

## **Detailed Requirements Document (DRD) Rail Engineering Advanced Technician Level 4 Track Knowledge & Skills Content**

### **Purpose**

The purpose of this Detailed Requirements Document (DRD) is to provide employers, colleges and training providers and those developing qualifications with an additional level of detail behind the Standard. The DRD should be used to support the delivery of the Railway Engineering Advanced Technician Apprenticeship

This document sets out the Knowledge and Skills required for anyone following the Signalling pathway. These requirements are in addition to the Rail Engineering Advanced Technician core knowledge and skills.

Once complete this document this document will form part of the Employer Occupational Brief (EOB).

### **Development process and sources**

The detail within this document has been developed from Rail Engineering Technician DRDS which in turn was developed from existing National Occupational Standards (NOS) to which additional requirements were added or items that were deemed no longer necessary (very few) were removed.

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## The Standard: Track Specialism

**Core Knowledge.** Within a Railway context all Rail Engineering Advanced Technicians need an in-depth knowledge and understanding of:

**1. Safe and Professional working practices** including legislation, regulation, industry procedures, safety requirements, risk management and environmental impact together with an understanding of human factors and techniques to address these.

**2. The scientific, technical, engineering, mathematical and design principles** (some of them complex) that are required in undertaking and directing maintenance, renewal and construction of and across The Railway.

**3. How to work effectively to design and develop engineering solutions and innovation** including understanding of failure modes and their causes; advanced problem solving, diagnostic systems and development of preventative maintenance; asset management and whole life asset costs.

**4. How to deliver engineering solutions effectively** including project management principles and systems to manage, time, resource, asset and quality management and assurance systems; business improvement and innovation systems, processes and techniques.

**5. How the Railway works as a system and their role within it.** The critical interfaces across the Railway system and how those interfaces are managed.

**6. The importance of 3rd party and internal business requirements and operational interfaces.** The need for and understanding of client confidentiality and compliance with corporate policies including ethics, equality and diversity and sustainability.

**7. How the Railway works commercially** including contractual principles and financial systems, forecasts and budgets, and performance implications and performance management techniques.

**8. How the Railway is evolving.** Awareness and understanding of new technological developments across the Railway and how these will impact the future operation of The Railway.

**The above to include the Track specific Knowledge requirements of the Standard:**

**Track Advanced Technicians will have the following specific knowledge regarding different techniques and methods used to construct, install, maintain and renew The Railway and to avoid Railway asset, equipment, process and systems failures:**

In depth understanding and broad experience of: track geometry and the impact of train wheels; the requirements, methods and techniques for installation and maintenance of the track and track foundation; the impact of the railway environment e.g. tunnels, embankments, vegetation and drainage.

Understand the physical and systems interfaces between the track and other aspects of The Railway and the operating requirements, implications and constraints of these.

**Core Skills.** Within a Railway context all Rail Engineering Advanced Technicians need to be able to:

<p><b>9. Keep themselves and others safe by leading and demonstrating safe working practices.</b> Understand, reinforce and comply with statutory regulations and organisational safety requirements, including competence and safe access to work locations.</p>
<p><b>10. Produce a work plan based on safe systems of work</b> that is informed by technical drawings, schematics and programmes of work needed for the development of rail engineering activity. Prepare contingency arrangements to manage change and risk as appropriate.</p>
<p><b>11. Undertake and direct a high standard of technical work.</b> Take responsibility for the efficient and effective delivery of technical work activities and projects. Undertake and supervise the operation of equipment &amp; systems. Complete integrity &amp; compliance checks on own work and that of others and ensure appropriate testing is undertaken. Transfer responsibility of assets once work has been completed. Be responsible and accountable for their own work and that of others.</p>
<p><b>12. Solve problems:</b> Design and develop a structured and/or innovative approach to problem solving and diagnosis. Apply appropriate methods and business improvement techniques. Predict and prevent failures through the analysis of data and the ability to provide feedback on these.</p>
<p><b>13. Make informed and considered decisions and complex critical judgements</b> as appropriate.</p>
<p><b>14. Supervise and manage resources</b> including the efficient utilisation of individuals, teams, tools, materials and equipment. Monitor and manage individual and team performance and development.</p>
<p><b>15. Work collaboratively maintaining effective relationships with colleagues, clients, suppliers and the public.</b> Support the development of others through coaching and mentoring.</p>
<p><b>16. Communicate effectively across all management levels.</b> Use oral, written, electronic and IT based methods and systems for the accurate communication, technical reporting &amp; recording of information and management reporting.</p>

**The above to include the Track specific Skills requirements of the Standard:**

<p><b>Track Advanced Technicians will have the following specific skills regarding different techniques and methods used to construct, install, maintain and renew The Railway and to avoid Railway asset, equipment, process and systems failures</b></p>
<p>Undertake and be responsible for the construction, reinstatement and enhancement, detailed inspection of track and it's environment.</p>
<p>Analyse the performance and condition of track, and where appropriate conductor rail; and cable systems.</p>
<p>Diagnose and correct complex track faults</p>
<p>Use and supervise the use of track specific plant and equipment as appropriate</p>

## Knowledge

### 1. Safe and Professional working practices

**1. Safe and Professional working practices** including legislation, regulation, industry procedures, safety requirements, risk management and environmental impact together with an understanding of human factors and techniques to address these.

