

# City & Guilds Level 3 Diplomas for Rail Engineering Technicians Competence

Version 1.6 (May 2023)

**Qualification Handbook**

Version and date	Change detail	Section
1.2 March 2019	Incorrect unit names with numbers changed from unit 353-360	Introduction – Optional Group F
1.3 June 2019	<p>Optional Group F (Traction and Rolling Stock) changed to Optional Group G (Traction and Rolling Stock)</p> <p>Missing unit 361 added to Optional Group G (Traction and Rolling Stock)</p> <p>Unit 353 moved from Optional Group G (Traction and Rolling Stock) to Optional Group F (Electrification)</p> <p>Rule of combination for Optional Group G amended</p> <p>Unit numbering amended for units 349-353</p> <p>Missing unit 348 added to Optional Group F</p> <p>Rule of combination for Optional Group F amended</p> <p>Unit 347 removed</p> <p>GLH for Unit 356 amended</p>	<p>Introduction – Optional Group F/Optional Group G</p> <p>5. Units – Unit 356</p>
1.4 April 2021	Clarifications made to units 301 and 302	Units 301-302
1.5 April 2023	Updates to title and unit titles	
1.6 May 2023	<p>Signalling pathway amend to 620 GLH</p> <p>Electrification pathway amend to 600 GLH</p> <p>Health and Safety at Work (Northern Ireland) Order 1978 - reference added</p> <p>Reasonable Adjustments – added</p> <p>Overall grading - added</p>	<p>page 3/page 12</p> <p>page 3/page 13</p> <p>page 24</p> <p>page 15</p> <p>page 17</p>

## Qualification at a glance

<b>Subject area</b>	Rail Engineering
<b>City &amp; Guilds number</b>	6499-03
<b>Entry requirements</b>	N/A
<b>Assessment types</b>	Portfolio
<b>Approvals</b>	Fast track approval
<b>Support materials</b>	Fast track approval forms
<b>Registration and certification</b>	Consult the Walled Garden/Online Catalogue for last dates

Title and level	GLH	TOT	City & Guilds qualification number	Ofqual accreditation number
City & Guilds Level 3 Diploma in Rail Engineering Technician Competence (Track)	682	682	6499-03	603/0407/8
City & Guilds Level 3 Diploma in Rail Engineering Technician Competence (Overhead Line Equipment)	585	585	6499-03	603/0407/8
City & Guilds Level 3 Diploma in Rail Engineering Technician Competence (Signalling)	620	620	6499-03	603/0407/8
City & Guilds Level 3 Diploma in Rail Engineering Technician Competence (Telecommunications)	650	650	6499-03	603/0407/8
City & Guilds Level 3 Diploma in Rail Engineering Technician Competence (Electrification)	600	600	6499-03	603/0407/8
City & Guilds Level 3 Diploma in Rail Engineering Technician Competence (Traction & Rolling Stock)	550	550	6499-03	603/0407/8



# Contents

<b>Qualification at a glance</b>	<b>3</b>
<b>Contents</b>	<b>5</b>
<b>1 Introduction</b>	<b>8</b>
Structure	9
Total Qualification Time	12
<b>2 Centre requirements</b>	<b>14</b>
Approval	14
Resource requirements	14
Learner entry requirements	15
Age restrictions	15
<b>3 Delivering the qualification</b>	<b>16</b>
Initial assessment and induction	16
Support materials	16
<b>4 Assessment</b>	<b>17</b>
Summary of assessment methods	17
Assessment strategy	17
<b>5 Units</b>	<b>20</b>
Structure of the units	20
<b>Unit 301 Complying with statutory regulations and organisational safety requirements in the rail industry</b>	<b>21</b>
<b>Unit 302 Using and communicating technical information</b>	<b>26</b>
<b>Unit 303 Working efficiently and effectively as a rail engineering technician</b>	<b>30</b>
<b>Unit 304 Plan permanent way activities</b>	<b>39</b>
<b>Unit 305 Implement and monitor safe working systems for permanent way maintenance or renewal activities</b>	<b>45</b>
<b>Unit 306 Allocate and monitor resources for permanent way engineering activities</b>	<b>49</b>
<b>Unit 307 Undertake detailed inspection of the permanent way infrastructure</b>	<b>53</b>
<b>Unit 308 Assess the performance and condition of permanent way assets</b>	<b>58</b>
<b>Unit 309 Establish track geometry and position</b>	<b>62</b>
<b>Unit 310 Ensure that the track is fit for operational purposes</b>	<b>66</b>
<b>Unit 311 Access overhead line equipment construction sites</b>	<b>69</b>
<b>Unit 312 Install overhead line equipment main steelwork</b>	<b>74</b>

Unit 313	Install overhead line equipment small part steelwork	80
Unit 314	Install overhead line equipment wiring	86
Unit 315	Installation of overhead line equipment sectioning, insulation, registration and in-span components	92
Unit 316	Install, enhance and renew overhead line equipment earthing and bonding	98
Unit 317	Complete testing, gauging and acceptance of overhead line equipment	104
Unit 318	Determine requirements for the safe access to work locations for signal engineering	110
Unit 319	Establish information for signal engineering testing	114
Unit 320	Establish information for signal engineering installation	117
Unit 321	Establish information for signal engineering maintenance and/or fault finding	120
Unit 322	Organise local signal engineering activities	124
Unit 323	Contribute to technical leadership of signal engineering activities	128
Unit 324	Allocate and monitor resources for signal engineering activities	132
Unit 325	Reinstate the work area after signal engineering activities	137
Unit 326	Transfer responsibility of signalling assets	142
Unit 327	Establish compliance with specifications for signalling assets	146
Unit 328	Conduct functional testing of newly installed signalling systems	154
Unit 329	Conduct maintenance testing of signalling assets	162
Unit 330	Carry out replacement of components from signalling assets	170
Unit 331	Carry out removal of components from signalling assets	177
Unit 332	Adjust signalling components and equipment to meet operational requirements	184
Unit 333	Determine requirements for the safe access to work locations for telecoms engineering	191
Unit 334	Establish information for telecoms engineering maintenance and/or fault finding	195
Unit 335	Establish information for telecoms engineering installation	198
Unit 336	Establish information for telecoms engineering testing	201
Unit 337	Organise local telecoms engineering activities	204
Unit 338	Contribute to technical leadership of telecoms engineering activities	208
Unit 339	Allocate and monitor resources for telecoms engineering activities	212
Unit 340	Reinstate the work area after telecoms engineering activities	217
Unit 341	Transfer responsibility of telecoms assets	222

Unit 342	Conduct specified testing of telecoms systems	226
Unit 343	Carry out replacement of components from telecoms assets	234
Unit 344	Carry out removal of components from telecoms assets	241
Unit 345	Adjust telecoms components and equipment to meet operational requirements	248
Unit 346	Carry out technical assessment of electrification and plant	255
Unit 348	Carry out installation of railway electrification equipment and components	259
Unit 349	Carry out maintenance on railway electrification equipment and components	262
Unit 350	Transfer responsibility of railway electrification equipment and components	267
Unit 351	Allocate and monitor resources for railway electrification engineering activities	270
Unit 352	Isolate and earth contact systems to meet defined isolation requirements in the rail engineering industry	274
Unit 353	Restore the contact systems	277
Unit 354	Hand over and confirm completion of traction and rolling stock maintenance activities	280
Unit 355	Carry out fault diagnosis on traction and rolling stock systems	286
Unit 356	Carry out preventative planned maintenance on traction and rolling stock systems	293
Unit 357	Maintain mechanical equipment within a traction and rolling stock system	299
Unit 358	Maintain electrical equipment within a traction and rolling stock system	307
Unit 359	Maintain fluid power equipment within a traction and rolling stock system	315
Unit 360	Maintain process controller equipment within a traction and rolling stock system	323
Unit 361	Maintain traction and rolling stock vehicle trim and fittings	331
Appendix 1	Relationships to other qualifications	337
Appendix 2	Sources of general information	338
Appendix 3	Useful contacts	340

# 1 Introduction

This document tells you what you need to do to deliver the qualification:

Area	Description
Who is the qualification for?	<p>These qualifications are aimed at learners aged 16 and above who would like to prove that they are able to work competently at the standard expected for Rail Engineering Technicians.</p> <p>These qualifications are part of new Apprenticeship standards. A learner could also take this qualification as a standalone option if they are self-employed as a contractor or on short term contracts that do not support an Apprenticeship. This would help an individual fit learning in with their own work and home circumstances and the opportunity to prove their competence.</p>
What does the qualification cover?	<p>The railways are a key part of the UK's transport infrastructure for commuting, leisure and business travel, as well as freight services.</p> <p>Rail Engineers are responsible for the safe construction, installation, maintenance and renewal of the railways to provide a safe and reliable railway for customers. Therefore, it is indispensable that rail engineers are able to prove their competence at the level expected by the industry.</p> <p>These qualifications provide evidence of competence for job roles such as: Track Technician, Overhead Line Technician, Electrification Technician, Traction &amp; Rolling Stock Technician, Signalling Technician, Telecoms Technician.</p>
What opportunities for progression are there?	<p>Upon completion of these qualifications learners will have been provided with the self-confidence and motivation to take advantage of the many opportunities for progression and development within the industry, such as:</p> <ul style="list-style-type: none"><li>• Carrying out further training in the following areas: track renewals, track maintenance, traction and rolling stock, electrification construction, electrification maintenance and signal and telecommunications.</li><li>• Progression into employment by taking up a Rail Engineering Advanced Technician Apprenticeship.</li></ul>

Area	Description
	<ul style="list-style-type: none"> <li>Improve their leadership and management skills by taking higher level qualifications through the Institute of Leadership and Management (ILM).</li> </ul>
Who did we develop the qualification with?	This qualification has been developed in collaboration with the Rail Engineering trailblazer group which is led by organisations from the industry including: Transport for London, Network Rail, Alstom Transport Services, Amey, Babcock, Carillion, DB Schenker Rail UK, DEG Signalling, First Group, Hitachi Europe, HS2, MGB Engineering, National Express (c2c Ltd), Siemens, Signalling Solutions, Southwest Trains, Telent Technology Services Ltd, VolkerRail, National Skills Academy for Rail, Eurostar, Merseyrail and Virgin East Coast.
Is it part of an apprenticeship framework or initiative?	<p>These qualifications have been developed as part of the new Apprenticeships for Rail Engineering Technicians which will replace the following SASE frameworks, at Level 3:</p> <ul style="list-style-type: none"> <li>Rail Infrastructure Engineering</li> <li>Rail Engineering Overhead Line Construction</li> <li>Rail Traction and Rolling Stock Engineering.</li> </ul>

## Structure

Learners must achieve all three units from Mandatory Group A (301 - 303), plus follow the rules for your chosen pathway.

City & Guilds component number	Title
<b>Mandatory Group A</b>	
301	Complying with statutory regulations and organisational safety requirements in the rail industry
302	Using and communicating technical information
303	Working efficiently and effectively as a rail engineering technician

### Optional Group B (Track)

You must complete all units

304	Plan Permanent Way activities
305	Implement and monitor safe working systems for permanent way maintenance or renewal activities
306	Allocate and Monitor Resources for permanent way engineering activities
307	Undertake detailed inspection of the Permanent Way infrastructure
308	Assess the performance and condition of the Permanent Way assets
309	Establish track geometry and position
310	Ensure that the track is fit for operational purposes

### Optional Group C (Overhead Line Equipment)

You must complete all units

311	Access overhead line equipment construction sites
312	Install overhead line equipment main steelwork
313	Install overhead line equipment small part steelwork
314	Install overhead line equipment wiring
315	Installation of overhead line equipment sectioning, insulation, registration, and in-span components
316	Install, enhance and renew overhead line equipment earthing and bonding
317	Complete testing, gauging and acceptance of overhead line equipment

### Optional Group D (Signalling)

You must complete units 318, 322-326, 330-332, plus **one** unit from 319-321 and **one** unit from 327-329

318	Determine Requirements for the Safe Access to Work Locations for Signal Engineering
319	Establish information for signal engineering testing
320	Establish information for signal engineering installation
321	Establish information for signal engineering maintenance or fault finding
322	Organise Local Signal Engineering Activities
323	Contribute to Technical Leadership of Signal Engineering Activities
324	Allocate and monitor resources for signal engineering activities
325	Reinstate the work area after signal engineering activities

### Optional Group D (Signalling)

You must complete units 318, 322-326, 330-332, plus **one** unit from 319-321 and **one** unit from 327-329

326	Transfer Responsibility of Signalling Assets
327	Establish compliance with specifications for signalling assets
328	Conduct functional testing of newly Installed Signalling Systems
329	Conduct maintenance testing of signalling assets
330	Carry Out Replacement of Components from Signalling Assets
331	Carry Out Removal of Components from Signalling Assets
332	Adjust Signalling Components and Equipment to Meet Operational Requirements

### Optional Group E (Telecommunications)

You must complete units 333, 337-345 plus **one** unit from 334-336

333	Determine Requirements for the Safe Access to Work Locations for Telecoms Engineering
334	Establish Information for Telecoms Engineering Maintenance and or Fault Finding
335	Establish Information for Telecoms Engineering Installation
336	Establish information for telecoms engineering testing
337	Organise Local Telecoms Engineering Activities
338	Contribute to Technical Leadership of Telecoms Engineering Activities
339	Allocate and Monitor Resources for Telecoms Engineering Activities
340	Reinstate the Work Area after Telecoms Engineering Activities
341	Transfer Responsibility of Telecoms Assets
342	Conduct specified testing of telecoms systems
343	Carry Out Replacement of Components from Telecoms Assets
344	Carry Out Removal of Components from Telecoms Assets
345	Adjust Telecoms Components and Equipment to Meet Operational Requirements

### Optional Group F (Electrification)

You must complete units 346, 350-353 plus **one** unit from 348-349

346	Carry Out Technical Assessment of Electrification and Plant
348	Carry out installation of railway electrification equipment and components
349	Carry out maintenance on railway electrification equipment and components

### Optional Group F (Electrification)

You must complete units 346, 350-353 plus **one** unit from 348-349

350	Transfer responsibility of railway electrification equipment and components
351	Allocate and monitor resources for railway electrification engineering activities
352	Isolate and earth contact systems to meet defined isolation requirements in the rail engineering industry
353	Restore the contact systems to operational condition in the rail engineering industry

### Optional Group G (Traction and Rolling Stock)

You must complete units 354-356 plus **two** units from 357-361

354	Hand Over and Confirm Completion of Traction and Rolling Stock Maintenance Activities
355	Carry Out Fault Diagnosis on Traction and Rolling Stock Systems
356	Carry Out Preventative Planned Maintenance on Traction and Rolling Stock Systems
357	Maintain Mechanical Equipment within a Traction and Rolling Stock System
358	Maintain Electrical Equipment within a Traction and Rolling Stock System
359	Maintain Fluid Power Equipment within a Traction and Rolling Stock System
360	Maintain Process Controller Equipment within a Traction and Rolling Stock System
361	Maintain Traction and Rolling Stock Vehicle Trim and Fittings

## Total Qualification Time

Total Qualification Time (TQT) is the total amount of time, in hours, expected to be spent by a Learner to achieve a qualification. It includes both guided learning hours (which are listed separately) and hours spent in preparation, study and assessment.

Title and level	GLH	TQT
Level 3 Diploma in Rail Engineering Technician Competence (Track)	682	682
Level 3 Diploma in Rail Engineering Technician Competence (Overhead Line Equipment)	585	585
Level 3 Diploma in Rail Engineering Technician Competence (Signalling)	620	620

Title and level	GLH	TQT
Level 3 Diploma in Rail Engineering Technician Competence (Telecommunications)	650	650
Level 3 Diploma in Rail Engineering Technician Competence (Electrification)	600	600
Level 3 Diploma in Rail Engineering Technician Competence (Traction & Rolling Stock)	550	550

## 2 Centre requirements

### Approval

If your Centre is approved to offer the qualification Level 3 Diploma in Rail Engineering (7597-07, -08, -09, -15, -16, -17, -18, -27) then you can apply for the new Level 3 Diploma in Rail Engineering Technician (Competence) (6499-03) approval using the fast track approval form, available from the City & Guilds website. Please see the Fast Track form for further details.

Centres should use the fast track form if:

- there have been no changes to the way the qualifications are delivered, and
- they meet all of the approval criteria in the fast track form guidance notes.

Fast track approval is available for 12 months from the launch of the qualification. After 12 months, the Centre will have to go through the standard Qualification Approval Process. The centre is responsible for checking that fast track approval is still current at the time of application.

To offer these qualifications, new centres will need to gain both centre and qualification approval. Please refer to the Centre Manual - Supporting Customer Excellence for further information.

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualifications before designing a course programme.

### Resource requirements

#### *Resources*

Centres can use specifically designated areas within a centre to assess, for example, the installation of specialised electrical equipment, alignment and setting up of electric motors and driven devices (pumps, compressors, generators) or areas of track. The equipment, systems and machinery must meet industrial standards and be capable of being used under normal working conditions, for example electric motors must have a method of applying sufficient power and not be connected up to show movement.

#### *Centre staffing*

Staff delivering these qualifications must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be occupationally competent or technically knowledgeable in the area[s] for which they are delivering training and/or have experience of providing training. This knowledge must be to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.

See also page 14 for details from the assessment strategy on the role of supervisors and managers in the assessment process.

Centre staff may undertake more than one role, eg tutor and assessor or internal verifier, but cannot internally verify their own assessments.

## Learner entry requirements

City & Guilds does not set entry requirements for these qualifications. However, centres must ensure that candidates have the potential and opportunity to gain the qualifications successfully.

## Age restrictions

City & Guilds cannot accept any registrations for learners under 16 as these qualifications are not approved for learners under 16.

## Access arrangements and reasonable adjustments

Access arrangements are adjustments that allow candidates with disabilities, special educational needs, and temporary injuries to access the assessment and demonstrate their skills and knowledge without changing the demands of the assessment. These arrangements must be made before assessment takes place.

The Equality Act 2010 requires City & Guilds to make reasonable adjustments where a disabled person would be at a substantial disadvantage in undertaking an assessment.

It is the responsibility of the centre to ensure at the start of a programme of learning that candidates will be able to access the requirements of the qualification.

Please refer to the JCQ access arrangements and reasonable adjustments and Access arrangements - when and how applications need to be made to City & Guilds for more information. Both are available on the City & Guilds website: <http://www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library/policies-and-procedures/access-arrangements-reasonable-adjustments>

## 3 Delivering the qualification

### Initial assessment and induction

An initial assessment of each candidate should be made before the start of their programme to identify:

- if the candidate has any specific training needs
- support and guidance they may need when working towards their qualifications
- any units they have already completed, or credit they have accumulated which is relevant to the qualifications
- the appropriate type and level of qualification.

We recommend that centres provide an induction programme so the candidate fully understands the requirements of the qualifications, their responsibilities as a learner, and the responsibilities of the centre. This information can be recorded on a learning contract.

### Support materials

The following resources are available for these qualifications:

Description	How to access
Fast track approval forms	<a href="http://www.cityandguilds.com">www.cityandguilds.com</a>

### Recording documents

Candidates and centres may decide to use a paper-based or electronic method of recording evidence.

City & Guilds endorses several ePortfolio systems, including our own, Learning Assistant, an easy-to-use and secure online tool to support and evidence learners' progress towards achieving qualifications. Further details are available at: [www.cityandguilds.com/eportfolios](http://www.cityandguilds.com/eportfolios).

City & Guilds has developed a set of *Recording forms* including examples of completed forms, for new and existing centres to use as appropriate. Recording forms are available on the City & Guilds website.

Although new centres are expected to use these forms, centres may devise or customise alternative forms, which must be approved for use by the external verifier, before they are used by candidates and assessors at the centre. Amendable (MS Word) versions of the forms are available on the City & Guilds website.

## 4 Assessment

### Summary of assessment methods

Candidates must:

- Although all of the content and assessment requirements must be met in full employers can tailor the training outcomes to ensure that the content of the programme is specific to their requirements in terms of products, processes, procedures, tools, equipment, materials, documentation and information systems.

This will allow each organisation to develop their own specific and tailored apprentice training programme whilst meeting their own business requirements whilst at the same time ensuring that the overall generic content is to a high standard in terms of depth and breadth to enable progression and/or transferability to other employers.

Individual assessments will be graded Pass/Fail. For the units to be achieved, candidates must achieve a minimum of Pass in each assessment, as per marking scheme provided for each assessment. Pass reflects the minimum requirements that are expressed in the unit.

### Assessment strategy

#### Access to assessment

There are no entry requirements required for the Units of Competence unless this is a legal requirement of the process or the environment in which the Apprentice is working in. Assessment is open to any Apprentice who has the potential to reach the assessment requirements set out in the relevant units.

Aids or appliances, which are designed to alleviate disability, may be used during assessment, providing they do not compromise the standard required.

#### Carrying out assessments

The Units of Competence have been specifically developed to cover a wide range of activities. The evidence produced for the units will, therefore, depend on the skills and knowledge required by employer and specified in the Apprentice's Training Plan. The Skills section of the Units of Competence makes reference to a number of optional items listed (for example 'any three from five'). This is the minimum standard set by employers.

Where the unit requirements gives a choice of optional areas, Assessors should note that Apprentices do not need to provide evidence of the other areas to complete the unit, unless specified by the employer particularly where these additional items may relate to other activities or methods that are not part of the Apprentice's normal workplace activities or required by the employer.

#### Performance evidence requirements

Performance evidence must be the main form of evidence gathered. In order to demonstrate consistent competent performance for a unit, a minimum of three different examples of performance of the unit activity will be required. Items of performance evidence often contain features that apply to more than one unit, and can be used as evidence in any unit where they are suitable.

Performance evidence must be:

- products of the Apprentice's work, such as items that have been produced or worked on, plans, charts, reports, standard operating procedures, documents produced as part of a work activity, records or photographs of the completed activity

together with:

- evidence of the way the Apprentice carried out the activities, such as witness testimonies, assessor observations or authenticated Apprentice reports of the activity undertaken.

Competent performance is more than just carrying out a series of individual set tasks. Many of the units in the Development Phase contain statements that require the Apprentice to provide evidence that proves they are capable of combining various features and techniques. Where this is the case, separate fragments of evidence would not provide this combination of features and techniques and, therefore, will not be acceptable as demonstrating competent performance.

If there is any doubt as to what constitutes suitable evidence the Internal/External Quality Assurer should be consulted.

### **Assessing knowledge and understanding requirements**

Knowledge and understanding are key components of competent performance, but it is unlikely that performance evidence alone will provide enough evidence in this area. Where the Apprentice's knowledge and understanding is not apparent from performance evidence, it must be assessed by other means and be supported by suitable evidence.

Knowledge and understanding can be demonstrated in a number of different ways. It is recommended that oral questioning and practical demonstrations are used perhaps whilst observing the apprentice undertake specific tasks, as these are considered the most appropriate for these units. Assessors should ask enough questions to make sure that the Apprentice has an appropriate level of knowledge and understanding, as required by the unit.

Evidence of knowledge and understanding will **not** be required for those items in the skills section of the Units of Competence that have not been selected by the employer.

Where oral questioning is used the assessor must retain a record of the questions asked, together with the Apprentice's answers.

### **Witness testimony**

Where observation is used to obtain performance evidence, this must be carried out against the unit assessment criteria. Best practice would require that such observation is carried out by a qualified assessor. If this is not practicable, then alternative sources of evidence may be used.

For example, the observation may be carried out against the assessment criteria by someone else that is in close contact with the Apprentice. This could be a team leader, supervisor, mentor or line manager who may be regarded as a suitable witness to the Apprentice's competency. However, the witness must be technically competent in the process or skills that they are providing testimony for, to at least the same level of expertise as that required of the Apprentice. It will be the responsibility of the assessor to make sure that any witness testimonies accepted as evidence of the Apprentice's competency are reliable, auditable and technically valid.

### **Maximising opportunities to use assessment evidence**

One of the critical factors required in order to make this Assessment Strategy as efficient and effective as possible and to ease the burden of assessment, is the Assessor's ability and expertise to work in partnership with the apprentice and their employer to provide advice and guidance on how to maximise opportunities to cross reference performance and knowledge evidence to all relevant Units

of Competence. For example if a knowledge statement is repeated in a number of separate Units of Competence and the expected evidence/response to that statement is the same including the context, then the same piece of evidence should be cross referenced to the appropriate units.

### ***Recognition of prior learning (RPL)***

Recognition of prior learning means using a person's previous experience, or qualifications which have already been achieved, to contribute to a new qualification.

For this qualification, RPL is allowed and is not sector specific.

<http://www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library/policies-and-procedures/quality-assurance-documents>

## 5 Units

### Structure of the units

These units each have the following:

- City & Guilds reference number
- Title
- Level
- Guided learning hours (GLH)
- Learning outcomes, which are comprised of a number of assessment criteria

Centres must deliver the full breadth of the range. Specialist equipment or commodities may not be available to all centres, so centres should ensure that their delivery covers their use. This may be covered by a practical demonstration (e.g. video). For the practical assessments for this qualification, centres should ensure that there are sufficient resources to complete the task but are not required to use all the equipment or commodities in the range.

## Unit 301

# Complying with statutory regulations and organisational safety requirements in the rail industry

<b>Unit level:</b>	Level 3
<b>GLH:</b>	100

---

**Unit aim:**

This Employer Unit of Competence (EUC) has been developed by employers in the Rail Engineering Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to:


Deal with statutory regulations and organisational safety requirements, in accordance with approved procedures. They will be required to comply with all relevant regulations that apply to their area of work as well as their general responsibilities as defined in the Health and Safety at Work Act. They must also be able to identify the relevant qualified first aiders or appointed person, and know the location of the first aid facilities. They will have an understanding of the procedures to be adopted in the case of accidents involving injury and in situations where there are dangerous occurrences or hazardous malfunctions of equipment, processes or machinery. They will also need to be fully conversant with the organisation's procedures for fire alerts and the evacuation of premises.

They will be required to identify the hazards and risks that are associated with their job. Typically, these will focus on their working environment, the tools and equipment that they use, materials and substances that they use, working practices that do not follow laid down procedures, and manual lifting and carrying techniques.

Their responsibilities will require them to comply with organisational policy and procedures for the statutory regulations and organisational safety activities undertaken, and to report any problems with the safety activities that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. They will be expected to work with minimal supervision, taking personal responsibility for their own actions, and for the way in which they carry out the required rail engineering activities.

Their underpinning knowledge will provide a good understanding of their work, and will provide an informed approach to applying statutory regulations and organisational safety requirements and procedures. They will understand the safety requirements and their application, and will know about the safety requirements in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

They will be able to apply the appropriate occupational behaviours required in the workplace to meet the job profile and overall



company objectives, including logical approach, problem solving orientation, quality focus, personal responsibility and resilience, clear communicator, team player, adaptability, self-motivation, willingness to learn and commitment

---

## Learning outcome

The learner will:

- 1 Be able to comply with statutory regulations and organisational safety requirements in the rail industry

## Assessment criteria

The learner can:

- 1.1 Comply with their duties and obligations as defined in the Health and Safety at Work Act
  - 1.2 Demonstrate their understanding of their duties and obligations to health and safety by carrying out all of the following:
    - 1.2a applying in principle their duties and responsibilities as an individual under the Health and Safety at Work Act and relevant current legislation
    - 1.2b identifying within their organisation, appropriate sources of information and guidance on health and safety issues, to include:
      - 1.2b(i) eye protection and personal protective equipment
      - 1.2b(ii) COSHH regulations
      - 1.2b(iii) risk assessments
    - 1.2c identifying the warning signs and labels of the main groups of hazardous or dangerous substances
    - 1.2d identifying the warning and safety signs applicable to the rail environment
    - 1.2e complying with the appropriate statutory regulations at all times
  - 1.3 Demonstrate the required occupational behaviours in line with the job role and company objectives
  - 1.4 Comply with company/sector procedures in regard to safe access to work locations
  - 1.5 Present themselves in the workplace suitably prepared for the activities to be undertaken
  - 1.6 Apply safe working practices and procedures to include:
    - 1.6a maintaining a tidy workplace with exits and gangways free from obstructions
    - 1.6b using tools and equipment safely and only for the purpose intended
    - 1.6c observing organisational safety rules, signs and hazard warnings
    - 1.6d taking measures to protect others from harm by any work they are carrying out
  - 1.7 Recognise and control hazards in the workplace
  - 1.8 Identify the hazards and risks that are associated with all of the following:
    - 1.8a their working environment
    - 1.8b the tools and equipment that they use
-

- 1.8c materials and substances that they use
  - 1.8d using working practices that do not follow laid down procedures
  - 1.9 Use correct manual lifting and carrying techniques
  - 1.10 Demonstrate two of the following methods of manual lifting and carrying techniques:
    - 1.10a lifting alone
    - 1.10b with assistance of others
    - 1.10c with mechanical assistance
  - 1.11 Follow organisational accident and emergency procedures
  - 1.12 Comply with all emergency requirements, to include:
    - 1.12a identifying the appropriate qualified first aiders or appointed person and the location of first aid facilities
    - 1.12b identifying the procedures to be followed in the event of injury to self or others
    - 1.12c following organisational procedures in the event of fire and the evacuation of premises
    - 1.12d identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions
- 

## Learning outcome

The learner will:

- 2 Know how to comply with statutory regulations and organisational safety requirements in the rail industry

## Assessment criteria

The learner can:

- 2.1 Describe the roles and responsibilities of themselves and others under the Health and Safety at Work Act 1974 and current legislation (such as The Management of Health and Safety at Work Regulations; Workplace Health and Safety and Welfare Regulations; Personal Protective Equipment at Work Regulations 1992; Manual Handling Operations Regulations; Provision and Use of Work Equipment Regulations; Display Screen at Work Regulations; The Electricity at Work Regulations). Reference can be made to local health and safety regulations eg The Health and Safety at Work (Northern Ireland) Order 1978.
- 2.2 Describe the specific regulations and safe working practices and procedures that apply to their work activities
- 2.3 Describe the warning signs for the nine main groups of hazardous substances defined by Classification, Packaging and Labelling of Dangerous Substances Regulations
- 2.4 Explain how to locate relevant health and safety information for their tasks and the sources of expert assistance when help is needed
- 2.5 Explain what constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, dust and fumes, handling and transporting,

- contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile or toxic materials, unshielded processes)
- 2.6 Describe their responsibilities for dealing with hazards and reducing risks in the workplace (such as hazard spotting and safety inspections; the use of hazard check lists, carrying out risk assessments, COSHH assessments and safe systems of working)
  - 2.7 Describe the risks associated with their working environment, the tools, materials and equipment that they use, spillages of oil and chemicals, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures
  - 2.8 Describe the importance of applying the appropriate occupational behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
  - 2.9 Describe first aid facilities exist within their work area and within the organisation in general and the procedures to be followed in the case of accidents involving injury
  - 2.10 Explain what constitutes dangerous occurrences and hazardous malfunctions, and why these must be reported even when no one was injured
  - 2.11 Describe the procedures for sounding the emergency alarms, evacuation procedures and escape routes to be used and the need to report their presence at the appropriate assembly point
  - 2.12 Describe the organisational policy is with regard to firefighting procedures, the common causes of fire and what they can do to help prevent them
  - 2.13 Describe the protective clothing and equipment is available for their areas of activity
  - 2.14 Explain how to lift and carry loads safely, and the manual and mechanical aids available
  - 2.15 Explain how to prepare and maintain safe working areas, standards and procedures to ensure good housekeeping
  - 2.16 Describe the importance of safe storage of tools, equipment, materials and products
  - 2.17 Describe the extent of their own authority and to whom they should report in the event of problems that they cannot resolve

## Unit 302

## Using and communicating technical information

<b>Unit level:</b>	Level 3
<b>GLH:</b>	50
<b>Unit aim:</b>	<p>This Employer Unit of Competence (EUC) has been developed by employers in the Rail Engineering Sector and is part of an overall development programme designed to meet the requirements of the Sector, the published Apprenticeship Standard and Employer Occupational Brief. This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to:</p> <p>Make effective use of text, numeric and graphical information by interpreting and using technical information extracted from rail engineering drawings, technical manuals, reference tables, specifications and charts, in accordance with approved procedures.</p> <p>You will be required to extract the necessary information from the various drawings and related documents in order to establish and carry out the requirements and to make valid decisions about the quality and accuracy of the equipment being worked on.</p> <p>Your responsibilities will require you to comply with organisational policy and procedures for obtaining and using the drawings and related specifications. You will be expected to report any problems with the use and interpretation of the drawings and specifications 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.</p> <p>Your underpinning knowledge will provide a good understanding of the types of drawings and documents used within a rail engineering environment, and will provide an informed approach to applying instructions and procedures. You will be able to read and interpret the drawings and documents used and will know about the conventions, symbols and abbreviations, in adequate depth to provide a sound basis for carrying out the activities to the required specification. They will be able to apply the appropriate occupational behaviours required in the workplace to meet the job profile and overall company objectives, including logical approach, problem solving orientation, quality focus, personal responsibility and resilience, clear communicator, team player, adaptability, self-motivation, willingness to learn and commitment</p>

---

## Learning outcome

The learner will:

- 1 Be able to use and communicate technical information

## Assessment criteria

The learner can:

- 1.1 Demonstrate the required occupational behaviours in line with the job role and company objectives
- 1.2 Use oral, written, electronic and IT based methods and systems for the accurate communication, reporting & recording of technical and other information
- 1.3 Use the approved source(s) to obtain the required data, documentation or specifications and carry out all of the following:
  - 1.3a check the currency and validity of the documentation used
  - 1.3b exercise care and control over the documentation at all times
  - 1.3c correctly extract all necessary data in order to carry out the required tasks
  - 1.3d seek out additional information where there are gaps or deficiencies in the information obtained
  - 1.3e report any problems found with the data, documentation or specifications
  - 1.3f make valid decisions based on the information extracted
  - 1.3g return all documentation to the approved location on completion of the work
- 1.4 Extract and interpret the required information from the data, documentation or specifications
- 1.5 Extract information that includes three of the following:
  - 1.5a materials or components required
  - 1.5b connections to be made
  - 1.5c dimensions
  - 1.5d processes or treatments required
  - 1.5e dismantling/assembly sequence required
  - 1.5f installation requirements
  - 1.5g location/orientation of parts
  - 1.5h tolerances and quality requirements
  - 1.5i circuit characteristics (such as pressure, flow, current, voltage, speed)
  - 1.5j test points
  - 1.5k inspection requirements
- 1.6 Use correct terms and information extracted from engineering drawings and related documentation, to include four of the following:
  - 1.6a general assembly drawings
  - 1.6b routing diagrams (such as piping, cables etc)
  - 1.6c fluid power drawings
  - 1.6d layout diagrams (such as schematic, block, physical, system)

- 1.6e wiring/circuit diagrams
  - 1.6f approved sketches
  - 1.6g installation drawings
  - 1.6h technical illustrations
  - 1.6i manufacturers' manuals/drawings
  - 1.6j visual display screens
  - 1.6k photographic images
  - 1.7 Use information extracted from related standards, templates and certifications to include four from the following:
    - 3.1 standard operating procedures
    - 3.2 maintenance log/reports
    - 3.3 reference tables/charts (such as logic tables, ladder diagrams)
    - 3.4 fault diagnosis guides
    - 3.5 national, international and organisational standards
    - 3.6 test schedules
    - 3.7 health and safety standards relating to activity (such as COSHH)
    - 3.8 test results
    - 3.9 environmental requirements/information
    - 3.10 manufacturers' instructions
  - 1.8 Use the information obtained to establish work requirements
  - 1.9 Deal promptly and effectively with any problems within your control and report those which cannot be solved
  - 1.10 Report any inaccuracies or discrepancies in drawings and specifications
- 

## Learning outcome

The learner will:

- 2 Know how to use and communicate technical information

## Assessment criteria

The learner can:

- 2.1 Describe the information sources used for the documentation and specifications that you use in your work activities
- 2.2 Explain how the required documentation is obtained, and how to check that it is current and valid
- 2.3 Describe the importance of applying the appropriate occupational behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- 2.4 Describe how to use other sources of information to support the rail engineering activity (such as electronic component pin configuration specifications, standard reference charts for

- limits and fits, tapping drill reference charts, cable current carrying capacities, thread reference tables)
- 2.5 Explain the procedure for reporting discrepancies, lost or damaged documentation
  - 2.6 Describe care and control procedures for the documentation, and the importance of returning them to the designated location on completion of the work activities
  - 2.7 Describe the basic drawing conventions that are used, and why there needs to be different types of drawings
  - 2.8 Describe the types of drawings/diagrams used, and how they interrelate (such as isometric and orthographic, first and third angle, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)
  - 2.9 Explain why technical information is presented in different forms
  - 2.10 Describe the meaning of common symbols and abbreviations used within the working environment/work area
  - 2.11 Explain imperial and metric systems of measurement, tolerancing and fixed reference points
  - 2.12 Describe the meaning of the different symbols and abbreviations found on the documentation that you use (such as surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure and flow characteristics)
  - 2.13 Describe the extent of their own responsibility, when to act on their own initiative to find, clarify and evaluate information, and to whom they should report if they have problems that they cannot resolve

## Unit 303

# Working efficiently and effectively as a rail engineering technician

<b>Unit level:</b>	Level 3
<b>GLH:</b>	50

---

**Unit aim:**

This Employer Unit of Competence (EUC) has been developed by employers in the Rail Engineering Sector and is part of an overall development programme designed to meet the requirements of the Sector, the Apprenticeship Standard and Employer Occupational Brief

This EUC identifies the training and development required in order that the apprentice can demonstrate that they are competent in being able to:

Work efficiently and effectively in the workplace, in accordance with approved procedures and practices. Prior to undertaking the rail engineering activity, they will be required to carry out all necessary preparations within the scope of their responsibility.

This may include preparing the work area and ensuring that it is in a safe condition to carry out the intended activities, ensuring they have the appropriate job specifications and instructions and that any tools, equipment, materials and other resources required are available and in a safe and usable condition.


On completion of the rail engineering activity, they will be required to return their immediate work area to an acceptable condition before recommencing further work requirements. This may involve placing completed work in the correct location, returning and/or storing any tools and equipment in the correct area, identifying any waste and/or scrapped materials and arranging for their disposal, and reporting any defects or damage to tools and equipment used.

Their responsibilities will require them to comply with organisational policy and procedures for the rail engineering activities undertaken, and to report any problems with the activities, tools or equipment that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. They will be expected to take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out and to identify and make recommendations where improvements could be made in their working area.

