
Overview

This standard identifies the competences you need to carry out efficient and effective fault diagnosis on electrical equipment and circuits, in accordance with approved procedures. You will be required to diagnose faults on a range of electrical equipment, such as single and three-phase power supplies, motors and starters, switchgear and distribution panels, electrical plant, control systems and equipment, and luminaires. You will be expected to use a variety of fault diagnosis methods and techniques, and to utilise a number of diagnostic aids and equipment. From the information gained, you will be expected to identify the fault and its probable cause, and to suggest action to remedy the problem.

Your responsibilities will require you to comply with organisational policy and procedures for the fault diagnostic activities undertaken, and to report any problems with these activities or the tools and equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work with minimal supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying fault diagnosis procedures on electrical equipment and circuits. You will understand the various fault diagnosis methods and techniques used, and their application. You will also know how to interpret and apply information obtained from the diagnostic aids and equipment, in adequate depth to provide a sound basis for carrying out the activities and for identifying faults or conditions that are outside the required specification.

You will understand the safety precautions required when carrying out the fault diagnosis activities, especially those for isolating the equipment. You will also understand your responsibilities for safety and the importance of taking the necessary safeguards to protect yourself and others in the workplace.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation and other relevant regulations, directives and guidelines
2. review and use all relevant information on the symptoms and problems associated with the products or assets
3. investigate and establish the most likely causes of the faults
4. select, use and apply diagnostic techniques, tools and aids to locate faults
5. complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved
6. determine the implications of the fault for other work and for safety considerations
7. use the information gained to draw valid conclusions about the nature and probable cause of the fault
8. complete and store all relevant documentation of the fault diagnosis in accordance with organisational requirements
9. dispose of waste materials in accordance with safe working practices and approved procedures and leave the work area in a safe condition

Knowledge and understanding

You need to know and understand:

1. the health and safety requirements of the area in which the fault diagnosis activity is to take place, and the responsibility these requirements place on you
2. the equipment isolation and lock-off procedure or permit-to-work procedure that applies to the testing activities (such as electrical isolation, locking off switchgear, removal of fuses, placing of maintenance warning notices, proving the isolation has been achieved and secured)
3. how to recognise and deal with victims of electric shock (to include methods of safely removing victim from power source, isolating the power source) and the differences between AC and DC electric shock and how this affects the victim
4. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber matting and isolating transformers)
5. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during fault diagnosis activities
6. hazards associated with carrying out fault diagnosis on electrical equipment (such as live electrical components, stored energy, misuse of tools), and how to minimise these and reduce any risks
7. the procedure to be adopted to establish the background of the fault
8. how to evaluate the various types of information available for fault diagnosis
9. how to use the various aids and reports available for fault diagnosis
10. how to use various items of fault diagnostic equipment to investigate the problem
11. the various fault finding techniques that can be used, and how they are applied (such as half-split, input-to-output, emergent problem sequence, six point technique, function testing, unit substitution, injection and sampling techniques and equipment self-diagnostics)
12. how to evaluate sensory information (such as sight, sound, smell, touch)
13. how to analyse information and evaluate possible characteristics and causes of specific faults/problems
14. how to relate previous reports/records of similar fault conditions
15. the care, handling and application of electrical test instruments (such as multimeters, insulation resistance testers)
16. how to calibrate electrical test instruments and check that they are free from

damage and defects

17. how to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, wiring regulations, and other documents needed in the maintenance process

18. the basic principles of how the circuit functions, the operating sequence, the purpose of individual units/components and how they interact relevant to the equipment being maintained

19. the different types of cabling (such as multi-core cables, single-core cables, SWA cables, MI cables, screened cables), their associated fittings, and their application

20. the different types of motors and starters, and their operation

21. the different types of control systems and components, and their operation

22. the different types of electrical components (such as plugs, switches, lighting and fittings, junction boxes, consumer units), and their operation

23. how to evaluate the likely risk to yourself and others, and the effects the fault could have on the overall process or system

24. how to prepare and produce a risk analysis report, where appropriate

25.

how to prepare a report or take follow-up action which satisfies the organisational policy on concluding fault diagnosis

26.

the extent of your own authority and to whom you should report if you have problems that you cannot resolve

Scope/range

1.