### **Handover Procedures**

Know and understand the hand-over procedures as approved by your organisation including as appropriate:

- Raising/removing speed restrictions
- Temporary and permanent situations
- Major geometrical repair
- The removal of environmental hazards

### **Loads**

How to interpret relevant information relating to the preparation and movement of materials, components and equipment, including as appropriate, information contained in a lift plan

The procedures for confirming the weight of loads as approved by the manufacturer and your organisation

The methods and techniques for securing loads, including how to eliminate slippage

The methods and techniques for slinging and lifting as approved by the manufacturer and your organisation, including as appropriate:

- Dealing with obstructions
- Responding to the crane controller and banks man

How to identify and use relevant lifting, moving and handling equipment, including as appropriate:

- Chains
- Straps
- Beams
- Sleeper lifting devices

How to check and confirm the load is safely in its final location

The methods and techniques for the safe release of the load

How to confirm the documentation required for the movement of a load is in place, including as appropriate:

- Licence and/or permit
- Lifting plan

Your organisation's procedures for the use, care and control of lifting equipment

### **Operational or environmental constraints**

The operational or environmental constraints that could occur whilst undertaking visual inspections, including as appropriate:

- Open to traffic
- Closed to traffic
- Restricted track access
- Day work/night work

### **Protection**

Understand the need for asset protection and the effect of renewal and maintenance activity on lineside assets and infrastructure
How to access resources for protection and verify them for sufficiency and suitability
The means of available protection and their potential impact on safety and operations
The limitations of protection equipment and systems
How to confirm and monitor safe working systems are in place during maintenance, renewal and project activities, including working progress /inspections
The implications of not implementing and monitoring a safe working system
The implications of not securing the work area, including taking into account of the: <ul style="list-style-type: none"> <li>• Risk of vandalism</li> <li>• Risk of trespass</li> <li>• Risk of animal access</li> <li>• Risk of theft</li> </ul>
Understand the importance of maintaining safe evacuation routes

## 2. The scientific, technical, engineering, mathematical and design principles

**The scientific, technical, engineering, mathematical and design principles (some of them complex) that are required in undertaking and directing maintenance, renewal and construction of and across The Railway.**

The knowledge qualification for the Track pathway is made up of the following two mandatory units:

1. Railway Infrastructure Construction and
2. Maintenance and Rail Technologies.

These have been updated to include Level 4 content and wording as identified by the contributing employers

For further guidance please see the knowledge qualification structure at annex A.

### **Railway Infrastructure Construction and Maintenance**

#### **Know the preparatory activities required for the construction of railway track infrastructure**

- Describe the legal and financial framework applicable to a project for a new section of railway infrastructure
- In-depth understanding of the development process required for a new build or renewal within a railway environment
- What constitutes the track or line side environment as defined by your organization
- Understanding of the impact of different environments and on the restraint and load bearing of track foundation on the formation

**Know the scope of earthwork activities that may be undertaken in association with railway track infrastructure**

- Describe the methodology used for a railway track earthworks project, including the plant and equipment required for a standard track cross section
- Describe the importance of track foundation to the load bearing capacity of the line and the impact of differing ground conditions and environment

**Understand the forms of construction and material specifications used in railway track infrastructure**

- The principles of geometrical engineering and how they are applied to the track Explain the essential design principles for track geometry and the importance of wheel rail interface
- How to identify and select the required data, including for:
  - Dimensions
  - Components, specification/types
- Describe the construction methods for initial placement and subsequent maintenance activities to ensure track position and geometry
- Describe the materials and quality control processes required to ensure the provision of suitable and sustainable track construction material and waste material disposal

**Understand track maintenance processes used to identify and correct defects in railways**

- Understand the methods, techniques and procedures for maintenance and / or adjustment of the permanent way, including as appropriate:
  - Method statements
  - Hot weather restrictions
  - Extreme weather plans
  - Track work instructions
  - Task risk control sheets
- Describe the maintenance issues that need to be considered to determine rail infrastructure integrity
- Explain how rail infrastructure defects are identified and the prescribed remedial action for each
- Understand how defects propagate including the different processes used for defect identification data collection and interrogation.
- Understand the processes for the prioritization and timescales for mitigation / remedial action in relation to defects.