Their underpinning knowledge will provide a good understanding of their work, and will provide an informed approach to working efficiently and effectively in a rail engineering environment. They will understand the need to work efficiently and effectively, and will know about the things they need to consider when preparing and tidying up the work area, how to contribute to improvements, deal with problems, maintain effective working relationships, and agree their development objectives and targets, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

They will understand the safety precautions required when carrying out rail engineering activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

They will be able to apply the occupational behaviours required in the workplace to meet the job profile and overall company



objectives, including being able to demonstrate; personal responsibility and resilience, working effectively in teams, effective communication and interpersonal skills, focus on quality and problem solving and continuous development

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and environmental legislation, regulations and other relevant guidelines
  - P2 demonstrate the required occupational behaviours in line with the job role and company objectives/values
  - P3 plan the rail engineering activities before they start them
  - P4 prepare the work area for carrying out the rail engineering activity
  - P5 obtain all necessary consumables, tools and equipment and check that they are in a safe and usable condition
  - P6 deal promptly and effectively with any rail engineering problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve
  - P7 contribute to the business by identifying possible opportunities for improving working practices, processes and/or procedures
  - P8 maintain effective working relationships with colleagues and supervisors
  - P9 review personal training and development, as appropriate to the job role
  - P10 clean, tidy up and restore the work area on completion of the rail engineering activity
- 

### Learning outcome

The learner will:

S1 Ensure that they apply all the following checks and practices at all times:

### Assessment criteria

The learner can:

- 1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
-

- 1.2 wear the appropriate personal protective equipment for the work area and specific activity being carried out
  - 1.3 use all tools and equipment safely and correctly, and only for their intended purpose including adherence to the Control of Vibration at Work Regulations (Hand and Arm)
  - 1.4 ensure that the work area is maintained and left in a safe and tidy condition
- 

### **Learning outcome**

The learner will:

- S2 Prepare to carry out the rail engineering activity, ensuring all the following as applicable to the activity to be undertaken:

### **Assessment criteria**

The learner can:

- 2.1 the work area is free from hazards and is suitably prepared for the activities to be undertaken
  - 2.2 any required safety procedures are implemented
  - 2.3 any necessary personal protection equipment is obtained, and is in a usable condition
  - 2.4 all necessary drawings, specifications and associated documents are obtained
  - 2.5 job instructions are obtained and understood
  - 2.6 the correct materials or components are obtained
  - 2.7 appropriate authorisation to carry out the work is obtained
- 

### **Learning outcome**

The learner will:

- S3 Complete the work activities to include all of the following:

### **Assessment criteria**

The learner can:

- 3.1 returning tools and equipment to the designated location
  - 3.2 returning drawings and work instructions
  - 3.3 disposing of waste materials, in line with organisational and environmental requirements
  - 3.4 completing all necessary documentation accurately and legibly
  - 3.5 identifying, where appropriate, any damaged or unusable tools or equipment
- 

### **Learning outcome**

The learner will:

- S4 Recognise and deal with problems affecting the rail engineering activity to include four of the following:
-

## Assessment criteria

The learner can:

- 4.1 materials
  - 4.2 job specification
  - 4.3 timescales
  - 4.4 tools and equipment
  - 4.5 quality
  - 4.6 safety
  - 4.7 drawings
  - 4.8 people
  - 4.9 work activities or procedures
  - 4.10 other (to be specified)
- 

## Learning outcome

The learner will:

- S5 Contribute to the business by identifying possible opportunities for improving working practices and/or processes that will impact on one of the following:

## Assessment criteria

The learner can:

- 5.1 standard operating procedures
  - 5.2 quality
  - 5.3 cost
  - 5.4 time such as lead or processing time
  - 5.5 waste
  - 5.6 energy utilisation
  - 5.7 equipment performance or condition
  - 5.8 resource
  - 5.9 engineering designs
  - 5 Plus one from the following
  - 5.10 health and safety
  - 5.11 customer service
  - 5.12 training and development
  - 5.13 regulatory compliance
  - 5.14 supplier relationships
  - 5.15 communication (internal and/or external)
  - 5.16 team working
  - 5.17 other improvement to be specified by employer
-

---

## Learning outcome

The learner will:

- S6 Contribute to developing their own Continuous Development Plan (CPD) relevant to their career aspirations to include all the following:

## Assessment criteria

The learner can:

- 6.1 describing the levels of skill, knowledge and understanding needed for competence in the areas of work expected of them
- 6.2 describing their development objectives/program, and how these were identified
- 6.3 providing information on their expectations and progress towards their identified objectives
- 6.4 using feedback and advice to improve their personal development and performance objectives

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the safe working practices and procedures to be followed whilst preparing and tidying up your work area
- K2 explain the importance of applying the appropriate occupational behaviours in the workplace and the implications for both the apprentice and the business if these are not adhered to
- K3 describe how to present themselves in the workplace suitably dressed for the activities to be undertaken (such as being neat, clean and dressed in clothes appropriate to the area of activity)
- K4 explain the importance of reporting to work on time and returning from breaks on time and the potential consequences if this is not adhered to
- K5 describe the types of attitudes and behaviours that are likely to create conflict or negative responses
- K6 describe the benefits of team working and understanding of team objectives.
- K7 explain the roles of individual team members and the strengths they bring to the team.
- K8 describe the importance of clear communication both oral and written, using appropriate language and format.
- K9 explain the need to change communication styles to meet the needs of the target audience
- K10 explain the need to adhere to timescales set for work, whilst maintaining appropriate quality standards and the implications if these are not adhered to.

- K11 explain the importance of seeking additional support and guidance when required.
- K12 describe why it is important to be open and honest and admit to any errors and/or mistakes
- K13 explain why they need to be flexible in their approach to work, responding positively to changes or amendments required by the business.
- K14 describe the importance of taking an active and positive part in the implementation of any amendments or changes to work requirements
- K15 explain their individual responsibility to work in an ethical manner and the organisations policies relating to ethical working and behaviours .
- K16 explain the importance of respecting others, including an awareness of diversity and inclusion.
- K17 describe the Personal Protective Equipment (PPE) to be worn for the rail engineering activities undertaken (such as correctly fitting overalls, safety shoes, eye protection, ear protection)
- K18 describe the correct use of any equipment used to protect the health and safety of themselves and their colleagues
- K19 describe the planning and preparing to carry out the rail engineering activity (such as obtaining the appropriate drawings/documentation to be used, determining the materials required, determining the tools and equipment required, determining a suitable sequence of operations, determining the quality checks to be made and equipment to be used)
- K20 explain the procedure for ensuring that all documentation relating to the work being carried out is available, prior to starting the activity
- K21 describe the procedure for ensuring that all tools and equipment are available prior to undertaking the activity
- K22 describe the checks to be carried out to ensure that tools and equipment are in full working order, prior to undertaking the activity
- K23 describe the checks to be carried out to ensure that all materials required are correct and complete, prior to undertaking the activity
- K24 explain how to deal effectively with problems that could arise with areas such as quality, safety, people, drawings and other documentation, tools and equipment or if material are incomplete or do not meet the requirements of the activity and the action that should be taken
- K25 describe the process and procedure used for making suggestions for improving the business
- K26 explain the importance of taking responsibility for identifying and making suggestions for making business improvements
- K27 describe their role in helping to develop their own skills and knowledge (such as checking with their supervisor about the work they are expected to carry out and the standard required to achieve; the safety points to be aware of and the skills and knowledge you will need to develop)
- K28 explain the benefits of continuous personal development, and the training opportunities that are available in the workplace
- K29 explain the importance of reviewing their training and development with trainers and supervisors, of comparing the skills, setting objectives to overcome any shortfall or address any development needs

- K30 describe their responsibilities for providing evidence of your performance and progress (such as submitting work for assessment or the completion of assignments or tests)
- K31 explain the importance of maintaining effective working relationships within the workplace (such as listening attentively to instructions from their supervisor, making sure they ask for help and advice in a polite and courteous manner, responding positively to requests for help from others)
- K32 explain the reason for informing others of their activities which may have impact on their work (such as the need to temporarily disconnect a shared resource like electricity or compressed air supply; making undue noise or creating sparks, fumes or arc flashes from welding)
- K33 explain how to deal with disagreements with others in ways which will help to resolve difficulties and maintain long term relationships
- K34 describe the organisational procedures to deal with and report any problems that can affect working relationships
- K35 describe the difficulties that can occur in working relationships, and how to resolve them
- K36 describe the current legislation covering discrimination in the workplace on the ground of race, religion sex, age and disability
- K37 explain the need to dispose of waste materials and consumables (such as oils and chemicals) in a safe and environmentally friendly way
- K38 explain where tools and equipment should be stored and located, and the importance of returning all tools and documentation to their designated area on completion of your work activities
- K39 explain when to act on their own initiative and when to seek help and advice from others
- K40 explain the importance of leaving the work area in a safe condition on completion of your activities (such as equipment correctly isolated, cleaning the work area and removing and disposing of waste)

**Unit 303**

**Working efficiently and effectively as a rail  
engineering technician**

Supporting Information

## Unit 304

## Plan permanent way activities

<b>Unit level:</b>	Level 3
--------------------	---------

---

<b>GLH:</b>	60
-------------	----

**Unit aim:**

This unit is about planning permanent way activities and covers the methods that are used to plan the utilisation of resources for maintenance or renewal activities including the estimation of timescales, preparation of method statements and planning for special requirements.

This unit consists of one element:

1. Plan permanent way activities

This element is about planning permanent way engineering activities and will result in the preparation of a plan. You will know the type and range of plans to be produced and will ensure that the information gathered is relevant to the work to be carried out. You will be able to take into account the activities to be undertaken and the limitations of the work environment. The complexity of the plan will depend on the nature or size of the activity to be undertaken.

The type of maintenance activities to be planned may include dismantling, replacing, adjusting and maintaining the permanent way infrastructure and may include as appropriate:

1. replacement of ballast profile (wet beds)
2. dealing with clogged and contaminated ballast
3. replacing and adjusting sleepers and bearers
4. replacing and adjusting rails (including clips, pads and insulators)
5. restoring track geometry
6. maintaining and clearing drains and vegetation
7. removing waste material
8. routine preventative maintenance

The type of permanent way renewal activities may include dismantling, installing and renewing the permanent way infrastructure and may include as appropriate:

1. earthworks, formations, structures and drainage
2. ballast
3. sleepers and bearers
4. rails and associated fastenings
5. restoration of track geometry

The type of plans to be produced will be those associated with maintaining the permanent way and may include as appropriate:

1. method statements
2. contingency plans
3. bar charts/norm times
4. critical activity milestones
5. lines open/blocked to traffic
6. AC and DC line working and isolations
7. lead times
8. site facilities (e.g. accommodation, toilets)

- 9. lifting plans

The types of resources to be used may include:

- 1. people (including skill requirements)
- 2. plant
- 3. equipment
- 4. materials

This unit is for all supervisors carrying out engineering activities in permanent way.

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 identify and analyse the information required for the activity
- P2 identify health and safety issues and safe working practices and procedures that must be followed, including as appropriate:
  - P2a relevant local safety certificates
  - P2b the implementation of relevant documentation
  - P2c the implementation of a safe system of work
  - P2d the use of relevant personal protective equipment
- P3 identify the activities to be carried out and determine their sequence
- P4 establish which methods are required and what resources are to be used, including as appropriate:
  - P4a documentation - current and appropriate
  - P4b tools, plant and test equipment -calibrated and serviceable
  - P4c materials, replacement equipment and consumables
  - P4d communications equipment
  - P4e personnel - total required and competence
- P5 identify any special requirements and incorporate them in the plan
- P6 identify where technical documentation, resources, equipment, materials or tools are not available and deal with the deficiency in accordance with your organisation's procedures
- P7 estimate timescales required
- P8 prepare and record the plan
- P9 make a record of agreed work plans and communicate the plans to all involved

- P10 deal effectively with problems within the limits of your own authority and report those that cannot be resolved
- P11 discuss and agree with line manager effective and efficient alternatives where planned activities cannot be achieved
- 

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation regulations and safe working practices and procedures as appropriate to the activity
- K2 explain the types of resources to be used and how to check their availability
- K3 describe how to prepare and record a plan
- K4 explain the relevant planning methods and techniques including as appropriate:
- K4a computer-based programmes
  - K4b diagrammatical plans
  - K4c resource estimating (quantities and cost)
- K5 describe the types of information and document systems approved by your organisation including, as appropriate:
- K5a work plans
  - K5b written company procedures
  - K5c method statements
  - K5d local policy statements
  - K5e safety briefing procedures
  - K5f skill databases
- K6 explain how to prioritise work activities to achieve objectives whilst taking into account cost and efficiency
- K7 explain how to source and interpret information and whom to approach for clarification
- K8 describe your organisation's procedures for specifying requirements, such as, requesting and securing resources required for the maintenance activities
- K9 explain how to present information to the required standard using set proformas and templates including as appropriate:
- K9a work methodology
  - K9b calculations of man hours
  - K9c staffing requirements
  - K9d equipment, tools and materials
- K10 explain the relevant reporting lines and procedures as approved by your organisation
- K11 explain how and when planned activities cannot be achieved
-

- K12 describe the likely impact of your work on the operations of other departments and the impact of their work for you
- K13 explain the limits of your own authority and responsibility and those of others involved

## **Unit 304**                      **Plan permanent way activities**

### Supporting Information

## Unit 305

# Implement and monitor safe working systems for permanent way maintenance or renewal activities

<b>Unit level:</b>	Level 3
<b>GLH:</b>	80
<b>Unit aim:</b>	<p>This unit is about implementing and monitoring safe working systems for permanent way maintenance or renewal activities and also covers methods to establish safe systems of work using technical knowledge and experience of renewal and maintenance activities. This will include the use of necessary documentation to establish safe systems of work.</p> <p>This unit consists of one element:</p> <ol style="list-style-type: none"><li>1. Implement and monitor safe working systems for permanent way maintenance or renewal activities</li></ol> <p>This element is about implementing and monitoring safe working systems during aspects of the maintenance or renewal of the permanent way. This involves protecting other people from the effects of the engineering work and from the movement of rail vehicles.</p> <p>The type and complexity of the environment will be that associated with being on or about the permanent way and must take account of, as appropriate:</p> <ol style="list-style-type: none"><li>1. lines open/closed to operational traffic</li><li>2. maintenance or renewals activities</li><li>3. requirements for depots, sidings, and the mainline including bi-directional operations</li><li>4. day/night working</li><li>5. noise</li><li>6. weather</li></ol> <p>You will know and understand the level and extent of your responsibility, including both your own safety and that of work colleagues. Where necessary, authorisation must be obtained before work is carried out and you will be expected to work within your organisation's procedures and specifications.</p> <p>This unit is for all supervisors carrying out engineering activities in permanent way.</p>

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely in accordance with the regulations for your work environment
- P2 source and interpret approved system procedures and information relating to the work area/site
- P3 identify and set access controls to meet agreed and approved system procedures
- P4 check that the requirements for safe access meet your organisation's requirements
- P5 take action to ensure the requirements for safe access to work are implemented
- P6 ensure that system records are accurate, up-to-date and complete and are stored correctly
- P7 advise other person(s) as required of the requirements for safe access
- P8 communicate system requirements and the responsibilities of individuals to the appropriate person(s)
- P9 review system operations regularly and forward suggestions for improvement to the appropriate person(s)
- P10 deal promptly and effectively with problems within your control and report those which cannot be resolved

---

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 explain how to source and interpret your organisation's approved system procedures and information relating to the work area/site
- K3 describe your organisation's methods and techniques for conducting safety assessments, including as appropriate:
  - K3a risk assessment
  - K3b safe systems of work
- K4 describe your organisation's procedures and guidelines for obtaining resources
- K5 describe your organisation's procedures for setting access controls and how to monitor these are in place

- K6 explain how to monitor safe working systems during maintenance or renewal activities
- K7 describe the implications of not implementing and monitoring a safe working system
- K8 describe how to present relevant information using set proformas and templates as appropriate
- K9 explain the relevant reporting lines and procedures as approved by your organisation
- K10 describe the limits of your own authority and responsibility and those of others involved

**Unit 305**

**Implement and monitor safe working systems  
for permanent way maintenance or renewal  
activities**

Supporting Information

## Unit 306

# Allocate and monitor resources for permanent way engineering activities

<b>Unit level:</b>	Level 3
<b>GLH:</b>	60
<b>Unit aim:</b>	<p>This unit is about allocating and monitoring resources for effective permanent way engineering activities. You will be able to work to a plan, identify and allocate the resources required and source information regarding those resources. You will monitor the use of resources and ensure that there are sufficient resources available for the activities to be undertaken and that resources are used in a safe, appropriate and timely manner. Where changes in resources or activities occur you will be able to challenge when a plan or resource allocation may need amending.</p> <p>This unit consists of one element:</p> <ol style="list-style-type: none"><li>1. Allocate and monitor resources for permanent way engineering activities</li></ol> <p>This element is about allocating and monitoring resources for permanent way engineering activities which may include maintenance, fault finding and/or installation work on permanent way assets and equipment.</p> <p>You are aware of your own responsibility for the care and use of resources and will be able to advise team members of their responsibilities for the care and use of resources. You will take into account the time the system will be available for the task when considering resources and also any influencing factors such as, environmental, site conditions and the additional requirements for working on operational railway equipment. Identifying inaccuracies and the non-availability of resources and being able to take appropriate remedial action are key to this element.</p> <p>You will ensure that your organisation's procedures are met and followed by yourself and those for whom you are responsible.</p> <p>The complexity of the activities will normally be determined by their technical nature. Weather constraints and contingencies may affect the level of difficulty.</p> <p>This unit is for all supervisors carrying out engineering activities in permanent way.</p>

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 ensure sufficient resources are available
- P3 ensure resource information and documentation is up-to-date and in line with your organisations procedures
- P4 monitor the use of resources
- P5 identify when changes to the planned use of resources may occur
- P6 take prompt and effective action to deal with actual and predicted changes to the planned use of resources
- P7 advise the appropriate person(s) where changes to resources have occurred or are likely to occur and the implications involved
- P8 make sure that those using resources are aware of their responsibilities for the care and use of the resources
- P9 record details on the use of resources including where appropriate any changes that have occurred

---

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 explain the types of resources available, including as appropriate:
  - K2a people (skilled and unskilled)
  - K2b plant
  - K2c equipment
  - K2d materials
  - K2e time
  - K2f transportation
  - K2g permits and legal documentation

- K3 explain your organisation's methods and techniques for resource planning, including as appropriate:
  - K3a computerised
  - K3b diagrammatic
  - K3c the use of estimating tools
- K4 explain how to obtain up-to-date information on engineering activities and the resources required
- K5 describe how to source and interpret the information and document systems as approved by your organisation
- K6 describe the types of problems that can occur when obtaining resources and how these problems can be overcome
- K7 describe how the planned use of resources could alter and the implications that may follow
- K8 describe your organisation's methods and techniques for effective monitoring of resources
- K9 explain your organisation's procedures for the care and use of resources, including tools and equipment identification and calibration
- K10 describe your organisation's methods and techniques for effective communication including the appropriate method for communicating changes, including, when a plan may need changing
- K11 explain the relevant reporting lines and procedures as approved by your organisation
- K12 describe the limits of your own authority and responsibility and those of others involved
- K13 describe the likely impact of your work on the operations of other departments and the impact of their work for you

**Unit 306**

**Allocate and monitor resources for permanent  
way engineering activities**

Supporting Information

## Unit 307

## Undertake detailed inspection of the permanent way infrastructure

<b>Unit level:</b>	Level 3
<b>GLH:</b>	72

---

**Unit aim:**

This unit is about undertaking detailed inspection of the permanent way infrastructure, including, verifying reported defects, identifying new defects, prioritising and checking work.

This unit consists of one element:

1. Undertake detailed inspection of the permanent way infrastructure

This element is about undertaking detailed inspection of the permanent way infrastructure. The aspects, characteristics and complexity of the checks will depend on the components that are to be inspected. The checks may include as appropriate:

1. visual checks
2. detailed checks
3. maintenance quality checks
4. ultrasonic testing

The inspection methods and techniques to be used will be approved by your organisation and may include the use of vehicle trolley or pedestrian means. The types of equipment to be used may include gauges, and the equipment or assets to be inspected may include, as appropriate:

1. cross levels (dynamic and static)
2. track gauges
3. rail profile/condition
4. cast crossings
5. switches
6. crossings
7. clearances
8. tunnels
9. buffer stops
10. longitudinal timbers

The quality standards and accuracy to be achieved will be approved by your organisation and the manufacturer and must take account of the approved tolerances. The inspection must be undertaken in a thorough and timely fashion.

This unit is for all supervisors carrying out engineering activities in permanent way.

---

**Learning outcome**

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
  - P2 access and interpret the relevant diagrams and specifications for the product or equipment being inspected
  - P3 ensure equipment is calibrated as required prior to use
  - P4 select and use the correct equipment to carry out the inspection
  - P5 identify and confirm the inspection checks to be made and acceptance criteria to be used
  - P6 carry out all required inspections as approved by your organisation
  - P7 identify and analyse any defects or variations from the specification
  - P8 record the results of the inspection in the appropriate format
  - P9 deal promptly and effectively with problems within your control and report those that cannot be resolved
- 

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
  - K2 explain how to access and interpret the relevant diagrams and engineering specifications
  - K3 explain how and when to confirm the specification is accurate
  - K4 describe what constitutes the permanent way infrastructure and how it integrates with other aspects of the rail engineering industry
  - K5 describe the operational and environmental constraints that could occur whilst undertaking an inspection, including as appropriate:
    - K5a open to traffic
    - K5b closed to traffic
    - K5c restricted track access
    - K5d day work/night work
  - K6 describe the methods and techniques for inspection as approved by your organisation
  - K7 describe the types of equipment required for the inspection and how to ensure it is calibrated as appropriate
  - K8 explain how to ensure authorisation is obtained for both the inspection and the use of equipment
  - K9 describe your organisation's procedures for the care and control of inspection equipment
-

- K10 describe what constitutes a defect or variation of the permanent way infrastructure
- K11 describe how to identify and analyse defects in the permanent way infrastructure, including as appropriate:
  - K11a visual means
  - K11b measured means
  - K11c calculated means
- K12 explain the importance of reporting a defect or variation, including when immediate action is required
- K13 describe the impact of a defect or variation on the operational performance and safety of the permanent way
- K14 explain the relevant reporting lines and procedures as approved by your organisation
- K15 describe the limits of your own authority and responsibility and those of others involved

**Unit 307**

**Undertake detailed inspection of the  
permanent way infrastructure**

Supporting Information

## Unit 308

# Assess the performance and condition of permanent way assets

<b>Unit level:</b>	Level 3
<b>GLH:</b>	60
<b>Unit aim:</b>	<p>This unit is about assessing the performance and condition of permanent way assets using data obtained from measuring equipment and by visual or vehicular inspection.</p> <p>This unit consists of one element:</p> <ol style="list-style-type: none"><li>1. Assess the performance and condition of permanent way assets obtained through inspection</li></ol> <p>This element is about assessing the performance and condition of permanent way assets using data obtained through inspection. These assets may include:</p> <ol style="list-style-type: none"><li>1. plain line</li><li>2. switches and crossings</li><li>3. track substructure</li><li>4. off track structures such as bridges, tunnels, embankments and cuttings</li></ol> <p>The type of data to be analysed may relate to:</p> <ol style="list-style-type: none"><li>1. track geometry (vehicular records including OTM reports, manual, historic and current information)</li><li>2. track inspection records</li><li>3. rail, ballast and sleeper integrity testing reports</li><li>4. rail defect analysis</li><li>5. survey information</li><li>6. dynamic/static readings</li><li>7. off track information</li><li>8. environmental information</li><li>9. ultrasonic testing records</li></ol> <p>The analysis methods to be used will include both calculation and comparison.</p> <p>This unit is for all supervisors carrying out engineering activities in permanent way.</p>

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 ensure that you have the necessary test data on which to conduct the assessment
- P3 carry out the assessment using all relevant data and approved methods
- P4 check that the assessment provides clear and accurate information
- P5 compare and analyse current performances and condition data with that from previous assessments
- P6 identify and report the implications arising from the assessments
- P7 record the results of the assessments in the appropriate format

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 explain how to access and interpret the relevant equipment operating and test specifications as approved by your organisation
- K3 describe the methods and procedures for monitoring equipment including ensuring consistency of data retrieval
- K4 describe how to analyse information received from equipment, including as appropriate, performing calculations
- K5 describe the assessment methods and techniques as approved by your organisation and the manufacturer(s), including:
  - K5a reading data
  - K5b calculation
  - K5c comparison
- K6 explain how to source and interpret approved manuals and related information
- K7 describe how and when the data and/or information received may be compromised
- K8 explain the relevant reporting documentation and control procedures as approved by your organisation

- K9 explain the relevant reporting lines and procedures as approved by your organisation
- K10 describe the limits of your own authority and responsibility and those of others involved

**Unit 308**

**Assess the performance and condition of  
permanent way assets**

Supporting Information

## Unit 309

## Establish track geometry and position

<b>Unit level:</b>	Level 3
--------------------	---------

---

<b>GLH:</b>	60
-------------	----

**Unit aim:**

This unit is about establishing track geometry and position and covers the methods that are used to gather site information, set out/measure and calculate/mark out, the geometrical requirements within specified tolerances.

This unit consists of one element:

1. Establish track geometry and position

This element is about establishing track geometry and position through a variety of engineering activities, including as appropriate:

1. gathering information
2. setting out
3. measuring
4. data analysing
5. marking up
6. calculating
7. site surveying /scoping

The complexity of the activities may involve:

1. calculating by the use of formulas
2. using variable/diverse sources of information
3. track configuration
4. deciding the optimum courses of action

The range of geometry and positioning issues may include:

1. top, cross level, alignment and gauge
2. dynamic movement of the track
3. drainage, position and gradient
4. structural clearances

The level and extent of responsibility includes acquiring the necessary amount of technical knowledge.

Advice from other relevant people should be sought where needed. You will be able to take responsibility for the quality of your work.

This unit is for all supervisors carrying out engineering activities in permanent way.

---

**Learning outcome**

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 identify and clearly confirm the objectives to be achieved
  - P2 assess and analyse the work circumstances and their technical implications
  - P3 identify technical requirements that could deliver the specified objectives
  - P4 select and specify for implementation the most appropriate technical requirements to achieve the objectives
  - P5 identify, analyse and report those requirements which cannot be achieved
- 

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
  - K2 describe the principles of geometrical engineering and how they are applied to the track
  - K3 explain how to source and interpret information and document systems as approved by your organisation, including as appropriate:
    - K3a work plans
    - K3b method statements
    - K3c skill data bases
  - K4 explain how and who to contact to clarify information
  - K5 describe the different types of specifications relevant to your role and how they are structured including as appropriate:
    - K5a your organisation's procedures
    - K5b manufacturers' specifications and instructions
    - K5c local instructions
  - K6 describe the requirements for presenting information as approved by your organisation, including as appropriate, using set proformas and templates
  - K7 explain the relevant reporting lines and procedures as approved by your organisation
  - K8 describe the likely impact of your work on the operations of other departments and the impact of their work for
  - K9 describe the limits of your own authority and responsibility and those of others involved
-

## Unit 309

## Establish track geometry and position

### Supporting Information

## Unit 310

# Ensure that the track is fit for operational purposes

<b>Unit level:</b>	Level 3
<b>GLH:</b>	90
<b>Unit aim:</b>	<p>This unit is about ensuring that the track is fit for operational purposes and covers the assessment of the condition of the infrastructure, following completion of maintenance, inspection and/or renewal work, to determine its fitness for use. This includes track that has been taken out of use and takes account of appropriate speed restrictions.</p> <p>This unit consists of one element:</p> <ol style="list-style-type: none"><li>1. Ensure that the track is fit for operational purposes</li></ol> <p>This element is about ensuring the track is fit for operational purposes.</p> <p>The type of assets will include the track and associated infrastructure following remedial work and inspection. The scale of the work could range from minor maintenance to major renewal/repair activities. This may include as appropriate:</p> <ol style="list-style-type: none"><li>1. raising/removing speed restrictions</li><li>2. temporary and permanent situations</li><li>3. major geometrical repair</li><li>4. removal of environmental hazards</li><li>5. maintenance works or inspections</li><li>6. track infrastructure</li><li>7. emergency inspections</li></ol> <p>This unit is for all skilled operatives and supervisors carrying out engineering activities in permanent way.</p>

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 confirm that everyone involved accepts the asset is in a satisfactory condition for hand-over to take place
- P3 identify and confirm any unusual features of the condition of the asset
- P4 make the hand-over and obtain agreement between everyone involved on the precise moment of transfer of responsibility
- P5 make sure that clear, accurate and complete records of the hand-over are made
- P6 deal effectively with problems within the limits of your own authority and report those that cannot be resolved

---

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 explain how to source and interpret engineering specifications as approved by your organisation
- K3 describe the hand-over procedures as approved by your organisation including as appropriate:
  - K3a raising/removing speed restrictions
  - K3b temporary and permanent situations
  - K3c major geometrical repair
  - K3d the removal of environmental hazards
- K4 explain the procedures and systems for records and documentation as approved by your organisation
- K5 describe your organisation's methods and techniques for effective communication including the appropriate method for communicating changes
- K6 explain the relevant reporting lines and procedures as approved by your organisation
- K7 describe the likely impact of your work on the operations of other departments and the impact of their work for you
- K8 describe the limits of your own authority and responsibility and those of others involved

**Unit 310**

**Ensure that the track is fit for operational purposes**

Supporting Information

## Unit 311

## Access overhead line equipment construction sites

<b>Unit level</b>	Level 3
<b>GLH:</b>	20
<b>Unit aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to gain safe access to overhead line equipment (OLE) construction sites according to defined operating procedures in the overhead line construction industry.</p> <p>The definition of OLE is an arrangement of wires, suspended over the railway line, for supplying electricity to electric trains, together with associated fittings, insulators and other attachments including feeders, autotransformer feeders, overhead line switches, jumpers and return conductors. This equipment together with its structures, foundations, lineside switching stations is described collectively as Overhead Line Equipment.</p> <p>The purpose of this unit is to define the competence requirements for the learner to access overhead line equipment construction sites safely, effectively and in line with relevant processes and procedures.</p> <p>The level and extent of responsibility shall include their own safety and that of others who they may accompany. Learners will be expected to refer to others for authorisation when required, be responsible for the implementation of instructions and work within set procedures and processes. Their actions shall not compromise the safety of others.</p> <p>To prove their competence in this unit, they must be able to demonstrate their ability to access OLE construction sites safely and effectively in line with process and procedures. Learners will also have to show that they can follow recording, reporting and escalation procedures.</p> <p><b>NOTE</b> All personnel accessing an OLE construction worksite must have with them a:</p> <ul style="list-style-type: none"><li>• Site Access Authorisation Card</li></ul> <p>And if applicable one of the following:</p> <ul style="list-style-type: none"><li>• Personal Track Safety (PTS) Certificate or</li><li>• Track Visitor Permit (TVP)</li></ul>

Only in an area of new construction, physically and electrically separated from existing Network Rail operational infrastructure is a PTS Card or TVP not required (such as when it is a 'green field' site).

**Relationship to NOS:**

This unit has been derived from national occupational standard Overhead Line Equipment Construction SEMOLEC2301 Access overhead line equipment construction sites (Suite 2)

---

## Learning outcome

The learner will:

P Access overhead line equipment construction sites

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 identify the requirements for site briefings to include all the following:
  - P2a safety arrangements
  - P2b nature of work
  - P2c hazards associated with the site
  - P2d extent of safe working limits
  - P2e emergency arrangements
  - P2f welfare arrangements
  - P2g PPE requirements
  - P2h whom they will need to report to while on site
  - P2i limits of personal responsibility
- P3 adhere to and follow site access requirements for both the following:
  - P3a receiving safety briefings
  - P3b personal safety
- P4 identify all the types of documentation that applies to access requirements:
  - P4a signing in and off site register
  - P4b site briefing attendance
  - P4c site access authorisation card
  - P4d personal track safety certificate
  - P4e track visitor permit
- P5 follow the relevant instructions in line with safe access procedure
- P6 adhere to site requirements for Personal Protective Equipment (PPE) including all the following:

- P6a safety helmets
  - P6b approved high visibility clothing
  - P6c approved safely footwear
  - P6d gloves
  - P6e goggles
  - P6f ear protection
  - P6g safety harnesses
  - P7 follow directions from competent personnel
  - P8 identify the hazards and risks related to all of the following:
    - P8a electrified lines
    - P8b radial loaded and tensioned lines
    - P8c limited clearances
    - P8d moving machinery (such as Road Rail Vehicles (RRVs))
    - P8e working at height
    - P8f lifting and moving equipment
    - P8g overloaded plant and equipment
  - P9 carry out on site activities within the limits of their personal authority
  - P10 report any instances where on site activities cannot be achieved or where there are safety issues outside the planned schedule
  - P11 comply with all the recording, reporting and escalation procedures including:
    - P11a emergency procedures
    - P11b standard reporting procedures associated with projects
  - P12 complete relevant records accurately and pass them on to the appropriate person
- 

## Learning outcome

The learner will:

- K Know how to access overhead line equipment construction sites

## Assessment criteria

The learner can:

- K1 describe the specific requirements of safety issues surrounding construction site access (such as moving machinery, working plant and equipment, electrified lines, hazards associated with OLE systems, awareness of working at height and how they can differ at each site of work)
  - K2 list the technical terminology associated with construction sites and how that applies to the safe access to the site
  - K3 describe the documentation associated with access to OLE construction sites
  - K4 describe the requirements for signing in and off site
  - K5 describe the purpose of the briefing by the site access controller before gaining access
-

- K6 describe what procedures need to be followed, to confirm operational and personal safety is maintained during the work
- K7 describe what procedures need to be followed for visitors to the construction site
- K8 describe how to avoid personal injury during the work
- K9 describe how the construction activity may affect the safe operation of the railway
- K10 state how the OLE is designed to function under normal operating conditions
- K11 state what each of the component parts contribute to the overall operation of the OLE system
- K12 list what terminology and methods are used to identify OLE and describe operational status of the equipment
- K13 state the recording, reporting lines and escalation procedures
- K14 describe the industry protocols relating to communication of important safety information
- K15 describe what the limits of their own responsibility/authority are and whom they should report to if they have a problem they cannot resolve

**Unit 311**

**Access overhead line equipment construction sites**

Supporting Information

## Unit 312

# Install overhead line equipment main steelwork

<b>Unit level:</b>	Level 3
<b>GLH:</b>	50
<b>Unit aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to install overhead line equipment (OLE) main steelwork to pre-prepared foundations according to defined operating procedures in the overhead line construction industry. The term main steelwork is used to describe the range of types of masts, cantilevers and portals that provide the structure to support the overhead line equipment.</p> <p>The definition of OLE is an arrangement of wires, suspended over the railway line, for supplying electricity to electric trains, together with associated fittings, insulators and other attachments including feeders, autotransformer feeders, overhead line switches, jumpers and return conductors. This equipment together with its structures, foundations, lineside switching stations is described collectively as Overhead Line Equipment.</p> <p>To prove competence in this unit the learner will need to demonstrate their ability to complete the main steelwork installation, renewal, enhancement or modification activities in accordance with current working instructions.</p> <p>The learner will be required to determine, from the drawings and specifications, what has to be done and how best it can be achieved safely, within the time frames allowed and appropriate to the environment and site conditions.</p> <p>The learner's underpinning knowledge will provide a good understanding of their work, and provide an informed approach to applying main steelwork assembly and erection procedures. They will understand the principles and processes associated with the erection and assembly of the steelwork and their application. Learners will know about the ways of handling main steelwork, the means of fixing them in position as well as the care and use of the tools and equipment in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the finished steelwork structure is produced to the required specification. They will understand the safety precautions required when working at height and with main steelwork components and their associated tools and equipment. The learner will be required to demonstrate safe working practices throughout, and will</p>

understand the responsibility they owe to themselves and others in the workplace.

The learner's responsibilities will require them to comply with organisational policy and procedures for the safe installation of the main steelwork and the associated assembly activities to be undertaken and to report any problems with the component parts, equipment or installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work with minimum supervision, taking personal responsibility for their own actions and the quality and accuracy of the work that they carry out.

#### NOTE

This unit does not cover the competencies required by the crane controller whose role would be to ensure that the lifting of the steelwork complies with the predetermined lift plan.

#### Relationship to NOS:

This unit has been derived from national occupational standard Overhead Line Equipment Construction SEMOLEC302 Install overhead line equipment main steelwork (Suite 3)

---

### Learning outcome

The learner will:

P Performance requirements: Install overhead line equipment main steelwork

### Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 carry out all of the following activities during the installation:
  - P2b adhere to safety briefing instructions, risk assessments, COSHH, safe system of work and other relevant safety standards
  - P2c checks to ensure currency of installation documentation (such as drawings, layouts, instructions, manufacturers' data, settings and other documentation)
  - P2d obtain authority before carrying out the installation activities
  - P2e dispose of waste items in accordance with the project plan
  - P2f leave the work area in a safe condition
- P3a select and use correctly six of the following types of personal protection equipment:
  - P3b safety harnesses
  - P3c safety helmets
  - P3d approved high visibility clothing

- P3e approved safety footwear
- P3f gloves
- P3g goggles
- P3h ear protection (as appropriate)
- P3i other specific equipment
- P4 use the correct tools, plant and equipment for the installation and check that they are in a safe and usable condition and are fit for purpose
- P5 interpret the main steel component requirements from all of the following design drawings and specifications:
  - P5a layouts
  - P5b cross sections
  - P5c OLE system design range (such as OLEMI) (as appropriate)
- P6 follow all relevant drawings and specifications for the installation being carried out
- P7 undertake all of the following installation activities:
  - P7a use of lifting equipment
  - P7b positioning and fastening of steelwork
  - P7c adjustments to level, rake and alignment
- P8 install or renew one of the following types of main steelwork:
  - P8a cantilever masts
  - P8b twin track cantilevers
  - P8c headspan masts
  - P8d portals
  - P8e 'A' frames
- P9a apply installation methods and techniques, to include five of the following:
  - P9b hole and fixing preparation
  - P9c shimming and packing (as applicable)
  - P9d positioning equipment
  - P9e securing using mechanical fixings
  - P9f levelling and aligning equipment
  - P9g torque loading
  - P9h applying locking devices (as applicable)
- P10 install, position and secure the main steelwork and components in accordance with correct procedures, drawings and specifications
- P11 confirm that all necessary connections, fittings and components are secure and complete
- P12 check installation is complete and that all components are free from damage
- P13 carry out checks appropriate to the type of steelwork being installed, to include all of the following:
  - P13a checking that the installed steelwork complies with the installation specification
  - P13b checking level, rake and alignment
  - P13c making visual checks for completeness and freedom from damage
- P14 follow relevant recording and reporting procedures to include one of the following:

- P14a installation record
  - P14b hand over document
  - P14c other specific recording document
  - P15 deal promptly and effectively with problems within their control and report those that cannot be solved
- 

## Learning outcome

The learner will:

- K Know how to Install overhead line equipment main steelwork

## Assessment criteria

The learner can:

- K1 explain what health and safety legislation, regulations and safe working practices and procedures apply including, current Rule Book, Working On Or About 25kV AC Electrified lines, Health and Safety at Work Act, control measures, lifting plans, Provision and Use of Work Equipment Regulations (PUWER) and Lifting Operations and Lifting Equipment Regulations (LOLER)
  - K2 explain the requirements for a safe system of work and the limits applicable
  - K3 explain how the activity may affect the safe operation of the railway
  - K4 explain what procedures need to be followed, to confirm operational and personal safety, is maintained during the work
  - K5 explain the general electrical hazards associated with working on and around overhead line equipment
  - K6 explain how to avoid personal injury and injury to others during the work
  - K7 explain the hazards associated with erecting structural steel components (such as lifting and handling long and heavy components, working at height) and how the risks can be minimised
  - K8 explain the Personal Protective Equipment (PPE) that they need to use for the activities that they are undertaking
  - K9 explain the correct methods of moving, lifting, handling and supporting heavy structural steel sections
  - K10 explain the documentation and certification (such as overhead line specifications, work/task instructions, inspection/test plan)
  - K11 explain the purpose for the different types of design drawings used in OLE steelwork installation (such as layouts and cross section diagrams)
  - K12 explain how to carry out currency/issue checks of the specifications they are working with
  - K13 explain the construction methodology for the main steelwork installation being undertaken
  - K14 describe how the OLE is designed to function under normal operating conditions
  - K15 describe what each of the OLE component parts contribute to the overall operation of the system
  - K16 describe what terminology and methods are used to identify OLE steelwork and to describe the operational status of the steelwork
-

- K17 explain the tools, plant and equipment used in the installation process including requirements to check that maintenance is in date and any calibration certificates are available
- K18 explain the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved
- K19 explain the types of tools and instruments used to position, secure and align the steelwork (such as podgers, spanners, wrenches, sockets, torque wrenches, levels, alignment and laser devices)
- K20 explain the techniques used to position, align, level and adjust the main steelwork
- K21 explain how to conduct any necessary checks to ensure the integrity, functionality, accuracy, and quality of the installation
- K22 explain the procedure for the safe disposal of waste materials and redundant structures
- K23 explain what the limits of their responsibility and authority are
- K24 explain who is responsible for taking equipment out of operational service and handing the equipment back to operational service
- K25 explain the installation activity reporting documentation
- K26 explain the reporting lines and escalation procedures
- K27 explain the industry protocols relating to communication of important safety information
- K28 explain the completing of records and how to confirm they are retained and preserved

**Unit 312**

**Install overhead line equipment main  
steelwork**

Supporting Information

## Unit 313

# Install overhead line equipment small part steelwork

<b>Unit level:</b>	Level 3
<b>GLH:</b>	60
<b>Unit aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to install overhead line equipment (OLE) small part steelwork according to defined operating procedures in the overhead line construction industry. The term small part steelwork is used to describe items of equipment that are assembled and fitted to the main steel structures such as cantilever assemblies, headspans, cross span wires, registration arms, bridge/tunnel supports and security guards.</p> <p>The definition of OLE is an arrangement of wires, suspended over the railway line, for supplying electricity to electric trains, together with associated fittings, insulators and other attachments including feeders, autotransformer feeders, overhead line switches, jumpers and return conductors. This equipment together with its structures, foundations, lineside switching stations is described collectively as Overhead Line Equipment.</p> <p>To prove competence in this unit the learner will need to demonstrate their ability to complete the small part steelwork installation, renewal, enhancement or modification activities in accordance with current working instructions.</p> <p>The learner will be required to determine, from the drawings and specifications, what has to be done and how best it can be achieved safely, within the time frames allowed and appropriate to the environment and site conditions.</p> <p>The learner's underpinning knowledge will provide a good understanding of their work, and provide an informed approach to applying steelwork assembly procedures. They will understand the principles and processes associated with the assembly of the small part steelwork and their application. Learners will know about the ways of handling steelwork, the means of fixing them in position as well as the care and use of the tools and equipment in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the installed small part steelwork is produced to the required specification. They will understand the safety precautions required when working at height and with steelwork components and their associated tools and equipment. The learner will be required to demonstrate safe working practices</p>

throughout, and will understand the responsibility they owe to themselves and others in the workplace.

