Electrical Safety of Machines

Should we be using AS/NZS 3000, AS/NZS 4024.1204 or IEC 60204-1?

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Question - What is the applicable NZ Legislation and Standard for machine electrical safety?

1. Executive Summary

There is a widespread misconception within the New Zealand electrical industry that **AS/NZS 3000** applies to the construction or modification of machinery. This document clarifies the applicable legislative framework and explains how New Zealand electrical legislation defines the scope and applicability of standards, particularly the distinction between electrical installations and appliances.

The key point is that a machine is not part of the building or site electrical installation; it is an appliance connected to that installation and as such, AS/NZS 3000 does not apply to the machine electrical systems.

2. Background

In the early 2000s, uncertainty existed within the electrical industry regarding the appropriate electrical standard for machinery. Industry practice commonly defaulted to **AS/NZS 3000**, with limited consideration of whether this standard was applicable to machinery rather than building installations.

A practical example arose at a processing facility where an electrical contractor declined to energise a machine, citing non-compliance with AS/NZS 3000 due to the use of yellow insulation on 200 VAC PLC output wiring. While AS/NZS 3000 prohibits the use of yellow insulation for live conductors, this raised a fundamental question: **Was AS/NZS 3000 the correct standard against which the machine should be assessed?**

Consultation with industry stakeholders, including Energy Safety, highlighted the importance of legislative definitions of "**installation**" and "**appliance**". Based on these definitions, the machinery was identified as an *appliance* rather than part of the electrical *installation*. Consequently, AS/NZS 3000 was determined to be an inappropriate reference standard for the machinery wiring and control systems.

At that time, the only comprehensive machinery electrical standard available was **BS EN 60204-1**, derived from **IEC 60204-1**. Although technically suitable, this standard was not explicitly recognised in the Electricity (Safety) Regulations, creating uncertainty about its acceptability as a compliance reference in New Zealand's highly regulated electrical environment.

In the absence of an alternative recognised machinery standard, BS EN 60204-1 was adopted as the technical basis for machinery electrical safety. This decision aligned with the principle of applying the most current state of knowledge to ensure safety and long-term suitability, particularly where international standards underpin many New Zealand requirements.

To support this approach, internal company documentation was developed, including:

- an electrical site standard defining the boundary between AS/NZS 3000 (installation) and BS EN 60204-1 (machine),
- an electrical Certified Design document, and
- a Certificate of Compliance (CoC) document.

Under this framework:

- AS/NZS 3000 was applied to the machine power supply cabling and protection up to the point of connection.
- The machinery electrical design followed the internal site standard based on BS EN 60204-1.
- Contractors completed compliance testing and certification against the approved Certified Design written by the designer, recording the results in the CoC document.

Additional requirements were defined to address gaps in BS EN 60204-1, including enhanced wire colour coding to clearly distinguish AC, DC, and voltage levels. Power conductor colours were specified as **Red**, **White**, and **Blue** for phases, **Black** for neutral, and **Green/Yellow** for earth. This differed from BS EN 60204-1, which specifies black conductors for three-phase systems, but better aligned with New Zealand practice and commonly available cabling.

In more recent reviews of machinery electrical documentation, it has been observed that contractors continue to reference **AS/NZS 3000** as the applicable standard for machine wiring. However, **IEC 60204-1 Ed. 6.1 (2021)** is now explicitly recognised and mandated in the Electricity (Safety) Regulations, making it a valid compliance standard for machinery electrical safety. The continued use of AS/NZS 3000 for machinery indicates that this regulatory update is not yet widely understood within the industry.

The Electricity (Safety) Regulations require that any work on installations or appliances results in equipment that is electrically safe. Compliance with recognised standards is one accepted method of meeting these obligations.

Below is information of the New Zealand electrical sector legislation and interpretations from the applicable legislation on installations and appliances to support this presentation.

3. Legislation in the New Zealand Electricity Sector

Let's start with a look at the electricity sector in New Zealand.

The New Zealand electricity sector is governed by a framework of legislation, government policy, and independent regulators, rather than by a single organisation.