Carry out all of the following during the fault diagnostic activity:

- 1.1 plan the fault diagnosis, based on the available information about the fault
- 1.2 obtain and use the correct issue of organisational and/or manufacturers' drawings and maintenance documentation
- 1.3 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
- 1.4 ensure the safe isolation of equipment (such as electricity, mechanical, gas, air or fluids) and safe release of stored energy provide and maintain safe access and working arrangements for the fault finding/maintenance area
- 1.5 carry out the fault diagnostic activities using approved procedures
- 1.6 collect equipment fault diagnostic information from 'live' and isolated circuits
- 1.7 disconnect or isolate components or parts of circuits, when appropriate, to confirm diagnosis
- 1.8 identify the fault and determine appropriate corrective action
- 1.9 dispose of waste materials in accordance with safe working practices and approved procedures and leave the work area in a safe condition

2.

Carry out fault diagnosis on four of the following types of equipment:

- 2.1 single-phase power circuits
- 2.2 motors and starters
- 2.3 three-phase power circuits
- 2.4 control systems and components
- 2.5 direct current power circuits
- 2.6 electrical plant
- 2.7 switchgear and distribution panels
- 2.8 luminaires
- 2.9 wiring enclosures (such as conduit, trunking or tray work)
- 2.10 other specific electric equipment

3.

Collect fault diagnostic information from four of the following sources:

- 3.1 the person or operator who reported the fault
- 3.2 recording devices
- 3.3 test instrument measurements (such as watt meters, multimeter, earth-loop impedance testers)
- 3.4 sensory input (such as sight, sound, smell, touch)
- 3.5 plant/equipment records
- 3.6 circuit meters (such as voltmeter, power factor meter, ammeter)
- 3.7 condition of end product
- 3.8 equipment self-diagnostics

4.

Use a range of fault diagnostic techniques, to include two of the following:

- 4.1 half-split technique
- 4.2 input/output technique
- 4.3 emergent sequence
- 4.4 injection and sampling
- 4.5 unit substitution
- 4.6 six point technique
- 4.7 function/performance testing
- 4.8 equipment self-diagnostics

5.

Use a variety of diagnostic aids and equipment to include two of the following:

- 5.1 logic diagrams
- 5.2 equipment self-diagnosis
- 5.3 trouble shooting guides
- 5.4 flow charts or algorithms
- 5.5 fault analysis charts (such as fault trees)
- 5.6 electronic aids
- 5.7 manufacturers' manuals

6.

Use all of the following fault diagnosis procedures:

- 6.1 inspection (such as breakages, wear/deterioration, signs of overheating, missing parts, loose fittings)
- 6.2 operation (such as manual switching off and on, RCD test buttons, automatic switching/timing/sequencing, desired outputs)
- 6.3 measurement (such as voltage, current, continuity, power, temperature, luminescence)

7.

Use three of the following types of test equipment to aid fault diagnosis:

- 7.1 multimeter
- 7.2 megameter
- 7.3 watt meter
- 7.4 voltmeter
- 7.5 ammeter
- 7.6 earth-loop impedance tester
- 7.7 insulation resistance tester
- 7.8 portable appliance tester
- 7.9 light meter
- 7.10 other specific test equipment

8.

Find faults that have resulted in two of the following breakdown categories:

- 8.1 intermittent action or circuit failure
- 8.2 partial failure or reduced performance
- 8.3 complete breakdown

9.

Complete and store all relevant documentation of the fault diagnosis in accordance with organisational requirements, using one of the following:

- 9.1 step-by-step analytical report
- 9.2 preventative maintenance log/report
- 9.3 corrective action report
- 9.4 organisational-specific reporting procedure
- 9.5 electronic reports

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