The learner's responsibilities will require them to comply with organisational policy and procedures for the safe installation of the small part steelwork and the associated assembly activities to be undertaken and to report any problems with the component parts, equipment or installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work with minimum supervision, taking personal responsibility for their own actions and the quality and accuracy of the work that they carry out.

**Relationship to NOS:**

This unit has been derived from national occupational standard Overhead Line Equipment Construction SEMOLEC303 Install overhead line equipment small part steelwork (Suite 3)

---

## Learning outcome

The learner will:

P Performance requirements: Install overhead line equipment small part steelwork

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 carry out all of the following activities during the installation:
  - P2a adhere to safety briefing instructions, risk assessments, COSHH, safe system of work and other relevant safety standards
  - P2b checks to ensure currency of installation documentation (such as drawings, layouts, instructions, manufacturers' data, settings and other documentation)
  - P2c obtain authority before carrying out the installation activities
  - P2d dispose of waste items in accordance with the project plan
  - P2e leave the work area in a safe condition
- P3a select and use correctly six of the following types of personal protection equipment:
  - P3b safety harnesses
  - P3c safety helmets
  - P3d approved high visibility clothing
  - P3e approved safety footwear
  - P3f gloves
  - P3g goggles
  - P3h ear protection (as appropriate)

- P3i other specific equipment
- P4 use the correct tools, plant and equipment for the installation and check that they are in a safe and usable condition and are fit for purpose
- P5 interpret the small part steel component requirements from all of the following design drawings and specifications:
  - P5a layouts
  - P5b cross sections
  - P5c OLE system design range (such as OLEMI)
- P6 follow all relevant drawings and specifications for the installation being carried out
- P7 undertake all of the following installation activities:
  - P7a use of lifting equipment (as appropriate)
  - P7b positioning and fastening of small part steelwork
  - P7c adjustments to position, level and alignment
- P8 install or renew small part steelwork components on different types of structures including one of the following:
  - P8a twin track cantilevers
  - P8b headspans
  - P8c portals
  - P8d masts
  - P8e bridge/tunnel
  - P8f rigid contact systems
  - P8g 'A' frames
- P9 apply installation methods and techniques, to include six of the following:
  - P9a mounting/locating area preparation
  - P9b shimming and packing (as applicable)
  - P9c positioning equipment
  - P9d securing using mechanical fixings
  - P9e position, levelling and aligning equipment
  - P9f torque loading
  - P9g applying locking devices
- P10 install, position and secure the small part steelwork components in accordance with the drawings and specification
- P11 confirm that all necessary connections, fittings and components are secure and complete
- P12 check installation is complete and that all components are free from damage
- P13 carry out checks on the small part steelwork being installed, to include all of the following:
  - P13 checking that the installed small part steelwork complies with the installation specification
  - P13 checking position, clearances, level and alignment
  - P13 making visual checks for completeness and freedom from damage
  - P13 checking locking devices
- P14 follow relevant recording and reporting procedures to include one of the following:
  - P14a installation record

- P14b hand over document
- P14c other specific recording document
- P15 deal promptly and effectively with problems within their control and report those that cannot be solved
- 

## Learning outcome

The learner will:

- K Knowledge and understanding: Know how to install overhead line equipment small part steelwork

## Assessment criteria

The learner can:

- K1 explain what health and safety legislation, regulations and safe working practices and procedures apply including, current Rule Book, Working On Or About 25kV AC Electrified lines, Health and Safety at Work Act, control measures, lifting plans, Provision and Use of Work Equipment Regulations (PUWER) and Lifting Operations and Lifting Equipment Regulations (LOLER)
- K2 explain the requirements for a safe system of work and the limits applicable
- K3 explain how the activity may affect the safe operation of the railway
- K4 explain what procedures need to be followed, to confirm operational and personal safety, is maintained during the work
- K5 explain the general electrical hazards associated with working on and around overhead line equipment
- K6 explain how to avoid personal injury and injury to others during the work
- K7 explain the hazards associated with erecting small part steelwork components (such as lifting and handling long and heavy components, working at height) and how the risks can be minimised
- K8 explain the personal protective equipment (PPE) that they need to use for the activities that they are undertaking
- K9 explain the correct methods of moving, lifting, handling and supporting steel assemblies and other small part components
- K10 explain the documentation and certification (such as overhead line specifications, work/task instructions, inspection/test plan, height/stagger sheet)
- K11 explain the purpose for the different types of design drawings used in OLE small part steelwork installation (such as layouts and cross section diagrams and OLE system design range (such as OLEMI))
- K12 explain how to carry out currency/issue checks of the specifications they are working with
- K13 explain the construction methodology for the small part steelwork installation being undertaken
- K14 describe how the OLE is designed to function under normal operating conditions
-

- K15 describe what each of the OLE component parts contribute to the overall operation of the system
- K16 explain what storage and handling precautions have to be taken to protect easily damaged components (such as insulators)
- K17 describe what terminology and methods are used to identify OLE small part steelwork and to describe the operational status of the steelwork
- K18 explain the tools, plant and equipment used in the installation process including requirements to check that maintenance is in date and any calibration certificates are available
- K19 explain the torque loading requirements of the fasteners and what to do if these loadings are exceeded or not achieved
- K20 explain the methods of securing the small part steelwork components safely (such as locking devices and pins)
- K21 explain the types of tools and instruments used to position, secure and align the small part steelwork (such as podgers, spanners, wrenches, sockets, torque wrenches, levels, alignment and laser devices)
- K22 explain the techniques used to position, align, level and adjust the small part steelwork
- K23 explain the installation of small part steelwork to ensure the designed mechanical, electrical and maintenance tolerances are achieved
- K24 explain how to conduct any necessary checks to ensure the integrity, functionality, accuracy, and quality of the installation
- K25 explain the procedure for the safe disposal of waste materials and redundant components
- K26 explain what the limits of their responsibility and authority are
- K27 explain who is responsible for taking equipment out of operational service and handing the equipment back to operational service
- K28 explain the installation activity reporting documentation
- K29 explain the reporting lines and escalation procedures
- K30 explain the industry protocols relating to communication of important safety information
- K31 explain the completing of records and how to confirm they are retained and preserved

**Unit 313**

**Install overhead line equipment small part  
steelwork**

Supporting Information

## Unit 314

## Install overhead line equipment wiring

<b>Unit level:</b>	Level 3
<b>GLH:</b>	60
<b>Unit aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to install overhead line equipment (OLE) contact wire and associated wiring such as catenary, along track conductors, droppers and headspans, according to defined operating procedures in the overhead line construction industry.</p> <p>The definition of OLE is an arrangement of wires, suspended over the railway line, for supplying electricity to electric trains, together with associated fittings, insulators and other attachments including feeders, autotransformer feeders, overhead line switches, jumpers and return conductors. This equipment together with its structures, foundations, lineside switching stations is described collectively as Overhead Line Equipment.</p> <p>To prove competence in this unit the learner will need to demonstrate their ability to complete the wiring installation, renewal, enhancement or modification activities in accordance with current working instructions.</p> <p>Learners will be required to determine, from the drawings and specifications, what has to be done and how best it can be achieved safely, within the time frames allowed and appropriate to the environment and site conditions.</p> <p>The learner underpinning knowledge will provide a good understanding of their work, and provide an informed approach to applying wiring selection, running out, termination, splicing and tensioning procedures. They will understand the principles and processes associated with the installation of the wiring and their application. The learner will know about the ways of handling wire, the means of fixing it into position, tensioning, as well as the care and use of the tools and equipment in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the finished wiring is produced to the required specification. They will understand the safety precautions required when working at height and with wiring components and their associated tools and equipment. Learners will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.</p>

The learner's responsibilities will require them to comply with organisational policy and procedures for the safe installation of the wiring and the associated terminating and tensioning activities to be undertaken and to report any problems with the component parts, equipment or wiring activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work with minimum supervision, taking personal responsibility for their own actions and the quality and accuracy of the work that they carry out.

**Relationship to NOS:**

This unit has been derived from national occupational standard Overhead Line Equipment Construction SEMOLEC304 Install overhead line equipment wiring (Suite 3)

---

## Learning outcome

The learner will:

P Performance requirements: Install overhead line equipment wiring

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 carry out all of the following activities during the installation:
  - P2a adhere to safety briefing instructions, risk assessments, COSHH, safe system of work and other relevant safety standards
  - P2b checks to ensure currency of installation documentation (such as drawings, layouts, instructions, manufacturers' data, settings and other documentation)
  - P2c obtain authority before carrying out the installation activities
  - P2d dispose of waste items in accordance with the project plan
  - P2e leave the work area in a safe condition
- P3 select and use correctly six of the following types of personal protection equipment:
  - P3a safety harnesses
  - P3b safety helmets
  - P3c approved high visibility clothing
  - P3d approved safety footwear
  - P3e gloves
  - P3f goggles
  - P3g ear protection (as appropriate)
  - P3h other specific equipment

- P4 use the correct tools, plant and equipment for the installation and check that they are in a safe and usable condition and are fit for purpose
- P5a interpret wire run requirements from all of the following design drawings and specifications:
  - P5b layouts
  - P5c cross sections
  - P5d OLE system design range (such as OLEMI) (as appropriate)
  - P5e height/stagger sheet
  - P5f dropper schedules
- P6 follow all relevant drawings and specifications for the installation being carried out
- P7 carry out three of the following wiring activities:
  - P7a recovery of wire
  - P7b running out wire
  - P7c splicing of conductors
  - P7d wire termination
  - P7e wire tensioning
- P8 install or renew one of the following types of wiring:
  - P8a catenary wire
  - P8b auxiliary wire (as appropriate)
  - P8c contact wire
  - P8d contact wire
  - P8e auto transformers feeder
  - P8f return conductors
  - P8g earth wire
- P9 use specialist plant and equipment including all of the following:
  - P9a drum carriers
  - P9b winches
  - P9c tensioners
- P10 install or renew one of the following wiring components:
  - P10a droppers
  - P10b jumpers
- P11 install, position and secure the wiring and components in accordance with the drawings and specification
- P12 confirm that all necessary connections, fittings and components are secure and complete
- P13 check installation is complete and that all wiring and components are free from damage
- P14 carry out checks on the wiring being installed, to include all of the following:
  - P14a checking that the installed wiring complies with the installation specification
  - P14b checking position and tension
  - P14c making visual checks for completeness and freedom from damage
  - P14d checking locking devices
- P15 follow relevant recording and reporting procedures to include one of the following:
  - P15a installation record

- P15b hand over document
- P15c other specific recording document
- P16 deal promptly and effectively with problems within their control and report those that cannot be solved
- 

## Learning outcome

The learner will:

- K Knowledge and understanding: Know how to install overhead line equipment wiring

## Assessment criteria

The learner can:

- K1 explain what health and safety legislation, regulations and safe working practices and procedures apply including, current Rule Book, Working On Or About 25kV AC Electrified lines, Health and Safety at Work Act, control measures, Provision and Use of Work Equipment Regulations (PUWER) and Lifting Operations and Lifting Equipment Regulations (LOLER)
- K2 explain and understand the requirements for a safe system of work and the limits applicable
- K3 explain how the activity may affect the safe operation of the railway
- K4 explain what procedures need to be followed, to confirm operational and personal safety, is maintained during the work
- K5 explain the general electrical hazards associated with working on and around overhead line equipment
- K6 explain how to avoid personal injury and injury to others during the work
- K7 explain the hazards associated with wiring activities (such as lifting and handling wire drums, working at height, tensioning wires and radial loads) and how the risks can be minimised
- K8 explain the Personal Protective Equipment (PPE) that they need to use for the activities that they are undertaking
- K9 explain the correct methods of moving, lifting, handling, straightening and supporting wires and associated components
- K10 explain the documentation and certification (such as overhead line specifications, work/task instructions, inspection/test plan, height/stagger sheet, dropper schedules)
- K11 explain the purpose for the different types of design drawings used in OLE wiring installation (such as layouts, cross section diagrams, OLE system design range (such as OLEMI))
- K12 explain how to carry out currency/issue checks of the specifications they are working with
- K13 explain the construction methodology for the wiring installation being undertaken
- K14 describe how the OLE is designed to function under normal operating conditions
- K15 describe what each of the wiring component parts contribute to the overall operation of the system
- K16 explain how to identify the range of cables used in wiring installation and what determines their suitability

- K17 describe what terminology and methods are used to identify OLE wiring and to describe the operational status of the wiring
- K18 explain the tools, plant and equipment used in the wiring installation process including requirements to check that maintenance is in date and any calibration certificates are available
- K19 explain the torque loading requirements of the components or connectors and what to do if these loadings are exceeded or not achieved
- K20 explain the methods of securing the wiring components and connections safely
- K21 explain the types of tools and equipment used to position, secure, terminate and tension the wiring (such as torque wrenches, winches , tensioners, tension gauges/meters)
- K22 explain the procedure for the safe disposal of waste materials and redundant wiring
- K23 explain what the limits of their responsibility and authority are
- K24 explain who is responsible for taking equipment out of operational service and handing the equipment back to operational service
- K25 explain the wiring activity reporting documentation
- K26 explain the reporting lines and escalation procedures
- K27 explain the industry protocols relating to communication of important safety information
- K28 explain the completing of records and how to confirm they are retained and preserved

## **Unit 314**

## **Install overhead line equipment wiring**

### Supporting Information

## Unit 315

# Installation of overhead line equipment sectioning, insulation, registration and in-span components

<b>Unit level:</b>	Level 3
<b>GLH:</b>	60
<b>Unit aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to install overhead line equipment (OLE) sectioning, insulation, registration and in-span components according to defined operating procedures in the overhead line construction industry. This will include adjusting the position and registration of the conductors and installation of discrete assemblies such as section insulators, neutral sections, switches, isolators, jumpers, cross contact assemblies and in-span components.</p> <p>The definition of OLE is an arrangement of wires, suspended over the railway line, for supplying electricity to electric trains, together with associated fittings, insulators and other attachments including feeders, autotransformer feeders, overhead line switches, jumpers and return conductors. This equipment together with its structures, foundations, lineside switching stations is described collectively as Overhead Line Equipment.</p> <p>To prove competence in this unit the learner will need to demonstrate their ability to complete the conductor registration, sectioning and insulation activities during the OLE installation, renewal, enhancement or modifications in accordance with current working instructions.</p> <p>The learner will be required to determine, from the drawings and specifications, what has to be done and how best it can be achieved safely, within the time frames allowed and appropriate to the environment and site conditions.</p> <p>The learner's underpinning knowledge will provide a good understanding of their work, and provide an informed approach to applying conductor adjustment and registration, including the installation of neutral and insulated sections. They will understand the principles and processes associated with the registration and installation of in span components and their application. Learners will know about the ways of adjusting the conductor position and the means of fixing in span components into position, as well as the care and use of the tools and equipment in adequate depth to provide a sound basis for carrying out the activities, correcting</p>

faults and ensuring the finished assemblies are produced to the required specification. They will understand the safety precautions required when working at height, tensioned conductors and with fragile components and their associated tools and equipment. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

The learner's responsibilities will require them to comply with organisational policy and procedures for the safe adjustment/registration of the conductor and installation of the in span components to be undertaken and to report any problems with the component parts, equipment or installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work with minimum supervision, taking personal responsibility for their own actions and the quality and accuracy of the work that they carry out.

---

**Relationship to NOS:**

This unit has been derived from national occupational standard Overhead Line Equipment Construction SEMOLEC305 Installation of overhead line equipment sectioning, insulation, registration and in-span components (Suite 3)

---

**Learning outcome**

The learner will:

- P Performance requirements: Install overhead line equipment sectioning, insulation, registration and in-span components

**Assessment criteria**

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 carry out all of the following activities during the installation:
  - P2a adhere to safety briefing instructions, risk assessments, COSHH, safe system of work and other relevant safety standards
  - P2b checks to ensure currency of installation documentation (such as drawings, layouts, instructions, manufacturers' data, settings and other documentation)
  - P2c obtain authority before carrying out the installation and adjustment activities
  - P2d dispose of waste items in accordance with the project plan
  - P2e leave the work area in a safe condition
- P3 select and use correctly six of the following types of personal protection equipment:
  - P3a safety harnesses

- P3b safely helmets
- P3c approved high visibility clothing
- P3d approved safety footwear
- P3e gloves
- P3f goggles
- P3g ear protection (as appropriate)
- P3h other specific equipment
- P4 use the correct tools, plant and equipment for the installation and check that they are in a safe and usable condition and are fit for purpose
- P5 interpret all the following design drawings and specifications for the registration, sectioning and insulation component parts required:
  - P5a layouts
  - P5b cross sections
  - P5c OLE system design range (such as OLEMI)
- P6 follow all relevant drawings and specifications for the installation being carried out
- P7 install or renew one of the following overhead line equipment components:
  - P7a section insulators
  - P7b neutral sections
  - P7 And one of the following:
    - P7c cross contact assemblies
    - P7d droppers and jumpers
    - P7 And one of the following:
      - P7e overlaps
      - P7f switches and isolators
      - P7g booster/auxiliary transformers
      - P7h cross track feeders
- P8 adjust the registration and installed components for all of the following:
  - P8a stagger
  - P8b height
  - P8c tension (as appropriate)
- P9 install, position and secure the overhead line equipment and components in accordance with the drawings and specification
- P10 confirm that all necessary connections, fittings and components are secure and complete
- P11 check installation is complete and that all installed and adjusted components are free from damage
- P12 carry out checks on the components being installed and adjusted, to include all of the following:
  - P12a checking that the installed components comply with the installation specification
  - P12b checking final adjustments for position, clearances, level and alignment
  - P12c making visual checks for completeness and freedom from damage
  - P12d checking locking devices

- P13 follow relevant recording and reporting procedures to include one of the following:
    - P13a installation record
    - P13b hand over document
    - P13c other specific recording document
  - P14 deal promptly and effectively with problems within their control and report those that cannot be solved
- 

## Learning outcome

The learner will:

- K Knowledge and understanding: Know how to install overhead line equipment sectioning, insulation, registration and in-span components

## Assessment criteria

The learner can:

- K1 explain what health and safety legislation, regulations and safe working practices and procedures apply including, current Rule Book, Working On Or About 25kV AC Electrified lines, Health and Safety at Work Act, control measures, Provision and Use of Work Equipment Regulations (PUWER) and Lifting Operations and Lifting Equipment Regulations (LOLER)
  - K2 explain and understand the requirements for a safe system of work and the limits applicable
  - K3 explain how the activity may affect the safe operation of the railway
  - K4 explain what procedures need to be followed, to confirm operational and personal safety, is maintained during the work
  - K5 explain the general electrical hazards associated with working on and around overhead line equipment
  - K6 explain how to avoid personal injury and injury to others during the work
  - K7 explain the hazards associated with the installation and adjustment activities (such as lifting components, working at height, tensioning wires and radial loads) and how the risks can be minimised
  - K8 explain the personal protective equipment (PPE) that they need to use for the activities that they are undertaking
  - K9 explain the correct methods of moving, lifting, handling and supporting wires and associated components
  - K10 explain the documentation and certification (such as overhead line specifications, work/task instructions, inspection/test plan, height/stagger sheet)
  - K11 explain the purpose for the different types of design drawings used in OLE wiring installation (such as layouts, cross section diagrams, OLE system design range (such as OLEMI))
  - K12 explain how to carry out currency/issue checks of the specifications they are working with
  - K13 explain the construction methodology for the installation being undertaken
  - K14 describe how the OLE is designed to function under normal operating conditions
-

- K15 describe what each of the installed component parts contribute to the overall operation of the system
- K16 explain the purpose of contact wire registration, neutral sections and section insulation of the contact wire
- K17 explain what storage and handling precautions have to be taken to protect easily damaged components (such as insulators and section insulators)
- K18 describe what terminology and methods are used to identify OLE components and to describe the operational status of the components
- K19 explain the tools, plant and equipment used in the installation process including requirements to check that maintenance is in date and any calibration certificates are available
- K20 explain the torque loading requirements of the components or connectors and what to do if these loadings are exceeded or not achieved
- K21 explain the methods of securing the installed components and connections safely
- K22 explain the types of tools and equipment used to position, adjust, secure, installed components and tension the wiring (such as torque wrenches, winches, clamps/wedges, tensioners, tension gauges/meters and jumpers for earth continuity)
- K23 explain the procedure for the safe disposal of waste materials and redundant components
- K24 explain what the limits of their responsibility and authority are
- K25 explain who is responsible for taking equipment out of operational service and handing the equipment back to operational service
- K26 explain the wiring installation activity reporting documentation
- K27 explain the reporting lines and escalation procedures
- K28 explain the industry protocols relating to communication of important safety information
- K29 explain the completing of records and how to confirm they are retained and preserved

## **Unit 315**

# **Installation of overhead line equipment sectioning, insulation, registration and in- span components**

## Supporting Information

## Unit 316

# Install, enhance and renew overhead line equipment earthing and bonding

<b>Unit level:</b>	Level 3
<b>GLH:</b>	60
<b>Unit aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to install, enhance or renew overhead line equipment (OLE) earthing and bonding cables according to defined operating procedures in the overhead line construction industry. This will include earthing and bonding cables such as continuity, cross, impedance, rail, red, return, return screen conductor, structure, transposition and yellow bonds.</p> <p>The definition of OLE is an arrangement of wires, suspended over the railway line, for supplying electricity to electric trains, together with associated fittings, insulators and other attachments including feeders, autotransformer feeders, overhead line switches, jumpers and return conductors. This equipment together with its structures, foundations, lineside switching stations is described collectively as Overhead Line Equipment.</p> <p>To prove competence in this unit the learner will need to demonstrate their ability to complete the earth and bonding installation, enhancement, renewal, or modification activities in accordance with current working instructions.</p> <p>The learner will be required to determine, from the drawings and specifications, what has to be done and how best it can be achieved safely, within the time frames allowed and appropriate to the environment and site conditions.</p> <p>Their underpinning knowledge will provide a good understanding of their work, and provide an informed approach to applying cable selection, termination and connection procedures. Learners will understand the principles and processes associated with the installation of the earthing and bonding cables and their application. They will know about the ways of handling, terminating, positioning and connecting cables, as well as the care and use of the tools and equipment in adequate depth to provide a sound basis for carrying out the activities, correcting faults and ensuring the finished earthing and bonding is produced to the required specification. The learner will understand the safety precautions required when working at height and with cable components and their associated tools and equipment. They will be required to demonstrate safe working practices throughout,</p>

and will understand the responsibility they owe to themselves and others in the workplace.

The learner's responsibilities will require them to comply with organisational policy and procedures for the safe installation of the earthing, bonding and the associated terminating and connection activities to be undertaken and to report any problems with the component parts, equipment or installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work with minimum supervision, taking personal responsibility for their own actions and the quality and accuracy of the work that they carry out.

---

**Relationship to NOS:**

This unit has been derived from national occupational standard Overhead Line Equipment Construction SEMOLEC306 Install, enhance and renew overhead line equipment earthing and bonding (Suite 3)

---

## Learning outcome

The learner will:

- P Performance requirements: Install, enhance and renew overhead line equipment earthing and bonding

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 carry out all of the following activities during the installation:
- P2a adhere to safety briefing instructions, risk assessments, COSHH, safe system of work and other relevant safety standards
- P2b checks to ensure currency of documentation (such as drawings, layouts, instructions, manufacturers' data, settings and other documentation)
- P2c obtain authority before carrying out the earthing and bonding activities
- P2d dispose of waste items in accordance with the project plan
- P2e leave the work area in a safe condition
- P3 select and use correctly six of the following types of personal protection equipment:
- P3a safety harnesses
- P3b safety helmets
- P3c approved high visibility clothing
- P3d approved safety footwear

- P3e gloves
- P3f goggles
- P3g ear protection (as appropriate)
- P3h other specific equipment
- P4 use the correct tools, plant and equipment for the installation and check that they are in a safe and usable condition and are fit for purpose
- P5 interpret earthing and bonding requirements from all of the following design drawings and specifications:
  - P5a layouts
  - P5b cross sections
  - P5c bonding layouts
- P6 follow all relevant drawings and specifications for the installation being carried out
- P7 carry out earthing and bonding activities including all of the following:
  - P7a cutting required length of bond
  - P7b termination of bond connections
  - P7c installation of bonds in the correct sequence
  - P7d correct use of tools and equipment
  - P7e electrical continuity testing (as appropriate)
  - P7f removal of temporary bonding (as appropriate)
- P8 install or renew one of the following types of bonding systems:
  - P8a Miles Royston (Glenair)
  - P8b Cembre
  - P8c other specific system type
- P9 install, position and secure the earthing and bonding components in accordance with the drawings and specification
- P10 check and confirm that all necessary connections, fittings and components are secure and complete
- P11 check installation is complete and that all earthing and bonding components are free from damage
- P12 carry out checks on the earthing and bonding being installed or renewed, to include all of the following:
  - P12a checking that the bonds comply with the installation, enhancement or renewal specification
  - P12b checking location, form, termination
  - P12c making visual checks for completeness and freedom from damage
- P13 follow relevant recording and reporting procedures to include one of the following:
  - P13a installation/renewal record
  - P13b hand over document
  - P13c other specific recording document
- P14 deal promptly and effectively with problems within their control and report those that cannot be solved

---

## Learning outcome

The learner will:

- K Knowledge and understanding: Know how to Install, enhance and renew overhead line equipment earthing and bonding

## Assessment criteria

The learner can:

- K1 explain what health and safety legislation, regulations and safe working practices and procedures apply including, current Rule Book, Working On Or About 25kV AC Electrified lines, Health and Safety at Work Act, control measures, lifting plans, Provision and Use of Work Equipment Regulations (PUWER) and Lifting Operations and Lifting Equipment Regulations (LOLER)
- K2 explain the requirements for a safe system of work and the limits applicable, including reference to the signalling standards were required
- K3 explain how the activity may affect the safe operation of the railway
- K4 explain what procedures need to be followed, to confirm operational and personal safety, is maintained during the work
- K5 explain the general electrical hazards associated with working on and around overhead line equipment
- K6 explain how to avoid personal injury and injury to others during the work
- K7 explain the hazards associated with earthing and bonding activities (such as working at height, drilling holes, cutting and terminating cables) and how the risks can be minimised
- K8 explain the Personal Protective Equipment (PPE) that they need to use for the activities that they are undertaking
- K9 explain the correct methods of moving, lifting, handling, shaping and supporting cables and associated components
- K10 explain the documentation and certification (such as overhead line specifications, work/task instructions and inspection/test plan)
- K11 explain the purpose for the different types of design drawings used in OLE wiring installation (such as layouts, cross section diagrams, bonding layouts, OLE system design range (such as OLEMI))
- K12 explain how to carry out currency/issue checks of the specifications they are working with
- K13 explain the construction methodology for the earthing and bonding installation being undertaken
- K14 describe how the OLE is designed to function under normal operating conditions
- K15 explain what each of the earthing and bonding component parts contribute to the overall operation of the OLE and how it interfaces with the signalling system
- K16 describe the function of the different types earthing and bonding cables used in OLE
- K17 explain how to identify the correct type and size of earthing and bonding cables required
- K18 describe the principles of the electrical checks to be carried out on the earthing and bonding cables

- K19 explain how to use electrical test equipment to carry out checks on the cables
- K20 describe what terminology and methods are used to identify OLE earthing and bonding and to describe the operational status of the cables
- K21 explain the types of bonding systems used (such as Miles Royston (Glenair), Cembre)
- K22 explain the tools, plant and equipment used in the earthing and bonding installation process including requirements to check that maintenance is in date and any calibration certificates are available
- K23 explain the torque loading requirements of the components or connectors and what to do if these loadings are exceeded or not achieved
- K24 explain the methods of securing the installed earthing and bonding components and connections safely
- K25 explain the types of tools and equipment used to shape, position, adjust, terminate and secure the installed components (such as drills, presses, pullers, torque wrenches)
- K26 explain what the limits of their responsibility and authority are
- K27 explain who is responsible for taking equipment out of operational service and handing the equipment back to operational service
- K28 explain the installation activity reporting documentation
- K29 explain the reporting lines and escalation procedures
- K30 explain the industry protocols relating to communication of important safety information
- K31 explain the completing of records and how to confirm they are retained and preserved

**Unit 316**

**Install, enhance and renew overhead line  
equipment earthing and bonding**

Supporting Information

## Unit 317

# Complete testing, gauging and acceptance of overhead line equipment

<b>Unit level:</b>	Level 3
<b>GLH:</b>	75
<b>Unit aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to complete testing, gauging and acceptance of overhead line equipment (OLE) according to defined operating procedures in the overhead line construction industry, prior to handback.</p> <p>The definition of OLE is an arrangement of wires, suspended over the railway line, for supplying electricity to electric trains, together with associated fittings, insulators and other attachments including feeders, autotransformer feeders, overhead line switches, jumpers and return conductors. This equipment together with its structures, foundations, lineside switching stations is described collectively as Overhead Line Equipment.</p> <p>To prove competence in this unit the learner will need to demonstrate their ability to complete the testing, gauging and acceptance checks on overhead line equipment in accordance with current working instructions.</p> <p>The learner will be required to determine, from the inspection/testing plans and specifications, what has to be done and how best it can be achieved safely, within the time frames allowed and appropriate to the environment and site conditions.</p> <p>Their underpinning knowledge will provide a good understanding of their work, and provide an informed approach to carrying out the testing, gauging and acceptance checks. Learner's will understand the principles and processes associated with the testing and gauging of newly installed, modified or enhanced overhead line equipment. They will know about the testing and gauging methods and techniques, as well as the care and use of the testing tools and equipment in adequate depth to provide a sound basis for carrying out the activities and ensuring the finished overhead line equipment is produced to the required specification. The learner will understand the safety precautions required when working at height and using associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.</p>

The learner's responsibilities will require them to comply with organisational policy and procedures for the safe testing, gauging and acceptance checks to be undertaken and to report any problems with the component parts, equipment or testing and gauging activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work with minimum supervision, taking personal responsibility for their own actions and the quality and accuracy of the work that they carry out.

**Relationship to NOS:**

This unit has been derived from national occupational standard Overhead Line Equipment Construction SEMOLEC307 Complete testing, gauging and acceptance of overhead line equipment (Suite 3)

---

## Learning outcome

The learner will:

- P Performance requirements: Complete testing, gauging and acceptance of overhead line equipment

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 carry out all of the following activities during the testing and gauging:
- P2a adhere to safety briefing instructions, risk assessments, COSHH, safe system of work and other relevant safety standards
- P2b checks to ensure currency of installation documentation (such as drawings, layouts, instructions, manufacturers' data, settings and other documentation)
- P2c obtain authority before carrying out the testing activities
- P2d dispose of waste items in accordance with the project plan
- P2e leave the work area in a safe condition
- P3 select and use correctly six of the following types of personal protection equipment:
- P3a safety harnesses
- P3b safety helmets
- P3c approved high visibility clothing
- P3d approved safety footwear
- P3e gloves
- P3f goggles
- P3g ear protection (as appropriate)
- P3h other specific equipment

- P4 use the correct tools, plant and equipment for the testing and gauging activities and check that they are in a safe and usable condition and are fit for purpose
- P5 interpret all the following design drawings and specifications for the testing and gauging requirements:
  - P5a layouts
  - P5b cross sections
  - P5c inspection/test plan
  - P5d electrical section diagrams
- P6 follow all relevant setting up and operating specifications for the products or assets being tested
- P7 carry out all of the following testing/gauging activities:
  - P7a use of measurement and recording equipment to check profile/set up/clearance
  - P7b record readings on test plan
  - P7c use of test pantographs
  - P7d use of bond testers
  - P7e use of magnet Strength and Polarity (S and P) testers
- P8 follow the defined procedures and set up the equipment correctly so that all operating parameters are achieved
- P9 check and confirm that all necessary connections, fittings and components are secure, complete and free from damage
- P10 carry out checks on the OLE to include all of the following:
  - P10a checking that the installed components comply with the installation specification
  - P10b checking final adjustments for position, clearances, level and alignment
  - P10c making visual checks for completeness and freedom from damage
  - P10d checking locking devices (as appropriate)
- P11 complete all relevant testing, gauging and acceptance documentation accurately and legibly
- P12 follow relevant recording and reporting procedures to include one of the following:
  - P12a installation record
  - P12b handover document
  - P12c other specific recording document
- P13 deal promptly and effectively with problems within their control and report those that cannot be solved

---

### Learning outcome

The learner will:

- K Knowledge and understanding: Know how to complete testing, gauging and acceptance of overhead line equipment

### Assessment criteria

The learner can:

- K1 explain what health and safety legislation, regulations and safe working practices and procedures apply including, current Rule Book, Working On Or About 25kV AC Electrified lines, Health and Safety at Work Act, control measures, Provision and Use of Work Equipment Regulations (PUWER) and Lifting Operations and Lifting Equipment Regulations (LOLER)
- K2 explain the requirements for a safe system of work and the limits applicable
- K3 explain how the activity may affect the safe operation of the railway
- K4 explain what procedures need to be followed, to confirm operational and personal safety, is maintained during the work
- K5 explain the general electrical hazards associated with working on and around overhead line equipment
- K6 explain how to avoid personal injury and injury to others during the work
- K7 explain the hazards associated with the testing and gauging activities (such as working at height, tensioned wires, radial loads and initial energisation) and how the risks can be minimised
- K8 explain the Personal Protective Equipment (PPE) that they need to use for the activities that they are undertaking
- K9 explain the documentation and certification (such as overhead line specifications, work/task instructions, inspection/test plan, height/stagger sheet)
- K10 explain the purpose for the different types of design drawings used in OLE wiring installation (such as layouts, cross section diagrams, OLE system design range (such as OLEMI))
- K11 explain how to carry out currency/issue checks of the specifications they are working with
- K12 explain the construction methodology for the installation being undertaken
- K13 describe how the OLE is designed to function under normal operating conditions
- K14 describe what each of the component parts contribute to the overall operation of the system
- K15 describe what terminology and methods are used to identify OLE and to describe the operational status of the equipment
- K16 explain the safe procedures for testing, gauging and acceptance checks
- K17 explain the acceptance parameters for handback
- K18 explain the tools, plant and equipment used in the testing and gauging process including requirements to check that maintenance is in date and any calibration certificates are available
- K19 explain the methods of using test pantographs
- K20 describe the principles of electrical section proving
- K21 explain how to use magnet strength and polarity testers
- K22 explain what the limits of their responsibility and authority are
- K23 explain who is responsible for taking equipment out of operational service and handing the equipment back to operational service
- K24 explain the testing, gauging and acceptance activity reporting documentation
- K25 explain the reporting lines and escalation procedures
- K26 explain the industry protocols relating to communication of important safety information

- K27 explain the completing of records and how to confirm they are retained and preserved
- K28 explain the acceptance and handback documentation

**Unit 317**

**Complete testing, gauging and acceptance of  
overhead line equipment**

Supporting Information

## Unit 318

# Determine requirements for the safe access to work locations for signal engineering

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to determine the requirements for the safe access to work locations prior to undertaking a signal engineering activity. These activities could involve the maintenance, fault finding, installation or testing of signalling equipment. The type of work locations that the activities will take place in could be from a range of different sites such as trackside, internal and public, each requiring different access requirements. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).</p> <p>The purpose of this standard is to define the competence requirements for you to access signal engineering work locations safely, effectively and in line with relevant processes and procedures.</p> <p>The level and extent of responsibility shall include your own safety and that of others who you may accompany. You will be expected to refer to others for authorisation when required, be responsible for the implementation of instructions, and work within set procedures and processes. Your actions shall not compromise the safety of others.</p> <p>You will be able to identify and agree the necessary safety requirements. You will ensure the implementation of the necessary safety requirements, protection and disconnection arrangements and that they remain in place throughout the duration of the signal engineering activity.</p> <p>Your underpinning knowledge will provide a good understanding of the relevant processes and procedures for the safe access to a work location prior to undertaking a signal engineering activity.</p> <p>Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.</p>

---

## Learning outcome

The learner will:

P Performance requirements:

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 confirm the location of the activity and determine the access requirements
- P3 check that the requirements for safe access meet your organisation's procedures
- P4 advise other people as required of the requirements for safe access
- P5 take action to ensure the requirements for safe access to work are implemented and remain in place for the duration of the activity
- P6 establish and maintain communication with relevant person(s)
- P7 deal effectively with problems within

---

## Learning outcome

The learner will:

K Knowledge and understanding:

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 describe the methods and techniques for conducting safety assessments, including assessment of risk
- K3 explain how to locate and safely access the work area/site
- K4 explain how to source and interpret information and document systems relating to the work area/site and activity
- K5 describe the relevant railway possession and protection arrangements for the work site and equipment to provide a safe system of work and how to check these have been implemented
- K6 explain how to secure the work area/site/system for maintenance/fault finding/installation/testing purposes
- K7 explain how to identify, agree and implement safe access
- K8 explain the relevant reporting lines and procedures that are approved by your organisation
- K9 describe the limits of your own authority and responsibility and those of others

## Unit 318

# Determine requirements for the safe access to work locations for signal engineering

## Supporting Information

### ***Unit Range Description***

1. Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans
- 1.5 track access restrictions
- 1.6 track work instructions
- 1.7 track possession
- 1.8 task risk control sheets
- 1.9 current rule book
- 1.10 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.11 equipment disconnections
- 1.12 manual handling regulations
- 1.13 RIDDOR
- 1.14 safety sign regulations
- 1.15 PPE

2 Identify the types of documentation from the following that applies to the access requirements as applicable to the work location:

- 2.1 signing in and off site register
- 2.2 site briefing attendance
- 2.3 site access authorisation card
- 2.4 personal track safety certificate

3 Identify the access requirements related to two of the following types of site locations:

- 3.1 trackside
- 3.2 internal (such as signal box, equipment room)
- 3.3 areas to which the public have access
- 3.4 confined spaces
- 3.5 elevated structures

- 4 Agree and implement the necessary safety requirements to ensure safe access from the following as applicable to the activity:
- 4.1 protection and possession
  - 4.2 isolation
  - 4.3 traction supply OHLE and DC
  - 4.4 establishment of a communication system

## Unit 319

# Establish information for signal engineering testing

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to establish information for signal engineering testing, which is technical and detailed and could be from a variety of sources such as design drawings, test plans, records of previously completed testing, installation plans, test specifications, industry procedures, manufactures handbooks and equipment specific requirements prior to undertaking signalling testing activities. The testing may be 'verification' or 'functional' testing of newly installed equipment and associated infrastructure or the testing of new signalling electronic equipment. The signalling equipment in this standard can be applicable for over ground or underground rail transportation systems and can be for the new European Train Control System (ETCS).</p> <p>You will be able to source and interpret the information required to undertake the allocated testing tasks in accordance with your organisation's procedures. You will be required to extract the necessary data from the various specifications and related documentation, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.</p> <p>Your responsibilities will require you to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. You will be expected to report any problems with the use and interpretation of the data that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work to instructions, with a minimum of supervision, and to take personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.</p> <p>Your underpinning knowledge will provide a good understanding of the types of documentation available for use, and will provide an informed approach to applying signal engineering instructions and procedures. You will be able to read and interpret the documentation available, and will know about the conventions, symbols and abbreviations used, in adequate depth to provide a sound basis for carrying out the activities to the required test specification.</p>

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 identify and interpret the sources of information required for testing activities
  - P2 source and interpret accurately the relevant information on technical requirements
  - P3 ensure that the information is current, authorised and contains all essential data
  - P4 identify and deal promptly with information, which is inadequate, contradictory and/or ambiguous
- 

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe how to access and interpret technical information for the testing activity
  - K2 describe your organisation's procedures for documentation care and control and the requirements for the retention of records
  - K3 explain how to ensure that documents are current and authorised and reflect the required level of detail accurately
  - K4 describe how to interpret the conventions, symbols, terminology and abbreviations used in site and equipment diagrams, engineering drawings and specifications including an understanding of signalling terminology
  - K5 describe how to identify, evaluate and respond to problems occurring with the information and its interpretation
  - K6 explain the relevant reporting lines and procedures that are approved by your organisation
  - K7 describe the limits of your own authority and responsibility, and those of others involved
-

## Unit 319

## Establish information for signal engineering testing

### Supporting Information

#### ***Unit Range Description***

1 Establish the required testing technical information for one of the following types of signalling equipment:

- 1.1 points
- 1.2 train control (such as signals or other method of authorising train movements)
- 1.3 train detection (such as track circuits or axle counters)
- 1.4 power supplies
- 1.5 balises
- 1.6 ETCS
- 1.7 other industry specific signalling equipment

2 Obtain and extract information from the following sources as applicable to the equipment being tested:

- 2.1 design drawings
- 2.2 test plans
- 2.3 records of previously completed testing
- 2.4 installation plans
- 2.5 test specifications
- 2.6 industry procedures
- 2.7 manufactures handbooks
- 2.8 equipment specific requirements
- 2.9 test procedures/handbook (such as SMTH)

3 Obtain information for following tests as applicable to the type of signalling equipment being verification tested:

- 3.1 physical inspection
- 3.2 function
- 3.3 wire count
- 3.4 continuity tests
- 3.5 insulation tests
- 3.6 interference
- 3.7 correspondence
- 3.8 other industry/equipment specific verification tests

## Unit 320

# Establish information for signal engineering installation

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to establish information for signal engineering installation tasks which is technical and detailed and could be from a variety of sources such as design drawings, installation plans, handbooks, installation standards and equipment specific requirements prior to undertaking signal installation activities. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).</p> <p>You will be able to source and interpret the information required to undertake the allocated installation tasks in accordance with your organisation's procedures. You will be required to extract the necessary data from the various specifications and related documentation, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.</p> <p>Your responsibilities will require you to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. You will be expected to report any problems with the use and interpretation of the data that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work to instructions, with a minimum of supervision, and to take personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.</p> <p>Your underpinning knowledge will provide a good understanding of the types of documentation available for use, and will provide an informed approach to applying signal engineering instructions and procedures. You will be able to read and interpret the documentation available, and will know about the conventions, symbols and abbreviations used, in adequate depth to provide a sound basis for carrying out the activities to the required specification.</p>

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 identify and source the information required for installation activities
- P2 source and interpret accurately relevant information on technical requirements
- P3 ensure that the information is current, authorised and contains all essential data
- P4 identify and deal promptly with information, which is inadequate, contradictory and/or ambiguous

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe how to source and interpret technical information for the installation activity
- K2 explain your organisation's procedures for documentation care and control and the requirements for the retention of records
- K3 explain how to ensure that documents are current and authorised and reflect the required level of detail accurately
- K4 describe how to interpret the relevant conventions, symbols, terminology and abbreviations used in site and equipment diagrams, engineering drawings and specifications including an understanding of signalling terminology
- K5 describe the relevant methods and techniques covering the installation of signalling equipment and how to interpret them
- K6 describe how to identify, evaluate and respond to problems occurring with the information and its interpretation
- K7 explain the relevant reporting lines and procedures that are approved by your organisation
- K8 describe the limits of your own authority and responsibility, and those of others involved

## Unit 320

# Establish information for signal engineering installation

## Supporting Information

### ***Unit Range Description***

1 Establish the required installation technical information for one of the following types of signalling equipment:

- 1.1 points
- 1.2 train control (such as signals or other method of authorising train movements)
- 1.3 train detection (such as track circuits or axle counters)
- 1.4 power supplies
- 1.5 balises
- 1.6 ETCS
- 1.7 other industry specific signalling equipment

2 Obtain and extract information from the following sources as applicable to the equipment being installed:

- 2.1 design drawings
- 2.2 installation plans
- 2.3 handbooks
- 2.4 installation standards
- 2.5 equipment specific requirements
- 2.6 manufactures instructions
- 2.7 schedules
- 2.8 procedures

## Unit 321

# Establish information for signal engineering maintenance and/or fault finding

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to establish information for signal engineering maintenance tasks which is technical and detailed and could be from a variety of sources such as drawings, defect history, fault reports, handbooks, maintenance specifications, instructions, procedures and schedules prior to undertaking maintenance and/or fault finding activities. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).</p> <p>You will be able to source and interpret the information required to undertake the allocated maintenance and/or fault finding tasks in accordance with your organisation's procedures. You will be required to extract the necessary data from the various specifications and related documentation, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.</p> <p>Your responsibilities will require you to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. You will be expected to report any problems with the use and interpretation of the data that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work to instructions, with a minimum of supervision, and to take personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.</p> <p>Your underpinning knowledge will provide a good understanding of the types of documentation available for use, and will provide an informed approach to applying signal engineering instructions and procedures. You will be able to read and interpret the documentation available, and will know about the conventions, symbols and abbreviations used, in adequate depth to provide a sound basis for carrying out the activities to the required specification.</p>

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 identify and source the required details for the maintenance and/or fault finding activities
  - P2 source and interpret relevant information on technical requirements
  - P3 ensure that the information is current, authorised and contains all essential data
  - P4 identify and deal promptly with information, which is inadequate, contradictory and/or ambiguous
  - P5 identify and deal promptly and effectively with any problems occurring with the requirements and their interpretation
- 

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe how to source and interpret technical information for maintenance and/or fault finding activities
  - K2 explain your organisation's procedures for documentation care and control and the requirements for the retention of records
  - K3 explain how to ensure that documents are current and authorised and accurately reflect the required level of detail
  - K4 describe how to interpret the relevant conventions, symbols, terminology and abbreviations used in site and equipment diagrams, engineering diagrams and specifications including an understanding of signalling terminology
  - K5 describe the relevant methods and techniques covering maintenance and/or fault finding of signalling equipment and how to interpret them
  - K6 describe how to identify, evaluate and respond to problems occurring with the information and its interpretation
  - K7 explain the relevant reporting lines and procedures that are approved by your organisation
  - K8 describe the limits of your own authority and responsibility, and those of others involved
-

## Unit 321

# Establish information for signal engineering maintenance and/or fault finding

## Supporting Information

### ***Unit Range Description***

1 Establish the required maintenance technical information for one of the following types of signalling equipment:

1.1 points

1.2 train control (such as signals or other method of authorising train movements)

1.3 train detection (such as track circuits or axle counters)

power supplies

1.4 balises

1.5 ETCS

1.6 other industry specific signalling equipment

2 Obtain and extract information from the following sources as applicable to the equipment being maintained:

2.1 drawings

2.2 defect history

2.3 fault reports (such as customer, monitoring centre)

2.4 handbooks

2.5 maintenance specifications

2.6 instructions

2.7 schedules

2.8 procedures



## Unit 322

## Organise local signal engineering activities

<b>Unit level:</b>	Level 3
--------------------	---------

---

<b>GLH:</b>	30
-------------	----

**Unit aim:**

This standard identifies the competences you need to organise local signal engineering activities for the maintenance, fault finding or installation of signalling systems and equipment. It includes planning, prioritising and determining roles and responsibilities in line with your organisations procedures. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).

You will be required to gather the relevant information to help you organise the engineering activities. The information will include site availability and access, operations and engineering notices, plans, schedules, procedures, diagrams, records and specifications.

You will be able to identify potential deviations from the allocated tasks and alter the plan as required within the limits of your own authority. Any alterations must be recorded, reported, and their impact on the allocated tasks monitored.

You will be able to accurately identify tasks, and their interdependence, ensuring that work is organised in a logical order. The allocation of activities and responsibilities to staff according to their competences is also one of your responsibilities and you will be able to provide staff with the required instructions.

You will establish and maintain communications and effective liaison arrangements with relevant person(s), including team members, other teams, operations staff, engineering control staff and peers. Communication will be both remote and face-to-face. Also you will be able to obtain suitable clarification and assistance where information is unclear, inaccurate or conflicting.

You will be aware of any health, safety and environmental requirements applicable to your area of responsibility. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 identify, source and confirm information required for the activity
  - P2 identify, plan and record work methods and activities that make optimum use of resources
  - P3 prioritise work activities to achieve objectives cost-effectively and efficiently
  - P4 allocate activities and responsibilities to relevant person(s) according to their competences, including providing the required instructions
  - P5 agree and record individual roles and group responsibilities
  - P6 seek advice from others to help resolve problems
  - P7 anticipate and show how changes to plans and/or allocated tasks will be accommodated, including providing details of the predicted impact on activities
  - P8 make a record of agreed work plans and communicate the plans to all involved
  - P9 deal promptly and efficiently with problems which are within your control and report those that cannot be resolved
- 

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations, statutory requirements and safe working practices and procedures as appropriate to the activity
  - K2 explain the relevant methods and techniques for prioritising and planning activities, including, time management and problem solving
  - K3 explain the roles and responsibilities of individuals and groups in relation to the activity
  - K4 explain how to source and analyse the required equipment and system documentation
  - K5 explain how to source, interpret and apply relevant technical information, standards, diagrams, instructions, specifications and schedules for signal engineering activities
  - K6 describe how to identify, analyse, and deal with influencing factors whilst carrying out the organising of activities, including environmental factors
  - K7 describe how to achieve and the importance of effective working relationships when organising local signal engineering activities
  - K8 describe how and when signalling activities cannot be achieved
  - K9 describe the impact of any deviations from the allocated tasks
  - K10 explain the relevant reporting lines and procedures that are approved by your organisation
  - K11 describe the limits of your own authority and responsibility and those of others involved
-

## Unit 322

## Organise local signal engineering activities

### Supporting Information

#### ***Unit Range Description***

1 Organise local signal engineering activities for one of the following types of signalling equipment:

1.1 points

1.2 train control (such as signals or other method of authorising train movements)

1.3 train detection (such as track circuits or axle counters)

1.4 power supplies

1.5 balises

1.6 ETCS

1.7 other industry specific signalling equipment

2 Ensure that the following resources and documents are considered during the organising of the activities as applicable to the signalling equipment:

2.1 site availability

2.2 access arrangements

2.3 operations and engineering notices

2.4 plans, schedules and procedures

2.5 diagrams, records and specifications

2.6 personnel (roles and responsibilities)

3 Record and present the agreed work plans to the appropriate people, using one of the following methods:

3.1 specific company documentation

3.2 pre-defined work plan

3.3 new work plan

## Unit 323

# Contribute to technical leadership of signal engineering activities

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to contribute to the technical leadership of signal engineering activities for the maintenance, fault finding or installation of signalling systems and equipment. It includes providing up to date information and advice to others in line with your organisations procedures. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).</p> <p>You will identify the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations. The safety requirements include relevant local safety certificates, the implementation of relevant documentation, the implementation of a safe system of work and the use of relevant personal protective equipment. You will ensure that your organisation's procedures are met and followed by yourself and those for whom you are responsible. You will ensure that all actions are taken within the limits of your own authority and responsibility.</p> <p>You will be able to identify potential deviations from the allocated tasks, and alter the plan as required within the limits of your own authority. You will ensure that any alterations are recorded, reported, and their impact on the allocated tasks monitored.</p> <p>You will be able to clarify and give guidance assistance where information is unclear, inaccurate or conflicting..</p>

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

P1 work safely at all times, complying with your organisation's procedures

- P2 assess work methods and procedures for their suitability and technical feasibility
  - P3 anticipate potential problems and choose which action to take to deal with them
  - P4 identify potential deviations from the allocated tasks and alter the plan as required within the limits of your authority
  - P5 record and report any alterations and monitor their impact on the allocated tasks
  - P6 provide colleagues with valid and up-to-date information, advice and guidance as necessary
  - P7 clarify and give guidance and assistance when information is unclear, inaccurate or conflicting
  - P8 analyse problems in full and choose effective solutions that will maintain the quality and progress of the work
  - P9 deal promptly and efficiently with problems which are within your control and report those that cannot be resolved
- 

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations, statutory requirements and safe working practices and procedures as appropriate to the activity
- K2 describe the relevant railway possession and protection arrangements for the work site and equipment to provide a safe system of work and how to check these have been implemented
- K3 explain the Controller of Infrastructure Regulations and procedures
- K4 describe how to determine and source the documentation requirements for the activities undertaken and how to confirm that these meet your organisation's procedures
- K5 explain how to locate and safely access the site and equipment
- K6 describe the relevant methods and techniques for planning and progressing work activities
- K7 explain how to present and communicate information relating to the engineering activity
- K8 describe the range and type of problem solving methods and techniques
- K9 describe the activities which may compromise system functionality and integrity
- K10 explain how to source, interpret and apply relevant technical information, standards, diagrams, instructions, specifications and schedules for signal engineering activities
- K11 describe the range and type of operational constraints and authorisation procedures for carrying out signalling activities on the operational railway
- K12 explain the requirements to make the system safe whilst undertaking engineering activities
- K13 describe how and when signalling activities cannot be achieved and the impact of any deviations from the planned activities
- K14 describe how to respond to influencing factors whilst carrying out the signal engineering activities, including environmental factors, site conditions and working on operational railway equipment

- K15 explain the relevant reporting lines and procedures that are approved by your organisation
- K16 describe the limits of your own authority and responsibility and those of others involved

## Unit 323

# Contribute to technical leadership of signal engineering activities

## Supporting Information

### ***Unit Range Description***

1 Contribute to the technical leadership of signal engineering activities for one of the following types of signalling equipment:

- 1.1 points
- 1.2 train control (such as signals or other method of authorising train movements)
- 1.3 train detection (such as track circuits or axle counters)
- 1.4 power supplies
- 1.5 balises
- 1.6 ETCS
- 1.7 other industry specific signalling equipment

2 Present and communicate the following information related to the engineering activities as applicable to the signal equipment:

- 2.1 special notices
- 2.2 engineering standards
- 2.3 work instructions
- 2.4 technical briefings
- 2.5 safety briefings

### ***Unit guidance***

## Unit 324

## Allocate and monitor resources for signal engineering activities

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30

---

**Unit aim:**


This standard identifies the competences you need to allocate and monitor resources for effective signal engineering activities. It includes working to a plan, identifying and allocating the resources required and sourcing information related to those resources. You will monitor the use of the resources and ensure that there are sufficient resources available for the activities to be undertaken and that the resources are used safely and in an appropriate and timely manner. Where changes in resources or activities occur you will be able to challenge when a plan or resource allocation may need amending. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).

You will be aware of your own responsibility for the care and use of resources and will be able to advise team members of their responsibilities for the care and use of resources. You will take into account the time the system will be available for the task when considering resources and also any influencing factors such as, environmental, site conditions and the additional requirements for working on operational railway equipment. Identifying inaccuracies and the non-availability of resources and being able to take appropriate remedial action are essential to this standard.

You must be able to identify all the necessary safety requirements and take action to ensure the safety of yourself, others and railway operations. The safety requirements include relevant local safety certificates, the implementation of relevant documentation, the implementation of a safe system of work, the use of relevant Personal Protective Equipment. You must ensure that protection and disconnection arrangements are implemented to ensure operational safety.

Your responsibilities will require you to comply with organisational policy and procedures for the allocation and monitoring activities, and to report any problems with the activities that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of 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 the techniques and procedures used when allocating and monitoring signal engineering activities. You will understand the activities within your area of responsibility, including the availability of resources, in adequate depth to provide a sound basis for carrying out there allocation efficiently. You will understand your organisation's methods of operation, in sufficient detail to enable you to make informed decisions.



Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

### Learning outcome

The learner will:

- P Performance requirements

### Assessment criteria

The learner can:

- P<sub>1</sub> work safely at all times, complying with your organisation's procedures
  - P<sub>2</sub> confirm the resources required
  - P<sub>3</sub> ensure sufficient resources are available
  - P<sub>4</sub> confirm information relating to resources is accurate and up to date
  - P<sub>5</sub> allocate and monitor the use of resources
  - P<sub>6</sub> identify when changes to the planned use of resources may occur
  - P<sub>7</sub> take prompt and effective action to deal with actual and predicted changes to the planned use of resources
  - P<sub>8</sub> advise the appropriate person(s) where changes to resources have occurred or are likely to occur and the implications involved
  - P<sub>9</sub> ensure that those using resources are aware of their responsibilities for the care and use of the resources
  - P<sub>10</sub> record details on the use of resources including where appropriate any changes that have occurred
- 

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K<sub>1</sub> describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
  - K<sub>2</sub> describe the types of resources available
  - K<sub>3</sub> describe the methods and techniques for ensuring sufficient resources
  - K<sub>4</sub> describe the methods and techniques for allocating resources
-

- K5 explain how to source and interpret information and document systems relating to the engineering activity and the resources required
- K6 describe the types of problems that can occur when allocating resources and how these problems can be overcome
- K7 explain how the planned use of resources could alter and the implications that may follow
- K8 describe the methods and techniques for effective monitoring of resources
- K9 explain your organisation's procedures for the care and use of resources
- K10 describe your organisation's procedures for communicating a change to resource allocation
- K11 explain the relevant reporting lines and procedures that are approved by your organisation
- K12 describe the limits of your own authority and responsibility and those of others involved

## Unit 324

# Allocate and monitor resources for signal engineering activities

## Supporting Information

### ***Unit Range Description***

1 Allocate and monitor resources for one of the following types of signalling equipment:

1.1 points

1.2 train control (such as signals or other method of authorising train movements)

1.3 train detection (such as track circuits or axle counters)

1.4 power supplies

1.5 balises

1.6 ETCS

1.7 other industry specific signalling equipment

2 Allocate and monitor the following resources as applicable to the signal engineering activities:

2.1 documentation (current and appropriate)

2.2 tools, plant and test equipment (calibrated and serviceable)

2.3 materials, replacement equipment and consumables

2.4 communications equipment

2.5 personnel (total required and competence)

2.6 access arrangements

3 Allocate and monitor resources for one of the following signalling engineering activities:

3.1 installation

3.2 maintenance

3.3 fault finding

3.4 testing

3.5 other industry specific signalling activity

## Unit 325

## Reinstate the work area after signal engineering activities

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30

---

**Unit aim:**

This standard identifies the competences you need to reinstate the work area after installing, maintaining, rectifying or testing signalling equipment and systems. It includes the safe storage of reusable materials and equipment. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).

You will ensure that the work area is left in a condition that meets your organisations procedures. This will include ensuring that any waste material, plant, tools and test equipment that cannot be removed is marked for later collection and secured where it will not interfere with the safe operation of the railway.

Your responsibilities will require you to comply with organisational policy and procedures for the activities undertaken, and to report any problems with reinstating the work area procedure that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work to instructions, alone or in conjunction with others, taking full responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will be sufficient to provide a sound understanding of your work, and will provide an informed approach to applying procedures. You will understand the safe storage requirements for the equipment, reusable/waste materials, and will know about the procedures and potential problems, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

You will understand the safety precautions to be observed when handling the equipment and materials. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace/area.

Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

**Learning outcome**

The learner will:

P Performance requirements

**Assessment criteria**

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
  - P2 withdraw all possession and protection measures in line with your organisation's procedures
  - P3 confirm the work area is secured on completion of the work
  - P4 restore the work areas to a safe condition in accordance with agreed requirements and schedules
  - P5 separate equipment, components, and materials for re-use from waste items
  - P6 store reusable materials and equipment in an appropriate location
  - P7 identify, mark and secure any waste items that cannot be removed immediately in such a way that the safe operation of the railway is maintained
  - P8 check that all plant, tools, and test equipment that cannot be removed are secured and stored where they do not interfere with the safe operation of the railway
  - P9 dispose of waste materials in line with your organisation's procedures
  - P10 deal promptly and effectively with problems within your control and report those that cannot be resolved
- 

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 describe the relevant railway possession and protection arrangements for the work site and equipment to provide a safe system of work and how to check these have been withdrawn
- K3 describe your organisation's procedures for restoring the work area
- K4 explain the work area security requirements
- K5 explain your organisation's procedures for storing material and equipment
- K6 describe the types of materials and equipment to be stored
- K7 describe the different types, methods and procedures for the disposal of waste items and hazardous substances as approved by your organisation
- K8 explain the relevant reporting lines and procedures that are approved by your organisation
- K9 describe the limits of your own authority and responsibility and those of others

## Unit 325

# Reinstate the work area after signal engineering activities

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans
- 1.5 track access restrictions
- 1.6 track work instructions
- 1.7 track possession
- 1.8 task risk control sheets
- 1.9 current rule book
- 1.10 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.11 equipment disconnections
- 1.12 manual handling regulations
- 1.13 RIDDOR
- 1.14 safety sign regulations
- 1.15 PPE

2 Identify the access requirements related to two of the following types of site locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Safely store tools and equipment, including the following as applicable to the work activities:

- 3.1 tools
- 3.2 test equipment
- 3.3 materials
- 3.4 consumables
- 3.5 plant
- 3.6 communications equipment

4 Assist in the completion of the relevant records, to include one of the following, and pass it to the appropriate people:

4.1 job card

4.2 maintenance log and action report

4.3 company reporting procedures

4.4 other handover records

## Unit 326

## Transfer responsibility of signalling assets

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to transfer responsibility of signalling assets following maintenance, fault finding or installation work to the control of others, in accordance with your organisation's procedures, having confirmed it is fit for entry into service. It also covers the transfer of responsibility for the operation of the equipment. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).</p> <p>You will be required to transfer responsibility of signalling equipment following maintenance, fault finding or installation work carried out by your team to the control of others. You will be able to provide suitable and sufficient evidence to confirm the operational status of the equipment, prior to the transfer of responsibility. It will include signalling systems that are fit for entry into service, restricted service, or systems that are not fit for service.</p> <p>You will ensure that the allocated tasks and the required integrity checks have been completed in accordance with your organisation's procedures.</p> <p>Also you will be able to carry out the transfer of responsibility processes concerned with the completion of tasks in accordance with your organisation's procedures.</p> <p>You will ensure that the equipment is handed back for operational use only after sufficient evidence exists to ensure safe working. Also you will ensure that the transfer of responsibility information supplied accurately identified the operational status of the system and/or equipment.</p> <p>Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.</p>

---

### Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 confirm and define the condition of the asset in line with the specification
- P3 ensure that all tasks, tests and checks have been completed in line with your organisation's procedures
- P4 confirm that everyone involved accepts the asset is in a satisfactory condition prior to transfer of responsibility
- P5 identify any unusual features, defects or discrepancies relating to the condition of the asset
- P6 make the transfer of responsibility and obtain agreement between everyone involved on the precise moment of transfer of responsibility
- P7 make sure that clear, accurate and complete records of the transfer of responsibility are made in line with your organisation's procedures
- P8 deal promptly and effectively with problems within your control and report those which cannot be resolved

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 explain your organisation's procedures for the transfer of responsibility of signalling assets
- K3 describe how to determine the condition of the asset prior to transfer of responsibility
- K4 explain the requirements for the completion of work and testing activities prior to returning equipment to service
- K5 describe what constitutes an unacceptable asset condition
- K6 explain your organisation's procedures for recording and documenting information on the status of the asset
- K7 explain what transfer of responsibility documentation should be supplied and to whom, in line with your organisation's procedures
- K8 explain the relevant reporting lines and procedures that are approved by your organisation
- K9 describe the limits of your own authority and responsibility and those of others involved

## Unit 326

## Transfer responsibility of signalling assets

### Supporting Information

#### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans
- 1.5 track access restrictions
- 1.6 track work instructions
- 1.7 track possession
- 1.8 task risk control sheets
- 1.9 current rule book
- 1.10 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.11 equipment disconnections
- 1.12 manual handling regulations
- 1.13 RIDDOR
- 1.14 safety sign regulations
- 1.15 PPE

2 Identify the access requirements related to two of the following types of site equipment locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Transfer responsibility for two of the following types of signalling equipment:

- 3.1 points
- 3.2 train control (such as signals or other method of authorising train movements)
- 3.3 train detection (such as track circuits or axle counters)
- 3.4 power supplies
- 3.5 balises
- 3.6 ETCS
- 3.7 other industry specific signalling equipment

4 Confirm the operational status of signalling equipment that is:

4.1 fit for entry into service

4.2 fit for entry into restricted service

4.3 not fit for entry into service

5 Ensure that transfer of responsibility transfer complies with one of the following:

5.1 infrastructure guidelines and standard operating procedures

5.2 equipment manufacturer's documents

5.3 BS, ISO and/or BS EN standards

5.4 SMTH

5.5 other industry specific signalling standards/specifications

6 Complete the relevant transfer records, to include one of the following, and pass it to the appropriate people:

6.1 job card

6.2 SMTH

6.3 maintenance log and action report

6.4 company reporting procedures

6.5 other industry specific maintenance records

## Unit 327

## Establish compliance with specifications for signalling assets

<b>Unit level:</b>	Level 3
<b>GLH:</b>	90

---

**Unit aim:**


This standard identifies the competences you need to establish that maintained or newly installed signalling systems and equipment (including software and hardware) are in compliance with the test specifications and plans. You will follow a prepared test plan, carrying out integrity checks and functional tests ensuring that the results are within specification prior to the signalling system returning to service. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).

You will be required to use the appropriate tools and equipment throughout the checking and testing activities, and to apply a range of methods and techniques to test the system equipment, and to make connections as appropriate to the equipment installed. Where appropriate, you may also work with computers or electronic controllers, making connections and testing hardware/software. The testing and checking activities will include making checks in line with your permitted authority, and assisting others to ensure that the signalling equipment functions to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the checking and testing activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the checking and testing activities are removed from the work area on completion of the work, and that the relevant job/task documentation is completed accurately and legibly. You will be expected to work to instructions in conjunction with others, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out. As a result of the tests you will determine whether the system is functioning correctly and complies with the testing plan prior to the signalling system entering/returning to service.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to following procedures for the checking and testing of signalling equipment. You will have an understanding of the equipment being tested, and its necessary checking requirements, in adequate depth to provide a sound basis for carrying out the process safely and effectively.

You will understand the safety precautions required when carrying out the checking and testing activities, especially those for ensuring the safe isolation of services. You will be required to demonstrate safe working practices throughout, and will



understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 identify any necessary changes to safety requirements on arriving at site, including prompt reporting to the relevant person(s)
- P3 source and interpret the relevant specifications for the product or asset being checked or tested, including previous compliance information and maintenance records, if applicable
- P4 identify and analyse the tests/checks to be carried out, the sequence in which they are to be performed and the methods and equipment to be used
- P5 select and use all the correct tools and inspection equipment and check that they are in a useable condition
- P6 carry out the tests and checks in an appropriate sequence, within appropriate timescales using approved methods and procedures in accordance with operational requirements
- P7 carry out tests and checks in a manner that minimises the interference with other systems and equipment and is within the limits of your own authority
- P8 observe sufficient operations of the asset to confirm it is functioning correctly for the type of equipment being tested or checked
- P9 identify and assess any defects or variations from the specification and take appropriate action
- P10 report completion of compliance activities in line with your organisation's procedures
- P11 report any instances where the tests/checks cannot be fully met or where there are identified defects outside the planned compliance activities
- P12 complete relevant records and/or documentation accurately and pass them onto the appropriate person(s)
- P13 deal promptly and effectively with problems within your control and report those that cannot be resolved

---

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 describe the relevant railway possession and protection arrangements for the work site and equipment to provide a safe system of work and how to check these have been implemented
- K3 explain how to locate and safely access the site
- K4 describe the activities which may compromise system functionality and integrity including the operational constraints to carrying out testing/checking activities
- K5 explain how to identify, analyse and deal with influencing factors whilst carrying out the tests, including environmental factors
- K6 describe the protection and disconnection requirements or permit to work procedure that apply to the system where the work will be undertaken to ensure personal and operational safety when working on the railway infrastructure
- K7 explain the classification of different voltage levels and the authority requirements for working on them
- K8 explain what constitutes a hazardous voltage/current and describe how to recognise victims of electric shock
- K9 describe how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
- K10 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the testing activities
- K11 describe the hazards associated with carrying out signalling test activities (such as stored energy, radio frequency radiation, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down testing procedures), and how to minimise these and reduce any risks
- K12 explain how to source and interpret relevant technical information, standards, diagrams, instructions, specifications, plans and other related information for the testing/checking of signalling equipment
- K13 explain the correct mode of operation of the system to be tested or checked, including acceptable operational variances
- K14 describe how to locate and identify the equipment to be tested or checked
- K15 describe how to select and use the correct tools and test equipment and confirm they are suitable for use and calibrated
- K16 describe the methods and techniques for compliance checking and testing
- K17 explain the types of analytical methods and techniques in checking and testing, including as appropriate, observation, calculation and comparison

- K18 explain how to use test equipment so as to ensure true and accurate measurements are taken
- K19 explain your organisation's procedures for the use, care and control of inspection tools and equipment
- K20 describe the importance of calibrating tools and test equipment
- K21 explain how to interpret and analyse information from measuring instruments, including as appropriate, performing calculations
- K22 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards when working with and handling electronic devices
- K23 explain the types of defects or variations that could occur in maintained or newly installed signalling systems
- K24 describe how defects and variations can affect the safety and performance of signalling system
- K25 describe the procedures for the control of a non-conforming component or asset and how to assess the safety implications
- K26 explain when independent testing is required
- K27 describe how to verify that the testing/checking activity has been completed
- K28 explain your organisation's procedures for the control testing/checking activities
- K29 explain the relevant reporting lines and procedures that are approved by your organisation
- K30 describe the limits of your own authority and responsibility and those of others involved

## Unit 327

# Establish compliance with specifications for signalling assets

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans
- 1.5 authorised test plan
- 1.6 track access restrictions
- 1.7 track work instructions
- 1.8 track possession
- 1.9 task risk control sheets
- 1.10 current rule book
- 1.11 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.12 equipment disconnections
- 1.13 manual handling regulations
- 1.14 RIDDOR
- 1.15 safety sign regulations
- 1.16 PPE

2 Identify the access requirements related to two of the following types of site testing locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Conduct compliance testing of one of the following types of maintained or newly installed signalling equipment:

- 3.1 points
- 3.2 train control (such as signals or other method of authorising train movements)
- 3.3 train detection (such as track circuits or axle counters)
- 3.4 power supplies
- 3.5 balises

3.6 ETCS

3.7 other industry specific signalling equipment

4 Use the following types of tools and equipment as applicable to the equipment being tested:

4.1 calibrated hand tools

4.2 un-calibrated hand tools

4.3 calibrated test leads/loads

4.4 computerised test equipment

4.5 test recording equipment

4.6 other specific signalling test equipment

5 Conduct the following checks as applicable to the type of signalling equipment being tested:

5.1 inspection

5.2 wire count

5.3 security

5.4 profile

5.5 labelling

5.6 correlation

5.7 compliance to diagrams

5.8 physical condition

5.9 other industry specific signalling checks

6 Conduct the following tests as applicable to the type of signalling equipment being tested:

6.1 continuity

6.2 insulation

6.3 earth arrangements

6.4 interference

6.5 correspondence

6.6 function

6.7 other industry specific signalling tests

7 Ensure that testing activities comply with one of the following:

7.1 infrastructure guidelines and standard operating procedures

7.2 equipment manufacturer's documents

7.3 BS, ISO and/or BS EN standards

7.4 SMTH

7.5 authorised test plan

7.6 other industry specific signalling standards/specifications

8 Complete the relevant test/compliance records, to include one of the following, and pass it to the appropriate people:

- 8.1 job card
- 8.2 SMTH
- 8.3 test certificates
- 8.4 test checklists
- 8.5 test log and action report
- 8.6 marked-up engineering drawings
- 8.7 company reporting procedures
- 8.8 other industry specific test/compliance records

## Unit 328

# Conduct functional testing of newly installed signalling systems

<b>Unit level:</b>	Level 3
<b>GLH:</b>	90

---

**Unit aim:**


This standard identifies the competences you need to conduct functional testing of newly installed signalling systems and equipment, including the use of correct tools and test equipment in accordance with your organisation's procedures. You will carry out functional tests ensuring that the test results are within the design specification, meeting the requirements appropriate to the application before transferring responsibility of the system. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).

You will be required to use the appropriate tools and equipment throughout the testing activities, and to apply a range of methods and techniques to test the system equipment, and to make connections as appropriate to the equipment installed. Where appropriate, you may also work with computers or electronic controllers, making connections and testing hardware/software. The testing and checking activities will include making checks in line with your permitted authority, and assisting others to ensure that the signalling equipment functions to the required design specification.

Your responsibilities will require you to comply with organisational policy and procedures for the checking and testing activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the checking and testing activities are removed from the work area on completion of the work, and that the relevant job/task documentation is completed accurately and legibly. You will be expected to work to instructions in conjunction with others, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out. As a result of the tests you will determine whether the system is functioning correctly appropriately to the application and identify any faults or variations for the specification.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying procedures for the checking and functionally testing of signalling equipment. You will have an understanding of the equipment being tested, and its necessary checking requirements, in adequate depth to provide a sound basis for carrying out the process safely and effectively.

You will understand the safety precautions required when carrying out the checking and testing activities, especially those for ensuring the safe isolation of services. You will be required to demonstrate safe working practices throughout, and will



understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 determine the scope of the work to be carried out and the status of the previously tested equipment
- P3 confirm that all the required documentation is available and the information supplied accurately identifies the work to be completed
- P4 identify and analyse any necessary changes to safety requirements on arriving at site, including prompt reporting to the relevant person(s)
- P5 identify and interpret the appropriate procedures and instructions for use of tools and test equipment when carrying out the required tests to ensure that true and accurate measurements are taken
- P6 confirm that the tests/checks are appropriate to the equipment and are in line with testing procedures/instructions
- P7 set up and carry out the tests/checks using approved procedures and within agreed timescales
- P8 carry out tests/checks as required by the test plan in sufficient detail to establish the equipment status
- P9 confirm that all testing records are complete and accurately reflect the results of the testing activities carried out
- P10 analyse any test evidence and ensure it is thorough and accurately identifies the state of the completed testing
- P11 compare the analysis against the product specification and identify any faults or variations from specification
- P12 identify, analyse and deal with any inconsistencies in the test data
- P13 ensure all actions are taken within the limits of your own authority and where doubt arises you seek advice from suitable reference documents or relevant person(s)
- P14 record the results of the tests in the appropriate format

P15 check that the progression of work is recorded accurately, clearly and in line with your organisation's procedures

---

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 describe the relevant railway possession and protection arrangements for the work site and equipment to provide a safe system of work and how to check these have been implemented
- K3 explain how to locate and safely access the site
- K4 explain how to secure the system for testing purposes
- K5 explain how to define the limits of testing to ensure operational equipment is not affected
- K6 describe the activities which may compromise system functionality and integrity including the operational constraints to carrying out testing activities
- K7 describe how to identify, analyse and deal with influencing factors whilst carrying out the tests, including environmental factors
- K8 describe the protection and disconnection requirements or permit to work procedure that apply to the system where the work will be undertaken to ensure personal and operational safety when working on the railway infrastructure
- K9 explain the classification of different voltage levels and the authority requirements for working on them
- K10 explain what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K11 describe how to reduce the risks of an electric shock (such as insulated tools, rubber matting and isolating transformers)
- K12 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the testing activities
- K13 describe the hazards associated with carrying out signalling test activities (such as stored energy, radio frequency radiation, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down testing procedures), and how to minimise these and reduce any risks
- K14 describe how to source, interpret and analyse relevant technical information, standards diagrams, instructions, specifications and control tables and other related information, including as appropriate, previous testing information
- K15 explain how to locate and identify the equipment to be tested and/or checked
- K16 explain the correct mode of operation of the system, equipment and/or component to be tested, including acceptable operational variances

- K17 describe the types of analytical methods and techniques in checking and testing, including as appropriate, observation, calculation and comparison
- K18 explain your organisation's procedures for the use, care and control of inspection tools and equipment including as appropriate calibration procedures
- K19 describe how to select and use the correct tools and test equipment and confirm they are suitable for use and calibrated
- K20 explain the importance of calibrating tools and test equipment
- K21 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards when working with and handling electronic devices
- K22 explain how to interpret and analyse information from measuring instruments, including as appropriate, performing calculations
- K23 describe how to use test equipment so as to ensure true and accurate measurements are taken
- K24 describe the types of defects or variations that could occur in signalling equipment, products and assets
- K25 explain how defects and variations can affect the safety and performance of signalling system
- K26 describe what constitutes a significant defect or variation
- K27 explain the procedures for the control of a non-conforming component or asset
- K28 explain when independent testing is required
- K29 explain the transfer of responsibility procedures for signalling products and assets
- K30 describe the conditions that must be fulfilled prior to transfer of responsibility of the allocated tasks
- K31 explain how to verify that the testing has been completed
- K32 explain the procedures for the control of testing
- K33 explain the relevant reporting lines and procedures that are approved by your organisation
- K34 describe the limits of your own authority and responsibility and those of others involved

## Unit 328

# Conduct functional testing of newly installed signalling systems

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans
- 1.5 authorised test plan
- 1.6 track access restrictions
- 1.7 track work instructions
- 1.8 track possession
- 1.9 task risk control sheets
- 1.10 current rule book
- 1.11 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.12 equipment disconnections
- 1.13 manual handling regulations
- 1.14 RIDDOR
- 1.15 safety sign regulations
- 1.16 PPE

2 Identify the access requirements related to two of the following types of site testing locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Conduct functional testing of one of the following types of newly installed signalling equipment:

- 3.1 points
- 3.2 train control (such as signals or other method of authorising train movements)
- 3.3 train detection (such as track circuits or axle counters)
- 3.4 power supplies
- 3.5 balises
- 3.6 ETCS

3.7 other industry specific signalling equipment

4 Use the following types of tools and equipment as applicable to the equipment being tested:

4.1 calibrated hand tools

4.2 un-calibrated hand tools

4.3 calibrated test leads/loads

4.4 computerised test equipment

4.5 test recording equipment

4.6 other specific signalling test equipment

5 Conduct the following checks as applicable to the type of signalling equipment being tested:

5.1 inspection

5.2 wire count

5.3 security

5.4 profile

5.5 labelling

5.6 correlation

5.7 compliance to diagrams

5.8 system configuration

5.9 physical condition

5.10 other industry specific signalling checks

6 Conduct the following tests as applicable to the type of signalling equipment being tested:

6.1 continuity

6.2 insulation

6.3 earth arrangements

6.4 interference

6.5 correspondence

6.6 function

6.7 other industry specific signalling tests

7 Ensure that testing activities comply with one of the following:

7.1 infrastructure guidelines and standard operating procedures

7.2 equipment manufacturer's documents

7.3 BS, ISO and/or BS EN standards

7.4 SMTH

7.5 authorised test plan

7.6 design specification

7.7 other industry specific signalling standards/specifications

8 Complete the relevant test records, to include one of the following, and pass it to the appropriate people:

8.1 job card

8.2 SMTH

8.3 records of previously completed testing

8.4 test log and action report

8.5 test checklists

8.6 diagrams

8.7 company reporting procedures

8.8 other industry specific test records

## Unit 329

## Conduct maintenance testing of signalling assets

<b>Unit level:</b>	Level 3
<b>GLH:</b>	90

---

**Unit aim:**


This standard identifies the competences you need to conduct specific checks and tests to confirm compliance when returning a repaired signalling system back to service, including the use of correct tools and test equipment in accordance with your organisation's procedures. You will carry out checking and testing activities to confirm that the signalling asset complies with specification and to provide suitable and sufficient evidence to confirm that renewed and repaired signalling equipment is fit for entry into service. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).