**Rail Technologies****Detailed understanding of surveying techniques at compliance level**

- Detailed understanding of surveying at compliance level
- The methods and techniques for dealing with ground condition surveys / inspection as approved by your organisation Identify linear surveying terminology and equipment
- Identify levelling surveying terminology and equipment
- Carry out linear surveys using appropriate equipment to produce drawings
- Carry out levelling surveys using appropriate equipment to produce drawings
- Identify angular terminology and equipment

**Understand materials in the rail environment**

- Describe mechanical, physical, thermal, electrical and magnetic properties of materials used in rail engineering
- Describe the effects of processing on the properties and behaviour of materials used in rail engineering

<ul style="list-style-type: none"> <li>• Describe the principles of the modes of failure</li> </ul>
<p><b>Understand mechanical systems in the rail environment</b></p> <ul style="list-style-type: none"> <li>• Describe the purpose and application of lubricants</li> <li>• Describe the operation and maintenance of lubrication systems</li> </ul>
<p><b>Understand the interface between railway systems</b></p> <ul style="list-style-type: none"> <li>• Describe the basic principles of electricity as applied to railway infrastructure including 3<sup>rd</sup> and 4<sup>th</sup> rail, buzz bar systems and OLE</li> <li>• Describe the principles of railway signalling</li> <li>• Explain the operation of points and point detection systems</li> <li>• Describe the relationship between track geometry and overhead line geometry</li> <li>• Describe the effects of track maintenance on Railway signaling systems</li> </ul>
<p><b>Track Maintenance</b></p>
<p>The types of maintenance activities that could occur</p> <ul style="list-style-type: none"> <li>• Replacement of ballast</li> <li>• Clogged ballast / wet beds</li> <li>• Replacing and adjusting sleepers and bearers</li> <li>• Replacing and adjusting rails</li> <li>• Restoring track geometry</li> <li>• Maintaining and cleaning drains and vegetation</li> <li>• Removing waste material</li> <li>• Preventative maintenance</li> </ul>
<p>Understand the need for and the methods for identifying defects and discrepancies in components prior to use, including as appropriate:</p> <ul style="list-style-type: none"> <li>• Recorded information</li> <li>• Visual inspection</li> <li>• Dynamic inspections/observations</li> </ul>
<p>The range of monitoring equipment available to measure:</p> <ul style="list-style-type: none"> <li>• Stress</li> <li>• Temperature</li> <li>• Track geometry</li> </ul>
<p>The methods and techniques for temporary and permanent component removal including:</p> <ul style="list-style-type: none"> <li>• Manual methods</li> <li>• Mechanical methods</li> </ul>
<p><b>Track Renewal &amp; Replacement</b></p>
<p>Understand why track renewal activities take place</p> <ul style="list-style-type: none"> <li>• Describe the difference between track renewal activities and track maintenance activities</li> <li>• List the factors that may lead to track renewal activities taking place</li> <li>• Explain the importance of track renewal activities</li> </ul>
<p>Know the importance of planning track renewal activities</p> <ul style="list-style-type: none"> <li>• List the key roles involved with planning track renewal activities</li> <li>• State how extremes of weather may affect the renewal activities</li> <li>• Describe how the track configuration may affect the renewal process</li> <li>• Describe the impact of track renewal activities on other areas of the rail industry</li> <li>• Describe the impact of a lack of planning to the renewal activities</li> </ul>

