind driven.

NOTES:

- 1 While not intended to be applied to other than generating sets driven by internal combustion engines, the electrical principles could be applied to generating sets with other types of energy sources.
- 2 Requirements for the performance and construction of transportable generating sets up to 25 kW are given in AS 2790.
- 3 Requirements for the design, installation and operation of emergency power supplies in hospitals are given in AS/NZS 3009.
- 4 Requirements for the design, installation and operation of uninterruptible power supplies are given in the AS 62040 series of Standards.
- 5 Attention is drawn to the fact that some Regulatory Authorities have requirements for limitation of noise levels and pollution emissions.

1.2 APPLICATION

In addition to complying with this Standard, the generating set installation may be required to comply with requirements of Electricity Distributors and other relevant Regulatory Authorities. It is, therefore, recommended that these Authorities be consulted prior to the installation of equipment.

Section 2 outlines general requirements for the installation of generating sets. Sections 3 and 4 introduce additional requirements for permanently connected and plug and socket-outlet connected generating sets respectively.

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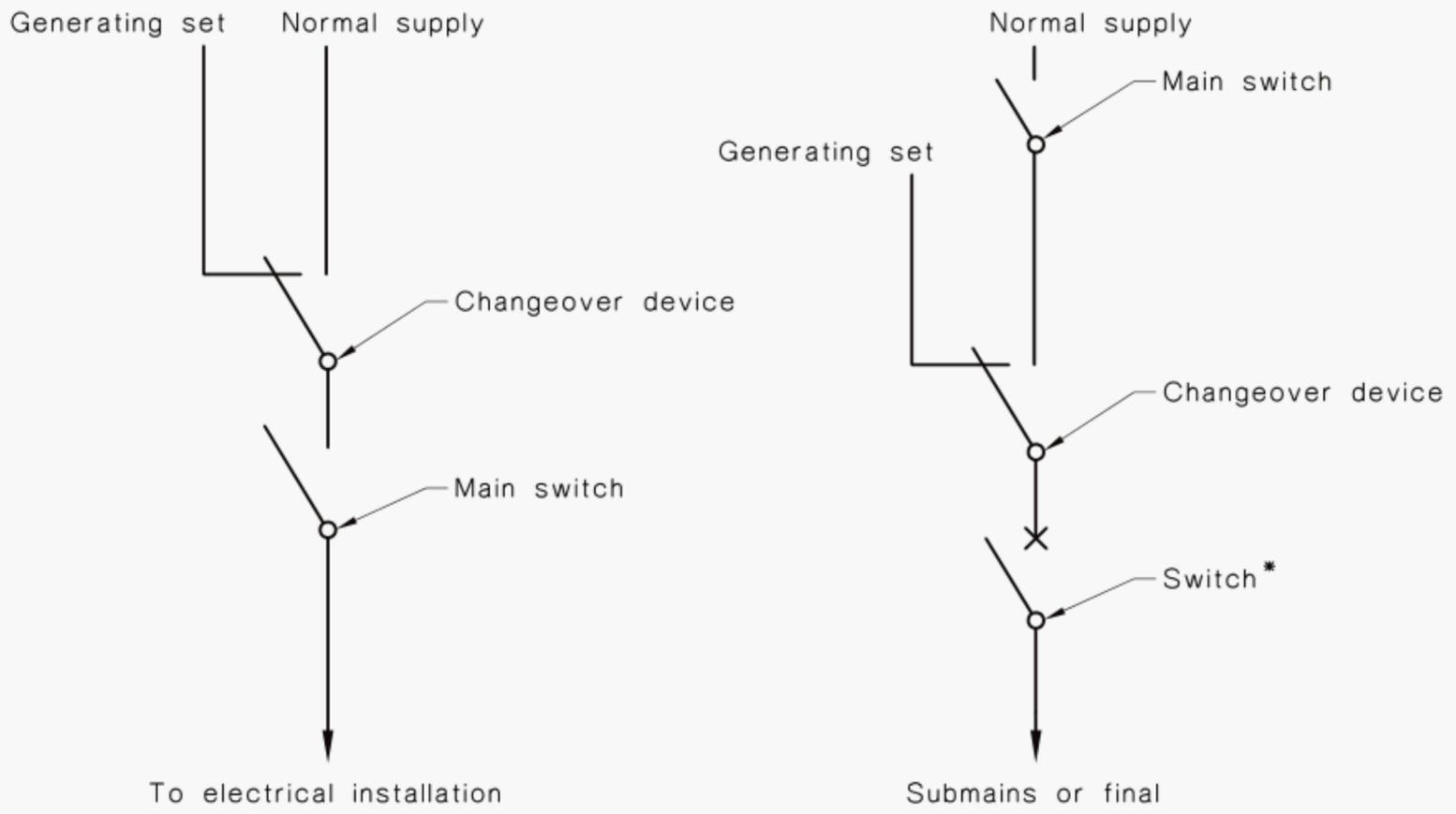
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1.2 APPLICATION

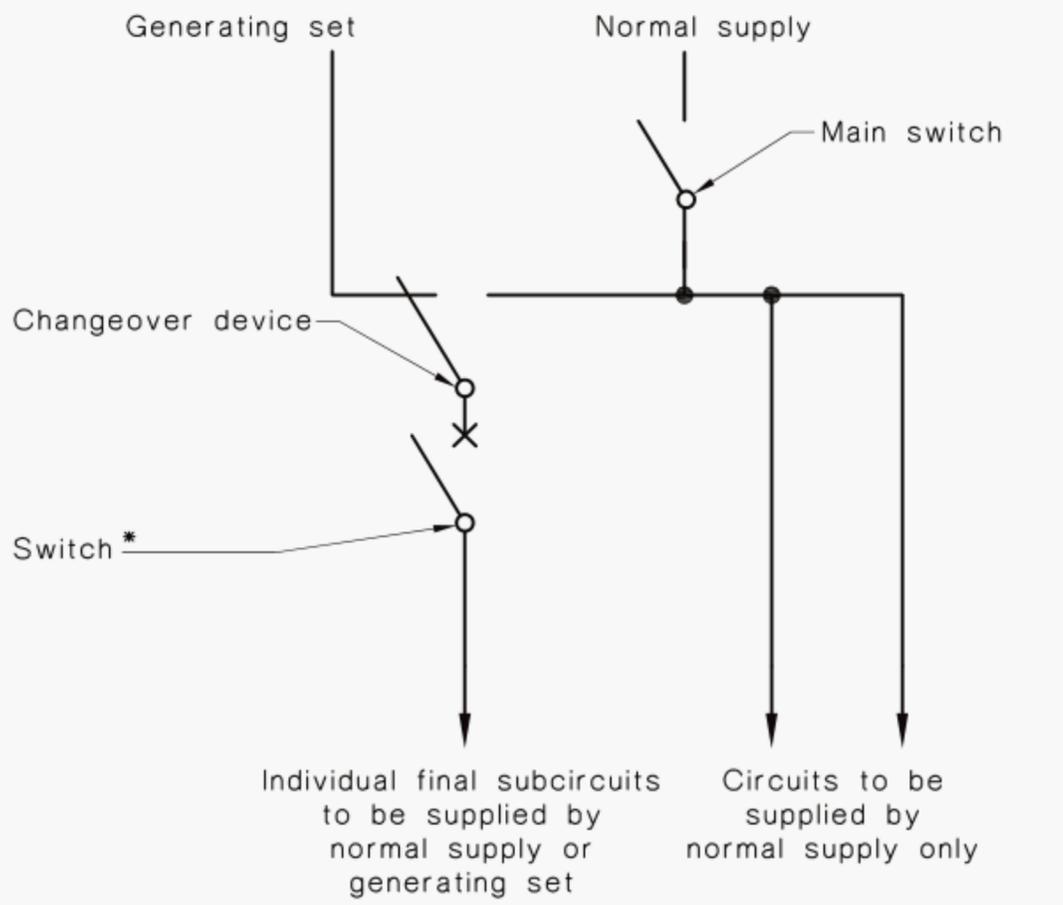
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(a) Ahead of main switch