The primary legislation is the Electricity Act 2010. The Act focuses on electrical safety including the health and safety of the public and preventing property damage, licensing and regulation of electrical workers, and standards for electrical installations and appliances. The Ministry of Business, Innovation and Employment (MBIE) is the lead policy agency for electricity where it develops electricity and energy policy, advises government ministers, and oversees the regulatory system as a whole.
https://legislation.govt.nz/act/public/1992/

The Health and Safety at Work Act 2015 (HSWA) forms part of the framework and applies to all electrical work in workplaces, including construction, industry, and utilities. It imposes a primary duty of care on PCBUs, and requires elimination or minimisation of electrical risks "so far as is reasonably practicable".
https://www.legislation.govt.nz/act/public/2015/

The secondary legislation is the Electricity (Safety) Regulations 2010. This is the core operational safety regulation for electricity in NZ. It defines what is electrically safe and unsafe, controls prescribed electrical work (PEW), requires Certificates of Compliance (CoC) and Records of Inspection, mandates use of recognised technical standards (e.g. AS/NZS 3000 and IEC 60204-1), and regulates electrical installations, fittings, appliances, and supply systems. These regulations are administered by MBIE and enforced by WorkSafe Energy Safety.
https://www.legislation.govt.nz/secondary-legislation/2010/

3.1.1 Mandatory Technical Standards

These standards are not laws by themselves but become legally enforceable because they are cited in the Electricity (Safety) Regulations. Some of the more common standards in general use are:

- AS/NZS 3000 - Electrical Installations (Wiring Rules)
- AS/NZS 3019 - Electrical installations - Periodic assessment
- AS/NZS 3760 - In-service safety inspection and testing of electrical equipment and RCDs
- AS/NZS 4836 - Safe working on or near low-voltage and extra-low voltage electrical installations and equipment
- IEC 60204-1 Ed 6.1 (2021) - Safety of machinery - Electrical equipment of machines - Part 1: General requirements

3.1.2 NZ Legislation Hierarchy Summary

Highest authority to Lowest authority

- Electricity Act 1992
- Health and Safety at Work Act 2015
- Electricity (Safety) Regulations 2010
- Cited Standards (AS/NZS 3000, IEC 60204-1, etc.)
- NZ Electrical Codes of Practice (NZECPs)
- WorkSafe guidance and industry best practice

4. Applicable Definitions and Interpretations

To determine where the electrical “installation” system finishes and the “appliance” (machine) starts, we first need to understand the definitions and interpretations of these parts from the applicable legislation.

4.1 Electricity Act 1992

4.1.1.1 electrical appliance means

(i) any appliance that **uses**, or is designed or intended to **use**, electricity, whether or not it also uses, or is designed or intended to use, any other form of energy

4.1.1.2 electrical installation means

(i) in relation to a property with a point of supply, all fittings beyond the point of supply that form part of a system that is used to **convey** electricity to a point of consumption, or used to **generate** or **store** electricity; and

An installation does not include any of the following:

(i) an **electrical appliance**:

(ii) any fittings that are owned or operated by an electricity generator and that are used, designed, or intended for use in or in association with the generation of electricity, or used to convey electricity from a source of generation to distribution or transmission lines:

(iii) any fittings that are used, designed, or intended for use in or in association with the conversion, transformation, or conveyance of electricity by distribution or transmission lines

4.1.2 Other applicable interpretations to be aware of:

4.1.2.1 PEW (prescribed electrical work) means electrical work prescribed in regulations made under section 169, being work that falls into any of the following categories:

(a) the design or construction or maintenance of electrical installations:

(b) the maintenance of electrical appliances:

(c) the connection or disconnection of works, electrical installations, and electrical appliances to or from a power supply, other than by means of:

(i) a plug; or

(ii) an appliance inlet; or

(iii) a pin that is inserted into a socket outlet:

(d) the design or construction or maintenance of works:

(e) the testing or certification or inspection or supervision of the work described in paragraphs (a) to (d)

4.2 Electricity (Safety) Regulations 2010 - Version as on 13 November 2025

4.2.1.1 **appliance** means an electrical appliance as defined in section 2(1) of the Act

4.2.1.2 **installation** means an electrical installation as defined in section 2(1) of the Act, and part installation means any part of an installation

4.2.2 Other applicable interpretations to be aware of:

4.2.2.1 supplier declaration of conformity means a declaration, relating to a low voltage or extra-low voltage fitting or appliance, that complies with regulation 83(3)

4.2.2.2 certificate of compliance means a certificate, issued under regulation 65, regarding the lawfulness and safety of prescribed electrical work done on an installation or part installation