<p>Know the function of the track side equipment encountered during track renewal activities including:</p> <ul style="list-style-type: none"> <li>• Signalling equipment</li> <li>• Telecommunications equipment</li> <li>• Traction power supply</li> <li>• Earth bonding</li> </ul> <p>Describe the function of track side equipment encountered during track renewal activities, including all of the following:</p> <ul style="list-style-type: none"> <li>• Signalling equipment</li> <li>• Telecommunications equipment</li> <li>• Traction power supply</li> <li>• Earth bonding</li> </ul>
<p>The methods and techniques for component and asset replacement relevant to your role</p>
<p>Understand the activities required during the track renewal process</p> <ul style="list-style-type: none"> <li>• Describe the activities involved during the removal of ballast and / or concrete track</li> <li>• Describe the methods of removing old track</li> <li>• Identify the machinery used during the track renewal process</li> <li>• List the resources required during the track renewal process</li> </ul> <p>Describe the activities involved during the replacement or refurbishment of ballast and / or concrete track</p>
<p><b>Rail Environment</b></p>
<p>Understand the types of drainage and drainage solutions used to manage water in the rail environment, when these would be used and the constraints to their use</p>
<p>Understand the maintenance requirements for draining and drainage solutions to manage water in a rail environment</p>
<p>Understand the methods of work and application of knowledge for safe and healthy work practices, procedures and skills relating to the method/area of work and materials used to:</p> <ul style="list-style-type: none"> <li>• Excavate trenches and provide trench support</li> <li>• Confirm ground conditions, site and excavations are suitable for the drainage installation work</li> <li>• Prepare bedding for pipework</li> <li>• Determine levels and gradients</li> <li>• Identify the differences between surface and foul water drainage</li> <li>• Lay, position, level, plumb, align, fit, fix and secure new and replacement drainage systems</li> <li>• Construct structures of a drainage system (storm alleviation, culverts, inspection chambers, lateral drains, overflows, sumps, filter drains, sustainable urban drainage systems)</li> <li>• Assemble pre-cast components (metal, concrete, clay and plastic) of a drainage system structure (inspection chambers, street iron work)</li> <li>• Connect and seal new systems to existing systems</li> <li>• Conduct smoke, water, ball, air mandrel and close circuit television tests on drainage systems</li> <li>• Work with plant and machinery</li> <li>• Use hand tools, power tools and equipment</li> <li>• Work at height and below ground level</li> <li>• Use access equipment</li> <li>• Team work and communication</li> <li>• Keeping people safe</li> <li>• Selecting the right people for the task</li> </ul>

<ul style="list-style-type: none"> <li>• Needs of other occupations associated with installing drainage</li> <li>• Resources: <ul style="list-style-type: none"> <li>○ Materials, components and equipment relating to types, quantity, quality, sizes and the sustainability of standard and/or specialist:</li> <li>○ Pipes, fittings and ancillary components</li> <li>○ Pre-cast (metal, concrete, clay or plastic) components</li> <li>○ Bricks, blocks and sandbags</li> <li>○ Granular materials, aggregates, cement, concrete, mortars and sand</li> <li>○ Sealant materials (adhesives, compounds, solvents)</li> <li>○ Hand and/or powered tools and ancillary equipment</li> </ul> </li> <li>• Methods of calculating quantity, length, area and wastage associated with the method/procedure to install drainage</li> </ul>
<p>Understand the need and process for securing the railway during work including</p> <ul style="list-style-type: none"> <li>• Maintaining a secure environment</li> <li>• Restricting access</li> <li>• Protection of the work and its surrounding area from damage</li> </ul>
<p>Understand the different types and uses of fencing material depending on the environment and organisational operations</p>

### 3. How to work effectively to design and develop engineering solutions and innovation

<p><b>How to work effectively to design and develop engineering solutions and innovation</b> including understanding of failure modes and their causes; advanced problem solving' diagnostic systems and development of preventative maintenance; asset management and whole life asset</p>
<p><b>Gathering &amp; Interpreting Information</b></p>
<p>How to ensure that information and documentation is current, complete and accurate</p>
<p>How to interpret the conventions, symbols and abbreviations approved by your organisation in its engineering diagrams and specifications</p>
<p>Working knowledge of planning processes including how to source and interpret information and documentation systems approved by your organization. This should include:</p> <ul style="list-style-type: none"> <li>• Safe system of work plan</li> <li>• Drawing numbering systems</li> <li>• Document control systems</li> <li>• Filing/library procedures</li> <li>• Electronic document systems</li> <li>• Acronyms</li> </ul>
<p>The methods and advanced techniques for analysing the types of monitoring information obtained</p>
<p>Understand and be able to apply the requirements for endorsing a work plan as being fit for purpose</p>
<p><b>Monitoring of the performance and condition</b></p>
<p>Understand when and why the monitoring of the performance and condition of the permanent way takes place:</p> <ul style="list-style-type: none"> <li>• Plain line</li> </ul>

