

# UKTTWE07

## Diagnose faults in Tramway components, equipment and assets



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### Overview

This standard is about diagnosing faults on Tramway components, equipment and assets. You will be able to use fault finding methods and techniques to locate and diagnose faults that involve the following interactive technologies:

- Electrification
- Signalling
- Telecommunications
- Track
- Trackside environment

The type and range of problems and faults could be complex and involve the interaction between two or more components, equipment and assets. Fault diagnosis may also involve one or more of the following technologies:

- Electrical
- Hydraulic
- Mechanical
- Pneumatic
- Electronic
- Thermal

Fault diagnosis could include continual and intermittent faults and be affected by factors such as environmental, ageing, human error and inherent design problems. From the evidence gained, you will be expected to identify the fault and probable cause. Where fault diagnosis is inconclusive you will be able to conduct further investigation, seek assistance or follow escalation procedures as required.

Your underpinning knowledge will provide a good understanding of your work and will provide an informed approach when applying fault diagnosis procedures within an integrated system. You will understand the various fault diagnosis methods and techniques used, and their application. You will know how to apply and interpret information obtained from diagnostic aids and equipment, in adequate depth to provide a sound basis for carrying out the activities and identifying faults or conditions that are outside the required specification. You will know about the interaction of the technologies and other associated integrated technologies and will have sufficient knowledge to carry out effective fault diagnosis of the Integrated system.

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

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### **Diagnose faults in Tramway components, equipment and assets**

This standard is for those who work in the Tramway engineering environment at supervisor or technician level.

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## Diagnose faults in Tramway components, equipment and assets

### Performance criteria

*You must be able to:*

- P1 interpret and analyse **information** on the symptoms and problems associated with the Tramway, components, equipment and assets
- P2 identify the **fault finding activities and diagnostic tests** to be carried out in line with organisational approved procedures
- P3 prepare **diagnostic tools and equipment** in line with organisational requirements
- P4 take action to prevent damage or interference with other components, equipment, assets or the wider environment during fault finding activities
- P5 communicate proposed activities to the relevant **stakeholders**, as required
- P6 select, use and apply diagnostic techniques, tools and aids to locate faults
- P7 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved
- P8 investigate and analyse diagnostic results to draw conclusions about the **nature and probable cause of the fault**
- P9 establish the implications of the fault on the operational Tramway and the wider environment
- P10 record details on the extent and location of the faults and repairs in line with organisational requirements
- P11 make **recommendations** on how the fault could be rectified

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## Diagnose faults in Tramway components, equipment and assets

### Knowledge and understanding

*You need to know and understand:*

- K1 the general operational and functional principles of Tramway components, equipment and assets
- K2 the relationship between Tramway assets, components, equipment and the wider environment
- K3 the types of diagnostic tests, aids and equipment available
- K4 how to interpret and analyse information relating to the fault and how this information may inform the fault diagnosis activities
- K5 the **hazards** associated with carrying out fault diagnosis on Tramway components, equipment and assets
- K6 the range of actions that can be taken to prevent damage or interference with other assets, components, equipment and the wider environment
- K7 the methods and techniques for diagnosing faults on Tramway components, equipment and assets
- K8 the methods and techniques for analysing and determining diagnostic results
- K9 how to assess the risks arising from faults and how the faults can affect the performance and safety of the operational Tramway
- K10 how repairs and rectifications are carried out within own organisation and the levels of responsibility of those involved
- K11 the extent of your own authority and to whom you should report if you have problems that you cannot resolve

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## Diagnose faults in Tramway components, equipment and assets

### Additional Information

#### Scope related to performance criteria

P1 **Information** may include; electronic or paper records and documents (drawings, defect history, fault reports, handbooks, manuals, charts, maintenance specifications/schedules, maintenance history, images, warrantee, instructions, schedules, catalogues, logbooks), eye witness accounts, operator reports, sensory (sight, smell, touch, sound).

P2 **Fault finding activities and diagnostic tests** may include; inspection (wear, breaks/bends, signs of overheating/fretting, missing parts, loose components/fittings, sensory input, leaks, software interactions), Measurement (voltage/resistance/frequency, torque, temperature, dial test, luminescence, power, continuity, current, flow, half-split technique, emergent sequence, unit substitution, input/output, function/performance testing, six point technique, injection, sampling, equipment self-diagnostics), operational (systematic testing, alignment checks, sensor checks, thermal checks, pressure checks, vibration checks, thermal checks, calibration, simulation, tolerance).

P3 **Diagnostic tools and equipment** may include; computer test equipment, in built management system, algorithms, manuals, analysis charts, trouble shooting guides, probability charts, fault analysis charts, diagrams and specifications, manufacturers manuals, measuring devices and indicators.

P5 **Stakeholders** may include; colleagues, contractors, pedestrians, road users, businesses, landowners, councils, general public, emergency services, transport operators, passengers, customers.

P8 **Nature and probable cause of the fault** may include; environmental, aging, accidental, human error, inherent/intermittent design problem, recurrent defect, component defect, fitting defect, partial failure, reduced performance, out of specification, maintenance technique, maintenance frequency, complete breakdown.

P11 **Recommendations** may include; timescales, responsibilities for the rectification, possible solutions.

#### Scope related to knowledge criteria

K5 **Hazards** may include; Tram vehicles and other road users, stored pressure/force, electrical contact, electrical/electronic interfaces, handling fluids, using faulty/damaged tools and equipment, using unauthorised procedures, working at height, working in confined spaces.

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### Additional Information

#### Glossary

##### **Tram**

Tramcars, tram vehicle, and any other rail vehicles that operate on tramways. It includes one or more trams coupled together and includes non-passenger-carrying vehicles.

##### **Tramway environment**

Includes the tramway (a set of rails, switches and crossings which form the route of a Tram) , infrastructure (fixed assets used for the running of the Tram transport system, including, the tramway, bridges, tunnels, stops, stations and fixed equipment for signalling, communications and electrification), depots, stabling yards.

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## Diagnose faults in Tramway components, equipment and assets

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