

Part 1: Short answer

Answer questions in the spaces provided giving references to Australian Standards as shown.

1. What are three acceptable methods of protection against mechanical damage when a wiring system is fixed within 50mm of the underside of roofing material?

1. Mechanical protection.
2. Earthed metallic armouring, screen, covering or enclosure.
3. Protected by a 30mA RCD.

AS/NZS 3000: 3.9.4.4

2. Where can the requirements for the separation of telecommunications cables from low voltage systems be found?

AS/CA S009

AS/NZS 3000: 3.9.8.4 (c)

3. What are the two classifications of 'patient area' in a medical treatment facility with regard to the supply of electrical equipment?

1. Body-protected areas
2. Cardiac-protected areas

AS/NZS 3003: 2.2.1

4. What is the maximum rated residual current permitted for RCDs used as Leakage Protection Devices (LPDs) in a body-protected area of a hospital ward?

10mA

AS/NZS 3003: 2.8.1

5. What is the requirement for the marking of 'construction wiring'?

Iridescent yellow tape marked every 5 metres with the words 'construction wiring'.

AS/NZS 3012: 5.4.4

6. What is the minimum depth of burial for underground cabling supplying caravan park pillars where the cable route passes under areas where tent pegs or stakes are likely to exceed 400mm in length?

1.0 metre

AS/NZS 3001: 2.2.2

7. What is the minimum IP rating for socket-outlets mounted on the external surface of a caravan?

IP24

AS/NZS 3001: 3.6.3.4

8. Where a socket-outlet for an individual berth of a marina is supplied via an individual isolating transformer, is the socket-outlet required to be protected by an RCD?

No

AS/NZS 3004: 2.4.2.4.5

9. Where a switchboard enclosure on a carnival site contains socket-outlets, a 'tie-bar' must be provided on the switchboard. What is the purpose of a 'tie-bar'?

To secure flexible cords plugged into outlets on the switchboard.

AS/NZS 3002: 2.4.2 (b) (v)

10. What are the two types of Hazardous Area recognized in AS/NZS 3000?

1. Explosive gas

2. Combustible dust

AS/NZS 3000: 7.7.2.2

11. List three ways to reduce or limit the degree of hazard associated with a Hazardous Area.

1. Plant layout

2. Product containment

3. Ventilation

AS/NZS 3000: 7.7.2.3

12. Which standard(s) should be referenced regarding inspection and maintenance of equipment installed in a Hazardous Area?

AS/NZS 60079.17

AS/NZS 3000: 7.7.2.4

13. What is the minimum horizontal distance from the internal rim of the water container of an in-ground swimming pool to be deemed to be outside the pool zone?

3.5m

AS/NZS 3000: Fig 6.15 (or 6.16, or 6.17)

14. What is the minimum horizontal distance from the outer edge of a sauna heater to be deemed to be outside of Zone 1?

0.5m

AS/NZS 3000: Fig 6.22

15. What is the zone classification for the internal base of the water container of a water feature?

Zone 0

AS/NZS 3000: Fig 6.20 (or 6.21)

16. Is it permissible to install a socket-outlet in Zone 2 of a bathroom?

Only shaver outlets, and other socket-outlets that are protected by a 30mA RCD and are enclosed in a cupboard that maintains the enclosure of the socket-outlet during operation of the connected equipment

AS/NZS 3000: 6.2.4.2 (b)

17. What are the prohibited measures of protection against electric shock in a pool zone?

Protection by means of obstacles

Protection by placing out of reach

AS/NZS 3000: 6.3.3.1

18. What is the minimum IP Rating for an underwater pump submersed in a water feature?

IPX8

AS/NZS 3000: 6.4.4.1

19. What are the requirements for a switch controlling a light fitting in a sauna room?

Must be outside the sauna room

AS/NZS 3000: 6.5.4.4

20. For high risk applications where the operation of electrical equipment could present a significant safety hazard, which of the following would be the most appropriate system to use? Circle the correct answer.

Separated extra-low voltage (SELV system)

Protected extra-low voltage (PELV system)

21. Is an earth required for equipment supplied at extra-low voltage (SELV)?

No

AS/NZS 3000: 7.5.5

22. What is the maximum permissible voltage drop in an extra-low voltage installation?

10%

AS/NZS 3000: 7.5.7

23. What is the minimum height above the ground, floor or platform for the point of attachment for an aerial consumer main?

3.0m

NSW Service Rules: 3.7.1 or Fig 3.5

24. What is the maximum height above the ground for the point of attachment for an aerial consumer main?

6.7m

NSW Service Rules: 3.7.1 or Fig 3.6

25. What is the maximum span for an aerial bundle cable?

60m

AS/NZS 3000: Table 3.9

26. What is the minimum permissible size for copper and aluminium aerial cables installed on a customer's premises?

1. Copper – 6mm²

2. Aluminium – 16mm²

AS/NZS 3000: 3.12.2.2 (a)

27. Give an example of a typical 'Category B' underground wiring system.

TPS cables buried direct (or in medium duty conduit) and covered with additional mechanical protection.

AS/NZS 3000: 3.11.3.2

28. Give an example of a typical 'Category C' underground wiring system.

Armoured cables laid in a trench chased in rock and covered with concrete.

AS/NZS 3000: 3.11.3.2

29. List three other types of underground service that might be present in an area where an electrical underground cable is to be installed.

