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FREQUENTLY ASKED QUESTIONS ON WRING RULES

The sixth edition of the Australian/New Zealand Standard for Wiring Rules (AS/NZS 3000:2018) was released in June 2018.

The following Frequently Asked Questions (FAQs) and answers have been developed by the committee responsible for the Wiring Rules (2018) to explain some of the issues which have been raised by users of the Standard.

Question	Answer
FAQ 001/2018: **AS/NZS 3000:2018, CLAUSE 3.7.2.1.2** **Electrical Connections—Connection methods—General—Aluminium conductors** **Question 001/2018:** **What factors need to be considered when connecting aluminium conductors?**	It is recommended that literature provided by manufacturers of aluminium cables and components designed for the connection of aluminium conductors be consulted to determine the appropriate techniques to use. Some of the techniques used in the jointing or termination of aluminium conductors are as follows: (a) The use of purpose designed bi-metallic cable lugs and other connection devices. (b) Welding, which may be used for solid or stranded conductors. (c) Soldering of solid conductors, utilizing special solders which scratch remove the aluminium oxide and tin the conductors. (d) Soldering of stranded conductors, utilizing special fluxes to remove the aluminium oxide and the use of solder basting techniques to tin the conductors.

Question	Answer
	FAQ 001:2018 –Answer Contd… (e) Crimping, indenting or compression of solid or stranded conductors using cable lugs or ferrules made of aluminium and designed for the purpose. (f) Removal of the aluminium oxide from contact surfaces by applying an oxide-inhibiting compound and leaving it in place to prevent the ingress of moisture and air to the completed joint. (g) Bolting or clamping terminations using aluminium alloy bolts and nuts that expand or contract at the same rate as the conductor and cable lug. (h) Using spring cup washers of the 'Belleville' type, which when properly selected will compensate for any differential expansion of the aluminium conductor and other metals in the joint. (i) Tunnel type terminals specifically designed to evenly distribute stress on conductors. Consideration needs to be given to the following: (i) Removal of the aluminium oxide film, which prevents good electrical contact, from the conductors. (ii) Avoiding contact with dissimilar metals that may initiate galvanic action (ii) The different coefficient of linear expansion of aluminium and other metals that, when connected together may over time, due to expansion and contraction, result in loose connections. (iii) The relative softness of aluminium, which when compressed may cause the metal to 'flow' away from the connection resulting in a high resistance connection.
FAQ 002/2018: **AS/NZS 3000:2018, CLAUSE 1.5.14, CLAUSE 3.9.4 & CLAUSE 3.9.4.4** **1.5.14 Protection against external influences** **3.9.4 Protection against mechanical damage** **3.9.4.4 Protection methods**	

Question	Answer
FAQ 002:2018 Contd… **Question 002/2018:** **What types or methods of protection are regarded as adequate to prevent mechanical damage in accordance with Clause 3.9.4?**	The provisions of Clause 3.9.4 are intended to protect wiring systems installed in locations where they may reasonably be expected to be subject to mechanical damage such as a screw or nail penetrating the surface of the structure containing the electrical installation. The method of protection of the wiring system may be any one of the three detailed in Clause 3.9.4.4. These three methods are: Clause 3.9.4.4 (a) that requires prevention of mechanical damage to the wiring system. The form of mechanical protection must be such as would **prevent** a screw or nail etc. penetrating the wiring system and should take into account the material and type of wall structure together with the type of tool likely to be used to insert a screw or nail into the surface (i.e. solid brick, plasterboard lining, concrete slab etc). If there remains a risk that the wiring system could be penetrated after the installation of the mechanical protection, the risk has not been prevented and either sub-clause (b) or (c) must be applied. Clause 3.9.4.4 (b) that requires the use of an armour, screen, covering or enclosure that is earthed to ensure that in the event of penetration of the wiring system the circuit protective device will operate. Metallic barriers, such as sheet metal, wall boxes and the like shall be earthed by means of a conductor having a size not less than that required for the largest associated circuit. *FAQ 002:2018 –Answer Contd…* Clause 3.9.4.4 (c) that requires the use of an RCD to provide additional electrical protection that obviates the need for the forms of additional mechanical protection detailed in (a) and (b).

Question	Answer
	FAQ 002:2018 –Answer Contd… It should also be noted that Clause 3.3.2.6 requires wiring systems to be arranged to minimize the risk of mechanical damage. Therefore suitable location of the system such that the risk does not exist should always be the first choice. For example, a wiring system installed within the cavity of a double brick cavity wall would not be considered at risk of mechanical damage. Wiring systems installed in an internal cavity wall where there is a cupboard or similar enclosure permanently installed in such a manner as to preclude the risk of penetrating the wall cavity would not be regarded as being at risk provided that the wiring is more than 50mm from the opposite (exposed) surface of the wall. For example, a cupboard arranged to form a duct of at least 50mm between the wall and the rear of the cupboard such as one above a wall oven arranged to provide for the dissipation of heat generated by the oven. (The 50mm could include the thickness of the wall surface.)
FAQ 003/2018: **AS/NZS 3000:2018, CLAUSE 3.11 AND TABLE 3.5** **3.11 Underground wiring systems** **TABLE 3.5 Underground wiring system categories** **Question 003/2018:** **What distinguishes a neutral screened cable suitable to be buried direct in the ground without mechanical protection from other neutral screened cables?**	A neutral screened cable with a sheath of at least 3.2 mm thickness, marked "UNDERGROUND" and complying with AS/NZS 4961.
FAQ 004/2018: **AS/NZS 3000:2018, CLAUSE 3.6.2 Voltage Drop – Value**	