<ul style="list-style-type: none"> <li>• Switches and crossings</li> <li>• Track substructure</li> <li>• Off track structures</li> </ul>
<p>Your organisation's methods and techniques for inspection relevant to your role e.g.</p> <ul style="list-style-type: none"> <li>• Road Rail Vehicles</li> <li>• Pedestrian means</li> </ul>
<p>Understand the types of equipment required for the inspection and how to ensure it is calibrated as appropriate</p>
<p>Your organisation's procedures for the care and control of inspection equipment</p>
<p>How to source and interpret information relating to small plant, measuring equipment and tools</p>
<p>How to check and confirm the small plant, measuring equipment and tools are suitable and calibration checked/approved for use.</p>
<p><b>Defects and variations in components and assets</b></p>
<p>The impact of a defect or variation on the operational performance and safety of the permanent way and permanent way assets</p>
<p>What constitutes a defect or variation of the permanent way infrastructure</p>
<p>How to identify defects and variations in products, equipment or systems by visual means</p>
<p>Types of inspection e.g.:</p> <ul style="list-style-type: none"> <li>• Visual checks</li> <li>• Detailed checks</li> <li>• Maintenance quality checks</li> <li>• Verification of patrolling records</li> </ul> <p>The types of defects that may occur on materials and components that can be identified by visual means</p>
<p>Identify any defects or variations from the specification</p>
<p>How to ensure authorisation is obtained for both the inspection and the use of equipment</p>
<p>The methods and techniques to determine a suitable inspection route, including as appropriate:</p> <ul style="list-style-type: none"> <li>• Visual inspection</li> <li>• Clearances and tolerances</li> <li>• Load bearing capacities</li> <li>• Angle of repose</li> </ul>
<p>How incorrectly installed components can affect the safety and performance of the permanent way</p>
<p>How incorrectly repaired plain line can affect the safety and performance of the permanent way</p>
<p>What constitutes a defect or variation of the permanent way infrastructure</p>
<p>Identify any defects or variations from the specification</p>
<p>The importance of carrying out repair activities in the specified sequence and agreed timescale</p>
<p>The importance of reporting a defect or variation, including when immediate action is required</p>

#### 4. How to deliver engineering solutions effectively

**How to deliver engineering solutions effectively** including project management principles and systems to manage, time, resource, asset and quality management and assurance systems; business improvement and innovation systems, processes and techniques.

**Quality control**

What quality control systems and documentation procedures are required by your organisation

**Resource Management**

Understand your organisation's procedures for the care and use of resources, including tools and equipment identification and calibration

- Resources to be stored
- Tools, plant and equipment
- Materials
- Consumables
- People

The types of resources available, including as appropriate:

- People (skilled and unskilled)
- Plant
- Equipment
- Materials
- Time
- Transportation
- Permits and legal documentation

How the planned use of resources could alter and the implications that may follow

**Materials / Component handling**

Working knowledge of methods and techniques for material/component handling and preparation including as appropriate:

- Timescales for preparation
- Manual handling techniques serviceable
- Mechanical handling
- Lifting regulations
- Lifting plans
- Ordering materials ready for use
- Booking timescales
- Checks of approved equipment register

The methods and techniques for component installation and assembly as appropriate to your role, including both temporary and permanent situations, manual and mechanical methods, and measuring to check tolerance

How to check the quality and quantity of materials and components

The methods and techniques for handling equipment, including as appropriate:

- Manual handling
- Mechanical handling
- Use of small tools
- Equipment handling

How and when movement activities cannot be achieved

The types of problems that can occur when obtaining materials and components and how these can be overcome
<b>Work place organisation</b>
*Apply the principles of workplace organisation to an operation or process using a 5S/5C audit and a 'red tag' exercise
*The steps in a 5S/5C audit and a 'red tag' exercise and how to carry them out
*How to score and audit the 5S/5C exercise
*Identify where information, and/or resources are missing and where improvement can be made to increase the 5S/5C score

**5. How the Railway works as a system and their role within it**

<b>How the Railway works as a system and their role within it.</b> The critical interfaces across the Railway system and how those interfaces are managed.
Understand the likely impact of your work on the operations of other departments and the impact of their work for you

**6. The importance of 3rd party and internal business requirements and operational interfaces**

<b>The importance of 3rd party and internal business requirements and operational interfaces.</b> The need for and understanding of client confidentiality and compliance with corporate policies including ethics, equality and diversity and sustainability.
<b>See Trailblazer document – no Track specific content</b>

**7. How the Railway works commercially**

<b>How the Railway works commercially</b> including contractual principles and financial systems, forecasts and budgets, and performance implications and performance management techniques.
<b>See Trailblazer document – no Track specific content</b>

## 8. How the Railway is evolving

**How the Railway is evolving.** Awareness and understanding of new technological developments across the Railway and how these will impact the future operation of The Railway.

**See Trailblazer document – no Track specific content**

## 9. Keep themselves and others safe by adhering to safe working practices

**Keep themselves and others safe by leading and demonstrating safe working practices.** Understand, reinforce and comply with statutory regulations and organisational safety requirements, including competence and safe access to work locations.