(b) Ahead of switch(es) controlling submain(s) or final subcircuit(s)



(c) Ahead of a switch controlling individual circuit

* May also be a circuit-breaker or switch fuse

FIGURE 2.1 LOCATION OF CHANGEOVER DEVICE WITHOUT AN INTERMEDIATE 'OFF' POSITION

TABLE 2.1
KEY TO SYMBOLS IN FIGURES 2.2 TO 2.9 AND 4.1 TO 4.3

SYMBOL	DESCRIPTION
E	Earth conductor
E-BAR	Earth bar or connection point
EE	Earth electrode
L or L1, L2, L3	Supply Active Phases
MEN	MEN link
N	Neutral conductor
N-BAR	Neutral bar or connection point
	Neutral conductor
	Protective earth conductor
	Combined protective earth and neutral conductor
	Frame or chassis
	Interlock

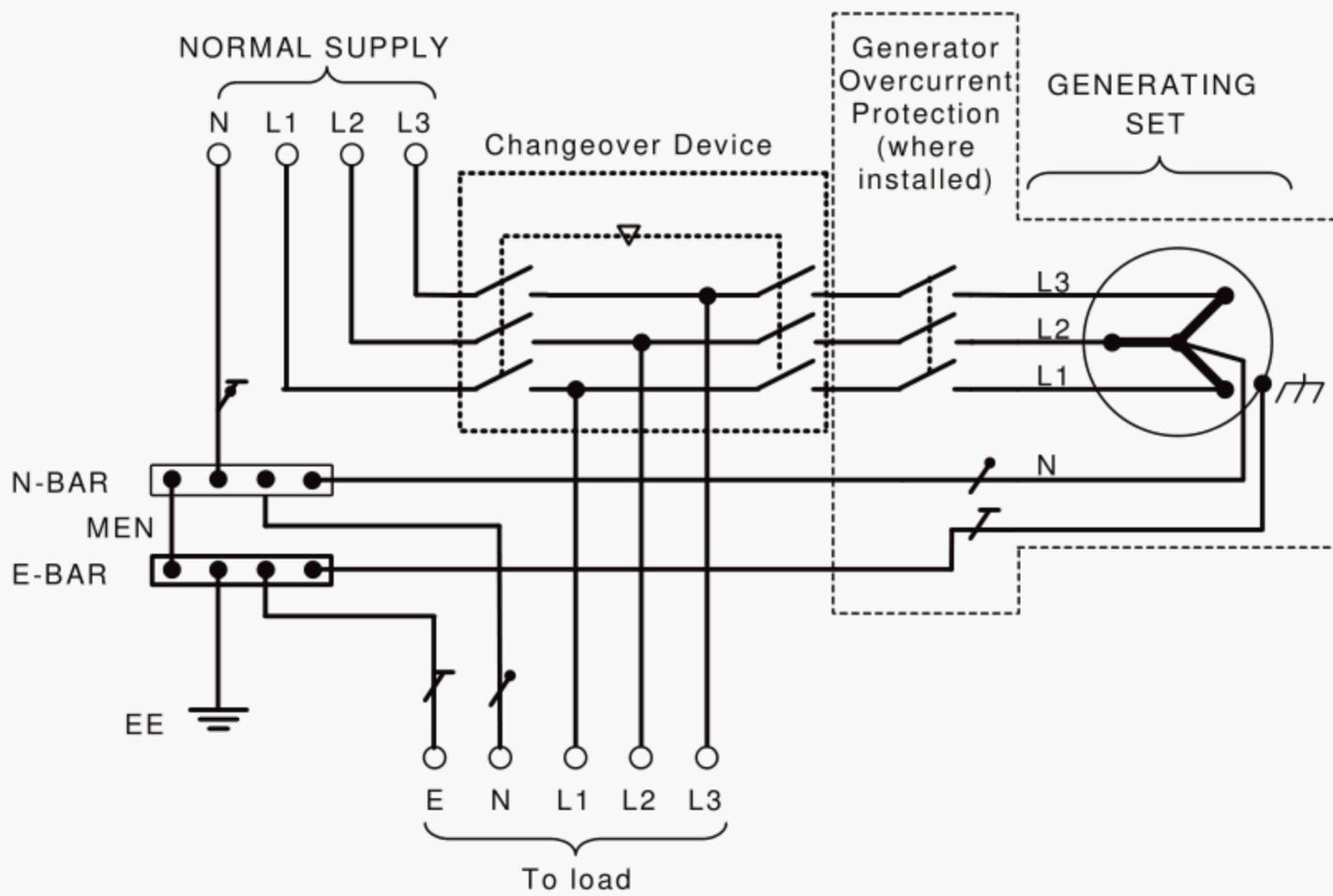


FIGURE 2.2 THREE POLE/THREE POLE CHANGEOVER ARRANGEMENT FOR A THREE-PHASE GENERATING SET INSTALLED ON A SWITCHBOARD WITH AN MEN LINK