4.2.2.3 certified design means a design for an installation that has been certified in accordance with regulation 58

4.2.2.4 electrical safety certificate means a certificate, issued under regulation 74A, regarding the electrical safety of an installation or part installation that is connected to a power supply

4.2.2.5 Meanings of electrically safe and electrically unsafe

(a) electrically safe means, in relation to works, **installations**, fittings, **appliances**, and associated equipment, that there is no significant risk that a person or property will be injured or damaged by dangers arising, directly or indirectly, from the use of, or passage of electricity through, the works, installations, fittings, appliances, or associated equipment

(b) electrically unsafe means, in relation to works, **installations**, fittings, **appliances**, and associated equipment, that there is a significant risk that a person may suffer serious harm, or that property may suffer significant damage, as a result of dangers arising, directly or indirectly, from the use of, or passage of electricity through, the works, installations, fittings, appliances, or associated equipment.

4.2.2.6 Doing work on works, installations, fittings, and appliances

(1) A person who does work on any works or **installation**, or on any part of any works or installation, must ensure

(a) that the resulting works or installation, or part of the works or installation, is electrically safe; and

(b) if the work is on only part of any works or installation, that the work has not adversely affected the electrical safety of the rest of the works or installation.

(2) A person who does work on any fittings or **appliances** must ensure that

(a) the resulting fittings or appliances are electrically safe.

(5) A person commits an offence and is liable on conviction to a level 2 penalty if he or she -

(a) does work on any works or installation and fails to comply with subclause (1); or

(b) does work on any fittings or appliances and fails to comply with subclause (2); or

(c) while doing work on any works, installations, fittings, or appliances, fails to ensure, so far as is reasonably practicable, that people and property are protected from dangers arising from the work, where the person doing the work knows, or can reasonably be expected to know, of the dangers that may arise from the work.

4.2.2.7 Designing works, installations, fittings, and appliances

(1) A person who designs, or supervises the design of, works, **installations**, fittings, or **appliances** must ensure that, if the finished design were constructed, installed, or manufactured as designed, the finished works, installations, fittings, or appliances would be electrically safe.

(2) A person who designs, or supervises the design of, works, installations, fittings, or appliances commits an offence and is liable on conviction to a level 2 penalty if he or she fails to comply with subclause (1).

5. Electrical Standards in New Zealand

As discussed earlier, one of the main operations of the Electricity (Safety) Regulations is to recognise and mandate the use of technical standards (e.g. AS/NZS 3000, IEC 60204-1) in the New Zealand electrical industry. An example of this is AS/NZS 3000:2018, this standard was released by Standards NZ in 2018 as the current standard, and changed the status of AS/NZS 3000:2007 to superseded. But this created a problem as the Electricity (Safety) Regulations was still mandating the 2007 version, making the 2018 version unusable. This has now been corrected with the Electricity (Safety) Regulations now recognising and mandating the 2018 versions with amendments, but only in 2025.

Making up part of the Electricity (Safety) Regulations are a series of Schedules which are used to present specific detail on topics. Schedule 2 and Schedule 4 are the two relevant here. Schedule 2 lists recognised and mandated electrical codes of practice and official standards, with Schedule 4 listing recognised and mandated standards applicable to fittings and appliances. Clause 3 of Schedule 4 lists standards applicable to low voltage electrical apparatus - this is where you will find the entry for IEC 60204-1, as shown below.

Schedule 2 - Electrical codes of practice and official standards cited in these regulations
Official standards referred to in regulations

Abbreviation used in regulations	Full title (and any modifications)
AS/NZS 3000	AS/NZS 3000:2018: Electrical installations (known as the Australian/New Zealand Wiring Rules), including Amendments 1, 2, and 3

Schedule 4 - Standards applicable to fittings and appliances
3. Low voltage electrical apparatus

Low voltage electrical apparatus	Applicable standard
Electrical equipment of machines	IEC 60204-1 Ed 6.1 (2021) Safety of machinery—Electrical equipment of machines—Part 1: General requirements

5.1 Machine safety standards in New Zealand

Within New Zealand and Australia, the AS/NZS 4024 series of standards should be referred to as the primary standard against which to guide machine safety. While these standards are not specifically mandated within NZ like the electrical standards are in the Electricity (Safety) Regulations (e.g. AS/NZS 3000, IEC 60204-1), the Health and Safety at Work Act 2015 (HSWA) mandates that machinery must be safe, and risks must be eliminated or minimised. WorkSafe NZ recognises the AS/NZS 4024 series of standards as the benchmark for "taking all reasonably practicable steps" to achieve safety.