Question	Answer
FAQ 004:2018 Contd… **Question 004/2018:** **Is the 7% voltage drop applicable to rural type installation (e.g. homestead, shearing shed, other accommodation, irrigation pumps, etc)?**	Yes. Provided the transformer is dedicated to the installation
FAQ 005/2018: **AS/NZS 3000:2018, CLAUSE 3.10.3.1 Installation of wiring enclosures – General** **Question 005/2018:** **May a wiring system be placed within a concrete path?**	No. A wiring enclosure placed within a concrete path does not satisfy the requirements for underground wiring and is not considered to be 'safe and sound practice' and does not provide adequate protection.
FAQ 006/2018: **AS/NZS 3000:2018, CLAUSE 5.4.6.2 Structural metalwork including conductive building materials – Connection to protective earthing conductors** **Question 006/2018:** **Is it necessary to earth individual lintels, posts, metal window frames and steel trusses mounted on timber walls?**	No, however in the case of unearthed structural metalwork and other conductive building materials the following must be considered: a) There shall be no risk of contact between insulated unsheathed cables coming into contact with the building material and, b) There shall be no risk of contact between live parts of electrical equipment and the building material c) The breaking of a conductor at a termination or connection shall not result in the above mentioned contacts from occurring. (this can be achieved by shrouding, tying, restraining, lacing or clipping)

Question	Answer
FAQ 007/2018: **AS/NZS 3000:2018, CLAUSE 5.3.3.2 Earthing conductor size (cross-sectional area) – Main earthing conductor** **Question 007/2018:** **Where the main earthing conductor forms part of the earth fault current path and its size needs to be determined based on the prospective fault current level and duration what sizes are required in the following two examples?** **Example A - An installation with consumers mains having a nominated fault current level of 25kA where the disconnection time of the overcurrent protective device is not available (The earthing conductor will not be laid up with other cables and will have PVC insulation)** **Example B – calculate the size required if the nominated fault current is reduced to 15kA and the protective device has a disconnection time of 0.4 seconds.**	If the disconnection time of the overcurrent protective device cannot be determined, the disconnection time shall be deemed to be 0.2 second. The 0.2 second disconnection time is intended to apply where the upstream overcurrent protective device is supplied or installed by a distributor and its characteristics are not available or where no such device is installed. Example A - From the formula $S = \sqrt{\left(I^2 t / K^2\right)}$ *I* is the nominal short circuit current (25kA) *t* is the disconnection time unspecified so use the deemed value of 0.2 seconds *K* has a value of 136 (for PVC insulated conductors) **So S = 82 square millimetres (use 95 mm² conductor)** Example B – *I* is the nominal short circuit current (15kA) *t* is the disconnection time – 0.4 seconds *K* has a value of 136 (for PVC insulated conductors) **In this case S = 70 square millimetres (use 70 mm conductor)**

Question	Answer
FAQ 008/2018: **AS/NZS 3000:2018, CLAUSE 5.5.5.5 Earthing arrangements—Installation—Buried earthing conductors** **Question 008/2018:** **(a) What depth of burial requirements apply to bare earthing conductors and bare equipotential bonding conductors buried direct in the ground or installed in an underground wiring enclosure.** **(b) What conditions apply where insulated conductors are substituted for the bare conductors?** **(c) When is a conductor forming part of an earthing grid, regarded as an earthing conductor and when is it an earthing electrode?**	(a) Bare or insulated earthing conductors which are buried directly in the ground shall be in accordance with the requirements of Clause 3.11 and be provided with protection appropriate to the expected conditions of mechanical damage at the point of installation (see Clause 5.5.5.2). (b) Where the installation of bare conductors would meet the requirements of Clause 5.5.5.5 and insulated conductors are substituted for the bare conductors (e.g. by choice of design, to provide added protection against corrosion, due to availability of suitable material or other such reason) then the installation of the insulated conductors need only comply with the requirements applicable to the bare conductors. (c) A bare earthing conductor which is not a part of any underground wiring system may be used as a strip-type earth electrode and buried in a horizontal trench in accordance with Clause 5.3.6.
FAQ 009/2018: **AS/NZS 3000:2018, CLAUSE 7.2.7.2, Wiring systems – Type of wiring** **Question 009/2018:** **May Exception in 7.2.7.2 be applied to the type of wiring system used for consumers mains supplying safety services where such mains are installed within a switchroom that is constructed to provide a fire rating of at least 2 hours?**	No. The Exception applies to wiring system enclosures that provide independent enclosure of such circuits. Safety service circuits must be arranged such that a fault on any other circuit cannot be transferred to the safety service circuit.