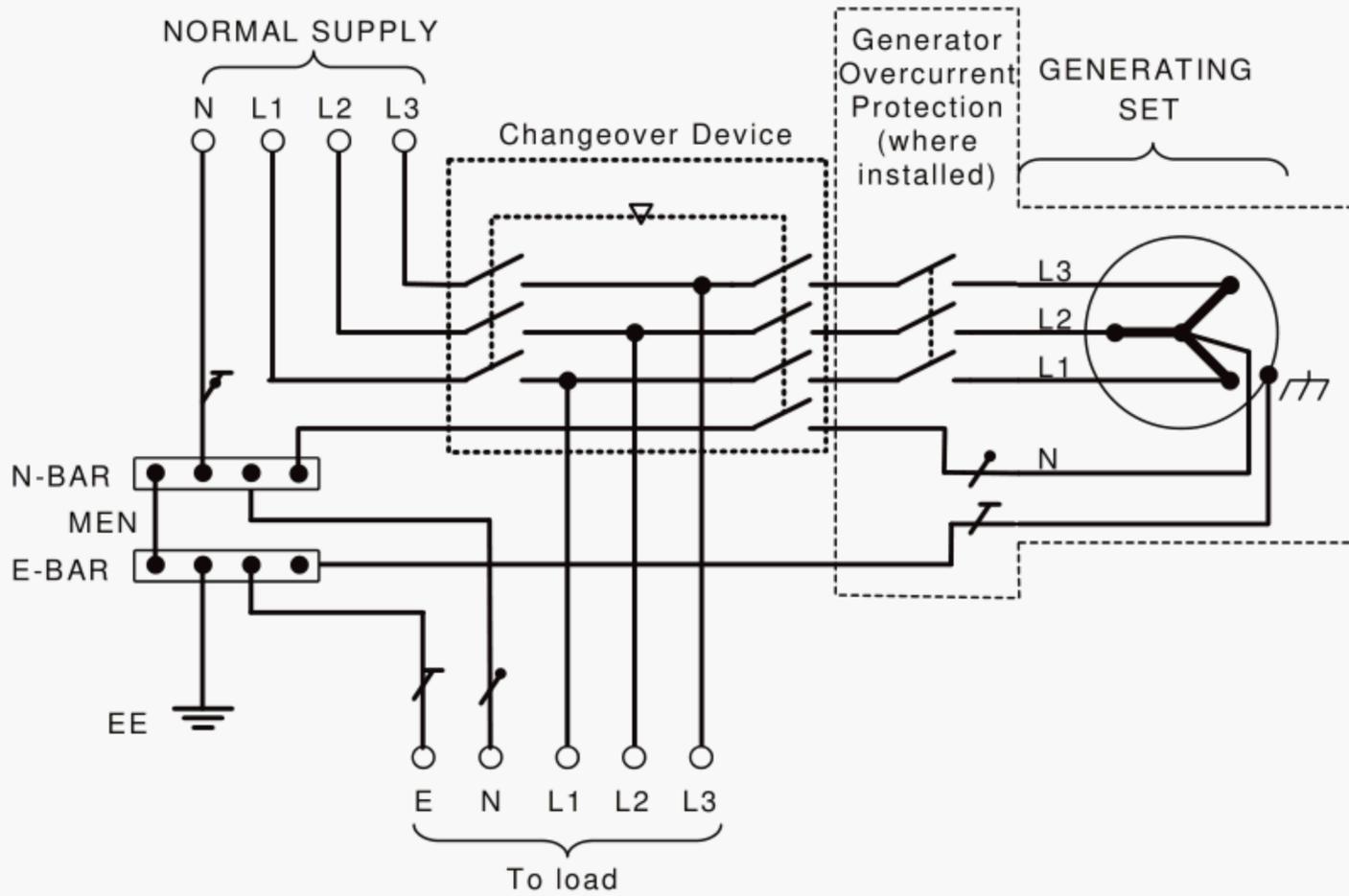


FIGURE 2.3 THREE POLE/FOUR POLE CHANGEOVER ARRANGEMENT FOR A THREE-PHASE GENERATING SET INSTALLED ON A SWITCHBOARD WITH AN MEN LINK

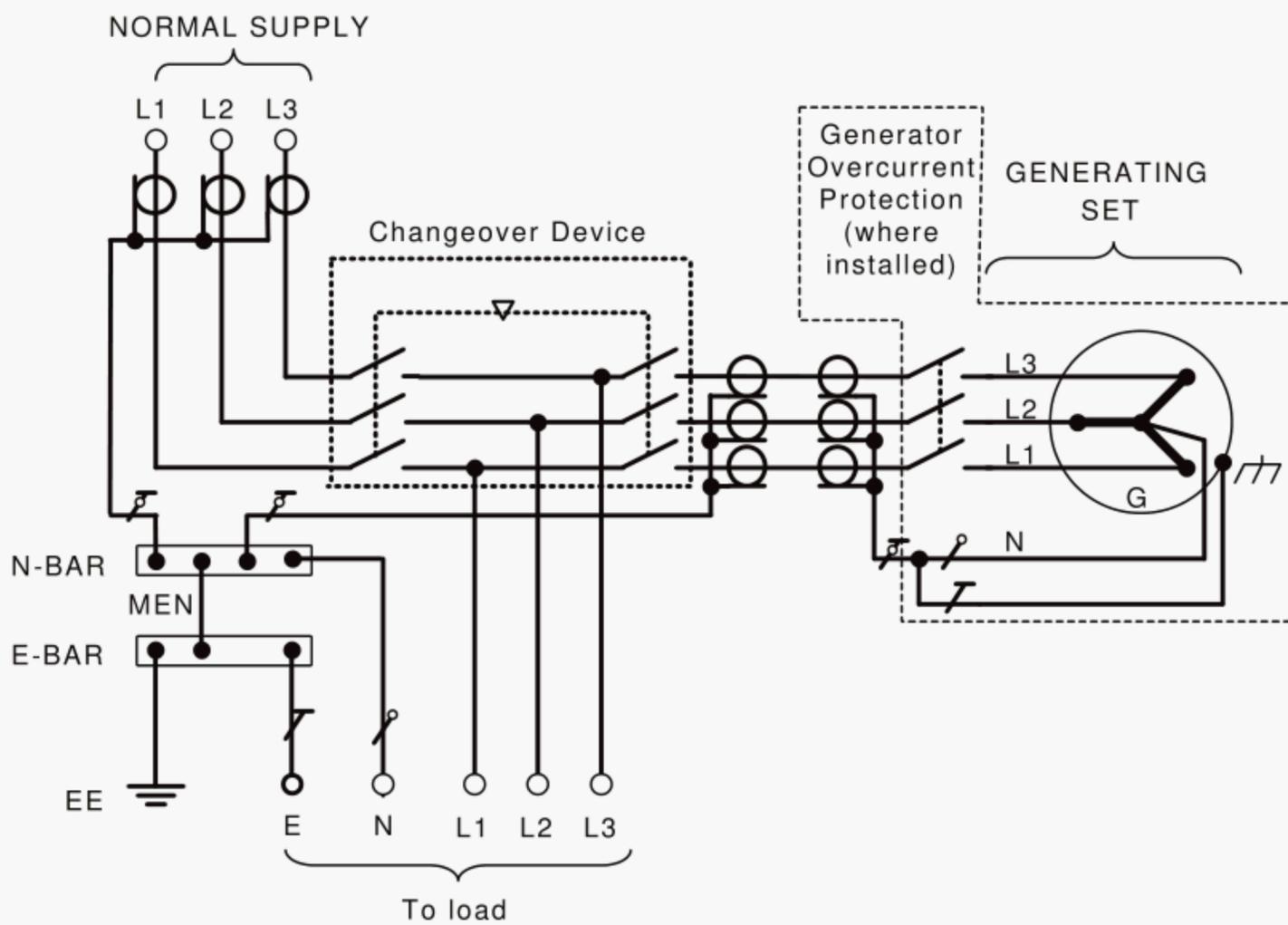


FIGURE 2.4 THREE POLE/THREE POLE CHANGEOVER ARRANGEMENT FOR A THREE-PHASE GENERATING SET INSTALLED WITH AN EARTH SHEATH RETURN SYSTEM