### Protection

Establish the need for protection accurately and promptly

The means of available protection and their potential impact on safety and operations

Establish accurately the location, nature, characteristics and extent of the area to be protected

Identify the access controls to meet agreed and approved system procedures

Check that implementation is based upon current, accurate and sufficient information about protection requirements

Identify correctly alternative courses of protection and evaluate them for impact on safety and operations

Check that protection arrangements make effective use of available resources according to your organisation's procedures

Advise the appropriate person(s) when changes to the planned movement activity have occurred and the implications involved

Review protection arrangements to meet any changed circumstances

Withdraw safely all possession and protection measures in line with your organisation's procedures

### Safe Handling

Be able to implement and supervise the methods and safe techniques for handling equipment, including as appropriate the selection of tools taking into account the environment in which working:

- Manual handling
- Mechanical handling
- Use of small tools
- Equipment handling

Ensure that any stored energy or substances are released safely and correctly e.g. rail stress and lubricants

<b>Moving Loads</b>
Interpret relevant information relating to the preparation and movement of materials, components and equipment, including as appropriate, information contained in a lift plan
Check that all materials and equipment that cannot be removed are secured and stored where they do not interfere with the safe operation of the railway
Establish the characteristics of the load to be moved
Assess the equipment to be used to confirm it is capable of moving the load within safe working limits and/or suitability for the environment.
Check the moving equipment to ensure the weight of the load is evenly distributed
Attach the appropriate handling equipment securely to the load, using approved methods to eliminate slippage
Establish a suitable route for moving the load minimising risk to people and property
Establish the method and select suitable equipment to move the load
Check and confirm the load is safely in its final location
Monitor the movement of permanent way materials, components and equipment
<b>Visual Management</b>
Apply the principle and processes of visual management to an operation or process using a variety of visual management techniques
Identify appropriate parts of the operation or process that will have visual controls

## **10. Produce a work plan based on safe systems of work**

<b>Produce a work plan based on safe systems of work</b> that is informed by technical drawings, schematics and programmes of work needed for the development of rail engineering activity. Prepare contingency arrangements to manage change and risk as appropriate.
Be able to write / develop effective: <ul style="list-style-type: none"> <li>• Method statements</li> <li>• Risk assessments</li> <li>• Hot weather precaution plans</li> <li>• Extreme weather plans</li> <li>• Emergency preparedness plans</li> </ul>

## **11. Undertake and direct a high standard of technical work.**

<b>Undertake and direct a high standard of technical work.</b> Take responsibility for the efficient and effective delivery of technical work activities and projects. Undertake and supervise the operation of equipment & systems. Complete integrity & compliance checks on own work and that of others and ensure appropriate testing is undertaken. Transfer responsibility of assets once work has been completed. Be responsible and accountable for their own work and that of others.
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## Analyse the Performance and Condition of Track

Detailed Analysis of data:

- Track geometry
- Track inspection records
- Integrity testing reports
- Rail defect analysis
- Survey information
- Dynamic/static readings
- Off track information
- Environmental information
- Trend analysis

## Installation

Be able to supervise and validate the following :

- Install, position and secure the components and assets in the correct sequence and in accordance with the specification
- Make any necessary settings or adjustments to the components to ensure they will function correctly
- Ensure the available equipment is calibrated as required prior to use
- Ensure that the repaired component meets the specified operating conditions

Know the track construction requirements ( for ballasted track):

- List the common depths of dig / breakout required during renewal activities
- Describe the impact of not achieving the minimum depth of dig / breakout on installation of track
- List the barriers to achieving a minimum depth of dig / breakout
- List the installation tolerances allowed when renewing track
- Explain the circumstances when a trackside drain may be required

Know the track construction requirements ( for concrete base):

- List the common depths of dig required during renewal activities
- Describe the impact of not achieving the minimum depth of concrete base on installation of track
- List the barriers to achieving a minimum depth of concrete base
- List the installation tolerances allowed when renewing track
- Explain the circumstances when a trackside drain may be required

## Track Maintenance

Be able to undertake, supervise and validate the following :

- That maintenance ( their own and others) activity complies with the original specification
- The maintenance activities have been carried out in the specified sequence and in an agreed timescale
- Relevant maintenance records are completed accurately and passed the appropriate person

Type of asset to be repaired:

- Plain line
- Switches and crossings
- Structures and off-track

Activities include:

<ul style="list-style-type: none"> <li>• Replacement of ballast</li> <li>• Clogged ballast / wet beds</li> <li>• Replacing and adjusting sleepers and bearers</li> <li>• Replacing and adjusting rails</li> <li>• Restoring track geometry</li> <li>• Maintaining and cleaning drains and vegetation</li> <li>• Removing waste material</li> <li>• Preventative maintenance</li> </ul>
<p>Able to apply and supervise the application of the methods for identifying defects and discrepancies in components prior to use, including as appropriate:</p> <ul style="list-style-type: none"> <li>• Recorded information</li> <li>• Visual inspection</li> <li>• Dynamic inspections/observations</li> </ul>
<p>Able to use and supervise the use of monitoring equipment available to measure:</p> <ul style="list-style-type: none"> <li>• Stress</li> <li>• Temperature</li> <li>• Track geometry</li> </ul>
<p>Understand and be able to use the types of test equipment and their application(s) and limitation(s) as approved by your organisation for the testing of rails e.g. ultra sonics</p>
<p>Be able to understand reports from the "Non Destructive Testing (NDT) team" and identify and prioritise appropriate investigations and remediation</p>
<p>Manage a programme of work to the required adjustments in the specified sequence and in an agreed timescale within the limits of your own authority</p>
<p>Report any instances where the asset/component fails to meet the required performance after adjustments or where there are identified defects outside the required adjustments. Apply suitable mitigation and plan for remediation</p>
<p><b>Track Renewal &amp; Replacement</b></p>
<p>Be able to undertake and supervise track activities on the railway track infrastructure</p> <ul style="list-style-type: none"> <li>• Select appropriate mechanical, plant or hand tool(s) for the renewal activity to be undertaken</li> <li>• Check the mechanical, plant or hand tool(s) and confirm that it is fit for purpose</li> </ul> <p>Supervise track activities, including all of the following:</p> <ul style="list-style-type: none"> <li>• Unclip and/or re-fasten rails</li> <li>• Replace sleeper pads</li> <li>• Fit a set of clamp plates</li> <li>• Remove a set of clamp plates</li> <li>• Fit rollers in preparation for rail stressing</li> <li>• Square a sleeper</li> <li>• Install a rail</li> <li>• Lift and pack a joint</li> <li>• Boxing in a ballast</li> <li>• Ensure everything is working after the work has been completed</li> </ul>
<p>Be able to effectively take part in and supervise site clearance</p> <ul style="list-style-type: none"> <li>• Describe the importance of site clearance</li> <li>• List materials that are considered scrap materials</li> <li>• Identify hazardous waste and report it in accordance with site regulations</li> </ul>

- Identify serviceable components and store in accordance with site regulations
- Carry out site clearance activities

Be able to undertake, supervise and validate the following:

- Repairs are carried out within agreed timescale using approved materials and components, methods and procedures
- The appropriate engineering diagrams and related standards/ specifications/ work instructions for the component/asset being replaced/repared have been followed and met.
- The safe removal of the required components using approved tools and techniques
- Checking of the condition of the removed components and record those that will require replacing
- Establish, and where appropriate, mark component orientation for re-assembly
- Components are replaced in the correct sequence using appropriate tools and techniques
- Ensure suitable precautions are taken to prevent damage to components, tools and equipment during removal
- Ensure that the new asset meets the specified operating conditions
- Ensure that the repaired asset meets the specified operating conditions
- Compare and analyse current performances and condition data with that from previous assessments

### **Rail Environment**

Be able to supervise safe and healthy work practices, procedures and skills relating to the method/area of work and materials used to:

- Excavate trenches and provide trench support
- Confirm ground conditions, site and excavations are suitable for the drainage installation work
- Prepare bedding for pipework
- Determine levels and gradients
- Identify the differences between surface and foul water drainage
- Lay, position, level, plumb, align, fit, fix and secure new and replacement drainage systems
- Construct structures of a drainage system (storm alleviation, culverts, inspection chambers, lateral drains, overflows, sumps, filter drains, sustainable urban drainage systems)
- Assemble pre-cast components (metal, concrete, clay and plastic) of a drainage system structure (inspection chambers, street iron work)
- Connect and seal new systems to existing systems
- Conduct smoke, water, ball, air mandrel and close circuit television tests on drainage systems
- Work with plant and machinery
- Use hand tools, power tools and equipment
- Work at height and below ground level
- Use access equipment
- Team work and communication
- Keeping people safe
- Selecting the right people for the task
- Needs of other occupations associated with installing drainage
- Resources:
  - Materials, components and equipment relating to types, quantity, quality, sizes and the sustainability of standard and/or specialist:
  - Pipes, fittings and ancillary components
  - Pre-cast (metal, concrete, clay or plastic) components
  - Bricks, blocks and sandbags