While Designers can use other standards (like international ISO or European EN standards), they must demonstrate they reach the same, or better, level of safety as AS/NZS 4024. If machinery is not compliant with AS/NZS 4024, it is highly likely that it does not meet the legal requirements of the Health and Safety at Work Act 2015.

This table shows some of the common AS/NZS 4024 standards and the relevant international version.

Australian/NZ Standard Designation	International / European Standard Designation	Full Title
AS/NZS 4024.1201:2014	ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
AS/NZS 4024.1204:2019	IEC 60204-1:2016	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
AS/NZS 4024.1503:2014	ISO 13849-1:2006	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
AS/NZS 4024.1601:2024	ISO 14120:2015	Safety of machinery - General requirements for the design and construction of fixed and movable guards
AS/NZS 4024.1602:2014	ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
AS/NZS 4024.1603:2019	ISO 14118:2017	Safety of machinery - Prevention of unexpected start-up
AS/NZS 4024.1604:2019	ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
AS/NZS 4024.1801:2025	ISO 13857:2019	Safety of machinery - Safety distances to prevent danger zones being reached by upper and lower limbs
AS/NZS 4024.1803:2019	ISO 13854:2017	Safety of machinery - Minimum gaps to prevent crushing of parts of the human body

5.1.1 AS/NZS 4024.1204:2019

The standard AS/NZS 4024.1204:2019 has been adopted by stakeholders in both countries, Standards Australia and Standards New Zealand as an Australian/New Zealand Standard.

This Standard is an adoption with national modifications, and has been reproduced from IEC 60204-1:2016, Safety of machinery - Electrical equipment of machines - Part 1: General requirements.

The national modifications are additional requirements and are set out in Appendix ZZ, which has been added at the end of the standard. The modifications listed in Appendix ZZ are generally listing replacing an international standard reference with an AS or AS/NZS reference.

The objective of this Standard is to provide requirements and recommendations relating to the safety of electrical, electronic and programmable electronic equipment and systems to machines not portable by hand while working, including a group of machines working together in a coordinated manner. The equipment covered by this part of AS/NZS 4024 commences at the point of connection of the supply to the electrical equipment of the machine.

6. Conclusion

This conclusion is based on the interpretations from the Electricity Act 1992 which states that the **installation** is all fittings beyond the point of supply that form part of a system that is used to **convey** electricity to a point of consumption, and an **appliance** is any appliance that **uses**, or is designed or intended to use, electricity, whether or not it also uses, or is designed or intended to use, any other form of energy. A machine falls into the appliance category.

AS/NZS 3000 shall be used for the design, installation, or modification of electrical installations or parts of installations. Its applicability ends at the point where the machine power supply cable terminates, whether at a switchboard or within the controller of a standalone machine.

AS/NZS 4024.1204 or **IEC 60204-1** shall be used for the design, installation, or modification of appliances, including machinery. These standards apply from the point at which the power supply cable from the site distribution system terminates at the machine.

While **AS/NZS 4024.1204** is not explicitly cited in the Electricity (Safety) Regulations, **IEC 60204-1 Ed 6.1 (2021)** is recognised and mandated. Given that AS/NZS 4024.1204 is an adoption of IEC 60204-1:2016 which is now not the current standard, consideration of whether to use AS/NZS 4024.1204:2019 as the reference standard for your design needs to be thought through. To comply with the Electricity (Safety) Regulations you must use the standard that is mandated by it, which in this case is IEC 60204-1 Ed 6.1 (2021). Using “local” adoptions of international standards i.e. AS/NZS 4024.1204:2019 will always require due diligence to ensure the local version is the mandated and legally binding version.

7. References

- NZ Electricity Act 1992
- NZ Health and Safety at Work Act 2015 (HSWA)
- NZ Electricity (Safety) Regulations 2010 - version as on 13 November 2025
- AS/NZS 3000 - Electrical Installations (Wiring Rules)
- AS/NZS 4024.1204
- BS EN 60204-1 / IEC 60204-1
- WorkSafe NZ - Safe use of machinery