PROMT13
Testing electrical systems and circuits

Overview

This standard identifies the competences you need to carry out inspections and tests on electrical equipment, such as switchgear, wiring systems, power, heating and lighting systems, motors and motor drives, contactors and relays, control panels, sensors and actuators, and power electronic systems, in accordance with approved procedures. You will be required to carry out formal inspections and tests, which will include protective insulation and resistance values, load current, voltage levels and power ratings, on a range of electrical equipment, to establish that it is functioning at optimal level and to specification.

Your responsibilities will require you to comply with organisational policy and procedures for the testing activities undertaken, and to report any problems with these activities, or with 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 sound understanding of your work, and will provide an informed approach to applying test procedures to electrical equipment and circuits. You will understand the equipment being worked on, the test equipment to be used, and the various test procedures, in adequate depth to provide a sound basis for carrying out the activities safely and correctly and ensuring that the equipment remains compliant with all standards and regulations. In addition, you will be expected to review the outcome of the tests, compare the results with appropriate standards, determine the action required, and to record and report the results in the appropriate format.

You will understand the safety precautions required when carrying out the inspection and testing activities, especially those for isolating the equipment and taking the necessary safeguards to protect yourself and others against direct and indirect electric shock. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

PROMT13

Testing electrical systems and circuits

Performance criteria

You must be able to:

P1	Work safely at all times, complying with health and safety and other relevant regulations and guidelines
P2	Follow the appropriate procedures for use of tools and equipment to carry out the required tests
P3	Set up and carry out the tests using the correct procedures and within agreed timescales
P4	Record the results of the tests in the appropriate format
P5	Review the results and carry out further tests if necessary

PROMT13

Testing electrical systems and circuits

Knowledge and understanding

You need to know and understand:

K1	The health and safety requirements of the work area where you are carrying out the testing activities, and the responsibility these requirements place on you
K2	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)
K3	The hazards associated with carrying out tests on electrical systems, and how to minimise these and reduce any risks
K4	The specific safety precautions to be taken when carrying out formal inspection and testing of electrical equipment
K5	How to recognise and deal with victims of electrical shock (to include methods of safely removing victim from the power source, isolating the power source, and methods of first aid resuscitation)
K6	The importance of wearing protective clothing and other appropriate safety equipment during the electrical testing activities
K7	Protection techniques for electrical systems (to prevent burn or fire risk)
K8	How to obtain and interpret drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations, and other documents needed in the testing activities
K9	Types of test equipment to be used, and their selection for particular types of tests
K10	How to ensure that the test equipment is maintained and correctly calibrated, in accordance with the appropriate organisational procedures
K11	How to connect the appropriate test equipment for the measurement of resistance, current, voltage, power, capacitance, inductance, frequency, power factor, and protective device disconnection/trip times
K12	The various testing methods and procedures, as recommended in approved electrical codes of practice, and how to apply them to different operating conditions
K13	Displaying/recording test results, and the documentation to be used
K14	How to interpret the value and significance of the test readings
K15	How to analyse test results using tables in approved electrical codes of practice, and how to use comparison and sequential techniques
K16	The importance of ensuring that test equipment is used only for its intended purpose and within its specified range and limits
K17	Problems or errors that may occur and which could affect the test results, and how they can be avoided
K18	The environmental control and company operating procedures relating to the testing activities

PROMT13

Testing electrical systems and circuits

Knowledge and understanding	K19	The documentation required and the procedures to be observed following the test
	K20	The extent of your own authority and to whom you should report if you have problems that you cannot resolve

PROMT13

Testing electrical systems and circuits

Scope related to performance criteria

1 Carry out all of the following during the testing activities:

1.1 plan the inspection and testing activities to cause minimal disruption to normal working
1.2 obtain and use the correct issue of company 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
1.5 provide and maintain safe access and working arrangements for the testing area
1.6 carry out the inspection and testing activities using appropriate techniques and procedures
1.7 re-connect and return the system to service on completion of the testing activities
1.8 dispose of waste items in a safe and environmentally acceptable manner, and leave the work area in a safe condition

2 Carry out inspections and tests on six of the following types of electrical equipment:

2.1 distribution switchgear
2.2 wiring systems
2.3 electric motors
2.4 contactors and relays
2.5 control panels
2.6 PLC systems
2.7 power electronic systems
2.8 motor drives
2.9 sensors
2.10 actuators
2.11 power, heating and lighting systems
2.12 accessories

3 **Use appropriate test equipment to carry out five of the following tests, as applicable to the equipment being maintained:**

3.1 protective conductor resistance values
3.2 insulation resistance values
3.3 load current
3.4 voltage levels
3.5 Impedance
3.6 continuity
3.7 polarity
3.8 power rating

Scope related to performance criteria

3.9 resistance
3.10 capacitance
3.11 frequency values
3.12 RCD disconnection time
3.13 specialised tests (such as speed, sound, light, temperature)

4 Carry out all of the following checks to ensure the accuracy and quality of the tests carried out:

4.1 the test equipment is correctly calibrated
4.2 test equipment used is appropriate for the tests being carried out
4.3 test procedures used are as recommended in the appropriate electrical codes of practice (BS7671/IEE)
4.4 test equipment is operated within its specification range

5 Provide a record/report of the test outcome, using one of the following:

5.1 preventative maintenance log/report
5.2 company-specific reporting procedure inspection schedule
5.3 specific test report

PROMT13

Testing electrical systems and circuits

Developed by	Proskills
Version number	1
Date approved	June 2009
Indicative review date	June 2013
Validity	Current
Status	Imported
Originating organisation	SEMTA
Original URN	EM14
Relevant occupations	Coal Mining Operatives; Managers in Mining; Quarry workers and related operatives
Suite	Mines Technical Operations
Key words	mines; technicians; technical; operations; mining; electrical; engineering; equipment; mechanical; maintenance