You will be required to use the appropriate tools and equipment throughout the testing activities, and to apply a range of methods and techniques to test the system equipment, and to make connections as appropriate to the equipment installed. Where appropriate, you may also work with computers or electronic controllers, making connections and testing hardware/software. The testing and checking activities will include making checks in line with your permitted authority, and assisting others to ensure that the signalling equipment functions to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the checking and testing activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the checking and testing activities are removed from the work area on completion of the work, and that the relevant job/task documentation is completed accurately and legibly. You will be expected to work to instructions in conjunction with others, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out. As a result of the tests you will determine whether the system is functioning correctly appropriately to the application and identify any faults or variations to the specification.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying procedures for the checking and testing of signalling equipment. You will have an understanding of the equipment being tested, and its necessary checking requirements, in adequate depth to provide a sound basis for carrying out the process safely and effectively.

You will understand the safety precautions required when carrying out the checking and testing activities, especially those for ensuring the safe isolation of services. You will be required to



demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 determine the scope of the work to be carried out and the status of the previously tested equipment
- P3 confirm that all the required documentation is available and the information supplied accurately identifies the work to be completed
- P4 identify and analyse any necessary changes to safety requirements on arriving at site, including prompt reporting to the relevant person(s)
- P5 identify and interpret the appropriate procedures and instructions for use of tools and test equipment when carrying out the required tests to ensure that true and accurate measurements are taken
- P6 confirm that the tests/checks are appropriate to the equipment and are in line with testing procedures/instructions
- P7 set up and carry out the tests/checks using approved procedures and within agreed timescales
- P8 carry out tests/checks as required by the test plan in sufficient detail to establish the equipment status
- P9 confirm that all testing records are complete and accurately reflect the results of the testing activities carried out
- P10 analyse any test evidence and ensure it is thorough and accurately identifies the state of the completed testing
- P11 compare the analysis against the product specification and identify any faults or variations from specification
- P12 identify, analyse and deal with any inconsistencies in the test data
- P13 ensure all actions are taken within the limits of your own authority and where doubt arises you seek advice from suitable reference documents or relevant person(s)

- P14 record the results of the tests in the appropriate format
  - P15 check that the progression of work is recorded accurately, clearly and in line with your organisation's procedures
  - P16 review the results and carry out further tests if necessary
  - P17 confirm compliance with the design details, specifications, industry standards, wiring diagrams and plans in accordance with testing instructions
  - P18 protect, report and deal with any damage or disturbance to operational equipment in accordance to operational processes
  - P19 define the limits of testing and clearly identify the boundaries between the product under test and operational equipment
- 

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
  - K2 describe the relevant railway possession and protection arrangements for the work site and equipment to provide a safe system of work and how to check these have been implemented
  - K3 explain how to locate and safely access the site
  - K4 explain how to secure the system for testing purposes
  - K5 explain how to define the limits of testing to ensure operational equipment is not affected
  - K6 describe the activities which may compromise system functionality and integrity including the operational constraints to carrying out testing activities
  - K7 explain how to identify, analyse and deal with influencing factors whilst carrying out the tests, including environmental factors
  - K8 describe the protection and disconnection requirements or permit to work procedure that apply to the system where the work will be undertaken to ensure personal and operational safety when working on the railway infrastructure
  - K9 explain the classification of different voltage levels and the authority requirements for working on them
  - K10 describe what constitutes a hazardous voltage/current and how to recognise victims of electric shock
  - K11 describe how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
  - K12 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the testing activities
  - K13 describe the hazards associated with carrying out signalling test activities (such as stored energy, radio frequency radiation, electrical supplies, electrical/electronic interfaces, using
-

- damaged or badly maintained tools and equipment, not following laid-down testing procedures), and how to minimise these and reduce any risks
- K14 explain how to source, interpret and analyse relevant technical information, standards diagrams, instructions, specifications and control tables and other related information, including as appropriate, previous testing information
  - K15 explain how to locate and identify the equipment to be tested and/or checked
  - K16 explain the correct mode of operation of the system, equipment and/or component to be tested, including acceptable operational variances
  - K17 describe the types of analytical methods and techniques in checking and testing, including as appropriate, observation, calculation and comparison
  - K18 explain your organisation's procedures for the use, care and control of inspection tools and equipment including as appropriate calibration procedures
  - K19 describe how to select and use the correct tools and test equipment and confirm they are suitable for use and calibrated
  - K20 explain the importance of calibrating tools and test equipment
  - K21 describe the procedures and precautions to be adopted to Eliminate Electrostatic Discharge (ESD) hazards when working with and handling electronic devices
  - K22 explain how to interpret and analyse information from measuring instruments, including as appropriate, performing calculations
  - K23 describe how to use test equipment so as to ensure true and accurate measurements are taken
  - K24 describe the types of defects or variations that could occur in signalling equipment, products and assets
  - K25 describe how defects and variations can affect the safety and performance of signalling system
  - K26 explain what constitutes a significant defect or variation
  - K27 explain the procedures for the control of a non-conforming component or asset
  - K28 explain when independent testing is required
  - K29 explain the transfer of responsibility procedures for signalling products and assets
  - K30 describe the conditions that must be fulfilled prior to transfer of responsibility of the allocated tasks
  - K31 explain how to verify that the testing has been completed
  - K32 explain the procedures for the control of testing
  - K33 explain the relevant reporting lines and procedures that are approved by your organisation
  - K34 describe the limits of your own authority and responsibility and those of others involved

## Unit 329

## Conduct maintenance testing of signalling assets

### Supporting Information

#### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans
- 1.5 authorised test plan
- 1.6 track access restrictions
- 1.7 track work instructions
- 1.8 track possession
- 1.9 task risk control sheets
- 1.10 current rule book
- 1.11 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.12 equipment disconnections
- 1.13 manual handling regulations
- 1.14 RIDDOR
- 1.15 safety sign regulations
- 1.16 PPE

2 Identify the access requirements related to two of the following types of site testing locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Conduct testing of one of the following types of repaired signalling equipment:

- 3.1 points
- 3.2 train control (such as signals or other method of authorising train movements)
- 3.3 train detection (such as track circuits or axle counters)
- 3.4 power supplies
- 3.5 balises
- 3.6 ETCS

3.7 other industry specific signalling equipment

4 Use the following types of tools and equipment as applicable to the equipment being tested:

4.1 calibrated hand tools

4.2 un-calibrated hand tools

4.3 calibrated test leads/loads

4.4 computerised test equipment

4.5 test recording equipment

4.6 other specific signalling test equipment

5 Conduct the following checks as applicable to the type of signalling equipment being tested:

5.1 inspection

5.2 wire count

5.3 security

5.4 profile

5.5 labelling

5.6 correlation

5.7 conformity to diagrams

5.8 system configuration

5.9 physical condition

5.10 other industry specific signalling checks

6 Conduct the following tests as applicable to the type of signalling equipment being tested:

6.1 continuity

6.2 insulation

6.3 earth arrangements

6.4 interference

6.5 correspondence

6.6 function

6.7 other industry specific signalling tests

7 Ensure that testing activities comply with one of the following:

7.1 infrastructure guidelines and standard operating procedures

7.2 equipment manufacturer's documents

7.3 BS, ISO and/or BS EN standards

7.4 SMTH

7.5 authorised test plan

7.6 design specification

7.7 other industry specific signalling standards/specifications

8 Complete the relevant test records, to include one of the following, and pass it to the appropriate people:

8.1 job card

8.2 SMTH

8.3 records of previously completed testing

8.4 test log and action report

8.5 test checklists

8.6 diagrams

8.7 company reporting procedures

8.8 other industry specific test records

## Unit 330

## Carry out replacement of components from signalling assets

<b>Unit level:</b>	Level 3
<b>GLH:</b>	40

---

**Unit aim:**


This standard identifies the competences you need to carry out the replacement of components from signalling systems and equipment as part of maintenance or fault finding, including the use of correct tools and equipment in accordance with your organisation's procedures. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).

You will be required to use the appropriate tools and equipment throughout the replacement activities, and to apply a range of connection methods and techniques to safely replace the components into the equipment, and to make safe any connections as appropriate to the components replaced. Where appropriate, you may also assist in working with computers or electronic controllers, making connections and replacing hardware components. The replacement activities will include making sure that any replacement signalling components are approved and fit for purpose. This may include identifying and assessing the difference in like-for-like replacements parts and may range from superseded part numbers or descriptions, through modification stages, to functionally equivalent parts, which are sourced from different manufacturers.

Your responsibilities will require you to comply with organisational policy and procedures for the replacement activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the activities are removed from the work area on completion of the work, and that the relevant job/task documentation is completed accurately and legibly. You will be expected to work to instructions in conjunction with others or alone, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

The replacement activity may be carried out as a team effort, but you must demonstrate a significant personal contribution to the activities, in order to satisfy the requirements of the standard, and you must demonstrate competence in all the areas required by the standard.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying procedures for the replacement of components from signalling equipment. You will have an understanding of the components being replaced and their connection requirements, in adequate depth to provide a sound basis for carrying out the replacement process safely and effectively.



You will understand the safety precautions required when carrying out the replacement activities, especially those for ensuring the safe isolation of services. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 identify and analyse any necessary changes to safety requirements on arriving at site, including prompt reporting to the relevant person(s)
- P3 source and interpret all relevant diagrams and specifications
- P4 obtain all the required component(s) and ensure that they are in a suitable condition for replacement and fit for purpose
- P5 check the replacement component(s) to ensure compliance with the required specification including confirming that the replacement component is compatible with the equipment/system
- P6 take adequate precautions to prevent damage to component(s) during replacement, including electrostatic protection if applicable
- P7 replace the component(s) in the correct sequence using appropriate tools and techniques
- P8 ensure that authorised practices are used where existing instructions are insufficient
- P9 ensure that the replacement is complete and that all components are free from damage including checking that all necessary connections to the equipment are complete
- P10 ensure that interference with other systems is minimised, and equipment and systems other than those being maintained are not disturbed without authority
- P11 make any necessary settings or adjustments to the component(s) to ensure they will function correctly
- P12 complete the replacement integrity checks in accordance with appropriate standards and that the completed work is to specification
- P13 observe sufficient operations of the asset to confirm it is functioning correctly

- P14 deal promptly and effectively with problems within your control and report those that cannot be resolved
- P15 complete all relevant documentation accurately and in accordance with your organisation's procedures
- 

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 explain how to locate and safely access the site
- K3 explain how to locate and identify the equipment to be worked on
- K4 describe the protection and disconnection requirements or permit to work procedure that apply to the system where the work will be undertaken to ensure personal and operational safety when working on the railway infrastructure
- K5 explain the classification of different voltage levels and the authority requirements for working on them
- K6 describe what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K7 describe how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
- K8 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the removal activities
- K9 describe the hazards associated with carrying out signalling component replacement activities (such as stored energy, radio frequency radiation, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down procedures), and how to minimise these and reduce any risks
- K10 describe how to source, interpret and apply relevant technical information, standards, diagrams, instructions, specifications and schedules for maintenance of signalling equipment
- K11 explain how to obtain and assess the required component(s) and ensure that they are fit for purpose, including assessing the compatibility of like-for-like components
- K12 describe the importance of making sure the component(s) orientation is correct before fitting and how to undertake this
- K13 describe the relevant methods, techniques and procedures to replace components and ensure they are fit for purpose
- K14 describe the implications of not following the methods and techniques for safe component handling
- K15 describe how to protect operational equipment from the replacement activity
-

- K16 explain your organisation's procedures for the use, care and control of tools and test equipment including calibration
- K17 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards when working with and handling electronic devices
- K18 explain how to select the correct tools for the activity, including how to confirm that they are calibrated and stored correctly after use
- K19 describe how to identify the various types of connectors used and the correct tools and equipment to make the connections correctly
- K20 describe the different types of mounting, connecting and cable supporting systems used by the signalling equipment
- K21 describe the correct mode of operation of the asset following replacement activities
- K22 explain when independent testing is required
- K23 describe how and when to carry out and the importance of integrity checks
- K24 describe how to identify, analyse and deal with influencing factors during the maintenance activities including environmental factors
- K25 explain your organisation's procedures for recording the replacement activity
- K26 explain the relevant reporting lines and procedures that are approved by your organisation
- K27 describe the limits of your own authority and responsibility and those of others involved

## Unit 330

# Carry out replacement of components from signalling assets

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans
- 1.5 track access restrictions
- 1.6 track work instructions
- 1.7 track possession
- 1.8 task risk control sheets
- 1.9 current rule book
- 1.10 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.11 equipment disconnections
- 1.12 manual handling regulations
- 1.13 RIDDOR
- 1.14 safety sign regulations
- 1.15 PPE

2 Identify the access requirements related to two of the following types of site locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Carry out the replacement of components from two of the following types of signalling equipment:

- 3.1 points
- 3.2 train control (such as signals or other method of authorising train movements)
- 3.3 train detection (such as track circuits or axle counters)
- 3.4 power supplies
- 3.5 balises
- 3.6 ETCS
- 3.7 other industry specific signalling equipment

4 Use the following types of approved/calibrated tools and equipment as applicable to the components being replaced:

- 4.1 power tools
- 4.2 hand tools
- 4.3 wire and cable strippers/cutters
- 4.4 IDC tools
- 4.5 termination tools
- 4.6 wrenches
- 4.7 soldering irons
- 4.8 manual handling equipment

5 Connect the following types of connections during the replacement of the components as applicable to the type of equipment:

- 5.1 mechanical
- 5.2 fluid power
- 5.3 electronic
- 5.4 soldered
- 5.5 IDC
- 5.6 optical
- 5.7 other specific type of termination/connection

6 Ensure that replacement activities comply with one of the following:

- 6.1 infrastructure guidelines and standard operating procedures
- 6.2 equipment manufacturer's documents
- 6.3 BS, ISO and/or BS EN standards
- 6.4 SMTH
- 6.5 other industry specific signalling standards/specifications

7 Complete the relevant replacement records, to include one of the following, and pass it to the appropriate people:

- 7.1 job card
- 7.2 SMTH
- 7.3 equipment logs and action report
- 7.4 company reporting procedures
- 7.5 other industry specific equipment records

## Unit 331

## Carry out removal of components from signalling assets

<b>Unit level:</b>	Level 3
<b>GLH:</b>	40

---

**Unit aim:**

This standard identifies the competences you need to carry out the removal of components from signalling systems and equipment as part of maintenance or fault finding, including the use of correct tools and equipment in accordance with your organisation's procedures. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).


You will be required to use the appropriate tools and equipment throughout the removal activities, and to apply a range of disconnection methods and techniques to safely remove the components from the equipment, and to make safe any connections as appropriate to the components removed. Where appropriate, you may also assist in working with computers or electronic controllers, making dis-connections and removing hardware components. The removal activities will include making sure that any removed signalling components are moved and stored safely before it is repaired, refitted or disposed of.

Your responsibilities will require you to comply with organisational policy and procedures for the removal activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the activities are removed from the work area on completion of the work, and that the relevant job/task documentation is completed accurately and legibly. You will be expected to work to instructions in conjunction with others or alone, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

The removal activity may be carried out as a team effort, but you must demonstrate a significant personal contribution to the activities, in order to satisfy the requirements of the standard, and you must demonstrate competence in all the areas required by the standard.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying procedures for the removal of components from signalling equipment. You will have an understanding of the components being removed and their disconnection requirements, in adequate depth to provide a sound basis for carrying out the removal process safely and effectively.

You will understand the safety precautions required when carrying out the removal activities, especially those for ensuring the safe isolation of services. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.



Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P<sub>1</sub> work safely at all times, complying with your organisation's procedures
- P<sub>2</sub> identify and analyse any necessary changes to safety requirements on arriving at site, including prompt reporting to the relevant person(s)
- P<sub>3</sub> locate and identify the component(s) to be removed
- P<sub>4</sub> source and interpret all relevant diagrams and specifications
- P<sub>5</sub> establish, and where appropriate, mark component(s) orientation for re-assembly
- P<sub>6</sub> ensure that any stored energy or substances are released safely and correctly
- P<sub>7</sub> label relevant wiring and components and note the configuration settings
- P<sub>8</sub> follow the required procedure for disconnection, when isolating the working area from other systems
- P<sub>9</sub> remove the required component(s) using approved procedures, tools and techniques and in a way that does not interfere with any operational railway systems
- P<sub>10</sub> use authorised practices where existing instructions are insufficient
- P<sub>11</sub> take suitable precautions to prevent damage to component(s) during removal
- P<sub>12</sub> check the condition of the removed component(s) and record those that will require replacing
- P<sub>13</sub> provide appropriate electrostatic protection for electronic equipment, where applicable
- P<sub>14</sub> store or discard the removed component(s) in line with your organisation's procedures
- P<sub>15</sub> ensure that interference with other systems is minimised, and equipment and systems other than those being maintained are not disturbed without authority
- P<sub>16</sub> deal promptly and effectively with problems within your control and report those that cannot be resolved
- P<sub>17</sub> complete all relevant documentation accurately and in line with your organisation's procedures

---

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 explain how to locate and safely access the site
- K3 explain how to locate and identify the component(s) to be removed
- K4 describe the protection and disconnection requirements or permit to work procedure that apply to the system where the removal work will be undertaken to ensure personal and operational safety when working on the railway infrastructure
- K5 describe the safe working practices for the release of stored energy, including electrical, pneumatic, hydraulic, mechanical
- K6 explain the classification of different voltage levels and the authority requirements for working on them
- K7 describe what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K8 describe how to reduce the risks of an electric shock (such as insulated tools, rubber matting and isolating transformers)
- K9 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the removal activities
- K10 describe the hazards associated with carrying out signalling removal activities (such as stored energy, radio frequency radiation, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down procedures), and how to minimise these and reduce any risks
- K11 explain how to source, interpret and apply relevant technical information, standards, diagrams, instructions, specifications and schedules for maintenance of signalling equipment
- K12 describe the importance of marking the component(s) orientation for re-assembly and how to undertake this
- K13 explain the relevant methods, techniques and procedures for component removal and handling
- K14 describe the implications of not following the methods and techniques for safe component handling
- K15 describe the types of component defects that could occur
- K16 describe your organisation's procedures for the use, care and control of tools and test equipment including calibration
- K17 explain the procedures and precautions to be adopted to eliminate Electrostatic Discharge (ESD) hazards when working with and handling electronic devices

- K18 describe how to select the correct tools for the activity, including how to confirm that they are calibrated and stored correctly after use
- K19 describe how to identify the various types of connectors used and the correct tools and equipment to make the disconnections correctly
- K20 explain the different types of mounting, connecting and cable supporting systems used by the signalling equipment
- K21 explain how to label and store removed component(s) for re-use, repair or disposal
- K22 explain how to respond to influencing factors whilst carrying out the maintenance tasks, including environmental factors
- K23 describe your organisation's procedures for recording the removal activity
- K24 explain the relevant reporting lines and procedures that are approved by your organisation
- K25 describe the limits of your own authority and responsibility and those of others involved

## Unit 331

# Carry out removal of components from signalling assets

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans
- 1.5 track access restrictions
- 1.6 track work instructions
- 1.7 track possession
- 1.8 task risk control sheets
- 1.9 current rule book
- 1.10 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.11 equipment disconnections
- 1.12 manual handling regulations
- 1.13 RIDDOR
- 1.14 safety sign regulations
- 1.15 PPE

2 Identify the access requirements related to two of the following types of site locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Carry out the removal of components from two of the following types of signalling equipment:

- 3.1 points
- 3.2 train control (such as signals or other method of authorising train movements)
- 3.3 train detection (such as track circuits or axle counters)
- 3.4 power supplies
- 3.5 balises
- 3.6 ETCS
- 3.7 other industry specific signalling equipment

4 Use the following types of approved/calibrated tools and equipment as applicable to the components being removed:

- 4.1 power tools
- 4.2 hand tools
- 4.3 wire and cable strippers/cutters
- 4.4 IDC tools
- 4.5 termination tools
- 4.6 wrenches
- 4.7 soldering irons
- 4.8 manual handling equipment

5 Disconnect the following types of connections during the removal of the components as applicable to the type of equipment:

- 5.1 mechanical
- 5.2 fluid power
- 5.3 electronic
- 5.4 soldered
- 5.5 IDC
- 5.6 optical
- 5.7 other specific type of termination/connection

6 Ensure that removal activities comply with one of the following:

- 6.1 infrastructure guidelines and standard operating procedures
- 6.2 equipment manufacturer's documents
- 6.3 BS, ISO and/or BS EN standards
- 6.4 SMTH
- 6.5 other industry specific signalling standards/specifications

7 Complete the relevant removal records, to include one of the following, and pass it to the appropriate people:

- 7.1 job card
- 7.2 SMTH
- 7.3 equipment logs and action report
- 7.4 company reporting procedures
- 7.5 other industry specific equipment records

## Unit 332

# Adjust signalling components and equipment to meet operational requirements

<b>Unit level:</b>	Level 3
<b>GLH:</b>	40

---

**Unit aim:**

This standard identifies the competences you need to carry out the adjustment of signalling components and equipment as part of maintenance or fault finding activities, including the use of correct tools and equipment in accordance with your organisation's procedures. The signalling equipment in this standard can be for over ground or underground rail transportation systems and can be applicable for the new European Train Control System (ETCS).

You will be required to use the appropriate tools and equipment throughout the adjusting activities, and to apply a range of methods and techniques to adjust the components and equipment. Where appropriate, you may also work with computers or electronic controllers, making connections, adjusting hardware and loading and updating software. The activities will include making checks and adjustments, in line with your permitted authority, and working with others to ensure that the adjusted components and equipment functions to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the adjustment activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the adjustment activities are removed from the work area on completion of the work, and that the relevant job/task documentation is completed accurately and legibly. You will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

The adjustment activity may be carried out as a team effort, but you must demonstrate a significant personal contribution to the activities, in order to satisfy the requirements of the standard, and you must demonstrate competence in all the areas required by the standard.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying procedures for the adjustment of signalling components and equipment. You will have a good understanding of the equipment being adjusted, in adequate depth to provide a sound basis for carrying out the process safely and effectively.

You will understand the safety precautions required when carrying out the adjustment activities, especially those for confirming that protection and disconnection arrangements are implemented to ensure operational safety. You will be required to demonstrate safe working practices throughout, and will understand your

responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 identify and analyse any necessary changes to safety requirements on arriving at site, including prompt reporting to the relevant person(s)
- P3 identify the area of work and the components/equipment which is to be adjusted
- P4 source and interpret the appropriate documentation and operating specifications for the equipment being adjusted
- P5 identify and correctly use the relevant tools, test equipment and measuring instruments
- P6 carry out adjustments within the limits of your own authority
- P7 carry out the required adjustments in the specified sequence and in an agreed timescale
- P8 confirm that the adjusted components/equipment meet the required operating specification
- P9 complete the relevant integrity checks in line with your organisation's procedures
- P10 identify, evaluate and report any instances where the equipment fails to meet the required performance after adjustments or where there are identified defects outside the required adjustments
- P11 identify and report any defects promptly, and agree a suitable course of action with the relevant person(s)
- P12 identify relevant authorisation changes, where urgent action is required, these may include the extension of possessions or the setting up of additional protection arrangements
- P13 ensure that interference with other systems is minimised, and equipment and systems other than those being maintained are not disturbed without authority
- P14 use alternative authorised adjustment practices where existing instructions are insufficient
- P15 identify the need for independent testing where required
- P16 observe sufficient operations of the components and equipment to confirm it is functioning correctly
- P17 maintain documentation in accordance with your organisation's procedures
- P18 submit all reports and communications to the appropriate authorities at the relevant times

P19 deal promptly and effectively with problems within your control and report those which cannot be resolved

---

### Learning outcome

The learner will:

K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
  - K2 explain how to locate and safely access the site
  - K3 explain how to check authorisation is in place for maintenance activities
  - K4 describe how to secure the system in preparation for the activity
  - K5 describe how to protect operational equipment from the adjustment activity
  - K6 explain the protection and disconnection requirements or permit to work procedure that apply to the system where the maintenance work will be undertaken to ensure personal and operational safety when working on the railway infrastructure
  - K7 explain the classification of different voltage levels and the authority requirements for working on them
  - K8 describe what constitutes a hazardous voltage/current and how to recognise victims of electric shock
  - K9 describe how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
  - K10 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities
  - K11 describe the hazards associated with carrying out signalling maintenance activities (such as stored energy, radio frequency radiation, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down procedures), and how to minimise these and reduce any risks
  - K12 explain how to locate and identify the equipment to be worked on
  - K13 describe the relevant methods, techniques and procedures for the adjustment of signalling components and equipment
  - K14 explain the types of operational constraints that could occur when carrying out the adjustments
  - K15 describe the activities which may compromise system functionality and integrity, including disturbing other equipment and systems without authority
  - K16 explain the correct mode of operation of signalling asset to be adjusted
  - K17 describe what constitutes a signalling component/equipment defect and the implication on safety and performance of the operational railway
  - K18 describe the activities which may compromise system functionality and integrity
-

- K19 explain how to identify, evaluate and deal with influencing factors whilst carrying out the tasks, including environmental factors
- K20 describe how to source, interpret and apply relevant technical information, standards, diagrams, instructions, specifications and schedules for the adjustment of signalling equipment including any diagnostic information or alarms
- K21 explain the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards when working with and handling electronic devices
- K22 describe how to check the adjustment activity to ensure compliance with the original specification
- K23 explain the importance of integrity checks, including how and when they should be carried out
- K24 describe when independent testing is required
- K25 explain your organisation's procedures for recording adjustment details
- K26 explain your organisation's procedures for the use, care and control of tools and equipment including calibration
- K27 describe the limits of your own authority and responsibility and those of others involved

## Unit 332

# Adjust signalling components and equipment to meet operational requirements

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans
- 1.5 track access restrictions
- 1.6 track work instructions
- 1.7 track possession
- 1.8 task risk control sheets
- 1.9 current rule book
- 1.10 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.11 equipment disconnections
- 1.12 manual handling regulations
- 1.13 RIDDOR
- 1.14 safety sign regulations
- 1.15 PPE

2 Identify the access requirements related to two of the following types of site equipment locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Carry out the adjustment of one of the following types of signalling equipment:

- 3.1 points
- 3.2 train control (such as signals or other method of authorising train movements)
- 3.3 train detection (such as track circuits or axle counters)
- 3.4 power supplies
- 3.5 balises
- 3.6 ETCS
- 3.7 other industry specific signalling equipment

4 Use the following types of tools and equipment as applicable to the equipment being maintained:

- 4.1 power tools
- 4.2 hand tools
- 4.3 torque wrenches
- 4.4 wire and cable strippers
- 4.5 IDC tools (such as punch down tool)
- 4.6 crimping tools
- 4.7 multi-meters
- 4.8 adjustment equipment
- 4.9 measuring equipment
- 4.10 alignment equipment
- 4.11 test equipment
- 4.12 other specific signalling maintenance tools/equipment

5 Carry out the following adjustment activities as applicable to the equipment being maintained:

- 5.1 electrical measurements and adjustments
- 5.2 electronic measurements and adjustments
- 5.3 mechanical measurements and adjustments
- 5.4 other specific signalling adjustment activity

6 Ensure that the maintenance activities comply with one of the following:

- 6.1 infrastructure guidelines and standard operating procedures
- 6.2 equipment manufacturer's documents
- 6.3 BS, ISO and/or BS EN standards
- 6.4 SMTH
- 6.5 other industry specific signalling standards/specifications

7 Complete the relevant maintenance records, to include one of the following, and pass it to the appropriate people:

- 7.1 job card
- 7.2 SMTH
- 7.3 maintenance log and action report
- 7.4 company reporting procedures
- 7.5 other industry specific maintenance records

## Unit 333

# Determine requirements for the safe access to work locations for telecoms engineering

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to determine the requirements for the safe access to work locations prior to undertaking a telecoms engineering activity. These activities could involve the maintenance, fault finding, installation or testing of telecoms equipment. The type of work locations that the activities will take place in could be from a range of different sites such as trackside, internal and public, each requiring different access requirements. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.</p> <p>The purpose of this standard is to define the competence requirements for you to access telecoms engineering work locations safely, effectively and in line with relevant processes and procedures.</p> <p>The level and extent of responsibility shall include your own safety and that of others who you may accompany. You will be expected to refer to others for authorisation when required, be responsible for the implementation of instructions, and work within set procedures and processes. Your actions shall not compromise the safety of others.</p> <p>You will be able to identify and agree the necessary safety requirements. You will ensure the implementation of the necessary safety requirements, protection and disconnection arrangements and that they remain in place throughout the duration of the telecoms engineering activity.</p> <p>Your underpinning knowledge will provide a good understanding of the relevant processes and procedures for the safe access to a work location prior to undertaking a telecoms engineering activity.</p> <p>Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.</p>

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 confirm the location of the activity and determine the access requirements
- P3 check that the requirements for safe access meet your organisation's procedures
- P4 advise other people as required of the requirements for safe access
- P5 take action to ensure the requirements for safe access to work are implemented and remain in place for the duration of the activity
- P6 establish and maintain communication with relevant person(s)
- P7 deal effectively with problems within the limits of your own authority and report those that cannot be resolved

---

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity such as Safe System of Work Planner (SSOWP)
- K2 the methods and techniques for conducting safety assessments, including assessment of riskdescribe
- K3 explain how to locate and safely access the work area/site
- K4 explain how to source and interpret information and document systems relating to the work area/site and activity
- K5 describe the relevant railway possession and protection arrangements for the work site and equipment to provide a safe system of work and how to check these are in place
- K6 describe how to secure the work area/site/system for maintenance/fault finding/installation/testing purposes
- K7 explain how to identify, agree and implement safe access
- K8 explain the relevant reporting lines and procedures that are approved by your organisation
- K9 describe the limits of you own authority and responsibility and those of others involved such as the Safe Work Leader (SWL)

## Unit 333

# Determine requirements for the safe access to work locations for telecoms engineering

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans (such as SSOWP)
- 1.5 SWL
- 1.6 track access restrictions
- 1.7 track work instructions
- 1.8 track possession
- 1.9 task risk control sheets
- 1.10 current rule book
- 1.11 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.12 equipment disconnections
- 1.13 manual handling regulations
- 1.14 RIDDOR
- 1.15 safety sign regulations
- 1.16 PPE

2 Identify the types of documentation from the following that applies to the access requirements as applicable to the work location:

- 2.1 signing in and off site register
- 2.2 site briefing attendance
- 2.3 site access authorisation card
- 2.4 personal track safety certificate

3 Identify the access requirements related to two of the following types of site locations:

- 3.1 trackside
- 3.2 internal (such as signal box, equipment room)
- 3.3 areas to which the public have access
- 3.4 confined spaces
- 3.5 elevated structures

4 Agree and implement the necessary safety requirements to ensure safe access from the following as applicable to the activity:

4.1 protection and possession

4.2 isolation

4.3 traction supply OHLE and DC

4.4 establishment of a communication system

## Unit 334

# Establish information for telecoms engineering maintenance and/or fault finding

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to establish information for telecoms engineering maintenance tasks which is technical and detailed and could be from a variety of sources such as drawings, defect history, fault reports, handbooks, maintenance specifications, instructions, procedures and schedules prior to undertaking maintenance and/or fault finding activities. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.</p> <p>You will be able to source and interpret the information required to undertake the allocated maintenance and/or fault finding tasks in accordance with your organisation's procedures. You will be required to extract the necessary data from the various specifications and related documentation, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.</p> <p>Your responsibilities will require you to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. You will be expected to report any problems with the use and interpretation of the data that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work to instructions, with a minimum of supervision, and to take personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.</p> <p>Your underpinning knowledge will provide a good understanding of the types of documentation available for use, and will provide an informed approach to applying telecom engineering instructions and procedures. You will be able to read and interpret the documentation available, and will know about the conventions, symbols and abbreviations used, in adequate depth to provide a sound basis for carrying out the activities to the required specification.</p>

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 identify and interpret the required details for the maintenance and/or fault finding activities
  - P2 source and interpret relevant information on technical requirements
  - P3 confirm the information is current, authorised and contains all essential data
  - P4 identify and deal promptly with information, which is inadequate, contradictory and/or ambiguous
  - P5 identify and deal promptly and effectively with any problems occurring with the requirements and their interpretation
- 

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe how to source and interpret sources of technical information for maintenance and/or fault finding activities
  - K2 explain your organisation's procedures for documentation care and control and the requirements for the retention of records
  - K3 explain how to ensure that documents are current and authorised and reflect the required level of detail accurately
  - K4 explain the customer/contractual requirements such as service level agreements
  - K5 describe how to interpret the relevant conventions, symbols, terminology and abbreviations used in site and equipment diagrams, engineering diagrams and specifications including an understanding of telecoms terminology
  - K6 describe the relevant methods and techniques covering maintenance and/or fault finding of telecoms equipment and how to interpret them
  - K7 explain how to identify, evaluate and respond to problems occurring with the information and its interpretation
  - K8 explain the relevant reporting lines and procedures that are approved by your organisation
  - K9 describe the limits of your own authority and responsibility, and those of others involved
-

## Unit 334

# Establish information for telecoms engineering maintenance and/or fault finding

## Supporting Information

### ***Unit Range Description***

1 Establish the required maintenance technical information for one of the following types of telecom equipment:

- 1.1 transmission systems
- 1.2 bearer circuits
- 1.3 telecoms bearers carrying signalling circuits
- 1.4 SCADA
- 1.5 operational telephones
- 1.6 switches and systems (such as telephone exchanges & concentrators)
- 1.7 railway operational information systems
- 1.8 PA and CCTV
- 1.9 operational CCTV (such as OPO/DOO)
- 1.10 GSM-R
- 1.11 other industry specific telecom equipment

2 Obtain and extract information from the following sources as applicable to the equipment being maintained:

- 2.1 drawings
- 2.2 defect history
- 2.3 fault reports (such as customer, monitoring centre)
- 2.4 handbooks
- 2.5 maintenance specifications
- 2.6 instructions
- 2.7 schedules
- 2.8 procedures

## Unit 335

# Establish information for telecoms engineering installation

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to establish information for telecoms engineering testing which is technical and detailed and could be from a variety of sources such as design drawings, test plans, records of previously completed testing, installation plans, test specifications, industry procedures, manufactures handbooks and equipment specific requirements prior to undertaking telecom testing activities. The testing will be of newly installed telecoms equipment and associated infrastructure. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.</p> <p>You will be able to source and interpret the information required to undertake the allocated testing tasks in accordance with your organisation's procedures. You will be required to extract the necessary data from the various specifications and related documentation, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.</p> <p>Your responsibilities will require you to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. You will be expected to report any problems with the use and interpretation of the data that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work to instructions, with a minimum of supervision, and to take personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.</p> <p>Your underpinning knowledge will provide a good understanding of the types of documentation available for use, and will provide an informed approach to applying telecom engineering instructions and procedures. You will be able to read and interpret the documentation available, and will know about the conventions, symbols and abbreviations used, in adequate depth to provide a sound basis for carrying out the activities to the required test specification.</p>

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 identify and interpret the sources of information required for testing activities
  - P2 source and interpret relevant information on technical requirements
  - P3 ensure that the information is current, authorised and contains all essential data
  - P4 identify and deal promptly with information, which is inadequate, contradictory and/or ambiguous
  - P5 identify and deal promptly and effectively with any problems occurring with the requirements and their interpretation
- 

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe how to source and interpret technical information for the testing activity
  - K2 describe your organisation's procedures for documentation care and control and the requirements for the retention of records
  - K3 explain how to ensure that documents are current and authorised and reflect the required level of detail accurately
  - K4 describe the customer/contractual requirements such as service level agreements
  - K5 describe how to interpret the conventions, symbols, terminology and abbreviations used in site and equipment diagrams, engineering drawings and specifications including an understanding of telecoms terminology
  - K6 explain how to identify, evaluate and respond to problems occurring with the information and its interpretation
  - K7 explain the relevant reporting lines and procedures that are approved by your organisation
  - K8 describe the limits of your own authority and responsibility, and those of others involved
-