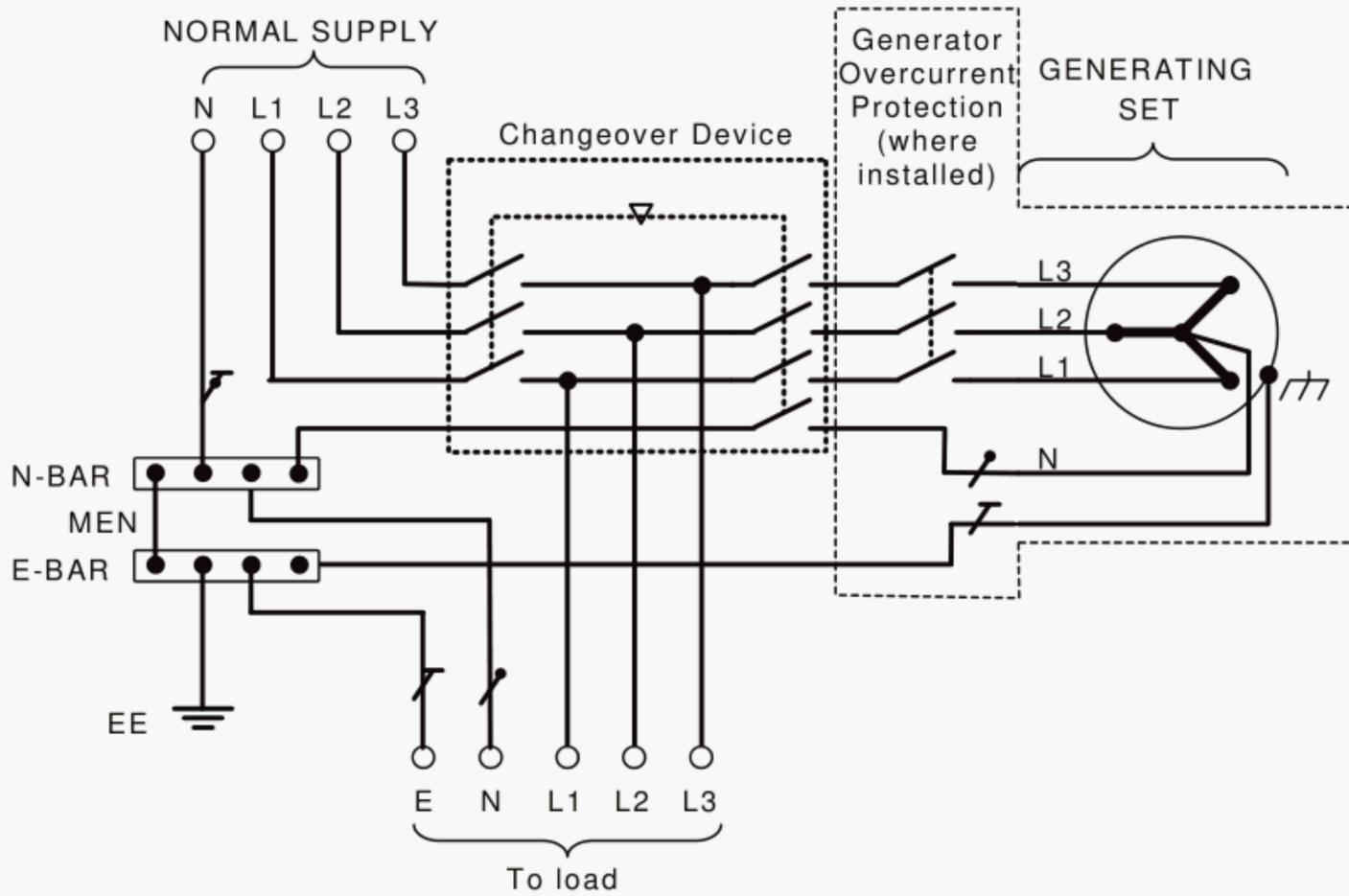


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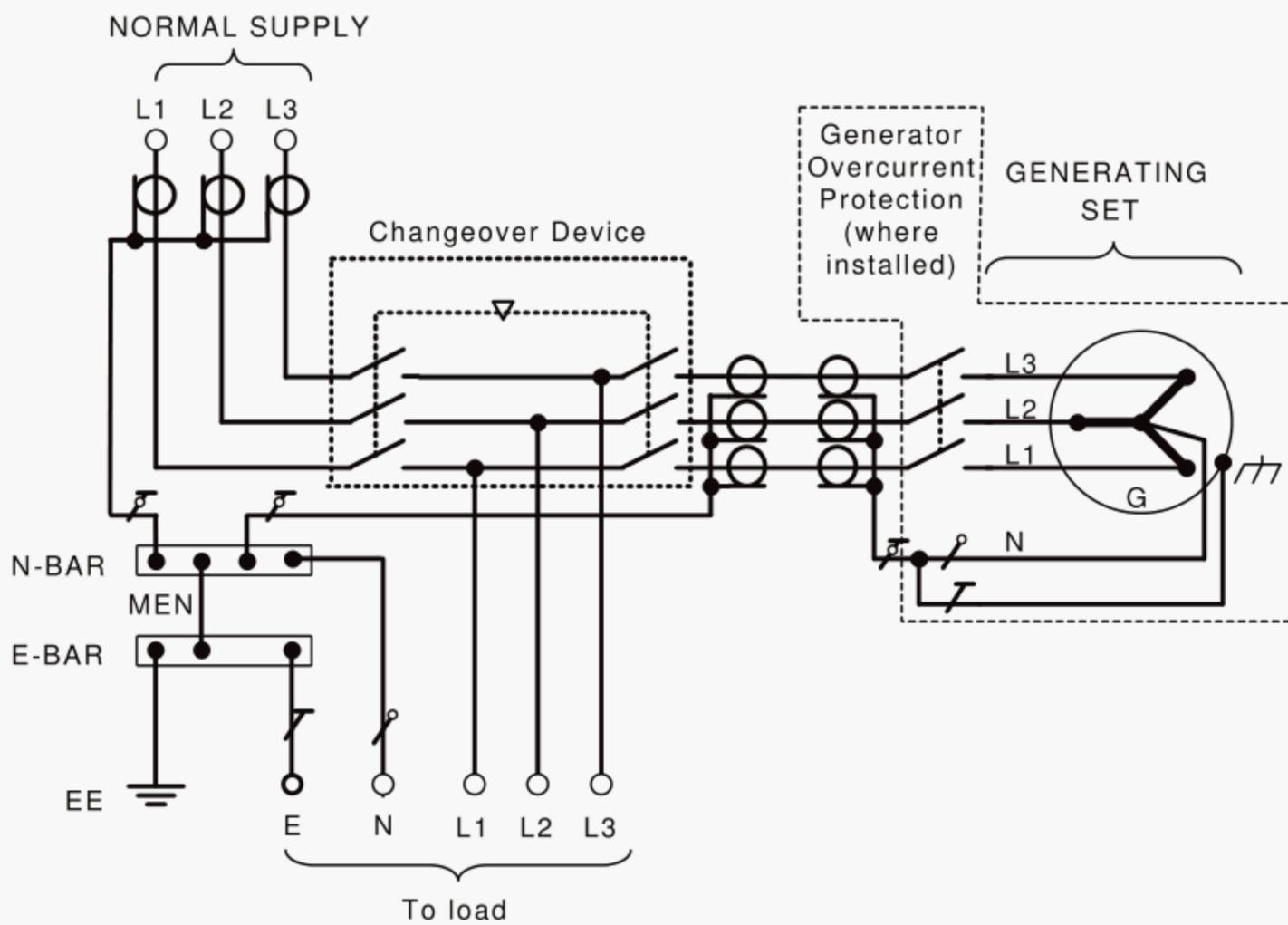


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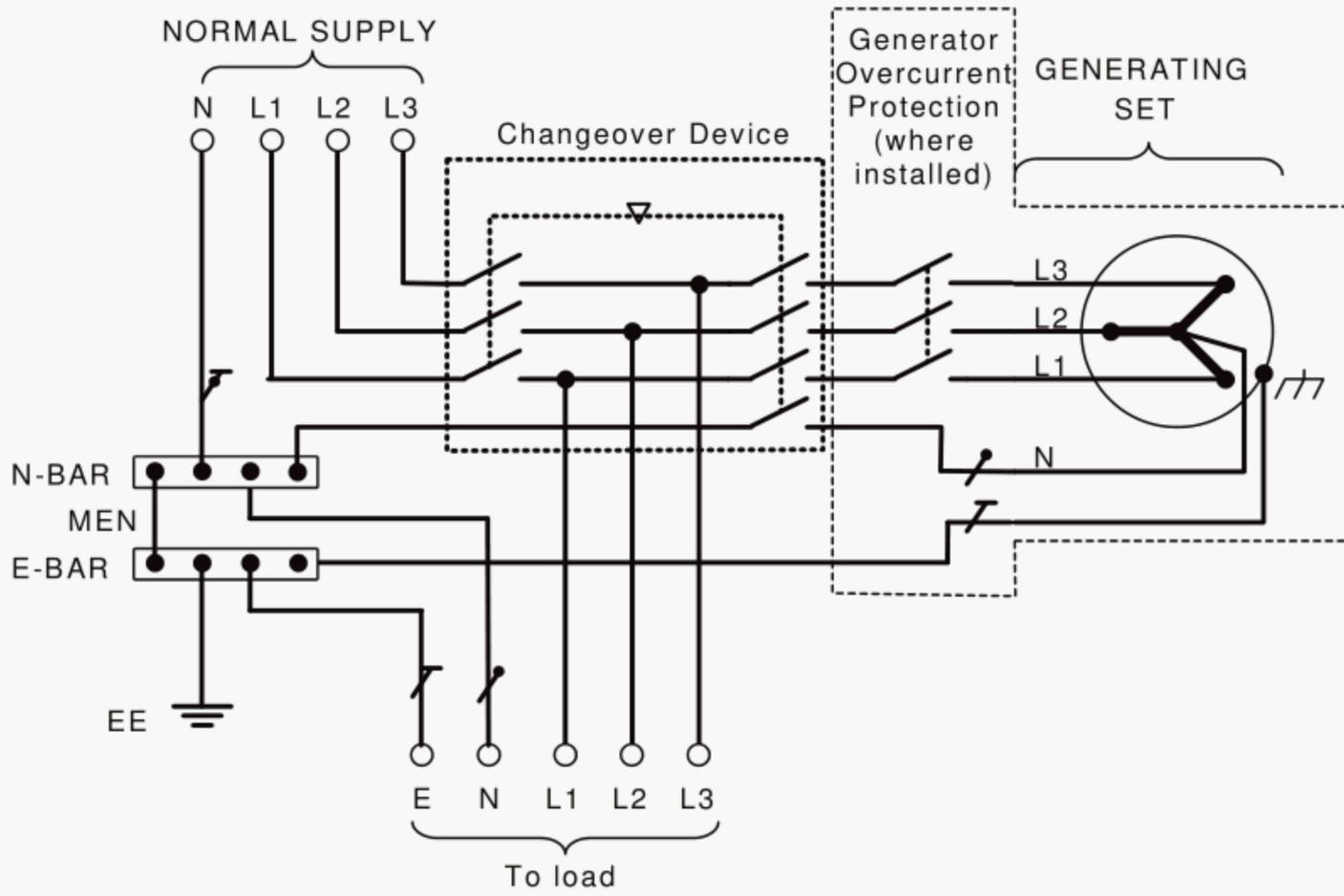