<ul style="list-style-type: none"> <li>○ Granular materials, aggregates, cement, concrete, mortars and sand</li> <li>○ Sealant materials (adhesives, compounds, solvents)</li> <li>○ Hand and/or powered tools and ancillary equipment</li> </ul> <ul style="list-style-type: none"> <li>● Methods of calculating quantity, length, area and wastage associated with the method/procedure to install drainage</li> </ul>
<p>Supervise the preparation for and repair, replacement and renewal of fencing components (e.g. timber, metal, plastic or composite materials), or make bespoke items to given working instructions relating to the following:</p> <ul style="list-style-type: none"> <li>● Gates</li> <li>● Posts</li> <li>● Fencing</li> <li>● Furnishings and fixings</li> <li>● Protective finishes</li> </ul> <p>Including:</p> <ul style="list-style-type: none"> <li>● Demonstration of work skills to measure, mark out, cut, level, plumb, fit, finish, position and secure</li> <li>● Minimise damage and maintain a clean work space</li> <li>● Disposal of waste in accordance with current legislation</li> <li>● Use and maintenance of hand tools, portable power tools and ancillary equipment</li> <li>● Safe reinstatement of ground, safe walking access etc</li> </ul>
<p><b>Undertake Detailed Inspection &amp; Monitoring</b></p>
<p>Be able to undertake and supervise the following:</p> <ul style="list-style-type: none"> <li>● Identify and confirm the inspection checks to be made and acceptance criteria to be used</li> <li>● Follow the correct specification for the product or equipment being inspected</li> <li>● Carry out all required inspections as approved by your organization</li> <li>● Set up and carry out the tests using the correct procedures and within agreed timescales</li> <li>● Carry out all required visual inspections</li> <li>● Record the results of the inspection in the appropriate format</li> </ul>
<p>Able to read a trace to identify defects</p>
<p>Formulate and supervise the implementation of an inspection test plan</p>
<p>Supervise and undertake the monitoring activities effectively with minimum disruption to normal activities</p>
<p>Identify and confirm any unusual features of the condition of the asset and take appropriate action</p>
<p>Understand the methods and techniques for load assessment including, as appropriate:</p> <ul style="list-style-type: none"> <li>● Observational means</li> <li>● Load assessment devices</li> <li>● Weight charts</li> <li>● Tolerance devices</li> <li>● Gauging devices</li> </ul>
<p>Take action to mitigate non-compliance of rail track geometry and position within own authority and responsibility</p>
<p><b>Testing</b></p>

Identify and recommend the type of tests to be carried out and the types of tools and equipment to be used
Be able to supervise and set up correctly and check the monitoring equipment, ensuring calibration as appropriate
Follow the appropriate procedures for use of tools and equipment to carry out the required tests
Investigate and confirm the fault diagnosis within the agreed time and inform the appropriate person(s) when this cannot be achieved
<b>Records</b>
Be able to undertake, supervise and validate the following: <ul style="list-style-type: none"> <li>• Production of accurate and complete records of all work carried out</li> </ul>
<b>Transfer Responsibility</b>
Understand the need and process for checking, assurance and handback following maintenance and/ or renewal activity
Ensure checks and processes are followed during handback of assets
Confirm that everyone involved accepts the asset is in a satisfactory condition for hand-over to take place
Make the hand-over and obtain agreement between everyone involved on the precise moment of transfer of responsibility

## 12. Solve problems

**Solve problems:** Design and develop a structured and/or innovative approach to problem solving and diagnosis. Apply appropriate methods and business improvement techniques. Predict and prevent failures through the analysis of data and the ability to provide feedback on these.

## 13. Make informed and considered decisions and complex critical judgements

**Make informed and considered decisions and complex critical judgements** as appropriate

**See Trailblazer document – no Track specific content**

## 14. Supervise and manage resources

**Supervise and manage resources** including the efficient utilisation of individuals, teams, tools, materials and equipment. Monitor and manage individual and team performance and development.

Supervise the implementation of your organisation's procedures for the care and use of resources, including tools and equipment identification and calibration

- Resources to be stored

<ul style="list-style-type: none"> <li>• Tools, plant and equipment</li> <li>• Materials</li> <li>• Consumables</li> </ul>
<p>Be able to supervise the following activities for material/component handling and preparation including as appropriate:</p> <ul style="list-style-type: none"> <li>• Calculation of timescales for preparation</li> <li>• Manual handling techniques serviceable</li> <li>• Mechanical handling</li> <li>• Development of lifting plans, confirm the documentation required for the movement of a load is in place &amp; lifting activity</li> <li>• Ordering material ready for use</li> <li>• Booking timescales</li> </ul>
<p>How the planned use of resources could alter and the implications that may follow</p>
<p>Supervise and undertake the following:</p> <ul style="list-style-type: none"> <li>• Obtain all the required equipment and ensure that it is in safe and usable condition</li> <li>• Carry out the necessary preparations to equipment in line with your organisation's procedures</li> <li>• Label and store the removed components in an appropriate location, as appropriate</li> <li>• Take adequate precautions to prevent damage to components, tools and equipment during replacement</li> <li>• Take prompt and effective action to deal with actual and predicted changes to the planned use of resources</li> </ul>

**15. Work collaboratively maintaining effective relationships with colleagues, clients, suppliers and the public**

**Work collaboratively maintaining effective relationships with colleagues, clients, suppliers and the public.** Support the development of others through coaching and mentoring.

**See Trailblazer document – no Track specific content**

**16. Communicate effectively**

**Communicate effectively across all management levels.** Use oral, written, electronic and IT based methods and systems for the accurate communication, technical reporting & recording of information and management reporting.