## Unit 335

# Establish information for telecoms engineering installation

## Supporting Information

### ***Unit Range Description***

1 Establish the required testing technical information for one of the following types of telecom equipment:

- 1.1 transmission systems
- 1.2 bearer circuits
- 1.3 telecoms bearers carrying signalling circuits
- 1.4 SCADA
- 1.5 operational telephones
- 1.6 switches and systems (telephone exchanges & concentrators)
- 1.7 railway operational information systems
- 1.8 PA and CCTV
- 1.9 operational CCTV (such as OPO/DOO)
- 1.10 GSM-R
- 1.11 other industry specific telecom equipment

2 Obtain and extract information from the following sources as applicable to the equipment being tested:

- 2.1 design drawings
- 2.2 test plans
- 2.3 records of previously completed testing
- 2.4 installation plans
- 2.5 test specifications
- 2.6 industry procedures
- 2.7 manufactures handbooks
- 2.8 equipment specific requirements
- 2.9 test procedures/handbook (such as TMTH)

## Unit 336

# Establish information for telecoms engineering testing

<b>Unit level:</b>	Level 3
<b>GLH:</b>	70
<b>Unit aim:</b>	<p>This standard identifies the competences you need to establish information for telecoms engineering testing which is technical and detailed and could be from a variety of sources such as design drawings, test plans, records of previously completed testing, installation plans, test specifications, industry procedures, manufactures handbooks and equipment specific requirements prior to undertaking telecom testing activities. The testing will be of newly installed telecoms equipment and associated infrastructure. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.</p> <p>You will be able to source and interpret the information required to undertake the allocated testing tasks in accordance with your organisation's procedures. You will be required to extract the necessary data from the various specifications and related documentation, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.</p> <p>Your responsibilities will require you to comply with organisational policy and procedures for obtaining and using the documentation applicable to the activity. You will be expected to report any problems with the use and interpretation of the data that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work to instructions, with a minimum of supervision, and to take personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.</p> <p>Your underpinning knowledge will provide a good understanding of the types of documentation available for use, and will provide an informed approach to applying telecom engineering instructions and procedures. You will be able to read and interpret the documentation available, and will know about the conventions, symbols and abbreviations used, in adequate depth to provide a sound basis for carrying out the activities to the required test specification.</p>

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 identify and interpret the sources of information required for testing activities
  - P2 source and interpret relevant information on technical requirements
  - P3 ensure that the information is current, authorised and contains all essential data
  - P4 identify and deal promptly with information, which is inadequate, contradictory and/or ambiguous
  - P5 identify and deal promptly and effectively with any problems occurring with the requirements and their interpretation
- 

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 how to source and interpret technical information for the testing activity
  - K2 your organisation's procedures for documentation care and control and the requirements for the retention of records
  - K3 how to ensure that documents are current and authorised and reflect the required level of detail accurately
  - K4 the customer/contractual requirements such as service level agreements
  - K5 how to interpret the conventions, symbols, terminology and abbreviations used in site and equipment diagrams, engineering drawings and specifications including an understanding of telecoms terminology
  - K6 how to identify, evaluate and respond to problems occurring with the information and its interpretation
  - K7 the relevant reporting lines and procedures that are approved by your organisation
  - K8 the limits of your own authority and responsibility, and those of others involved.
-

## Unit 336

## Establish information for telecoms engineering testing

### Supporting Information

#### ***Unit Range Description***

1 Establish the required testing technical information for one of the following types of telecom equipment:

- 1.1. transmission systems
- 1.2. bearer circuits
- 1.3. telecoms bearers carrying signalling circuits
- 1.4. SCADA
- 1.5. operational telephones
- 1.6. switches and systems (telephone exchanges & concentrators)
- 1.7. railway operational information systems
- 1.8. PA and CCTV
- 1.9. operational CCTV (such as OPO/DOO)
- 1.10. GSM-R
- 1.11. other industry specific telecom equipment

2.2. Obtain and extract information from the following sources as applicable to the equipment being tested:

- 2.1. design drawings
- 2.2. test plans
- 2.3. records of previously completed testing
- 2.4. installation plans
- 2.5. test specifications
- 2.6. industry procedures
- 2.7. manufactures handbooks
- 2.8. equipment specific requirements
- 2.9. test procedures/handbook (such as TMTH)

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to organise local telecoms engineering activities for the maintenance, fault finding or installation of telecoms systems and equipment. It includes planning, prioritising and determining roles and responsibilities in line with your organisations procedures. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.</p> <p>You will be required to gather the relevant information to help you organise the engineering activities. The information will include site availability and access, operations and engineering notices, plans, schedules, procedures, diagrams, records and specifications.</p> <p>You will be able to identify potential deviations from the allocated tasks and alter the plan as required within the limits of your own authority. Any alterations must be recorded, reported, and their impact on the allocated tasks monitored.</p> <p>You will be able to accurately identify tasks, and their interdependence, ensuring that work is organised in a logical order. The allocation of activities and responsibilities to staff according to their competences is also one of your responsibilities and you will be able to provide staff with the required instructions.</p> <p>You will establish and maintain communications and effective liaison arrangements with relevant person(s), including team members, other teams, operations staff, engineering control staff and peers. Communication will be both remote and face-to-face. Also you will be able to obtain suitable clarification and assistance where information is unclear, inaccurate or conflicting.</p> <p>You will be aware of any health, safety and environmental requirements applicable to your area of responsibility. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.</p> <p>Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.</p>

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 identify, source and confirm information required for the activity
- P2 identify, plan and record work methods and activities that make optimum use of resources
- P3 prioritise work activities to achieve objectives cost-effectively and efficiently
- P4 allocate activities and responsibilities to relevant person(s) according to their competences, including providing the required instructions
- P5 agree and record individual roles and group responsibilities
- P6 seek advice from others to help resolve problems
- P7 anticipate and show how changes to plans and/or allocated tasks will be accommodated, including providing details of the predicted impact on activities
- P8 make a record of agreed work plans and communicate the plans to all involved
- P9 deal promptly and efficiently with problems which are within your control and report those that cannot be resolved

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 explain the relevant health and safety legislation, regulations, statutory requirements and safe working practices and procedures as appropriate to the activity such as the Safe System of Work Planner (SSOWP)
- K2 describe the relevant methods and techniques for prioritising and planning activities, including, time management and problem solving
- K3 explain the roles and responsibilities of individuals and groups in relation to the activity
- K4 describe how to source and analyse the required equipment and system documentation
- K5 describe how to source, interpret and apply relevant technical information, standards, diagrams, instructions, specifications and schedules for telecom engineering activities
- K6 explain how to identify, analyse, and deal with influencing factors whilst carrying out the organising of activities, including environmental factors
- K7 explain how to achieve and the importance of effective working relationships when organising local telecoms engineering activities

- K8 explain how and when telecoms activities cannot be achieved
- K9 describe the impact of any deviations from the allocated tasks
- K10 explain the relevant reporting lines and procedures that are approved by your organisation
- K11 describe the limits of your own authority and responsibility and those of others involved such as the Safe Work Leader (SWL)

## Unit 337

## Organise local telecoms engineering activities

### Supporting Information

#### ***Unit Range Description***

1 Organise local telecoms engineering activities for one of the following types of telecom equipment:

1.1 transmission systems

1.2 bearer circuits

1.3 telecoms bearers carrying signalling circuits

1.4 SCADA

1.5 operational telephones

1.6 switches and systems (such as telephone exchanges & concentrators)

1.7 railway operational information systems

1.8 PA and CCTV

1.9 operational CCTV (such as OPO/DOO)

1.10 GSM-R

1.11 other industry specific telecom equipment

2 Ensure that the following resources and documents are considered during the organising of the activities as applicable to the telecom equipment:

2.1 site availability

2.2 access arrangements

2.3 operations and engineering notices

2.4 plans, schedules and procedures

2.5 diagrams, records and specifications

2.6 personnel (roles and responsibilities)

3 Record and present the agreed work plans to the appropriate people, using one of the following methods:

3.1 specific company documentation

3.2 pre-defined work plan

3.3 new work plan

## Unit 338

# Contribute to technical leadership of telecoms engineering activities

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to contribute to the technical leadership of telecoms engineering activities for the maintenance, fault finding or installation of telecoms systems and equipment. It includes providing up to date information and advice to others in line with your organisations procedures. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.</p> <p>You will identify the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations. The safety requirements include relevant local safety certificates, the implementation of relevant documentation, the implementation of a safe system of work and the use of relevant personal protective equipment. You will ensure that your organisation's procedures are met and followed by yourself and those for whom you are responsible. You will ensure that all actions are taken within the limits of your own authority and responsibility.</p> <p>You will be able to identify potential deviations from the allocated tasks, and alter the plan as required within the limits of your own authority. You will ensure that any alterations are recorded, reported, and their impact on the allocated tasks monitored.</p> <p>You will be able to clarify and give guidance assistance where information is unclear, inaccurate or conflicting.</p>

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

P1 work safely at all times, complying with your organisation's procedures

P2 assess work methods and procedures for their suitability and technical feasibility

- P3 anticipate potential problems and choose which action to take to deal with them
  - P4 identify potential deviations from the allocated tasks and alter the plan as required within the limits of your authority
  - P5 record and report any alterations and monitor their impact on the allocated tasks
  - P6 provide colleagues with valid and up-to-date information, advice and guidance as necessary
  - P7 clarify and give guidance and assistance when information is unclear, inaccurate or conflicting
  - P8 analyse problems in full and choose effective solutions that will maintain the quality and progress of the work
  - P9 deal promptly and efficiently with problems which are within your control and report those that cannot be resolved
- 

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations, statutory requirements and safe working practices and procedures as appropriate to the activity such as the Safe System of Work Planner (SSOWP)
  - K2 describe the relevant railway possession and protection arrangements for the work site and equipment to provide a safe system of work and how to check these have been implemented
  - K3 explain the Controller of Infrastructure Regulations and procedures
  - K4 describe how to locate and safely access the site and equipment
  - K5 explain how to determine and source the documentation requirements for the activities undertaken and how to confirm that these meet your organisation's procedures
  - K6 describe how to access, interpret & apply relevant technical information, standards, drawings, instructions, specifications and schedules for telecoms engineering activities
  - K7 describe the relevant methods and techniques for planning and progressing work activities
  - K8 describe the range and type of problem solving methods and techniques
  - K9 explain how to present and communicate information relating to the engineering activity
  - K10 describe the range and type of operational constraints and authorisation procedures for carrying out telecoms activities on the operational railway
  - K11 explain the requirements to make the system safe whilst undertaking engineering activities
  - K12 describe how and when telecoms activities cannot be achieved
  - K13 describe the impact of any deviations from the planned activities
  - K14 describe how to respond to influencing factors whilst carrying out the telecoms engineering activities, including environmental factors, site conditions and working on operational railway equipment
  - K15 explain the relevant reporting lines and procedures that are approved by your organisation
-

K16 describe the limits of your own authority and responsibility and those of others involved such as the Safe Work Leader (SWL)

## Unit 338

# Contribute to technical leadership of telecoms engineering activities

## Supporting Information

### ***Unit Range Description***

1 Contribute to the technical leadership of telecoms engineering activities for one of the following types of telecom equipment:

- 1.1 transmission systems
- 1.2 bearer circuits
- 1.3 telecoms bearers carrying signalling circuits
- 1.4 SCADA
- 1.5 operational telephones
- 1.6 switches and systems (such as telephone exchanges & concentrators)
- 1.7 railway operational information systems
- 1.8 PA and CCTV
- 1.9 operational CCTV (such as OPO/DOO)
- 1.10 GSM-R
- 1.11 other industry specific telecom equipment

2 Present and communicate the following information related to the engineering activities as applicable to the telecom equipment:

- 2.1 special notices
- 2.2 engineering standards
- 2.3 work instructions
- 2.4 technical briefings
- 2.5 safety briefings

## Unit 339

## Allocate and monitor resources for telecoms engineering activities

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30

---

**Unit aim:**

This standard identifies the competences you need to allocate and monitor resources for effective telecoms engineering activities. It includes working to a plan, identifying and allocating the resources required and sourcing information related to those resources. You will monitor the use of the resources and ensure that there are sufficient resources available for the activities to be undertaken and that the resources are used safely and in an appropriate and timely manner. Where changes in resources or activities occur you will be able to challenge when a plan or resource allocation may need amending. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.

You will be aware of your own responsibility for the care and use of resources and will be able to advise team members of their responsibilities for the care and use of resources. You will take into account the time the system will be available for the task when considering resources and also any influencing factors such as, environmental, site conditions and the additional requirements for working on operational railway equipment. Identifying inaccuracies and the non-availability of resources and being able to take appropriate remedial action are essential to this standard.

You must be able to identify all the necessary safety requirements and take action to ensure the safety of yourself, others and railway operations. The safety requirements include relevant local safety certificates, the implementation of relevant documentation, the implementation of a safe system of work, the use of relevant Personal Protective Equipment. You must ensure that protection and disconnection arrangements are implemented to ensure operational safety.

Your responsibilities will require you to comply with organisational policy and procedures for the allocation and monitoring activities, and to report any problems with the activities that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of 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 the techniques and procedures used when allocating and monitoring telecoms engineering activities. You will understand the activities within your area of responsibility, including the availability of resources, in adequate depth to provide a sound basis for carrying out their allocation efficiently. You will understand your organisation's methods of operation, in sufficient detail to enable you to make informed decisions.

Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the

relevant action to ensure the safety of yourself, others and railway operations.

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 confirm the resources required
- P3 ensure sufficient resources are available
- P4 confirm information relating to resources is accurate and up to date
- P5 allocate and monitor the use of resources
- P6 identify when changes to the planned use of resources may occur
- P7 take prompt and effective action to deal with actual and predicted changes to the planned use of resources
- P8 advise the appropriate person(s) where changes to resources have occurred or are likely to occur and the implications involved
- P9 ensure that those using resources are aware of their responsibilities for the care and use of the resources
- P10 record details on the use of resources including where appropriate any changes that have occurred

---

### Learning outcome

The learner will:

K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity such as the Safe System of Work Planner (SSOWP)
- K2 describe the types of resources available
- K3 describe the methods and techniques for ensuring sufficient resources
- K4 describe the methods and techniques for allocating resources

- K5 explain how to source and interpret information and document systems relating to the engineering activity and the resources required
- K6 describe the types of problems that can occur when allocating resources and how these problems can be overcome
- K7 explain how the planned use of resources could alter and the implications that may follow
- K8 describe the methods and techniques for effective monitoring of resources
- K9 explain your organisation's procedures for the care and use of resources
- K10 explain your organisation's procedures for communicating a change to resource allocation
- K11 explain the relevant reporting lines and procedures that are approved by your organisation
- K12 describe the limits of your own authority and responsibility and those of others involved such as the Safe Work Leader (SWL)

## Unit 339

# Allocate and monitor resources for telecoms engineering activities

## Supporting Information

### ***Unit Range Description***

1 Allocate and monitor resources for one of the following types of telecom equipment:

- 1.1 transmission systems
- 1.2 bearer circuits
- 1.3 telecoms bearers carrying signalling circuits
- 1.4 SCADA
- 1.5 operational telephones
- 1.6 switches and systems (such as telephone exchanges & concentrators)
- 1.7 railway operational information systems
- 1.8 PA and CCTV
- 1.9 operational CCTV (such as OPO/DOO)
- 1.10 GSM-R
- 1.11 other industry specific telecom equipment

2 Allocate and monitor the following resources as applicable to the telecom engineering activities:

- 2.1 documentation (current and appropriate)
- 2.2 tools, plant and test equipment (calibrated and serviceable)
- 2.3 materials, replacement equipment and consumables
- 2.4 communications equipment
- 2.5 personnel (total required and competence)
- 2.6 access arrangements

3 Allocate and monitor resources for one of the following telecom engineering activities:

- 3.1 installation
- 3.2 maintenance
- 3.3 fault finding
- 3.4 testing
- 3.5 other industry specific telecoms activity

## Unit 340

# Reinstate the work area after telecoms engineering activities

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to reinstate the work area after installing, maintaining, rectifying or testing telecoms equipment and systems. It includes the safe storage of reusable materials and equipment. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.</p> <p>You will ensure that the work area is left in a condition that meets your organisations procedures. This will include ensuring that any waste material, plant, tools and test equipment that cannot be removed is marked for later collection and secured where it will not interfere with the safe operation of the railway.</p> <p>Your responsibilities will require you to comply with organisational policy and procedures for the activities undertaken, and to report any problems with reinstating the work area procedure that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work to instructions, alone or in conjunction with others, taking full responsibility for your own actions, and for the quality and accuracy of the work that you carry out.</p> <p>Your underpinning knowledge will be sufficient to provide a sound understanding of your work, and will provide an informed approach to applying procedures. You will understand the safe storage requirements for the equipment, reusable/waste materials, and will know about the procedures and potential problems, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.</p> <p>You will understand the safety precautions to be observed when handling the equipment and materials. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace/area.</p> <p>Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.</p>

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 withdraw all possession and protection measures in line with your organisation's procedures
- P3 confirm the work area is secured on completion of the work
- P4 restore the work areas to a safe condition in accordance with agreed requirements and schedules
- P5 separate equipment, components, and materials for re-use from waste items
- P6 store reusable materials and equipment in an appropriate location
- P7 identify, mark and secure any waste items that cannot be removed immediately in such a way that the safe operation of the railway is maintained
- P8 check that all plant, tools, and test equipment that cannot be removed are secured and stored where they do not interfere with the safe operation of the railway
- P9 dispose of waste materials in line with your organisation's procedures
- P10 deal promptly and effectively with problems within your control and report those that cannot be resolved

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity such as the Safe System of Work Planner (SSOWP)
- K2 the relevant railway possession and protection arrangements for the work site and equipment to provide a safe system of work and how to check these have been withdrawn
- K3 your organisation's procedures for restoring the work area
- K4 the work area security requirements
- K5 your organisation's procedures for storing material and equipment
- K6 the types of materials and equipment to be stored
- K7 the different types, methods and procedures for the disposal of waste items and hazardous substances as approved by your organisation
- K8 the relevant reporting lines and procedures that are approved by your organisation

K9 the limits of your own authority and responsibility and those of others involved such as the Safe Work Leader (SWL)

## Unit 340

# Reinstate the work area after telecoms engineering activities

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans (such as SSOWP)
- 1.5 SWL
- 1.6 track access restrictions
- 1.7 track work instructions
- 1.8 track possession
- 1.9 task risk control sheets
- 1.10 current rule book
- 1.11 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.12 equipment disconnections
- 1.13 manual handling regulations
- 1.14 RIDDOR
- 1.15 safety sign regulations
- 1.16 PPE

2 Identify the access requirements related to two of the following types of site locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Safely store tools and equipment, including the following as applicable to the work activities:

- 3.1 tools
- 3.2 test equipment
- 3.3 materials
- 3.4 consumables
- 3.5 plant
- 3.6 communications equipment

4 Assist in the completion of the relevant records, to include one of the following, and pass it to the appropriate people:

4.1 job card

4.2 maintenance log and action report

4.3 company reporting procedures

4.4 other handover records

## Unit 341

## Transfer responsibility of telecoms assets

<b>Unit level:</b>	Level 3
<b>GLH:</b>	30
<b>Unit aim:</b>	<p>This standard identifies the competences you need to transfer responsibility of repaired or newly installed telecoms assets, in accordance with your organisation's procedures, having confirmed it is fit for entry into service. It also covers the transfer of responsibility for the operation of the equipment. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.</p> <p>You will be required to transfer responsibility of configured telecoms assets following maintenance, fault finding or installation work carried out by your team to the control of others. You will be able to provide suitable and sufficient evidence to confirm the operational status of the equipment, prior to the transfer of responsibility. It will include telecoms systems that are fit for entry into service, restricted service, or systems that are not fit for service.</p> <p>You will ensure that the allocated tasks and the required integrity checks have been completed in accordance with your organisation's procedures.</p> <p>Also you will be able to carry out the transfer of responsibility processes concerned with the completion of tasks in accordance with your organisation's procedures.</p> <p>You will ensure that the equipment is handed back for operational use only after sufficient evidence exists to ensure safe working. Also you will ensure that the transfer of responsibility information supplied accurately identified the operational status of the system and/or equipment.</p> <p>Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.</p>

---

### Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 confirm and define the condition of the asset in accordance with the specification
- P3 ensure that all tasks, tests and checks have been completed in line with your organisation's procedures
- P4 confirm that everyone involved accepts the asset is in a satisfactory condition prior to transfer of responsibility
- P5 identify any unusual features, defects or discrepancies relating to the condition of the asset
- P6 make the transfer of responsibility and obtain agreement between everyone involved on the precise moment of transfer of responsibility
- P7 make sure that clear, accurate and complete records of the transfer of responsibility are made in line with your organisation's procedures
- P8 deal promptly and effectively with problems within your control and report those which cannot be resolved

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity such as the Safe System of Work Planner (SSOWP)
- K2 your organisation's procedures for the transfer of responsibility of telecoms assets
- K3 how to determine the condition of the asset prior to transfer of responsibility
- K4 the requirements for the completion of work and testing activities prior to returning equipment to service
- K5 what constitutes an unacceptable asset condition
- K6 your organisation's procedures for recording and documenting information on the status of the asset
- K7 what transfer of responsibility documentation should be supplied and to whom, in line with your organisation's procedures
- K8 the relevant reporting lines and procedures that are approved by your organisation
- K9 the limits of your own authority and responsibility and those of others involved such as the Safe Work Leader (SWL)

## Unit 341

## Transfer responsibility of telecoms assets

### Supporting Information

#### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans (such as SSOWP)
- 1.5 SWL
- 1.6 track access restrictions
- 1.7 track work instructions
- 1.8 track possession
- 1.9 task risk control sheets
- 1.10 current rule book
- 1.11 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.12 equipment disconnections
- 1.13 manual handling regulations
- 1.14 RIDDOR
- 1.15 safety sign regulations
- 1.16 PPE

2 Identify the access requirements related to two of the following types of site equipment locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Transfer responsibility for two of the following types of telecom equipment:

- 3.1 transmission systems
- 3.2 bearer circuits
- 3.3 telecoms bearers carrying signalling circuits
- 3.4 SCADA
- 3.5 operational telephones
- 3.6 switches and systems (such as telephone exchanges & concentrators)
- 3.7 railway operational information systems

- 3.8 PA and CCTV
- 3.9 operational CCTV (such as OPO/DOO)
- 3.10 GSM-R
- 3.11 other industry specific telecom equipment

4 Confirm the operational status of telecoms equipment that is:

- 4.1 fit for entry into service
- 4.2 fit for entry into restricted service
- 4.3 not fit for entry into service

5 Ensure that transfer of responsibility transfer complies with one of the following:

- 5.1 infrastructure guidelines and standard operating procedures
- 5.2 equipment manufacturer's documents
- 5.3 BS, ISO and/or BS EN standards
- 5.4 TMTH
- 5.5 other industry specific telecom standards/specifications

6 Complete the relevant transfer records, to include one of the following, and pass it to the appropriate people:

- 6.1 job card
- 6.2 TMTH
- 6.3 maintenance log and action report
- 6.4 company reporting procedures
- 6.5 other industry specific maintenance records

## Unit 342

## Conduct specified testing of telecoms systems

<b>Unit level:</b>	Level 3
--------------------	---------

---

<b>GLH:</b>	90
-------------	----

**Unit aim:**

This standard identifies the competences you need to conduct specified testing of operational telecoms systems and equipment, including the use of correct tools and test equipment in accordance with your organisation's procedures. You will carry out tests ensuring that the test results are within specification before bringing the system into service. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.

You will be required to use the appropriate tools and equipment throughout the testing activities, and to apply a range of methods and techniques to test the system equipment, and to make connections as appropriate to the equipment installed. Where appropriate, you may also work with computers or electronic controllers, making connections and testing hardware/software. The testing and checking activities will include making checks in line with your permitted authority, and assisting others to ensure that the telecom equipment functions to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the testing and checking activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the testing and checking activities are removed from the work area on completion of the work, and that the relevant job/task documentation is completed accurately and legibly. You will be expected to work to instructions in conjunction with others, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out. As a result of the tests you will determine whether the system is functioning correctly, if further tests may be required or if the system needs to be taken out of service.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying procedures for the testing and checking of telecoms equipment. You will have an understanding of the equipment being tested, and its necessary checking requirements, in adequate depth to provide a sound basis for carrying out the process safely and effectively.

You will understand the safety precautions required when carrying out the testing and checking activities, especially those for ensuring the safe isolation of services. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 determine the scope of the work to be carried out and the status of the previously tested equipment
- P3 obtain confirmation that the personnel allocated for the testing activity are available and authorised to undertake the tasks
- P4 confirm that all the required documentation is available and the information accurately identifies the work to be completed
- P5 identify and analyse any necessary changes to safety requirements on arriving at site and comply with operational requirements, including prompt reporting to the relevant person(s)
- P6 identify and interpret the appropriate procedures and instructions for use of tools and test equipment when carrying out the required tests to ensure that true and accurate measurements are taken
- P7 confirm that the tests/checks are appropriate to the equipment and are in line with testing procedures/instructions
- P8 set up and carry out the tests/checks using approved procedures and within agreed timescales
- P9 carry out tests/checks as required by the test plan in sufficient detail to establish the equipment status
- P10 carry out tests/checks in a manner that minimises the interference with other systems and equipment and is within the limits of your own authority
- P11 confirm that all testing/checking records are complete and accurately reflect the results of the testing/checking activities carried out
- P12 identify, analyse and deal with any inconsistencies in the test data
- P13 ensure that any course of remedial action is effective, safe, complies with instructions and is completed within the required timescales
- P14 ensure all actions are taken within the limits of your own authority and where doubt arises you seek advice from suitable reference documents or relevant person(s)
- P15 analyse any test evidence and ensure it is thorough and accurately identifies the state of the completed testing
- P16 compare the analysis against the product specification and identify any faults or variations from specification
- P17 record the results of the tests in the appropriate format
- P18 check that the progression of work is recorded accurately, clearly and in line with your organisation's procedures

- P19 review the results and carry out further tests if necessary
- P20 confirm compliance with the design details, specifications, industry standards, wiring diagrams and plans in accordance with testing instructions
- P21 protect, report and deal with any damage or disturbance to operational equipment in line with your organisation's procedures
- 

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity such as the Safe System of Work Planner (SSOWP)
- K2 the relevant railway possession and protection arrangements for the work site and equipment to provide a safe system of work and how to check these have been implemented
- K3 how to locate and safely access the site
- K4 how to secure the system for testing purposes
- K5 how to define the limits of testing to ensure operational equipment is not affected
- K6 the activities which may compromise system functionality and integrity including the operational constraints to carrying out testing activities
- K7 how to identify, analyse and deal with influencing factors whilst carrying out the tests, including environmental factors
- K8 the isolation and lock-off procedure or permit-to-work procedure that applies to the system (such as electrical isolation, locking off switchgear, placing of warning notices, proving the isolation has been achieved and secured)
- K9 the classification of different voltage levels and the authority requirements for working on them
- K10 what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K11 how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
- K12 the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the testing activities
- K13 hazards associated with carrying out telecom test activities (such as stored voltages, radio frequency radiation, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down testing procedures), and how to minimise these and reduce any risks
- K14 the activities which may compromise system functionality and integrity including the operational constraints to carrying out testing/checking activities
-

- K15 how to source, interpret and analyse engineering diagrams and related specification approved manuals and other related information, including as appropriate, previous testing information
- K16 how to locate and identify the equipment to be tested and/or checked
- K17 the correct and incorrect mode of operation of the system to be tested, including acceptable operational variances
- K18 the types of analytical methods and techniques in testing and checking, including, observation, calculation and comparison
- K19 the methods, techniques and procedures for tests and checks to establish compliance
- K20 how to select and use the correct tools and test equipment and confirm they are suitable for use and calibrated
- K21 your organisation's procedures for the use, care and control of inspection tools and equipment
- K22 the importance of calibrating tools and test equipment
- K23 how to interpret and analyse information from measuring instruments, including as appropriate, performing calculations
- K24 how to use test equipment so as to ensure true and accurate measurements are taken
- K25 the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards when working with and handling electronic devices
- K26 the types of damage or disturbance that could occur to operational equipment and how this could affect the safety of the operational railway
- K27 the types of defects or variations that could occur in telecoms systems
- K28 how defects and variations can affect the safety and performance of telecoms system
- K29 what constitutes a significant defect or variation in telecoms systems
- K30 the procedures for the control of a non-conforming component or asset and how to assess the safety implications
- K31 when independent testing is required
- K32 your organisation's procedures for the control of testing/checking
- K33 the relevant reporting lines and procedures that are approved by your organisation
- K34 the limits of your own authority and responsibility and those of others involved such as the Safe Work Leader (SWL)

## Unit 342

## Conduct specified testing of telecoms systems

### Supporting Information

#### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans (such as SSOWP)
- 1.5 SWL
- 1.6 authorised test plan
- 1.7 track access restrictions
- 1.8 track work instructions
- 1.9 track possession
- 1.10 task risk control sheets
- 1.11 current rule book
- 1.12 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.13 equipment disconnections
- 1.14 manual handling regulations
- 1.15 RIDDOR
- 1.16 safety sign regulations
- 1.17 PPE

2 Identify the access requirements related to two of the following types of site testing locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Conduct testing of one of the following types of telecom equipment:

- 3.1 transmission systems
- 3.2 bearer circuits
- 3.3 telecoms bearers carrying signalling circuits
- 3.4 SCADA
- 3.5 operational telephones

- 3.6 switches and systems (such as telephone exchanges & concentrators)
- 3.7 railway operational information systems
- 3.8 PA and CCTV
- 3.9 operational CCTV (such as OPO/DOO)
- 3.10 GSM-R
- 3.11 other industry specific telecom equipment

4 Use the following types of tools and equipment as applicable to the equipment being tested:

- 4.1 calibrated hand tools
- 4.2 un-calibrated hand tools
- 4.3 calibrated test leads/loads
- 4.4 computerised test equipment
- 4.5 test recording equipment
- 4.6 other specific telecom test equipment

5 Conduct the following tests as applicable to the type of telecom equipment being tested:

- 5.1 bandwidth
- 5.2 power
- 5.3 interference
- 5.4 attenuation
- 5.5 frequency
- 5.6 image quality
- 5.7 alignment
- 5.8 day/night settings
- 5.9 OTDR
- 5.10 psophometric
- 5.11 insertion loss measurement
- 5.12 data error rate
- 5.13 voltage
- 5.14 current
- 5.15 resistance
- 5.16 continuity
- 5.17 other industry specific telecoms tests

6 Ensure that testing activities comply with one of the following:

- 6.1 infrastructure guidelines and standard operating procedures
- 6.2 equipment manufacturer's documents
- 6.3 BS, ISO and/or BS EN standards
- 6.4 TMTM
- 6.5 authorised test plan
- 6.6 other industry specific telecom standards/specifications

7 Complete the relevant test records, to include one of the following, and pass it to the appropriate people:

7.1 job card

7.2 TMTH

7.3 test log and action report

7.4 company reporting procedures

7.5 other industry specific test records

## Unit 343

## Carry out replacement of components from telecoms assets

<b>Unit level:</b>	Level 3
<b>GLH:</b>	40

---

**Unit aim:**

This standard identifies the competences you need to carry out the replacement of components from telecoms systems and equipment as part of maintenance or fault finding, including the use of correct tools and equipment in accordance with your organisation's procedures. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.

You will be required to use the appropriate tools and equipment throughout the replacement activities, and to apply a range of connection methods and techniques to safely replace the components into the equipment, and to make safe any connections as appropriate to the components replaced. Where appropriate, you may also assist in working with computers or electronic controllers, making connections and replacing hardware components. The replacement activities will include making sure that any replacement telecoms components are approved and fit for purpose. This may include identifying and assessing the difference in like-for-like replacements parts and may range from superseded part numbers or descriptions, through modification stages, to functionally equivalent parts, which are sourced from different manufacturers.

Your responsibilities will require you to comply with organisational policy and procedures for the replacement activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the activities are removed from the work area on completion of the work, and that the relevant job/task documentation is completed accurately and legibly. You will be expected to work to instructions in conjunction with others or alone, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

The replacement activity may be carried out as a team effort, but you must demonstrate a significant personal contribution to the activities, in order to satisfy the requirements of the standard, and you must demonstrate competence in all the areas required by the standard.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying procedures for the replacement of components from telecoms equipment. You will have an understanding of the components being replaced and their connection requirements, in adequate depth to provide a sound basis for carrying out the replacement process safely and effectively.

You will understand the safety precautions required when carrying out the replacement activities, especially those for ensuring the safe isolation of services. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 identify and analyse any necessary changes to safety requirements on arriving at site, including prompt reporting to the relevant person(s)
- P3 source and interpret all relevant diagrams and specifications
- P4 obtain all the required component(s) and ensure that they are in a suitable condition for replacement and fit for purpose
- P5 check the replacement component(s) to ensure compliance with the required specification including confirming that the replacement component is compatible with the equipment/system
- P6 take adequate precautions to prevent damage to component(s) during replacement, including electrostatic protection if applicable
- P7 replace the component(s) in the correct sequence using appropriate tools and techniques
- P8 ensure that authorised practices are used where existing instructions are insufficient
- P9 ensure that the replacement is complete and that all components are free from damage including checking that all necessary connections to the equipment are complete
- P10 ensure that interference with other systems is minimised, and equipment and systems other than those being maintained are not disturbed without authority
- P11 make any necessary settings or adjustments to the component(s) to ensure they will function correctly
- P12 complete the replacement integrity checks in accordance with appropriate standards and that the completed work is to specification
- P13 observe sufficient operations of the asset to confirm it is functioning correctly

- P14 deal promptly and effectively with problems within your control and report those that cannot be resolved
- P15 complete all relevant documentation accurately and in accordance with your organisation's procedures
- 

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity such as the Safe System of Work Planner (SSOWP)
- K2 how to locate and safely access the site
- K3 how to locate and identify the equipment to be worked on
- K4 the isolation and lock-off procedure or permit-to-work procedure that applies to the system (such as electrical isolation, locking off switchgear, placing of warning notices, proving the isolation has been achieved and secured)
- K5 the classification of different voltage levels and the authority requirements for working on them
- K6 what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K7 how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
- K8 the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the removal activities
- K9 hazards associated with carrying out telecom component replacement activities (such as stored voltages, radio frequency radiation, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down procedures), and how to minimise these and reduce any risks
- K10 how to source, interpret and apply relevant technical information, standards, diagrams, instructions, specifications and schedules for maintenance of telecoms equipment
- K11 how to obtain and assess the required component(s) and ensure that they are fit for purpose, including assessing the compatibility of like-for-like components
- K12 the importance of making sure the component(s) orientation is correct before fitting and how to undertake this
- K13 the relevant methods, techniques and procedures to replace components and ensure they are fit for purpose
- K14 the implications of not following the methods and techniques for safe component handling
- K15 how to protect operational equipment from the replacement activity
- K16 your organisation's procedures for the use, care and control of tools and test equipment including calibration
-

- K17 the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards when working with and handling electronic devices
- K18 how to select the correct tools for the activity, including how to confirm that they are calibrated and stored correctly after use
- K19 how to identify the various types of connectors used and the correct tools and equipment to make the connections correctly
- K20 the different types of mounting, connecting and cable supporting systems used by the telecoms equipment
- K21 the correct mode of operation of the asset following replacement activities
- K22 when independent testing is required
- K23 how and when to carry out and the importance of integrity checks
- K24 how to identify, analyse and deal with influencing factors during the maintenance activities including environmental factors
- K25 your organisation's procedures for recording the replacement activity
- K26 the relevant reporting lines and procedures that are approved by your organisation
- K27 the limits of your own authority and responsibility and those of others involved (Safe Work Leader)

## Unit 343

# Carry out replacement of components from telecoms assets

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans (such as SSOWP)
- 1.5 SWL
- 1.6 track access restrictions
- 1.7 track work instructions
- 1.8 track possession
- 1.9 task risk control sheets
- 1.10 current rule book
- 1.11 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.12 equipment disconnections
- 1.13 manual handling regulations
- 1.14 RIDDOR
- 1.15 safety sign regulations
- 1.16 PPE

2 Identify the access requirements related to two of the following types of telecom site locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Carry out the replacement of components from two of the following types of telecom equipment:

- 3.1 transmission systems
- 3.2 bearer circuits
- 3.3 telecoms bearers carrying signalling circuits
- 3.4 SCADA
- 3.5 operational telephones
- 3.6 switches and systems (such as telephone exchanges & concentrators)

- 3.7 railway operational information systems
- 3.8 PA and CCTV
- 3.9 operational CCTV (such as OPO/DOO)
- 3.10 GSM-R
- 3.11 other industry specific telecom equipment

4 Use the following types of approved/calibrated tools and equipment as applicable to the components being replaced:

- 4.1 power tools
- 4.2 hand tools
- 4.3 wire and cable strippers/cutters
- 4.4 IDC tools
- 4.5 termination tools
- 4.6 wrenches
- 4.7 soldering irons
- 4.8 manual handling equipment

5 Connect the following types of connections during the replacement of the components as applicable to the type of equipment:

- 5.1 mechanical
- 5.2 soldered
- 5.3 IDC
- 5.4 optical
- 5.5 other specific type of termination/connection

6 Ensure that replacement activities comply with one of the following:

- 6.1 infrastructure guidelines and standard operating procedures
- 6.2 equipment manufacturer's documents
- 6.3 BS, ISO and/or BS EN standards
- 6.4 TMTH
- 6.5 other industry specific telecom standards/specifications

7 Complete the relevant replacement records, to include one of the following, and pass it to the appropriate people:

- 7.1 job card
- 7.2 TMTH
- 7.3 equipment logs and action report
- 7.4 company reporting procedures
- 7.5 other industry specific equipment records

## Unit 344

## Carry out removal of components from telecoms assets

<b>Unit level:</b>	Level 3
<b>GLH:</b>	40

---

**Unit aim:**

This standard identifies the competences you need to carry out the removal of components from telecoms systems and equipment as part of maintenance or fault finding, including the use of correct tools and equipment in accordance with your organisation's procedures. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.


You will be required to use the appropriate tools and equipment throughout the removal activities, and to apply a range of disconnection methods and techniques to safely remove the components from the equipment, and to make safe any connections as appropriate to the components removed. Where appropriate, you may also assist in working with computers or electronic controllers, making dis-connections and removing hardware components. The removal activities will include making sure that any removed telecoms components are moved and stored safely before it is repaired, refitted or disposed of.

Your responsibilities will require you to comply with organisational policy and procedures for the removal activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the activities are removed from the work area on completion of the work, and that the relevant job/task documentation is completed accurately and legibly. You will be expected to work to instructions in conjunction with others or alone, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

The removal activity may be carried out as a team effort, but you must demonstrate a significant personal contribution to the activities, in order to satisfy the requirements of the standard, and you must demonstrate competence in all the areas required by the standard.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying procedures for the removal of components from telecoms equipment. You will have an understanding of the components being removed and their disconnection requirements, in adequate depth to provide a sound basis for carrying out the removal process safely and effectively.

You will understand the safety precautions required when carrying out the removal activities, especially those for ensuring the safe isolation of services. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.



Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
  - P2 identify and analyse any necessary changes to safety requirements on arriving at site, including prompt reporting to the relevant person(s)
  - P3 locate and identify the component(s) to be removed
  - P4 source and interpret all relevant diagrams and specifications
  - P5 establish, and where appropriate, mark component(s) orientation for re-assembly
  - P6 ensure that any stored energy or substances are released safely and correctly
  - P7 label relevant wiring and components and note the configuration settings
  - P8 follow the required procedure for disconnection, when isolating the working area from other systems
  - P9 remove the required component(s) using approved procedures, tools and techniques and in a way that does not interfere with any operational railway systems
  - P10 use authorised practices where existing instructions are insufficient
  - P11 take suitable precautions to prevent damage to component(s) during removal
  - P12 check the condition of the removed component(s) and record those that will require replacing
  - P13 provide appropriate electrostatic protection for electronic equipment, where applicable
  - P14 store or discard the removed component(s) in line with your organisation's procedures
  - P15 ensure that interference with other systems is minimised, and equipment and systems other than those being maintained are not disturbed without authority
  - P16 deal promptly and effectively with problems within your control and report those that cannot be resolved
  - P17 complete all relevant documentation accurately and in line with your organisation's procedures
- 

## Learning outcome

The learner will:

K Knowledge and understanding

---

## Assessment criteria

The learner can:

- K1 the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity such as the Safe System of Work Planner (SSOWP)
- K2 how to locate and safely access the site
- K3 how to locate and identify the component(s) to be removed
- K4 the isolation and lock-off procedure or permit-to-work procedure that applies to the system (such as electrical isolation, locking off switchgear, placing of warning notices, proving the isolation has been achieved and secured)
- K5 the classification of different voltage levels and the authority requirements for working on them
- K6 what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K7 how to reduce the risks of an electric shock (such as insulated tools, rubber matting and isolating transformers)
- K8 the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the removal activities
- K9 hazards associated with carrying out telecom removal activities (such as stored voltages, radio frequency radiation, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down procedures), and how to minimise these and reduce any risks
- K10 how to source, interpret and apply relevant technical information, standards, diagrams, instructions, specifications and schedules for maintenance of telecoms equipment
- K11 the importance of marking the component(s) orientation for re-assembly and how to undertake this
- K12 the relevant methods, techniques and procedures for component removal and handling
- K13 the implications of not following the methods and techniques for safe component handling
- K14 the types of component defects that could occur
- K15 your organisation's procedures for the use, care and control of tools and test equipment including calibration
- K16 the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards when working with and handling electronic devices
- K17 how to select the correct tools for the activity, including how to confirm that they are calibrated and stored correctly after use
- K18 how to identify the various types of connectors used and the correct tools and equipment to make the disconnections correctly
- K19 the different types of mounting, connecting and cable supporting systems used by the telecoms equipment
- K20 how to label and store removed component(s) for re-use, repair or disposal
- K21 how to respond to influencing factors whilst carrying out the maintenance tasks, including environmental factors
- K22 your organisation's procedures for recording the removal activity

- K23 the relevant reporting lines and procedures that are approved by your organisation
- K24 the limits of your own authority and responsibility and those of others involved (Safe Work Leader)

## Unit 344

# Carry out removal of components from telecoms assets

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans (such as SSOWP)
- 1.5 SWL
- 1.6 track access restrictions
- 1.7 track work instructions
- 1.8 track possession
- 1.9 task risk control sheets
- 1.10 current rule book
- 1.11 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.12 equipment disconnections
- 1.13 manual handling regulations
- 1.14 RIDDOR
- 1.15 safety sign regulations
- 1.16 PPE

2 Identify the access requirements related to two of the following types of telecom site locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Carry out the removal of components from two of the following types of telecom equipment:

- 3.1 transmission systems
- 3.2 bearer circuits
- 3.3 telecoms bearers carrying signalling circuits
- 3.4 SCADA
- 3.5 operational telephones
- 3.6 switches and systems (such as telephone exchanges & concentrators)

- 3.7 railway operational information systems
- 3.8 PA and CCTV
- 3.9 operational CCTV (such as OPO/DOO)
- 3.10 GSM-R
- 3.11 other industry specific telecom equipment

4 Use the following types of approved/calibrated tools and equipment as applicable to the components being removed:

- 4.1 power tools
- 4.2 hand tools
- 4.3 wire and cable strippers/cutters
- 4.4 IDC tools
- 4.5 termination tools
- 4.6 wrenches
- 4.7 soldering irons
- 4.8 manual handling equipment

5 Disconnect the following types of connections during the removal of the components as applicable to the type of equipment:

- 5.1 mechanical
- 5.2 soldered
- 5.3 IDC
- 5.4 optical
- 5.5 other specific type of termination/connection

6 Ensure that removal activities comply with one of the following:

infrastructure guidelines and standard operating procedures

- 6.1 equipment manufacturer's documents
- 6.2 BS, ISO and/or BS EN standards
- 6.3 TMTH
- 6.4 other industry specific telecom standards/specifications

7 Complete the relevant removal records, to include one of the following, and pass it to the appropriate people:

- 7.1 job card
- 7.2 TMTH
- 7.3 equipment logs and action report
- 7.4 company reporting procedures
- 7.5 other industry specific equipment records

## Unit 345

# Adjust telecoms components and equipment to meet operational requirements

<b>Unit level:</b>	Level 3
<b>GLH:</b>	40

---

**Unit aim:**

This standard identifies the competences you need to carry out the adjustment of operational telecoms components and equipment as part of maintenance or fault finding activities, including the use of correct tools and equipment in accordance with your organisation's procedures. The telecoms equipment in this standard can be for over ground or underground rail transportation systems.


You will be required to use the appropriate tools and equipment throughout the adjusting activities, and to apply a range of methods and techniques to adjust the components and equipment. Where appropriate, you may also work with computers or electronic controllers, making connections, adjusting hardware and loading and updating software. The activities will include making checks and adjustments, in line with your permitted authority, and working with others to ensure that the adjusted components and equipment functions to the required specification.

Your responsibilities will require you to comply with organisational policy and procedures for the adjustment activities undertaken, and to report any problems with the activities, tools or equipment used that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You must check that all tools, equipment and materials used in the adjustment activities are removed from the work area on completion of the work, and that the relevant job/task documentation is completed accurately and legibly. You will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

The adjustment activity may be carried out as a team effort, but you must demonstrate a significant personal contribution to the activities, in order to satisfy the requirements of the standard, and you must demonstrate competence in all the areas required by the standard.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will enable you to adopt an informed approach to applying procedures for the adjustment of telecoms components and equipment. You will have a good understanding of the equipment being adjusted, in adequate depth to provide a sound basis for carrying out the process safely and effectively.

You will understand the safety precautions required when carrying out the adjustment activities, especially those for ensuring the safe isolation of services. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.



Safety is a key theme throughout this standard and you will be able to identify all the necessary safety requirements and take the relevant action to ensure the safety of yourself, others and railway operations.

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 identify and analyse any necessary changes to safety requirements on arriving at site, and comply with operational requirements, including prompt reporting to the relevant person(s)
- P3 identify the area of work and the components/equipment which is to be adjusted
- P4 source and interpret the appropriate documentation and operating specifications for the equipment being adjusted
- P5 identify and correctly use the relevant tools, test equipment and measuring instruments
- P6 carry out adjustments within the limits of your own authority
- P7 make the required adjustments in the specified sequence and in an agreed timescale
- P8 confirm that the adjusted components/equipment meet the required operating specification
- P9 identify, evaluate and report any instances where the equipment fails to meet the required performance after adjustments or where there are identified defects outside the required adjustments
- P10 complete the relevant integrity checks in line with your organisation's procedures
- P11 identify and report any defects promptly, and agree a suitable course of action with the relevant person(s)
- P12 identify relevant authorisation changes, where urgent action is required, these may include the extension of possessions or the setting up of additional protection arrangements
- P13 use alternative authorised adjustment practices where existing instructions are insufficient
- P14 observe sufficient operations of the components and equipment to confirm it is functioning correctly
- P15 maintain documentation in accordance with your organisation's procedures
- P16 deal promptly and effectively with problems within your control and report those which cannot be resolved

---

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity such as the Safe System of Work Planner (SSOWP)
- K2 how to locate and safely access the site
- K3 how to check authorisation is in place for maintenance activities
- K4 how to secure the system in preparation for the activity
- K5 how to protect operational equipment from the adjustment activity
- K6 the isolation and lock-off procedure or permit-to-work procedure that applies to the system (such as electrical isolation, locking off switchgear, placing of warning notices, proving the isolation has been achieved and secured)
- K7 the classification of different voltage levels and the authority requirements for working on them
- K8 what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K9 how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
- K10 the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities
- K11 hazards associated with carrying out telecom maintenance activities (such as stored voltages, radio frequency radiation, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down procedures), and how to minimise these and reduce any risks
- K12 how to locate and identify the equipment to be worked on
- K13 how to source, interpret and apply relevant technical information, standards, diagrams, instructions, specifications and schedules for the adjustment of telecoms equipment
- K14 the relevant methods, techniques and procedures for the adjustment of telecoms components and equipment
- K15 the types of operational constraints that could occur when carrying out the adjustments
- K16 the activities which may compromise system functionality and integrity, including disturbing other equipment and systems without authority
- K17 the correct mode of operation of telecoms asset to be adjusted
- K18 what constitutes a component/equipment defect and the implication on safety and performance
- K19 how to check the adjustment activity to ensure compliance with the original specification
- K20 the importance of integrity checks, including how and when they should be carried out
- K21 your organisation's procedures for recording adjustment details

- K22 your organisation's procedures for the use, care and control of tools and equipment including calibration
- K23 the procedures and precautions to be adopted to eliminate Electrostatic Discharge (ESD) hazards when working with and handling electronic devices
- K24 the relevant reporting lines and procedures that are approved by your organisation
- K25 the limits of your own authority and responsibility and those of others involved such as the Safe Work Leader (SWL)

## Unit 345

# Adjust telecoms components and equipment to meet operational requirements

## Supporting Information

### ***Unit Range Description***

1 Follow the health and safety legislation, regulations and safe working practices and procedures, from the following as applicable to the work location and activities:

- 1.1 your organisation's safety management system
- 1.2 relevant sections of the HASWA
- 1.3 COSHH
- 1.4 safe work plans (such as SSOWP)
- 1.5 SWL
- 1.6 track access restrictions
- 1.7 track work instructions
- 1.8 track possession
- 1.9 task risk control sheets
- 1.10 current rule book
- 1.11 regulations for working under OHLE and in the vicinity of DC lines (where appropriate)
- 1.12 equipment disconnections
- 1.13 manual handling regulations
- 1.14 RIDDOR
- 1.15 safety sign regulations
- 1.16 PPE

2 Identify the access requirements related to two of the following types of site equipment locations:

- 2.1 trackside
- 2.2 internal (such as signal box, equipment room)
- 2.3 areas to which the public have access
- 2.4 confined spaces
- 2.5 elevated structures

3 Carry out the adjustment of two of the following types of telecom equipment:

- 3.1 transmission systems
- 3.2 bearer circuits
- 3.3 telecoms bearers carrying signalling circuits
- 3.4 SCADA
- 3.5 operational telephones
- 3.6 switches and systems (such as telephone exchanges & concentrators)

- 3.7 railway operational information systems
- 3.8 PA and CCTV
- 3.9 operational CCTV (such as OPO/DOO)
- 3.10 GSM-R
- 3.11 other industry specific telecom equipment

4 Use the following types of tools and equipment as applicable to the equipment being maintained:

- 4.1 power tools
- 4.2 hand tools
- 4.3 wire and cable strippers
- 4.4 IDC tools (such as punch down tool)
- 4.5 crimping tools
- 4.6 multi-meters
- 4.7 adjustment equipment
- 4.8 measuring equipment
- 4.9 alignment equipment
- 4.10 test equipment
- 4.11 other specific telecoms maintenance tools/equipment

5 Carry out the following adjustment activities as applicable to the equipment being maintained:

- 5.1 electrical measurements and adjustments
- 5.2 electronic measurements and adjustments
- 5.3 mechanical measurements and adjustments
- 5.4 other specific telecom adjustment activity

6 Ensure that the maintenance activities comply with one of the following:

- 6.1 infrastructure guidelines and standard operating procedures
- 6.2 equipment manufacturer's documents
- 6.3 BS, ISO and/or BS EN standards
- 6.4 TMTM
- 6.5 other industry specific telecom standards/specifications

7 Complete the relevant maintenance records, to include one of the following, and pass it to the appropriate people:

- 7.1 job card
- 7.2 TMTM
- 7.3 maintenance log and action report
- 7.4 company reporting procedures
- 7.5 other industry specific maintenance records

## Unit 346

# Carry out technical assessment of electrification and plant

<b>Unit level:</b>	Level 3
<b>GLH:</b>	50
<b>Unit aim:</b>	<p>This unit is about carrying out technical assessments of contact systems (OHLE, Conductor rails) in the rail engineering industry. This could include intrusive or non-intrusive inspection or other methods appropriate for the asset type which may be routine. At all times the inspection or other methods must be approved by your organisation.</p> <p>This unit consists of one element:</p> <ol style="list-style-type: none"><li>1. Carry Out Technical Assessment of Electrification and Plant</li></ol> <p>This element is about carrying out technical assessment of contact systems (OHLE, Conductor rails) in the rail industry to ensure that the system is fit for purpose and complies with specifications.</p> <p>This could include intrusive or non-intrusive inspection or other methods such as testing and monitoring, appropriate for the asset type.</p> <p>The contact systems could include all aspects of overhead line electrification equipment and conductor rails.</p> <p>The assets are mainly electrical but the activity could include one or more structural and/or mechanical components.</p> <p>The types of activities could vary and will generally be multi stage processes. At all times you will be working within the limits of your own responsibility and will report any instances where the activities cannot be achieved to the relevant person(s). This may include following reporting, recording and escalating procedures.</p> <p>This unit is for those individuals who are required to restore contact systems to operational condition.</p>

---

### Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
  - P2 source and interpret the relevant specifications for the system, product or asset being assessed, including any previous assessment information, if applicable
  - P3 identify, analyse and determine the sequence of the assessment activities to be undertaken
  - P4 identify the components and/or equipment to be assessed
  - P5 carry out assessment activities in a manner that minimises the interference with other systems and equipment, within the limits of your own authority
  - P6 carry out the assessment activities in the specified sequence and in an agreed timescale
  - P7 establish the operational condition of the equipment
  - P8 identify and assess any defects or variations from the specification and take appropriate action
  - P9 complete relevant documentation accurately and pass them on to the appropriate person(s), if applicable
  - P10 report any instances where the assessment activities cannot be fully met or where there are identified defects outside the planned activities
  - P11 identify where the operational condition of the contact system may affect the functional integrity and safety of the operational system
- 

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 the relevant health and safety legislation, regulations and safe working practices and procedures as defined by your organisation
  - K2 how to source and interpret specifications and instructions that are approved by your organisation, including any previous assessment data, if applicable
  - K3 how to identify discrepancies in specifications and instructions, including, as appropriate version control
  - K4 how to identify and analyse the assessment activities to be undertaken
  - K5 how to identify the components, systems and/or equipment to be assessed
  - K6 your organisation's methods and techniques for carrying out assessment activities relevant to your role
  - K7 the importance of carrying out activities in the specified sequence and agreed timescale and in a manner that minimises the interference with other systems and equipment
  - K8 how to establish the operational condition of the contact system
-

- K9 the types of defects or variations that could occur and how to compare these to the specification
- K10 how and when assessment activities cannot be completed
- K11 the implications of when assessment activities cannot be completed
- K12 the types of conditions that would impact on the functional integrity and safety of the operational system
- K13 the relevant reporting lines and procedures that are approved by your organisation the limits of your own authority and responsibility and those of others involved

**Unit 346**

**Carry out technical assessment of  
electrification and plant**

Supporting Information

## Unit 348

# Carry out installation of railway electrification equipment and components

<b>Unit level:</b>	Level 3
<b>GLH:</b>	70
<b>Unit aim:</b>	<p>This unit is about installing, positioning and securing electrification and plant equipment and components correctly and making the necessary connections in accordance with policies and procedures. This unit contains one element:</p> <p>This element is about installing, positioning and securing electrification and plant equipment and components correctly and making the necessary connections in accordance with your organisation's procedures. You will generally be performing single stage processes.</p> <p>The types of equipment and components may include:</p> <ul style="list-style-type: none"><li>• Contact and catenary wire</li><li>• Insulators</li><li>• Droppers</li></ul> <p>These may also be in one or more of the following areas:</p> <ul style="list-style-type: none"><li>• Structural</li><li>• Mechanical</li><li>• Electrical</li></ul> <p>The equipment and components will be sub-sets of the following assets</p> <ul style="list-style-type: none"><li>• Contact Systems (OLE, Conductor rails)</li><li>• Power Supply Equipment</li></ul> <p>Types of installation activities may include:</p> <ul style="list-style-type: none"><li>• Replacing insulators</li><li>• Replacing droppers</li></ul> <p>At all times you will be working to within the limits of your own responsibility and report any instances where the activities cannot be achieved to the relevant person(s).</p> <p>This unit is for those who carry out installation of electrification and plant equipment and components.</p>

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 follow the relevant installation schedules and instructions to carry out the required activities
- P3 ensure that all equipment and components are free from damage
- P4 carry out the installation activities within the limits of your own authority
- P5 carry out the installation activities in the specified sequence and in an agreed timescale
- P6 report any instances where the installation activities cannot be fully met or where there are identified defects outside the planned schedule
- P7 complete relevant records accurately and pass them on to the appropriate person(s), if applicable
- P8 dispose of waste materials in line with your organisation's procedures

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as defined by your organisation
- K2 explain how to follow installation schedules and instructions that are approved by your organisation
- K3 describe the types of defects that could occur in equipment and components
- K4 describe your organisation's methods and techniques for carrying out installation activities relevant to your role
- K5 explain the importance of carrying out installation activities in the specified sequence and agreed timescale
- K6 explain your organisation's procedures for waste disposal
- K7 explain the relevant reporting lines and procedures that are approved by your organisation
- K8 describe the limits of your own authority and responsibility and those of others involved

## **Unit 348**

# **Carry out installation of railway electrification equipment and components**

## Supporting Information

## Unit 349

# Carry out maintenance on railway electrification equipment and components

<b>Unit level:</b>	Level 3
<b>GLH:</b>	80

---

**Unit aim:**

This unit is about carrying out maintenance activities on electrification and plant equipment and components. The activities may be routine and include preventative and corrective maintenance activities. It could also involve adjusting, replacing and dismantling electrification and plant equipment and components.

This unit consist of one element.

This element is about carrying out maintenance on electrification and plant equipment and components and may also include inter-connections which may include preventative and corrective maintenance activities. The activities will be routine and may involve adjusting, replacing and dismantling electrification and plant equipment and components. The types of equipment, components and inter-connections may include:

1. conductors (overhead wires and rails)
2. support and registration assemblies
3. in span equipment such as section insulators and neutral section
4. contact and catenary wire
5. earthing and bonding cables and connectors
6. insulators
7. foundations
8. support structures such as masts and portals
9. droppers

These may also be in one or more of the following areas:

1. structural
2. mechanical
3. electrical

The equipment, components and interconnections will be sub-sets of the following assets:

1. contact Systems (OLE, Conductor rails)
2. power supply equipment


Examples of maintenance activities may include:

1. lubrication
2. cleaning and security of equipment such as, insulation, signage, guarding

Examples of replacement techniques may include:

1. crimping
2. fastening
3. rail drilling
4. using tensioning rigs

The types of maintenance activities will be both planned and unplanned but will generally be single stage processes. At all times you will be working to within the limits of your own responsibility



and report any instances where the maintenance activities cannot be achieved to the relevant person(s).

This unit is for those operatives undertaking electrification and plant engineering.

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 follow the relevant maintenance schedules and instructions to carry out the required activities
- P3 carry out the maintenance activities within the limits of your own authority
- P4 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P5 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P6 complete relevant maintenance records accurately and pass them on to the appropriate person(s), if applicable
- P7 dispose of waste materials in line with your organisation's procedures

---

### Learning outcome

The learner will:

K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as defined by your organisation
- K2 explain how to follow maintenance schedules and instructions that are approved by your organisation
- K3 describe your organisation's methods and techniques for carrying out maintenance activities relevant to your role

- K4 explain the importance of carrying out maintenance activities in the specified sequence and agreed timescale
- K5 describe your organisation's procedures for waste disposal
- K6 describe the relevant reporting lines and procedures that are approved by your organisation
- K7 describe the limits of your own authority and responsibility and those of others involved

**Unit 349**

**Carry out maintenance on railway  
electrification equipment and components**

Supporting Information

## Unit 350

# Transfer responsibility of railway electrification equipment and components

<b>Unit level:</b>	Level 3
<b>GLH:</b>	60
<b>Unit aim:</b>	<p>This unit is about the transfer of responsibility of electrification and plant equipment and components, having confirmed they are fit for entry into the operational system. It also covers the transfer of responsibility for the operation of the equipment.</p> <p>This unit consists of one element:</p> <p>This element is about transferring responsibility of electrification and plant equipment and components following maintenance, fault finding or installation work. You will be able to provide suitable and sufficient evidence to confirm the operational status of the equipment and/or components including recommending whether the:</p> <ol style="list-style-type: none"><li>1. system is fit for entry into service</li><li>2. system is fit for entry into restricted service</li><li>3. system is not fit for entry into service</li></ol> <p>You will ensure that the equipment and/or components are transferred back only after sufficient evidence exists to ensure safe working and the information supplied accurately and clearly identifies the operational status of the equipment and/or components.</p> <p>This unit is for those who transfer responsibility of electrification and plant equipment and components.</p>

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines

- P2 confirm and define the condition of the engineering equipment and/or components in accordance with the specification
  - P3 ensure that all tasks, tests and checks have been completed in accordance with your organisation's procedures
  - P4 confirm that everyone involved accepts the equipment and/or component is in a satisfactory condition for transfer of responsibility to take place
  - P5 identify any unusual features, defects or discrepancies relating to the condition of the equipment and/or component
  - P6 make the transfer of responsibility and obtain agreement between everyone involved on the precise moment of transfer of responsibility
  - P7 make sure that clear, accurate and complete records of the transfer are made
- 

### **Learning outcome**

The learner will:

- K Knowledge and understanding

### **Assessment criteria**

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as appropriate to the activity
- K2 describe your organisation's procedures for transfer of responsibility of equipment and/or components
- K3 explain how to determine the condition of the equipment and/or components prior to transfer of responsibility
- K4 explain your organisation's requirements for the completion of work and testing activities prior to returning equipment to operational service
- K5 describe what constitutes an unacceptable equipment or component condition
- K6 describe the implications of when transfer of responsibility activities cannot be completed
- K7 explain the relevant reporting lines and procedures that are approved by your organisation
- K8 describe the limits of your own authority and how to deal with situations that go beyond such authority

**Unit 350**

**Transfer responsibility of railway  
electrification equipment and components**

Supporting Information

## Unit 351

# Allocate and monitor resources for railway electrification engineering activities

<b>Unit level:</b>	Level 3
<b>GLH:</b>	100
<b>Unit aim:</b>	<p>This unit is about allocating and monitoring resources for effective electrification and plant engineering activities. You will be able to work to a plan, identify and allocate the resources required and source information regarding those resources. You will monitor the use of resources and ensure that there are sufficient resources available for the activities to be undertaken and that resources are used safe, appropriate and timely manner. Where changes in resources or activities occur you will be able to challenge when a plan or resource allocation may need amending.</p> <p>This unit consists of one element:</p> <p>This element is about allocating and monitoring resources for electrification and plant engineering activities which may be routine and could involve installing, adjusting, replacing and dismantling electrification and plant assets.</p> <p>Examples of the types of resources may include:</p> <ol style="list-style-type: none"><li>1. documentation – current and appropriate</li><li>2. tools, plant and test equipment- calibrated and serviceable</li><li>3. materials, replacement equipment and consumables</li><li>4. communications equipment</li><li>5. personnel - total required and their competence</li></ol> <p>You will be aware of your own responsibility for the care and use of resources and will be able to advise team members accordingly. You will take into account the time the system will be available for the task when considering resources and also any influencing factors such as, environmental, site conditions and the additional requirements for working on operational railway equipment. Identifying inaccuracies and the non-availability of resources and being able to take appropriate remedial action are key to this element.</p> <p>You will be able to ensure that your organisation’s procedures are met and followed by yourself and those for whom you are responsible.</p> <p>This unit is for individuals who are responsible for allocating and monitoring resources.</p>

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with your organisation's procedures
- P2 confirm the resources required
- P3 ensure sufficient resources are available
- P4 ensure resource information and documentation is up-to-date and in line with your organisation's procedures
- P5 allocate resources effectively
- P6 monitor the use of resources
- P7 identify when changes to the planned use of resources may occur
- P8 take prompt and effective action to deal with actual and predicted changes to the planned use of resources
- P9 advise the appropriate person(s) where changes to resources have occurred or are likely to occur and the implications involved
- P10 ensure that those using resources are aware of their responsibilities for the care and use of the resources
- P11 record details on the use of resources including where appropriate any changes that have occurred

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as defined by your organisation
- K2 describe the types of resources available
- K3 explain your organisation's methods and techniques for ensuring sufficient resources
- K4 explain your organisation's methods and techniques for allocating resources
- K5 explain how to source and interpret information and document systems relating to the engineering activity
- K6 explain how to source and interpret the required documentation on resources

- K7 describe the types of problems that can occur when allocating resources and how these problems can be overcome
- K8 describe how the planned use of resources could alter and the implications that may follow
- K9 describe your organisation's methods and techniques for effective monitoring of resources
- K10 explain your organisation's procedures for the care and use of resources
- K11 describe your organisation's methods and techniques for communicating a change to resource allocation
- K12 explain the relevant reporting lines and procedures that are approved by your organisation
- K13 describe the limits of your own authority and responsibility and those of others involved

**Unit 351**

**Allocate and monitor resources for railway  
electrification engineering activities**

Supporting Information

*Evidence requirements*

## Unit 352

# Isolate and earth contact systems to meet defined isolation requirements in the rail engineering industry

<b>Unit level:</b>	Level 3
<b>GLH:</b>	70
<b>Unit aim:</b>	<p>This unit is about restoring the contact systems (OHLE, Conductor rails) to operational condition in the rail engineering industry. This includes assessing the condition of the contact system and mode of failure following a de-wirement and undertaking re-construction work to restore the contact system to full operational capability.</p> <p>This unit consists of one element:</p> <ol style="list-style-type: none"><li>1. Restore the contact systems to operational condition in the rail engineering industry</li></ol> <p>This element is about restoring the contact system to operational condition, including assessing, determining the cause and re-constructing the contact system assets to full operational capacity.</p> <p>The contact systems could include all aspects of overhead line electrification equipment and conductor rails.</p> <p>The assets are mainly electrical but the restoration activity could include one or more structural and/or mechanical components.</p> <p>The types activities could vary and will generally be multi stage processes. At all times you will be working within the limits of your own responsibility and will report any instances where the activities cannot be achieved to the relevant person(s). This may include following reporting, recording and escalating procedures.</p> <p>This unit is for those individuals who are required to restore contact systems to operational condition.</p>

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

- P1 set up a safe system of work and work to the system
  - P2 source and interpret the relevant information relating to the contact system and the location of the isolation and earthing activity
  - P3 identify and determine the sequence of the isolation and earthing activities to be undertaken
  - P4 identify and confirm the required isolation and earthing methods and procedures
  - P5 carry out the required isolation and earthing activities in the specified sequence and in agreed timescales
  - P6 confirm the isolating and earthing activities have been completed within the limits of own authority
  - P7 report any instances where the activities cannot be fully met or where there are identified defects outside the planned activities
  - P8 complete relevant documentation accurately and pass them on to the appropriate person(s), if applicable
- 

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the relevant health and safety working practices appropriate to the activity and organisation
  - K2 describe how to source and interpret information relating to the contact system, including operational activity as appropriate
  - K3 describe how to identify the sequence of testing and earthing activities to be undertaken
  - K4 describe own organisation's methods and procedures for carrying out isolation activities
  - K5 describe own organisation's methods and procedures for carrying out testing and earthing activities
  - K6 describe the importance of carrying out activities in the specified sequence and agreed timescale
  - K7 describe why and when activities cannot be completed
  - K8 describe the implications of not reporting instances of where the activities cannot be fully completed
  - K9 describe the relevant reporting lines and procedures that are approved by own organisation
  - K10 explain the limits of own authority and responsibility and those of others involved in the activity
-

## **Unit 352**

# **Isolate and earth contact systems to meet defined isolation requirements in the rail engineering industry**

## Supporting Information

## Unit 353

## Restore the contact systems

<b>Unit level:</b>	Level 3
<b>GLH:</b>	50
<b>Unit aim:</b>	<p>This unit is about restoring the contact systems (OHLE, Conductor rails) to operational condition in the rail engineering industry. This includes assessing the condition of the contact system and mode of failure following a de-wirement and undertaking re-construction work to restore the contact system to full operational capability.</p> <p>This unit consists of one element:</p> <ol style="list-style-type: none"><li>1. Restore the contact systems to operational condition in the rail engineering industry</li></ol> <p>This element is about restoring the contact system to operational condition, including assessing, determining the cause and re-constructing the contact system assets to full operational capacity.</p> <p>The contact systems could include all aspects of overhead line electrification equipment and conductor rails.</p> <p>The assets are mainly electrical but the restoration activity could include one or more structural and/or mechanical components.</p> <p>The types activities could vary and will generally be multi stage processes. At all times you will be working within the limits of your own responsibility and will report any instances where the activities cannot be achieved to the relevant person(s). This may include following reporting, recording and escalating procedures.</p> <p>This unit is for those individuals who are required to restore contact systems to operational condition.</p>

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

P1 work safely at all times, complying with your organisation's procedures

---

- P2 source and interpret the relevant specifications
  - P3 identify, analyse and determine the sequence of the restoration activities to be undertaken
  - P4 identify the components and/or equipment to be restored
  - P5 carry out the restoration activities within the limits of your own authority
  - P6 carry out the restoration activities in the specified sequence and in an agreed timescale
  - P7 establish the operational condition of the contact system
  - P8 complete relevant documentation accurately and pass them on to the appropriate person(s), if applicable
  - P9 identify where the operational condition of the contact system may affect the functional integrity and safety of the operational system
  - P10 report any instances where the restoration activities cannot be fully met
- 

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the relevant health and safety legislation, regulations and safe working practices and procedures as defined by your organisation
- K2 explain how to source and interpret specifications and instructions that are approved by your organisation
- K3 describe how to identify discrepancies in specifications and instructions, including as appropriate, version control
- K4 describe how to identify and analyse the restoration activities to be undertaken
- K5 describe how to identify the components and/or equipment to be restored
- K6 explain your organisation's methods and techniques for carrying out restoration activities relevant to your role
- K7 explain the importance of carrying out activities in the specified sequence and agreed timescale
- K8 explain how to establish the operational condition of the contact system
- K9 describe the implications of when restoration activities cannot be completed
- K10 describe the types of conditions that would impact on the functional integrity and safety of the operational system
- K11 explain the relevant reporting lines and procedures that are approved by your organisation
- K12 describe the limits of your own authority and responsibility and those of others involved

## Unit 353

## Restore the contact systems

### Supporting Information

## Unit 354

## Hand over and confirm completion of traction and rolling stock maintenance activities

<b>Unit level:</b>	Level 3
<b>GLH:</b>	50

---

**Unit aim:**

This standard identifies the competences you need to hand over traction and rolling stock that has been repaired, or on which some form of maintenance activity has taken place, and to confirm that it is now ready to return to service. Following the maintenance activity, you will be required to, either set up the equipment and hand it over to another person to complete the required start-up procedures, or complete the run-up operation yourself, ensuring that the equipment is ready for operation before handover. This will involve checking that all the required equipment and safety devices are operable and correctly set and/or calibrated, and that the equipment functions safely and correctly to the required specification. The term traction and rolling stock used in this standard applies to passenger, freight and on-track machinery (OTM).

On handing over the equipment, you will be expected to highlight any new, current or changed operating features of the equipment, and to inform the appropriate person of any future maintenance requirements. You must also ensure that you receive confirmation that everyone involved in the handover accepts that the maintained equipment is in a satisfactory condition to return to service.

Your responsibilities will require you to comply with organisational policy and procedures for the handover activities undertaken, and to report any problems with the handing over procedure 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 maintenance handover procedures. You will understand the equipment being handed over, and its application, and will know about the operating procedures and potential problems, in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 confirm that everyone involved accepts the traction and rolling stock is in a satisfactory condition for handover to take place
- P3 clearly identify any unusual features of the condition of the traction and rolling stock
- P4 carry out the handover and obtain agreement between everyone involved on the precise moment of transfer of responsibility
- P5 deal promptly and effectively with problems within your control and report those that you cannot solve
- P6 complete the relevant records/documents of the handover

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the health and safety requirements of the area in which the handover is to take place, and the responsibility they place on you
- K2 explain the isolation and lock-off procedure or permit-to-work procedure that applies to the equipment being maintained
- K3 describe the specific health and safety precautions to be applied during the handover procedure, and their effects on others
- K4 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) whilst operating/using the equipment during the handover operations and where it may be obtained
- K5 describe the checking process to be followed before handing over the equipment (such as are the safety and quality systems operable, does the equipment function to specification)
- K6 describe the appropriate handover procedure, depending on the maintenance activity carried out (repair, modification, preventative maintenance, scheduled servicing)
- K7 explain the procedure for involving the appropriate people when operating/using the equipment

- K8 explain the need to highlight, where appropriate, any new, current or changed operating features of the maintained or installed equipment
- K9 explain the importance of informing the appropriate person of any future maintenance requirements
- K10 explain the need to confirm that the other person understands how to use/operate the equipment before handing the equipment over to them
- K11 explain the need to ensure that the person you are handing over the equipment to accepts that it is in a satisfactory condition
- K12 describe the organisational documentation procedures to be used with regard to the handover
- K13 describe how to create and maintain effective working relationships with appropriate people (such as encouraging, helping, politeness, open discussions both ways)
- K14 describe the problems that can occur during handover, and how they can be overcome
- K15 describe the extent of your own authority and to whom you should report if you have problems that you cannot resolve

## Unit 354

# Hand over and confirm completion of traction and rolling stock maintenance activities

## Supporting Information

### ***Unit Range Description***

- 1 Confirm that the equipment is ready for service by carrying out all of the following checks, as applicable to the equipment being handed over:
  - 1.1 the maintenance activity has been completed and the equipment functions to specification work
  - 1.2 all safety systems or features are functioning correctly
  - 1.3 any waste materials, safety barriers and warning signs have been removed (where appropriate)
  - 1.4 any auxiliary systems or equipment involved are connected and operable
  - 1.5 any environmental controls are operable (where appropriate)
  - 1.6 others involved in using the equipment are aware that the equipment is about to be operated/used
  
- 2 Carry out correct handover procedures for one type of equipment/service from the following:
  - 2.1 mechanical equipment
  - 2.2 electrical equipment
  - 2.3 electronic-communication equipment
  - 2.4 fluid power equipment
  - 2.5 process control/instrumentation and control equipment
  - 2.6 environmental control equipment
  - 2.7 other specific equipment
  
- 3 Carry out all of the following during the handover procedures:
  - 3.1 operate/use the maintained equipment through a complete cycle in the presence of the appropriate person
  - 3.2 confirm that the other person accepts that the equipment functions satisfactorily to specification
  - 3.3 highlight to the appropriate person any modifications that would result in unusual features in the operating procedure
  - 3.4 inform the appropriate person of any future maintenance activities that may be required
  - 3.5 obtain agreement from the other person that they now accept responsibility for the equipment to be returned to service
  - 3.6 complete any necessary handover documentation
  - 3.7 confirm the other person knows how and who to contact for future maintenance requirements

- 4 Carry out handover procedures to one of the following:
  - 4.1 driver
  - 4.2 maintenance supervisor
  - 4.3 team leader
  - 4.4 other specific person
  
- 5 Carry out the handover following two of the following maintenance activities:
  - 5.1 breakdown
  - 5.2 scheduled servicing
  - 5.3 preventative maintenance activity
  - 5.4 modification to equipment
  
- 6 Complete the relevant paperwork/records from one of the following, and pass it to the appropriate people:
  - 6.1 job card
  - 6.2 company-specific documentation
  - 6.3 maintenance log or report
  - 6.4 other specific handover records

## Unit 355

## Carry out fault diagnosis on traction and rolling stock systems

<b>Unit level:</b>	Level 3
<b>GLH:</b>	50

---

**Unit aim:**

This standard identifies the competences you need to carry out fault diagnosis on traction and rolling stock systems, in accordance with approved procedures. You will be required to diagnose faults on a traction and rolling stock system involving the following interactive technologies: mechanical, electrical, fluid power or process controller, at sub-assembly/component level. 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 evidence gained, you will be expected to identify the fault and its probable cause, and to suggest appropriate action to remedy the problem. The term traction and rolling stock used in this standard applies to passenger, freight and on-track machinery (OTM).

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 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 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. You will be required to demonstrate safe working practices throughout.