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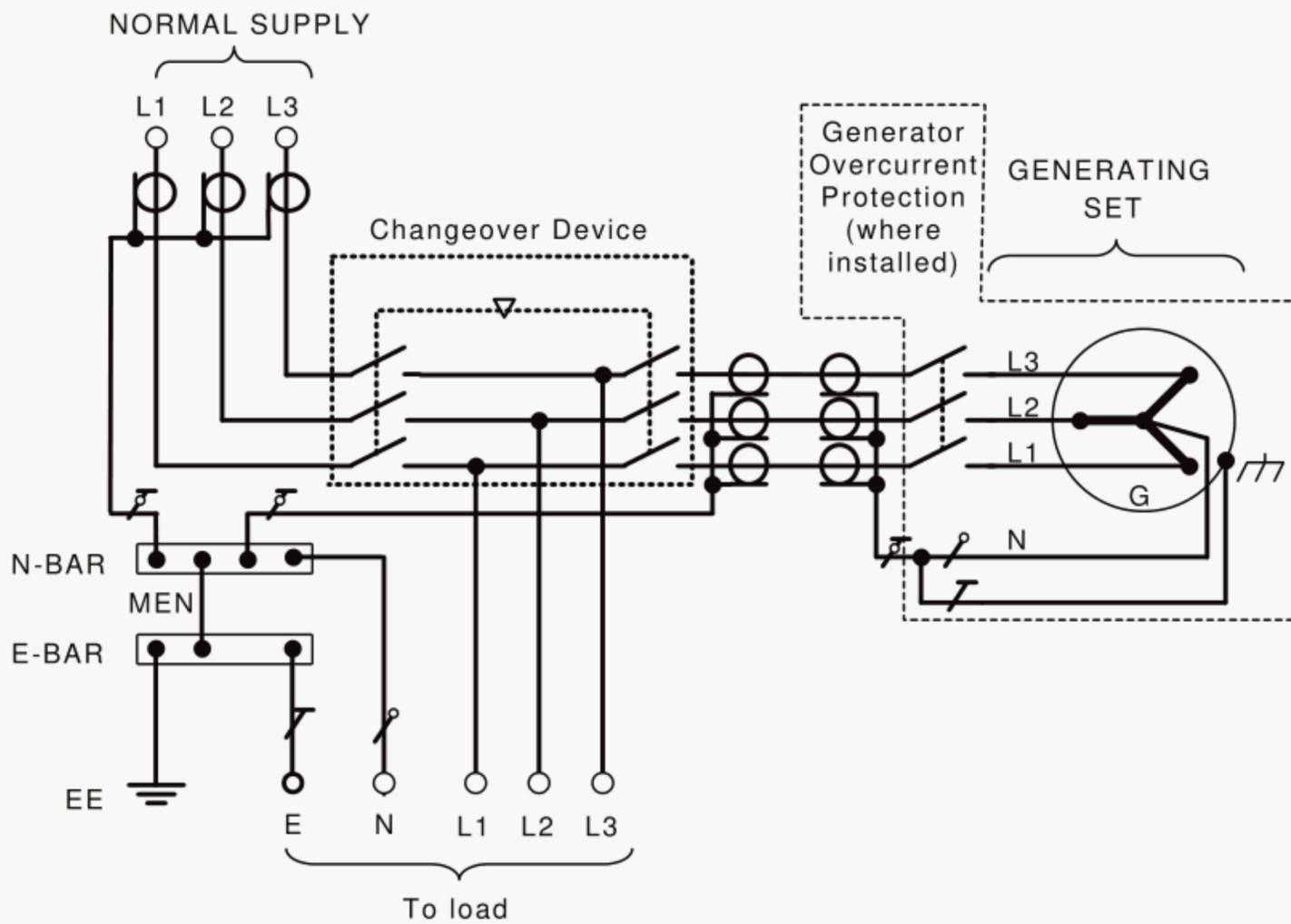
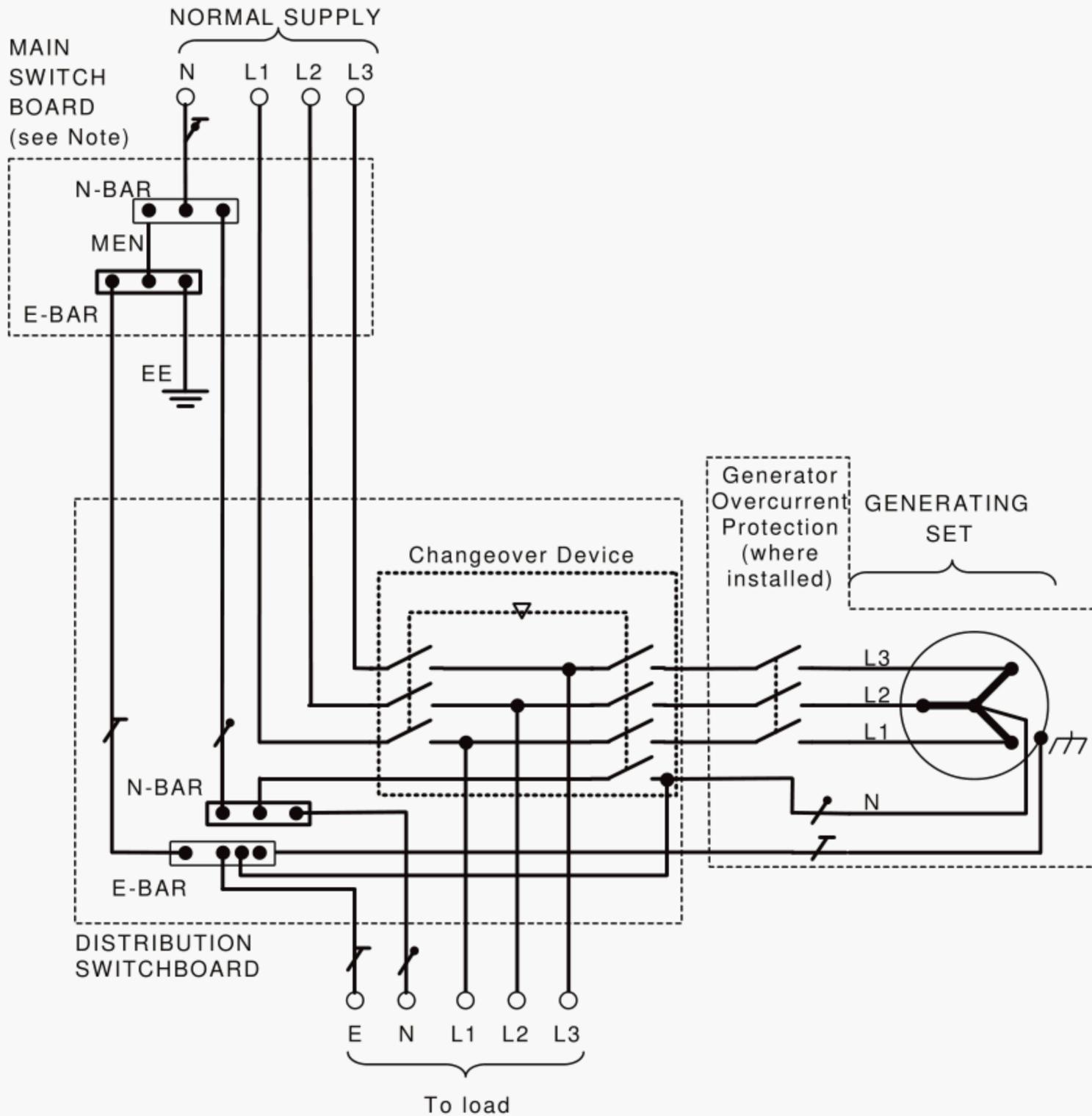