1. Gas pipes,
2. Water pipes,
3. Telecommunications cables

(Also accept Sewer, Drainage, other power cables)

NSW Service Rules: 2.4.2

30. How must orange marker tape be installed for a Category A underground wiring system?

Above the wiring system for the length of the run at 50% of the depth of cover.

AS/NZS 3000: 3.11.4.5

31. What is the minimum permissible size conduit for an underground service cable in NSW?

40mm

NSW Service Rules: 2.5.1

32. List two disadvantages of an underground wiring system compared to an aerial wiring system.

1. Higher cost of construction
2. Susceptible to unintentional damage due to excavation (eg: in rural areas where the ground is subject to farming/digging).

33. Service cables must be XLPE insulated PVC sheathed and comply with which Australian Standard?

AS/NZS 5000.1 Electric cables - Polymeric insulated

NSW Service Rules: 2.6.1

34. What are the AS/NZS 3000 requirements where sheathed cables pass through holes in metallic structural members?

Any aperture through which the cables pass must be bushed or shaped to minimise abrasion of the cables. Where likely to be disturbed the cables must be fixed in position at a point adjacent to the aperture.

AS/NZS 3000: 3.9.3.1

35. What are the installation requirements for TPS cables installed running across ceiling joists in an accessible ceiling space?

1. Supported to prevent undue sagging.
2. Supported to prevent accidental withdrawal of cables from electrical equipment exposing single insulated conductors.
3. Protected against mechanical damage.

AS/NZS 3000: 3.9.3.3.2

36. What are the requirements for covers on cable trunking that contain single insulated cables where the trunking is installed 1.5m above the ground?

Covers must be effectively retained in position and require a tool for removal.

AS/NZS 3000: 3.10.2.1

37. What support is required for cables placed on an immovable continuous surface?

None

AS/NZS 3000: 3.9.3.1 Exception 1

38. List four factors that need to be considered when terminating aluminium conductors.

1. Removal of any oxide coating.
2. The relative softness of aluminium.
3. Different coefficient of expansion compared to other metals.
4. Galvanic action that can occur when dissimilar metals are in contact.

AS/NZS 3000: 3.7.2.1.2

39. List four factors to consider when making joints in cables?

1. Material of the conductor and its insulation.
2. Number and shape of wires forming the conductor.

3. Cross-sectional area of the conductor.
4. Number of conductors being terminated.

(Also, Temperature attained by terminals in normal service, and Prevention of entry of moisture)

AS/NZS 3000: 3.7.2.1.1

40. Explain why the insulation resistance of a cabling system needs to be tested.

To ensure the integrity of the insulation to prevent electric shock, fire hazards and equipment damage.

AS/NZS 3000: 8.3.6.1

41. When installing wiring systems under wall lining or roofing materials, what are the prohibited locations in which to install wiring systems?

Wiring systems shall not be installed through any space formed between roofing or wall-lining materials and its immediate supporting member.

AS/NZS 3000: 3.9.4.3.1

42. Volumes One and Two of the NCC contain provisions that may affect the selection and installation of equipment that forms part of an electrical installation, and which may vary according to the building classification, construction, use and local environment. What are the two categories of provisions in the NCC that affect electrical installations?

1. Fire Safety
2. Health, amenity sustainability and energy efficiency

AS/NZS 3000: 2018 E.2.3.1

43. When installing new electrical services, such as wiring systems, ductwork, pipework and air conditioners, in heritage buildings and premises, care should be taken to install them inconspicuously to minimise damage to the heritage fabric of the building. Name three techniques that could be used to achieve this aim.

1. Install wiring systems in sub-floor spaces or roof spaces or bury them underground.
2. Pull cord switches as a viable alternative to chasing walls for electrical wiring.
3. Installation of floor mounted socket outlets as an alternative to damaging skirtings and rendered walls.

44. When providing temporary power to a demolition sites, from where shall construction wiring be supplied?

Construction wiring shall be supplied from:

1. An electricity distributor's main; or

2. An existing switchboard in the permanent installation of the premises; or
3. A low voltage generator complying with the principles of AS 2790, which shall be installed in accordance with AS/NZ 3010; or
4. An inverter complying with the requirements of AS/NZS 4763.

AS/NZS 3012:2010 2.1.1

45. What does overhead wiring need to consist of when providing a caravan park with electricity supply, and at what minimum height must they be installed?

1. Overhead wiring shall consist of:
 - (a) Insulated aerial conductors; or
 - (b) Cable supported by a catenary.
2. Cables must be maintained at a height of not less than 6m above the ground.

AS/NZS 3001:2008

46. Describe an aerial cable and give two examples of what they would be used for in Australia.

Description: An aerial cable is a cable, either bare conductor or insulated, single or bundled, which is suspended above the ground and is directly exposed to the weather.

Example 1:

Power transmission cables

Example 2:

Telecommunications cabling

AS/NZS 3000: 2018 1.4.7

47. If a penetration through a fire rated wall is sealed, what are the three requirements for the sealing arrangements?

1. Provide the same resistance to combustion as the building construction
2. Provide the same degree of protection from water penetration as the building construction
3. Protect it from dripping water that may travel along the wiring system or may otherwise collect around the seal.

AS/NZS 3000: 2018 3.9.9.3(e)