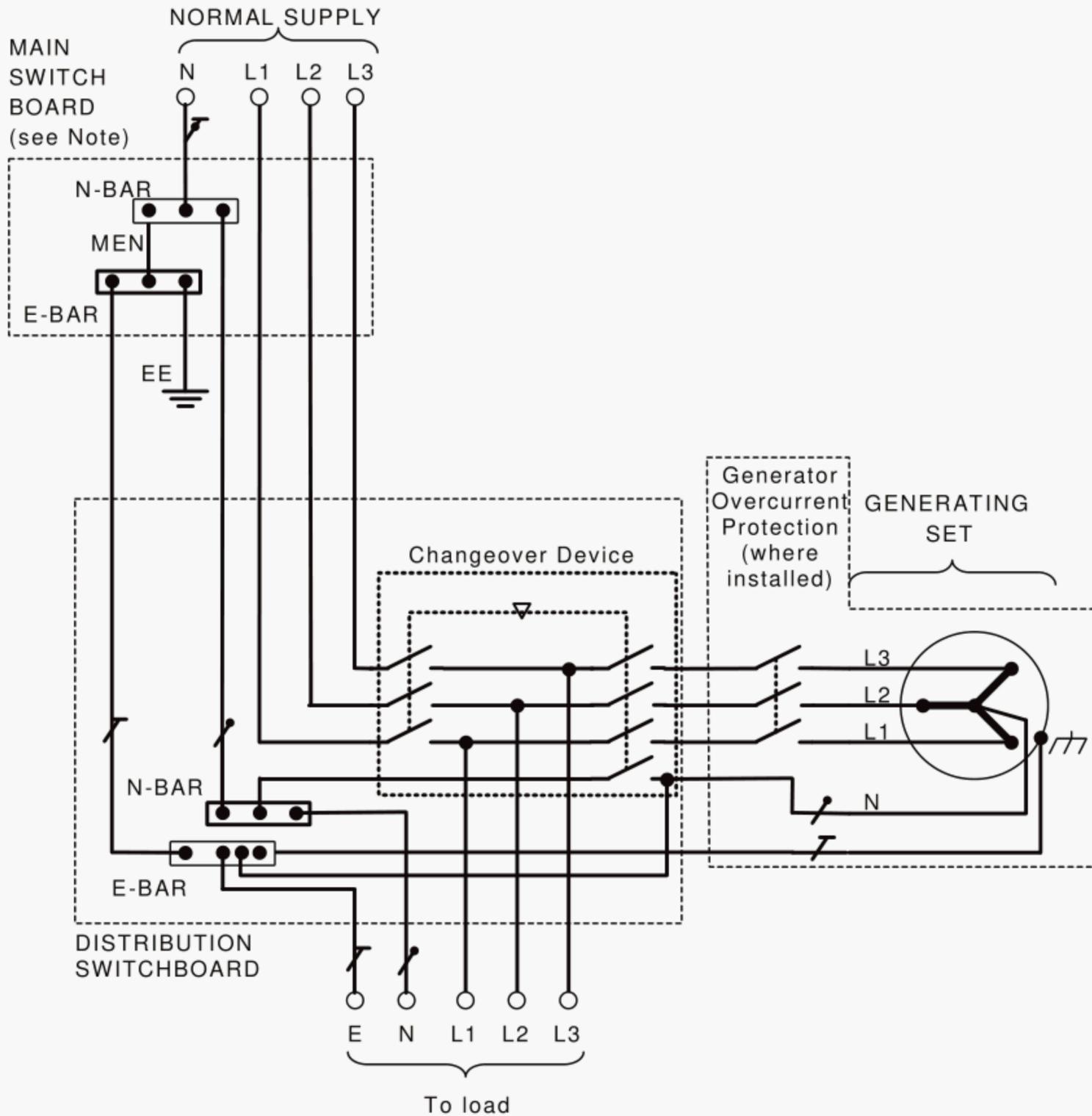
FIGURE 2.4 THREE POLE/THREE POLE CHANGEOVER ARRANGEMENT FOR A THREE-PHASE GENERATING SET INSTALLED WITH AN EARTH SHEATH RETURN SYSTEM



NOTES:

- 1 For guidance on the sizing of the neutral and earth conductors, see Clause 2.5.4(e).
- 2 The generator and normal supply should both be isolated when undertaking repair or maintenance of the main switchboard.

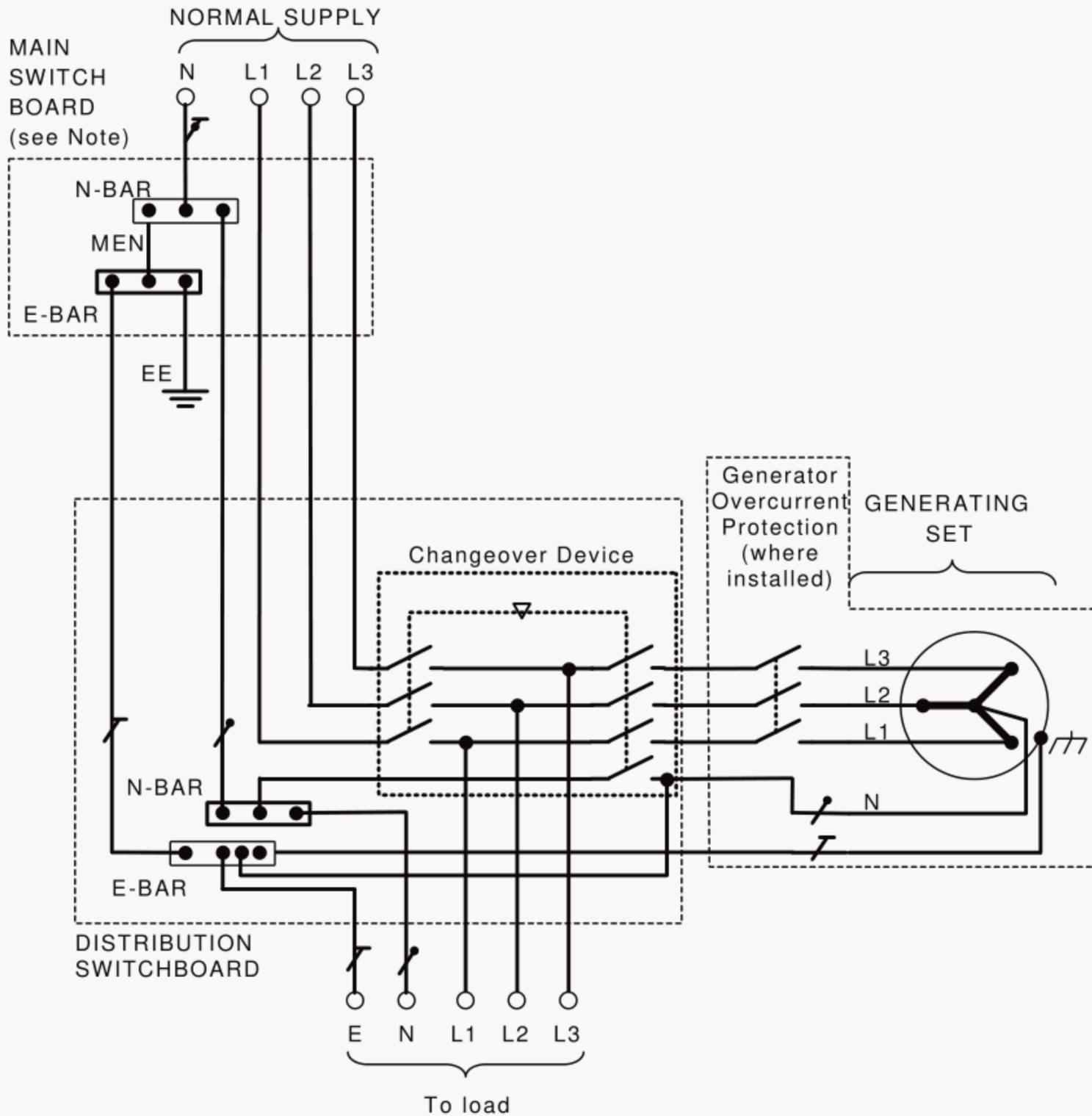
FIGURE 2.8 THREE POLE/FOUR POLE CHANGEOVER ARRANGEMENT FOR A THREE-PHASE GENERATING SET INSTALLED ON A SWITCHBOARD WITHOUT AN MEN LINK



NOTES:

- 1 For guidance on the sizing of the neutral and earth conductors, see Clause 2.5.4(e).
- 2 The generator and normal supply should both be isolated when undertaking repair or maintenance of the main switchboard.

FIGURE 2.8 THREE POLE/FOUR POLE CHANGEOVER ARRANGEMENT FOR A THREE-PHASE GENERATING SET INSTALLED ON A SWITCHBOARD WITHOUT AN MEN LINK



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- 2 The generator and normal supply should both be isolated when undertaking repair or maintenance of the main switchboard.

FIGURE 2.8 THREE POLE/FOUR POLE CHANGEOVER ARRANGEMENT FOR A THREE-PHASE GENERATING SET INSTALLED ON A SWITCHBOARD WITHOUT AN MEN LINK

Alternatively, the generating set windings referred to in Items (a) and (b) above may be arranged through a protection system in a manner that ensures the disconnection of the electrical installation in the event of an earth fault.

2.5.6.4 *Generating set used with other arrangements*

Where a generating set supplies one or more items of electrical equipment—

- (a) by individual attachment; or
- (b) as a part of an electrical installation that does not incorporate an earthing system;

the exposed conductive parts of each item of equipment being supplied shall be effectively connected to the generating set bonding system described in Clause 2.5.6.1.

2.5.7 **Switchboards**

2.5.7.1 *Arrangement of equipment*

Switchboards for the control of a generating set or its outgoing circuits, in addition to complying with AS/NZS 3000, shall be equipped with such instruments, relays and control equipment as may be necessary for safe and correct operation. All starting and shutdown devices, isolating switches, changeover devices and other devices that may require reading or adjustment, shall be accessible.

2.5.8 **Switchgear**

2.5.8.1 *Rating*

Switches, circuit-breakers, fuses, contactors, reclosers and other switchgear shall be selected with appropriate regard to the rated values of voltage, service duty and continuous and instantaneous current of the circuits on which they are installed.

All protective devices shall be capable of safely interrupting the prospective short-circuit current at the point where the devices are installed.

All switchgear used to break load current shall be marked with the rated breaking and making current capacity of the device. Switches that are not rated to interrupt the full-load current of the circuit shall be interlocked with load-breaking devices to prevent the possibility of the switches being opened under load.

2.5.8.2 *Provisions for securing isolating devices*

Where isolating devices are installed in accordance with Clause 2.4.2.3(b), means shall be provided to secure the device in the open position.

Where the accidental opening of devices may cause a hazard, similar means are recommended for retaining the device in the closed position.

NOTE: This recommendation may apply to manual changeover switches or some switches associated with the security of supply to emergency systems.

2.5.8.3 *Indication of switch position*

Where any equipment or circuit that operates at greater than extra-low voltage could be required to be worked on while activated, an isolating switch shall be provided in each unearthed conductor supplying the equipment. Such switches shall be of the visible-break type or be marked or provided with a device to indicate clearly whether the switch is open or closed. In addition means shall be provided for securing the device in the open position.

Where withdrawable switchgear equipment is used, the withdrawn position of the switchgear, where clearly indicated, constitutes a visible break for this purpose.

NOTE: Provision for protective earthing of equipment during repair or maintenance is recommended. See Clause 3.4 for the requirements for high voltage generating sets.

Alternatively, the generating set windings referred to in Items (a) and (b) above may be arranged through a protection system in a manner that ensures the disconnection of the electrical installation in the event of an earth fault.

2.5.6.4 *Generating set used with other arrangements*

Where a generating set supplies one or more items of electrical equipment—

- (a) by individual attachment; or
- (b) as a part of an electrical installation that does not incorporate an earthing system;

the exposed conductive parts of each item of equipment being supplied shall be effectively connected to the generating set bonding system described in Clause 2.5.6.1.

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NOTE: This recommendation may apply to manual changeover switches or some switches associated with the security of supply to emergency systems.

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Alternatively, the generating set windings referred to in Items (a) and (b) above may be arranged through a protection system in a manner that ensures the disconnection of the electrical installation in the event of an earth fault.

2.5.6.4 *Generating set used with other arrangements*

Where a generating set supplies one or more items of electrical equipment—

- (a) by individual attachment; or
- (b) as a part of an electrical installation that does not incorporate an earthing system;

the exposed conductive parts of each item of equipment being supplied shall be effectively connected to the generating set bonding system described in Clause 2.5.6.1.

2.5.7 **Switchboards**

2.5.7.1 *Arrangement of equipment*

Switchboards for the control of a generating set or its outgoing circuits, in addition to complying with AS/NZS 3000, shall be equipped with such instruments, relays and control equipment as may be necessary for safe and correct operation. All starting and shutdown devices, isolating switches, changeover devices and other devices that may require reading or adjustment, shall be accessible.

2.5.8 **Switchgear**

2.5.8.1 *Rating*

Switches, circuit-breakers, fuses, contactors, reclosers and other switchgear shall be selected with appropriate regard to the rated values of voltage, service duty and continuous and instantaneous current of the circuits on which they are installed.

All protective devices shall be capable of safely interrupting the prospective short-circuit current at the point where the devices are installed.

All switchgear used to break load current shall be marked with the rated breaking and making current capacity of the device. Switches that are not rated to interrupt the full-load current of the circuit shall be interlocked with load-breaking devices to prevent the possibility of the switches being opened under load.

2.5.8.2 *Provisions for securing isolating devices*

Where isolating devices are installed in accordance with Clause 2.4.2.3(b), means shall be provided to secure the device in the open position.

Where the accidental opening of devices may cause a hazard, similar means are recommended for retaining the device in the closed position.

NOTE: This recommendation may apply to manual changeover switches or some switches associated with the security of supply to emergency systems.

2.5.8.3 *Indication of switch position*

Where any equipment or circuit that operates at greater than extra-low voltage could be required to be worked on while activated, an isolating switch shall be provided in each unearthed conductor supplying the equipment. Such switches shall be of the visible-break type or be marked or provided with a device to indicate clearly whether the switch is open or closed. In addition means shall be provided for securing the device in the open position.

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2.5.8.3 *Indication of switch position*

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Where withdrawable switchgear equipment is used, the withdrawn position of the switchgear, where clearly indicated, constitutes a visible break for this purpose.

NOTE: Provision for protective earthing of equipment during repair or maintenance is recommended. See Clause 3.4 for the requirements for high voltage generating sets.

Alternatively, the generating set windings referred to in Items (a) and (b) above may be arranged through a protection system in a manner that ensures the disconnection of the electrical installation in the event of an earth fault.

2.5.6.4 *Generating set used with other arrangements*

Where a generating set supplies one or more items of electrical equipment—

- (a) by individual attachment; or
- (b) as a part of an electrical installation that does not incorporate an earthing system;

the exposed conductive parts of each item of equipment being supplied shall be effectively connected to the generating set bonding system described in Clause 2.5.6.1.

2.5.7 **Switchboards**

2.5.7.1 *Arrangement of equipment*

Switchboards for the control of a generating set or its outgoing circuits, in addition to complying with AS/NZS 3000, shall be equipped with such instruments, relays and control equipment as may be necessary for safe and correct operation. All starting and shutdown devices, isolating switches, changeover devices and other devices that may require reading or adjustment, shall be accessible.

2.5.8 **Switchgear**

2.5.8.1 *Rating*

Switches, circuit-breakers, fuses, contactors, reclosers and other switchgear shall be selected with appropriate regard to the rated values of voltage, service duty and continuous and instantaneous current of the circuits on which they are installed.

All protective devices shall be capable of safely interrupting the prospective short-circuit current at the point where the devices are installed.

All switchgear used to break load current shall be marked with the rated breaking and making current capacity of the device. Switches that are not rated to interrupt the full-load current of the circuit shall be interlocked with load-breaking devices to prevent the possibility of the switches being opened under load.

2.5.8.2 *Provisions for securing isolating devices*

Where isolating devices are installed in accordance with Clause 2.4.2.3(b), means shall be provided to secure the device in the open position.

Where the accidental opening of devices may cause a hazard, similar means are recommended for retaining the device in the closed position.

NOTE: This recommendation may apply to manual changeover switches or some switches associated with the security of supply to emergency systems.

2.5.8.3 *Indication of switch position*

Where any equipment or circuit that operates at greater than extra-low voltage could be required to be worked on while activated, an isolating switch shall be provided in each unearthed conductor supplying the equipment. Such switches shall be of the visible-break type or be marked or provided with a device to indicate clearly whether the switch is open or closed. In addition means shall be provided for securing the device in the open position.

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Alternatively, the generating set windings referred to in Items (a) and (b) above may be arranged through a protection system in a manner that ensures the disconnection of the electrical installation in the event of an earth fault.

2.5.6.4 *Generating set used with other arrangements*

Where a generating set supplies one or more items of electrical equipment—

- (a) by individual attachment; or
- (b) as a part of an electrical installation that does not incorporate an earthing system;

the exposed conductive parts of each item of equipment being supplied shall be effectively connected to the generating set bonding system described in Clause 2.5.6.1.

2.5.7 **Switchboards**

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Where the accidental opening of devices may cause a hazard, similar means are recommended for retaining the device in the closed position.

NOTE: This recommendation may apply to manual changeover switches or some switches associated with the security of supply to emergency systems.

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Alternatively, the generating set windings referred to in Items (a) and (b) above may be arranged through a protection system in a manner that ensures the disconnection of the electrical installation in the event of an earth fault.

2.5.6.4 *Generating set used with other arrangements*

Where a generating set supplies one or more items of electrical equipment—

- (a) by individual attachment; or
- (b) as a part of an electrical installation that does not incorporate an earthing system;

the exposed conductive parts of each item of equipment being supplied shall be effectively connected to the generating set bonding system described in Clause 2.5.6.1.

2.5.7 **Switchboards**

2.5.7.1 *Arrangement of equipment*

Switchboards for the control of a generating set or its outgoing circuits, in addition to complying with AS/NZS 3000, shall be equipped with such instruments, relays and control equipment as may be necessary for safe and correct operation. All starting and shutdown devices, isolating switches, changeover devices and other devices that may require reading or adjustment, shall be accessible.

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2.5.8.2 *Provisions for securing isolating devices*

Where isolating devices are installed in accordance with Clause 2.4.2.3(b), means shall be provided to secure the device in the open position.

Where the accidental opening of devices may cause a hazard, similar means are recommended for retaining the device in the closed position.

NOTE: This recommendation may apply to manual changeover switches or some switches associated with the security of supply to emergency systems.

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2.5.6.4 *Generating set used with other arrangements*

Where a generating set supplies one or more items of electrical equipment—

- (a) by individual attachment; or
- (b) as a part of an electrical installation that does not incorporate an earthing system;

the exposed conductive parts of each item of equipment being supplied shall be effectively connected to the generating set bonding system described in Clause 2.5.6.1.

2.5.7 **Switchboards**

2.5.7.1 *Arrangement of equipment*

Switchboards for the control of a generating set or its outgoing circuits, in addition to complying with AS/NZS 3000, shall be equipped with such instruments, relays and control equipment as may be necessary for safe and correct operation. All starting and shutdown devices, isolating switches, changeover devices and other devices that may require reading or adjustment, shall be accessible.

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2.5.6.4 *Generating set used with other arrangements*

Where a generating set supplies one or more items of electrical equipment—

- (a) by individual attachment; or
- (b) as a part of an electrical installation that does not incorporate an earthing system;

the exposed conductive parts of each item of equipment being supplied shall be effectively connected to the generating set bonding system described in Clause 2.5.6.1.

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2.5.6.4 *Generating set used with other arrangements*

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GPO Box 5420 Sydney NSW 2001

Administration

Phone (02) 8206 6000

Fax (02) 8206 6001

Email mail@standards.com.au

Customer Service

Phone 1300 65 46 46

Fax 1300 65 49 49

Email sales@standards.com.au

Internet www.standards.org.au



Level 10 Radio New Zealand House

155 The Terrace Wellington 6001

(Private Bag 2439 Wellington 6020)

Phone (04) 498 5990

Fax (04) 498 5994

Customer Services (04) 498 5991

Information Service (04) 498 5992

Email snz@standards.co.nz

Internet www.standards.co.nz



GPO Box 5420 Sydney NSW 2001

Administration

Phone (02) 8206 6000

Fax (02) 8206 6001

Email mail@standards.com.au

Customer Service

Phone 1300 65 46 46

Fax 1300 65 49 49

Email sales@standards.com.au

Internet www.standards.org.au



Level 10 Radio New Zealand House

155 The Terrace Wellington 6001

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Phone (04) 498 5990

Fax (04) 498 5994

Customer Services (04) 498 5991

Information Service (04) 498 5992

Email snz@standards.co.nz

Internet www.standards.co.nz