---

**Learning outcome**

The learner will:

P Performance requirements

**Assessment criteria**

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
  - P2 review and use all relevant information on the symptoms and problems associated with the products or assets
  - P3 investigate and establish the most likely causes of the faults
  - P4 select, use and apply diagnostic techniques, tools and aids to locate faults
  - P5 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved
  - P6 determine the implications of the fault for other work and for safety considerations
  - P7 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault
  - P8 record details on the extent and location of the faults in an appropriate format
- 

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the health and safety requirements of the area in which you are carrying out the fault diagnosis activities, and the responsibility these requirements place on you
  - K2 describe the specific safety precautions to be taken when carrying out the fault diagnosis of the particular engineered system
  - K3 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the maintenance activities (such as electrical isolation, locking off switchgear, placing of maintenance warning notices, proving the isolation has been achieved and secured)
  - K4 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the fault diagnosis activities, the type of safety equipment to be used and where to obtain it
  - K5 describe the hazards associated with carrying out fault diagnosis on engineered systems (such as handling fluids, stored pressure/force, electrical contact, electrical/electronic interfaces, using faulty or damaged tools and equipment, using practices and procedures that do not follow laid-down procedures), and how to minimise these and reduce any risks
  - K6 explain the classification of different voltage levels and the authority requirements for working on them
  - K7 describe what constitutes a hazardous voltage/current and how to recognise victims of electric shock
  - K8 describe how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
-

- K9 explain the procedures and precautions to be adopted to eliminate Electrostatic Discharge (ESD) hazards
- K10 explain where to obtain and describe how to interpret, drawings, circuit diagrams, specifications, manufacturers' manuals and other documents needed for the fault diagnosis activities
- K11 describe the basic principles of how the system functions, and the working purpose of the various integrated systems
- K12 describe the various fault finding techniques that can be used, and how they are applied (such as half-split, input/output, emergent problem sequence, six point technique, functional testing, unit substitution, injection and sampling techniques, and equipment self-diagnostics)
- K13 describe how to evaluate the various types of information available for fault diagnosis (such as operator reports, monitoring equipment, sensory inputs, history records, and condition of the equipment)
- K14 describe how to evaluate sensory information from sight, sound, smell, touch
- K15 describe the procedures to be followed to investigate faults, and how to deal with intermittent conditions
- K16 explain how to use the various aids and reports available for fault diagnosis
- K17 explain the types of equipment that can be used to aid fault diagnosis (such as mechanical measuring instruments, electrical measuring instruments, test rigs, and pressure and flow devices), and how to check the equipment is calibrated or configured correctly for the intended use, and that it is free from damage and defects
- K18 explain the application of specific fault finding methods and techniques that are best suited to the problem
- K19 describe how to analyse and evaluate possible characteristics and causes of specific faults/problems
- K20 explain how to make use of previous reports/records of similar fault conditions
- K21 explain the procedures that are in place and have to be followed for non-safety critical permitted defects
- K22 describe the permitted defects that can be deferred until the next planned maintenance
- K23 explain how to prepare a handover report which complies with the company policy on fault diagnosis
- K24 describe the extent of your own authority and to whom you should report if you have problems that you cannot resolve

## Unit 355

# Carry out fault diagnosis on traction and rolling stock systems

## Supporting Information

### ***Unit Range Description***

- 1 Carry out all of the following during the fault diagnostic activities:
  - 1.1 plan the fault diagnosis activities prior to beginning the work
  - 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 (such as mechanical, electricity, air or fluids)
  - 1.5 provide and maintain safe access and working arrangements for the maintenance area
  - 1.6 warn others in the area if they are at risk of injury from the system being tested
  - 1.7 collect equipment fault diagnosis evidence from system
  - 1.8 carry out the fault diagnostic activities using approved procedures
  - 1.9 disconnect or isolate components or parts of the system, when appropriate, to confirm diagnosis
  - 1.10 connect and restore any components after diagnostics have taken place
  - 1.11 identify the fault and determine appropriate corrective action
  - 1.12 dispose of waste items in safe and environmentally acceptable manner and leave the work area in a safe condition
  
- 2 Carry out fault diagnosis on three of the following types of interactive technologies, to sub-assembly or component level:
  - 2.1 mechanical
  - 2.2 electrical
  - 2.3 fluid power
  - 2.4 process controller
  
- 3 Collect information about the fault from four of the following sources:
  - 3.1 the person or operator who reported the fault
  - 3.2 sensory (such as sight, sound, smell, touch)
  - 3.3 monitoring equipment or gauges
  - 3.4 equipment records/history
  - 3.5 recording devices
  - 3.6 functional test data
  - 3.7 other sources (such as electronic, images)

- 4 Use a range of fault diagnostic techniques, to include two of the following:
  - 4.1 half-split technique
  - 4.2 emergent problem sequence
  - 4.3 functional/performance testing
  - 4.4 input/output
  - 4.5 six point technique
  - 4.6 injection and sampling
  - 4.7 unit substitution
  - 4.8 equipment self-diagnostics
  
- 5 Use a variety of diagnostic aids and equipment, to include two of the following:
  - 5.1 manufacturer's manual
  - 5.2 logic diagrams
  - 5.3 algorithms
  - 5.4 flow charts
  - 5.5 probability charts/reports
  - 5.6 fault analysis charts (such as fault trees)
  - 5.7 equipment self-diagnostics
  - 5.8 troubleshooting guides
  - 5.9 circuit diagrams/specifications
  
- 6 Use two of the following types of test equipment to help in the fault diagnosis:
  - 6.1 mechanical measuring equipment (such as measuring instruments, dial test indicators, torque instruments)
  - 6.2 electrical/electronic measuring instruments (such as multimeters, logic probes, analysers)
  - 6.3 fluid power test equipment (such as test rigs, flow meters, pressure gauges)
  
- 7 Find faults that have resulted in two of the following breakdown categories:
  - 7.1 intermittent problem
  - 7.2 partial failure or reduced performance/out of specification
  - 7.3 complete breakdown
  
- 8 Ensure that fault diagnostic activities comply with one of the following:
  - 8.1 organisational guidelines and codes of practice
  - 8.2 equipment manufacturer's operation range
  - 8.3 BS, ISO and/or BS EN standards
  - 8.4 company Standard Operating Procedures (SOP's)
  - 8.5 documents such as technical procedures, vehicle maintenance instructions, vehicle overhaul instructions, workshop overhaul standards specifications

- 9 Provide a record of the outcome of the fault diagnosis, 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 company-specific reporting procedure
- 9.5 job cards
- 9.6 electronic reports

## Unit 356

# Carry out preventative planned maintenance on traction and rolling stock systems

<b>Unit level:</b>	Level 3
<b>GLH:</b>	50

---

**Unit aim:**

This standard identifies the competences you need to carry out preventative planned maintenance activities on traction and rolling stock systems, in accordance with approved procedures. You will be required to carry out the maintenance activities on traction and rolling stock systems involving at least two of the following interactive technologies: mechanical, electrical, fluid power, process controller or communications-electronic systems. You will need to organise and carry out the maintenance activities to minimise down time, and ensure that the maintained system performs at optimal level and functions to the required specification. The term traction and rolling stock used in this standard applies to passenger, freight and on-track machinery (OTM).

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with the maintenance activities, tools or equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment, and materials used in the maintenance activities are removed from the work area on completion of the work, and that all necessary job/task documentation is completed accurately and legibly. 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 planned maintenance procedures within a traction and rolling stock system. You will know about the integrated technologies within the system, how the system functions, and potential problems or defects that may occur. You will understand the process of developing planned maintenance, and its application, and will know about the maintenance criteria, in adequate depth to provide a sound basis for carrying out the activities safely and effectively, and for ensuring that the system is maintained to the required specification and remains compliant with all standards and regulations. In addition, you will be expected to report where the outcome of the maintenance activity identifies the need for further investigation or maintenance work.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment and taking the necessary safeguards to protect yourself and others in the workplace. You will be required to demonstrate safe working practices throughout.

---

## Learning outcome

The learner will:

P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 follow the relevant system maintenance schedules to carry out the required work
- P3 carry out the system maintenance activities within the limits of your personal authority
- P4 carry out the system maintenance activities in the specified sequence and in an agreed timescale
- P5 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P6 complete relevant system maintenance records accurately and pass them on to the appropriate person
- P7 dispose of waste materials in accordance with safe working practices and approved procedures

---

## Learning outcome

The learner will:

K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility these requirements place on you
- K2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the system being maintained (such as electrical isolation, locking off switchgear, placing of maintenance warning notices, proving the isolation has been achieved and secured)
- K3 describe the specific health and safety precautions to be applied during the maintenance activities, and their effects on others
- K4 explain the classification of different voltage levels and the authority requirements for working on them
- K5 describe what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K6 describe how to reduce the risks of an electric shock (such as insulated tools, rubber matting and isolating transformers)

- K7 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities, and where it may be obtained
- K8 describe the hazards associated with carrying out maintenance activities on an integrated system (handling fluids, stored pressure/force, electrical supplies, process controller interface, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risks
- K9 describe the procedures and precautions to be adopted to eliminate Electrostatic Discharge (ESD) hazards when working with and handling electronic devices
- K10 describe how to obtain and interpret drawings, charts, specifications, manufacturers' manuals, history/maintenance reports and other documents needed for the maintenance activities
- K11 explain the various planned maintenance schedules that are generally used (such as condition based maintenance, scheduled maintenance, and Total Preventative Maintenance (TPM))
- K12 describe the basic principles of how the system functions, its operation sequence, the working purpose of individual units/components, and how they interact
- K13 explain the equipment operating and control procedures, and how to apply them in order to carry out the planned maintenance activities
- K14 explain the testing methods and procedures to be used to check that the system conforms to acceptable limits
- K15 describe how to make sensory checks by sight, sound, smell, touch
- K16 explain the procedure for obtaining consumables and 'lived' items that will require replacing during the maintenance activity
- K17 explain the maintenance requirements for 'lived', consumable and on condition components
- K18 describe company policy on repair/replacement of components during the maintenance activities
- K19 describe the methods of checking that components are fit for purpose, and the need to replace 'lived' items such as batteries, filters, seals, gaskets, belts, chains and bearings
- K20 explain how to make adjustments to components and assemblies to ensure they function correctly
- K21 describe the different types of bearings that are used and their care, handling and maintenance requirements
- K22 explain the torque loading and locking devices requirements for the maintained components
- K23 describe the generation of maintenance documentation and/or reports on completion of the maintenance activity
- K24 describe the problems that can occur during the planned maintenance activity, and how they can be overcome
- K25 explain the organisational procedure to be adopted for the safe disposal of waste of all types of materials
- K26 describe the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

## Unit 356

# Carry out preventative planned maintenance on traction and rolling stock systems

## Supporting Information

### ***Unit Range Description***

1. Carry out all of the following during the maintenance activities:
  - 1.1 plan and communicate the maintenance 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 (such as mechanical, electricity, air or fluids)
  - 1.5 provide and maintain safe access and working arrangements for the maintenance area
  - 1.6 warn others in the maintenance area if they are at risk of injury from the system being tested
  - 1.7 carry out the maintenance activities using appropriate techniques and procedures
  - 1.8 reconnect and return the system to service on completion of the maintenance activities
  - 1.9 dispose of waste items in safe and environmentally acceptable manner, and leave the work area in a safe condition
  
2. Carry out planned maintenance activities on traction and rolling stock systems, involving two of the following interactive technologies, to sub-assembly/component level:
  - 2.1 mechanical
  - 2.2 fluid power
  - 2.3 electrical
  - 2.4 process control
  - 2.5 communication-electronics
  
3. Follow planned maintenance activities based on one of the following types of maintenance schedule:
  - 3.1 condition based maintenance
  - 3.2 Total Preventative Maintenance (TPM)
  - 3.3 scheduled maintenance
  - 3.4 preventative planned maintenance
  
4. Carry out ten of the following planned maintenance activities:
  - 4.1 visual examination and testing of the system against the maintenance schedule
  - 4.2 removing excessive dirt and grime

- 4.3 checking operation of all gauges and sensors
  - 4.4 monitoring component condition/deterioration
  - 4.5 checking condition of fans, belts, bearings, seals
  - 4.6 making sensory checks (such as sight, sound, smell, touch)
  - 4.7 making routine adjustments
  - 4.8 carrying out leak checks on all connections
  - 4.9 replacing 'lived' consumables (such as batteries, filters, fluids)
  - 4.10 checking the torque loading of fasteners and the condition of locking devices
  - 4.11 testing and reviewing system operation
  - 4.12 carrying out system self-analysis checks
  - 4.13 recording the results of the maintenance activity and reporting any defects found
5. Ensure the maintained equipment/system meets all of the following:
- 5.1 all maintenance activities have been completed to the required schedule
  - 5.2 equipment operates within acceptable limits for successful continuous operation to meet output specification
  - 5.3 equipment remains compliant with appropriate regulations and safety requirements
  - 5.4 any potential defects are identified and reported for future action
6. Ensure that the maintenance activities comply with one of the following:
- 6.1 organisational guidelines and codes of practice
  - 6.2 equipment manufacturer's operation range
  - 6.3 BS, ISO and/or BSEN standards
  - 6.4 company Standard Operating Procedures (SOP's)
  - 6.5 documents such as technical procedures, vehicle maintenance instructions, vehicle overhaul instructions, workshop overhaul standards specifications
7. Complete the relevant paperwork/records from one of the following and pass it to the appropriate people:
- 7.1 job cards
  - 7.2 permit to work/formal risk assessment and/or sign on/off procedures
  - 7.3 maintenance log or report
  - 7.4 company-specific documentation
  - 7.5 electronic records

## Unit 357

## Maintain mechanical equipment within a traction and rolling stock system

<b>Unit level:</b>	Level 3
<b>GLH:</b>	100

---

**Unit aim:**


This standard identifies the competences you need to carry out corrective maintenance on mechanical equipment within a traction and rolling stock system, in accordance with approved procedures. You will be required to maintain a range of mechanical equipment, such as wheel sets, bogies, suspension, gearboxes, pumps, engines, and equipment, which are working in an integrated system involving two of the following interactive technologies: electrical, fluid power or process controller. The term traction and rolling stock used in this standard applies to passenger, freight and on-track machinery (OTM).

You will be expected to isolate and disconnect items and components of the interactive technologies in order to gain access to and remove the mechanical units and components that require replacing or repair. This will involve dismantling and reassembling a variety of different types of assemblies and sub-assemblies which, in some instances, may need to be dismantled to component level.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with the maintenance activities, tools or equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the work, and that all necessary job/task documentation is completed accurately and legibly. 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 mechanical maintenance procedures within a traction and rolling stock system. You will know about the integrated technology assemblies and sub-assemblies, and their properties, functions and associated defects, in adequate depth to provide a sound basis for carrying out the dismantling and reassembly process safely and effectively. You will also understand the maintenance methods and procedures used, and their application within the traction and rolling stock system, in sufficient depth to be able to carry out the maintenance activities, correct faults, and ensure that the maintained equipment functions to specification and remains compliant with all standards and regulations. You will also know about the interaction of the other associated integrated technologies and have sufficient knowledge to carry out the maintenance and testing safely and effectively.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the



equipment and taking the necessary safeguards to protect yourself and others in the workplace. You will be required to demonstrate safe working practices throughout.

---

### Learning outcome

The learner will:

- P Performance requirements

### Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
  - P2 follow the relevant maintenance schedules to carry out the required work
  - P3 carry out the maintenance activities within the limits of your personal authority
  - P4 carry out the maintenance activities in the specified sequence and in an agreed timescale
  - P5 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
  - P6 complete relevant maintenance records accurately and pass them on to the appropriate person
  - P7 dispose of waste materials in accordance with safe working practices and approved procedures
- 

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility these requirements place on you
  - K2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the system (such as electrical isolation, locking off switchgear, placing of maintenance warning notices, proving the isolation has been achieved and secured)
  - K3 describe the specific health and safety precautions to be applied during the maintenance activity, and their effects on others
  - K4 explain the classification of different voltage levels and the authority requirements for working on them
-

- K5 describe what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K6 describe how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
- K7 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities
- K8 describe the hazards associated with carrying out maintenance activities on an integrated system (such as handling fluids, stored pressure/force, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risks
- K9 explain how to obtain and interpret drawings, charts, specifications, manufacturers' manuals, history/maintenance reports and other documents needed for the maintenance activities
- K10 describe the basic principles of how the system functions, its operation sequence, the working purpose of individual units/components, and how they interact
- K11 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance
- K12 describe the company policy on repair/replacement of components during the maintenance activities
- K13 explain the sequence to be adopted for dismantling and reassembling the equipment, to both sub-assembly and individual component level
- K14 describe the methods of removing components that have interference fits (expansion, contraction or pressure)
- K15 describe the techniques used to dismantle/assemble integrated equipment (such as release of pressures/force, proof marking to aid assembly, plugging exposed pipe/component openings, dealing with soldered joints, screwed, clamped and crimped connections)
- K16 describe the methods of attaching identification marks/labels to removed components or cables, to assist with re-assembly
- K17 explain the torque loading and locking devices requirements for the maintained mechanical components
- K18 describe the methods of checking that components are fit for purpose, and the need to replace 'lived' items (such as filters, seals, gaskets and bearings)
- K19 explain the maintenance requirements for 'lived', consumable and on condition components
- K20 describe how to make adjustments to components/assemblies, to ensure they function correctly
- K21 describe the different types of bearings that are used and their care, handling and fitting procedures
- K22 describe how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose
- K23 explain the importance of making 'integrity' checks before proving the equipment with the systems supplies turned on
- K24 explain the generation of maintenance documentation and/or reports on completion of the maintenance activity

- K25 describe the equipment operating and control procedures to be applied during the maintenance activity
- K26 describe how to use lifting and handling equipment safely and correctly in the maintenance activity
- K27 describe the problems that can occur during the maintenance activity, and how they can be overcome
- K28 describe the organisational procedure to be adopted for the safe disposal of waste of all types of material
- K29 describe the extent of your authority and to whom you should report if you have a problem that you cannot resolve

## Unit 357

# Maintain mechanical equipment within a traction and rolling stock system

## Supporting Information

### ***Unit Range Description***

1. Carry out all of the following during the maintenance activities as applicable to the equipment being maintained:
  - 1.1 plan and communicate the maintenance 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 (such as mechanical, electricity, air or fluids)
  - 1.5 provide and maintain safe access and working arrangements for the maintenance area
  - 1.6 warn others in the maintenance area if they are at risk of injury from the system being tested
  - 1.7 carry out the maintenance activities using appropriate techniques and procedures
  - 1.8 reconnect and return the system to service on completion of the maintenance activities
  - 1.9 dispose of waste items in a safe and environmentally acceptable manner, and leave the work area in a safe condition
  
2. Use appropriate dismantling and re-assembly techniques to deal with two of the following:
  - 2.1 fluid power components
  - 2.2 releasing stored pressure
  - 2.3 chocking/supporting cylinders/rams/components
  - 2.4 disconnecting/removing hoses and pipes
  - 2.5 removing and replacing units/components (such as pumps, valves, actuators)
  - 2.6 electrical components
  - 2.7 isolating the power using correct lock-off communication procedure
  - 2.8 removing/replacing minor electrical components (such as relays, sensing devices, limit switches)
  - 2.9 disconnecting and reconnecting wires/cables
  - 2.10 removing and replacing major electrical components (such as motors, switch/control gear)
  - 2.11 removing and replacing wiring supports (such as conduit, trunking, traywork, cable ways, looms)
  - 2.12 process controller components:
  - 2.13 de-activating and resetting program controller
  - 2.14 disconnecting/reconnecting wires/cables

- 2.15 re-loading software/programs and making data amendments
- 2.16 removing and replacing peripherals
- 2.17 removing and replacing input/output interfacing
  
- 3. Carry out maintenance activities on three of the following types of mechanical equipment:
  - 3.1 gearboxes
  - 3.2 mechanical structures
  - 3.3 engines
  - 3.4 pumps
  - 3.5 doors
  - 3.6 compressors
  - 3.7 suspension
  - 3.8 bogies
  - 3.9 control valves
  - 3.10 brakes
  - 3.11 fuel tanks
  - 3.12 auto couplers
  - 3.13 other specific mechanical equipment
  
- 4. Carry out all of the following maintenance techniques, as applicable to the equipment being maintained:
  - 4.1 draining and removing fluids
  - 4.2 proofmarking/labelling of components
  - 4.3 dismantling equipment to unit/sub-assembly level
  - 4.4 dismantling units to component level
  - 4.5 replacing damaged/defective components
  - 4.6 replacing all 'lified' items (such as filters, seals, bearings, gaskets)
  - 4.7 checking components for serviceability
  - 4.8 setting, aligning and adjusting replaced components
  - 4.9 tightening fastenings to the required torque
  - 4.10 correct fitting of locking devices
  - 4.11 replenishing oils and greases
  - 4.12 making 'integrity' checks before powering up system
  - 4.13 functionally testing the complete system
  
- 5. Replace/refit a range of mechanical components, to include seven of the following:
  - 5.1 shafts
  - 5.2 valves and seats
  - 5.3 cams and followers
  - 5.4 pulleys and belts
  - 5.5 couplings

- 5.6 brakes
  - 5.7 axles
  - 5.8 dampers
  - 5.9 springs
  - 5.10 slides
  - 5.11 gears
  - 5.12 bearing and seals
  - 5.13 chains and sprockets
  - 5.14 levers and links
  - 5.15 clutches
  - 5.16 fitting keys
  - 5.17 locking and retaining devices (such as circlips, pins)
6. Ensure that the maintenance activities comply with one of the following:
- 6.1 organisational guidelines and codes of practice
  - 6.2 equipment manufacturer's operation range
  - 6.3 BS, ISO and/or BSEN standards
  - 6.4 company Standard Operating Procedures (SOP's)
  - 6.5 documents such as technical procedures, vehicle maintenance instructions, vehicle overhaul instructions, workshop overhaul standards specifications
7. Complete the relevant paperwork/records from one of the following, and pass it to the appropriate people:
- 7.1 job cards
  - 7.2 permits to work/formal risk assessment and/or sign on/off procedures
  - 7.3 maintenance log or report
  - 7.4 company-specific documentation
  - 7.5 electronic records

## Unit 358

# Maintain electrical equipment within a traction and rolling stock system

<b>Unit level:</b>	Level 3
<b>GLH:</b>	100

---


**Unit aim:**

This standard identifies the competences you need to carry out corrective maintenance activities on electrical equipment within a traction and rolling stock system, in accordance with approved procedures. You will be required to maintain a range of electrical equipment, such as single and three-phase power supplies, traction motors, switchgear and distribution panels, control systems and equipment, and luminaries, which are working in an integrated system involving two of the following interactive technologies: mechanical systems, fluid power or process controller. The term traction and rolling stock used in this standard applies to passenger, freight and on-track machinery (OTM).

You will be expected to isolate and disconnect items and components of the interactive technologies, in order to gain access to and remove the electrical units and components that require replacing or repair. This will involve dismantling and reassembling a variety of different types of electrical equipment which, in some instances, may need to be dismantled to component level.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with the maintenance activities, tools or equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment, and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. 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 electrical maintenance procedures within a traction and rolling stock system. You will also know about the integrated technology assemblies and sub-assemblies, their properties, functions and associated defects, in adequate depth to provide a sound basis for carrying out the dismantling and reassembly process effectively. You will understand the maintenance methods and procedures used, and their application within a traction and rolling stock system, in sufficient depth to be able to carry out the maintenance activities, correct faults, and ensure that the repaired equipment functions to specification and remains compliant with all standards and regulations. You will also know about the interaction of the other associated integrated technologies and have sufficient knowledge to carry out the maintenance and testing safely and effectively.



You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment and for taking the necessary safeguards to protect yourself and others in the workplace. You will be required to demonstrate safe working practices throughout.

---

### Learning outcome

The learner will:

- P Performance requirements

### Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
  - P2 follow the relevant maintenance schedules to carry out the required work
  - P3 carry out the maintenance activities within the limits of your personal authority
  - P4 carry out the maintenance activities in the specified sequence and in an agreed timescale
  - P5 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
  - P6 complete relevant maintenance records accurately and pass them on to the appropriate person
  - P7 dispose of waste materials in accordance with safe working practices and approved procedures
- 

### Learning outcome

The learner will:

- K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility these requirements place on you
  - K2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the system (such as electrical isolation, locking off switchgear, placing of maintenance warning notices, proving the isolation has been achieved and secured)
  - K3 describe the specific health and safety precautions to be applied during the maintenance activity, and their effects on others
-

- K4 explain the classification of different voltage levels and the authority requirements for working on them
- K5 describe what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K6 describe how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
- K7 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities
- K8 describe the hazards associated with carrying out electrical maintenance activities on an integrated system (such as handling fluids, stored pressure/force, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risks
- K9 explain how to obtain and interpret drawings, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, wiring regulations and other documents needed for the maintenance activities
- K10 describe the basic principles of how the system functions, its operation sequence, the working purpose of individual units/components, and how they interact
- K11 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards when working with and handling electronic devices
- K12 describe the different types of cabling and their application (such as multi-core cables, single-core cables, steel wire armoured (SWA), data cables, screened cables)
- K13 describe the different types of electric traction motors
- K14 describe the different types of control systems and their various components
- K15 describe the application and use of a range of electrical components (such as plugs, switches, sockets, lighting and fittings, junction boxes, relays, protection devices)
- K16 describe the various lighting systems used including tungsten, light emitting diodes (LED), sodium, mercury vapour and fluorescent
- K17 describe the different types of wiring supports that are used (to include conduit, trunking and traywork systems)
- K18 describe the care, handling, pre use checks and application of multimeters and other electrical measuring instruments
- K19 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities
- K20 explain company policy on repair/replacement of components during the maintenance activities
- K21 describe the techniques used to dismantle/assemble integrated equipment (such as release of pressures/force, proof marking to aid re-assembly, plugging exposed pipe/component openings, dealing with soldered joints, screwed, clamped and crimped connections)
- K22 describe the methods of removing and replacing cables and wires in wiring enclosures, without causing damage to existing cables
- K23 explain the use of manufacturers data when selecting wires and cables, and when carrying out tests on systems

- K24 describe the methods of attaching identification marks/labels to removed components or cables, to assist with re-assembly
- K25 describe the methods of checking that components are fit for purpose, and the need to replace 'lived' items (such as motor brushes, seals and gaskets, and overload protection devices)
- K26 describe the maintenance requirements for 'lived', consumable and on condition components
- K27 describe how to make adjustments to components/assemblies to ensure they function correctly
- K28 describe how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose
- K29 explain the importance of making system integrity checks before proving the equipment with the electrical supply on
- K30 describe the generation of maintenance documentation and/or reports on completion of the maintenance activity
- K31 explain the equipment operating and control procedures to be applied during the maintenance activity
- K32 describe how to use lifting and handling equipment in the maintenance activity
- K33 describe the problems that can occur during the electrical maintenance activity, and how they can be overcome
- K34 explain the organisational procedure to be adopted for the safe disposal of waste of all types of materials
- K35 describe the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

## Unit 358

# Maintain electrical equipment within a traction and rolling stock system

## Supporting Information

### ***Unit Range Description***

1. Carry out all of the following during the maintenance activity as applicable to the equipment being maintained:
  - 1.1 plan and communicate the maintenance 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 (such as electricity, mechanical, air or fluids)
  - 1.5 provide and maintain safe access and working arrangements for the maintenance area
  - 1.6 warn others in the maintenance area if they are at risk of injury from the system being tested
  - 1.7 carry out the maintenance activities using appropriate techniques and procedures
  - 1.8 reconnect and return the system to service on completion of the maintenance activities
  - 1.9 dispose of waste items in safe and environmentally acceptable manner, and leave the work area in a safe condition
  
2. Use appropriate dismantling and re-assembly techniques to deal with two of the following:
  - 2.1 fluid power components:
    - 2.2 releasing stored pressure
    - 2.3 chocking/supporting cylinders/rams/components
    - 2.4 disconnecting/removing hoses/pipes
    - 2.5 removing and replacing units/components (such as pumps, valves, actuators)
  - 2.6 mechanical components:
    - 2.7 draining and replenishing fluids
    - 2.8 removing major mechanical units (such as gear boxes, pumps, engines)
    - 2.9 removing and refitting locking and retaining devices
    - 2.10 removing minor mechanical units/sub-assemblies (such as guards, structures)
    - 2.11 proofmarking components to aid reassembly
    - 2.12 setting, aligning and adjusting replaced units
  - 2.13 process controller components:
    - 2.14 de-activating and resetting program controller
    - 2.15 disconnecting/reconnecting wires/cables
    - 2.16 reloading software/programs and making data amendments

- 2.17 removing and replacing peripherals
- 2.18 removing and replacing input/output interfacing
  
- 3. Carry out maintenance activities on six of the following types of electrical equipment:
  - 3.1 single-phase power supplies
  - 3.2 control systems and components
  - 3.3 three-phase power supplies
  - 3.4 direct current power supplies
  - 3.5 wiring enclosures
  - 3.6 traction motors
  - 3.7 luminaires
  - 3.8 switchgear and distribution panels
  - 3.9 other specific electrical equipment
  
  - 3.12 auto couplers
  - 3.13 other specific mechanical equipment
  
- 4. Carry out all of the following maintenance activities, as applicable to the equipment being maintained:
  - 4.1 isolating and locking off equipment
  - 4.2 removing and replacing damaged wires / cables
  - 4.3 disconnecting / reconnecting wires and cables
  - 4.4 removing and replacing wiring enclosures (as appropriate)
  - 4.5 removing electrical units/components
  - 4.6 checking components for serviceability)
  - 4.7 attaching suitable cable identification markers
  - 4.8 replacing damaged/defective components
  - 4.9 setting and adjusting replaced components
  - 4.10 torque loading of fasteners and correct fitting of locking devices
  - 4.11 making 'integrity' checks before powering up the system
  - 4.12 functionally testing completed system
  
- 5. Replace/refit a range of electrical components, to include eight of the following:
  - 5.1 cables and connectors
  - 5.2 switches
  - 5.3 sensors
  - 5.4 invertors
  - 5.5 alternators
  - 5.6 generators
  - 5.7 controllers
  - 5.8 contactors

- 5.9 solenoids
  - 5.10 circuit boards
  - 5.11 relay components
  - 5.12 capacitors
  - 5.13 lighting fixtures
  - 5.14 transformers
  - 5.15 rectifiers
  - 5.16 batteries
  - 5.17 overload protection devices
  - 5.18 encoders or resolvers
  - 5.19 locking and retaining devices (such as cable ties, clips, proprietary fasteners)
  - 5.20 other specific electrical equipment
6. Ensure that maintenance activities comply with one of the following:
- 6.1 organisational guidelines and codes of practice
  - 6.2 equipment manufacturer's documents
  - 6.3 BS, ISO and/or BS EN standards
  - 6.4 company Standard Operating Procedures (SOP's)
  - 6.5 documents such as technical procedures, vehicle maintenance instructions, vehicle overhaul instructions, workshop overhaul standards specifications
7. Complete the relevant paperwork/record from one of the following, and pass it to the appropriate people:
- 7.1 job cards
  - 7.2 maintenance log or report
  - 7.3 permits to work/formal risk assessment and/or sign-on/off procedures
  - 7.4 company-specific documentation
  - 7.5 electronic records

## Unit 359

# Maintain fluid power equipment within a traction and rolling stock system

<b>Unit level:</b>	Level 3
<b>GLH:</b>	100

---

**Unit aim:**


This standard identifies the competences you need to carry out corrective maintenance activities on fluid power equipment within a traction and rolling stock system, in accordance with approved procedures. You will be required to maintain a range of equipment, such as pumps, valves, actuators, sensors, compressors and other fluid power equipment, which are working in an integrated system involving two of the following interactive technologies: mechanical, electrical, or process controller. The term traction and rolling stock used in this standard applies to passenger, freight and on-track machinery (OTM).

You will be expected to isolate and disconnect items and components of the interactive technologies in order to gain access to and remove the fluid power units and components that require replacing or repair. This will involve dismantling and reassembling a variety of different types of assemblies and sub-assemblies which, in some instances, may need to be dismantled to component level.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with the maintenance activities, tools or equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the work, and that all necessary job/task documentation is completed accurately and legibly. 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 fluid power maintenance procedures within a traction and rolling stock system. You will also know about the integrated technology assemblies and sub-assemblies, their properties, functions and associated defects, in adequate depth to provide a sound basis for carrying out the dismantling and reassembly process safely and effectively. You will understand the maintenance methods and procedures used, and their application within a traction and rolling stock system, in sufficient depth to enable you to carry out the maintenance activities, correct faults, and ensure that the maintained equipment functions to specification and remains compliant with all standards and regulations. You will also know about the interaction of the other associated integrated technologies and have sufficient knowledge to carry out the maintenance and testing safely and effectively.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the



equipment and for taking the necessary safeguards to protect yourself and others in the workplace. You will be required to demonstrate safe working practices throughout.

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
  - P2 follow the relevant maintenance schedules to carry out the required work
  - P3 carry out the maintenance activities within the limits of your personal authority
  - P4 carry out the maintenance activities in the specified sequence and in an agreed timescale
  - P5 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
  - P6 complete relevant maintenance records accurately and pass them on to the appropriate person
  - P7 dispose of waste materials in accordance with safe working practices and approved procedures
- 

### Learning outcome

The learner will:

K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility these requirements place on you
  - K2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the system being worked on (such as electrical isolation, locking off switchgear, placing of maintenance warning notices, proving the isolation has been achieved and secured)
  - K3 explain the specific health and safety precautions to be taken during the maintenance activities, and their effects on others
  - K4 explain the classification of different voltage levels and the authority requirements for working on them
-

- K5 describe what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K6 describe how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
- K7 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities, and where to obtain it
- K8 describe the hazards associated with carrying out maintenance activities on an integrated system (such as handling fluids, stored pressure/force, electrical supplies, electrical/electronic interfaces, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risks
- K9 explain the regulations and codes of practice that apply to working with fluid power equipment
- K10 explain how to obtain and interpret drawings, charts, circuit and physical layouts, specifications, manufacturers' manuals, history/maintenance reports, symbols used in fluid power, and other documents needed for the maintenance activities
- K11 describe the basic principles of operation of the equipment to be maintained
- K12 describe the principles and theories associated with fluid power equipment (such as cascading and truth tables, logic/ladder diagrams, sequential charts/tables or functional diagrams)
- K13 describe dry and lubricated systems and their application
- K14 explain the selection, types and describe the characteristics of fluids for the system
- K15 explain the effects of pressure and flow on the performance of the system
- K16 explain the identification of different compressors (such as screw piston, rotary vane)
- K17 explain the identification of different hydraulic motors (such as piston, gear, vane)
- K18 explain the importance of following the correct preventative contamination procedures
- K19 describe the effects, and likely symptoms, of contamination in the system
- K20 describe the different types of pipework, fittings and manifolds, and their application
- K21 explain the identification, application, function and operation of different types of valves (such as poppet, spool, piston, disc and slide)
- K22 explain the identification, application function and operation of different types of sensors and actuators (such as rotary, linear, mechanical, electrical)
- K23 explain the identification, application function and operation of different types of actuators/cylinders (such as single acting, double acting and telescopic)
- K24 explain the identification and application of different types of pumps (positive, gear vane and piston)
- K25 describe the application and fitting of static and dynamic seals
- K26 explain company policy on repair/replacement of components, and the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities
- K27 describe the sequence to be adopted for the dismantling and reassembling of the equipment, to both sub-assembly and individual component level
- K28 describe the techniques used to dismantle/re-assemble integrated equipment (release of pressures/force, proofmarking to aid assembly, plugging exposed pipe/component openings, dealing with soldered joints, screwed, clamped and crimped connections)

- K29 describe the methods of attaching identification marks/labels to removed components or cables, to assist with re-assembly
- K30 describe the methods of checking that components are fit for purpose, and the need to replace 'lived' items (such as seals, gaskets, filters, pistons, spools and bearings)
- K31 describe the maintenance requirements for lified, consumable and on condition components
- K32 describe the torque loading and locking devices requirements for the maintained fluid power components
- K33 describe how to make adjustments to components/assemblies, to ensure they function correctly
- K34 describe how to check tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose
- K35 explain the importance of making integrity checks before applying full pressure
- K36 describe the generation of maintenance documentation and/or reports on completion of the maintenance activity
- K37 explain the manufacturer's equipment operating and control procedures to be applied during the maintenance activity
- K38 describe how to use lifting and handling equipment in the maintenance activity
- K39 describe the problems that can occur during the maintenance activity, and how they can be overcome
- K40 explain the organisational procedure to be adopted for the safe disposal of waste of all types of materials
- K41 describe the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

## Unit 359

# Maintain fluid power equipment within a traction and rolling stock system

## Supporting Information

### ***Unit Range Description***

- 1 Carry out all of the following during the maintenance activity:
  - 1.1 plan and communicate the maintenance 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 (such as mechanical, electricity, air or fluids)
  - 1.5 provide and maintain safe access and working arrangements for the maintenance area
  - 1.6 warn others in the maintenance area if they are at risk of injury from the system being tested
  - 1.7 carry out the maintenance activities using appropriate techniques and procedures
  - 1.8 reconnect and return the system to service on completion of the maintenance activities
  - 1.9 dispose of waste items in safe and environmentally acceptable manner, and leave the work area in a safe condition
  
- 2 Use appropriate dismantling and re-assembly techniques to deal with two of the following:
  - 2.1 mechanical components:
    - 2.2 draining and replenishing fluids
    - 2.3 removing major mechanical units (such as gear boxes, pumps, engines)
    - 2.4 removing and refitting locking and retaining devices
    - 2.5 removing minor mechanical units/sub-assemblies (such as guards, structures)
    - 2.6 proofmarking components to aid re-assembly
    - 2.7 setting, aligning and adjusting replaced units
  - 2.8 electrical components:
    - 2.9 isolating power supply
    - 2.10 removing / replacing minor electrical components (such as relays, sensing devices, limit switches)
    - 2.11 disconnecting and reconnecting wires/cables
    - 2.12 removing and replacing major electrical components (such as motors, switch/control gear)
    - 2.13 removing and replacing wiring supports (such as conduit, trunking, traywork, cable ways, looms)
  - 2.14 process controller components:
    - 2.15 de-activating and resetting program controller

- 2.16 disconnecting/re-connecting wires/cables
- 2.17 reloading software/programs and making data amendments
- 2.18 removing and replacing peripherals
- 2.19 removing and replacing input/output interfacing
  
- 3 Carry out maintenance activities on one of the following types of fluid power equipment:
  - 3.1 pneumatic
  - 3.2 hydraulic
  - 3.3 vacuum
  
- 4 Carry out all of the following maintenance activities, as applicable to the equipment being maintained:
  - 4.1 chocking/supporting actuators/rams/component
  - 4.2 releasing stored pressure
  - 4.3 draining, removing and replacing oil/fluids (as appropriate)
  - 4.4 disconnecting/removing hoses, pipes and tubing
  - 4.5 proofmarking/labelling of removed components
  - 4.6 removing and replacing units/components (such as compressors, cylinders, valves, actuators)
  - 4.7 replacing all 'lived' items (seals, filters, gaskets, hoses)
  - 4.8 checking components for serviceability
  - 4.9 replacing damaged/defective components
  - 4.10 setting, aligning and adjusting replaced components
  - 4.11 tightening fastenings to the required torque
  - 4.12 correct fitting of locking devices
  - 4.13 making 'integrity' checks before re-pressurising system
  - 4.14 priming and bleeding the system (where appropriate)
  - 4.15 functional/performance testing of the maintained system
  
- 5 Carry out maintenance activities to component level on one of the following fluid power components:
  - 5.1 pumps
  - 5.2 compressors
  - 5.3 valves
  - 5.4 motors
  - 5.5 actuators
  
- 6 Replace/refit a range of fluid power components, to include seven of the following:
  - 6.1 pumps
  - 6.2 bearings
  - 6.3 compressors
  - 6.4 sensors

- 6.5 pistons
  - 6.6 reservoirs
  - 6.7 receivers
  - 6.8 lubricators/filters/dryers
  - 6.9 spools
  - 6.10 accumulators
  - 6.11 gaskets and seals
  - 6.12 regulators
  - 6.13 valves
  - 6.14 pipework and hoses
  - 6.15 actuators/cylinders
  - 6.16 switches
  - 6.17 other specific fluid power components
- 7 Ensure that maintenance activities comply with one of the following:
- 7.1 organisational guidelines and codes of practice
  - 7.2 equipment manufacturer's operation range
  - 7.3 BS, ISO and/or BS EN standards
  - 7.4 company Standard Operating Procedures (SOP's)
  - 7.5 documents such as technical procedures, vehicle maintenance instructions, vehicle overhaul instructions, workshop overhaul standards specifications
- 8 Complete the relevant paperwork/records from one of the following, and pass it to the appropriate people:
- 8.1 job cards
  - 8.2 maintenance log or report
  - 8.3 permit to work/formal risk assessment and/or sign on/off procedures
  - 8.4 company-specific documentation
  - 8.5 electronic records

## Unit 360

# Maintain process controller equipment within a traction and rolling stock system

<b>Unit level:</b>	Level 3
<b>GLH:</b>	100

---

**Unit aim:**

This standard identifies the competences you need to carry out corrective maintenance to process controller equipment within a traction and rolling stock system, in accordance with approved procedures. You will be required to maintain a range of process controller equipment that typically includes process controllers, sequential controllers or programmable controllers, which are working in an integrated traction and rolling stock system involving two of the following interactive technologies: mechanical, electrical or fluid power. The term traction and rolling stock used in this standard applies to passenger, freight and on-track machinery (OTM).

This will involve dismantling, removing and replacing faulty peripheral components, process controller units, and line replaceable components, on process controller systems. You will also need to be able to load and download process controller programs, check them for errors, make alterations to programs (if applicable), input data and create and maintain back-up copies of completed programs.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with the maintenance activities, process control system, tools or 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 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 maintenance procedures on process controller systems within an integrated system. You will understand the maintenance methods and procedures used, and their application, and will know about the various process controller units and peripheral components, their functions and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activities, correcting faults and ensuring that the equipment operates to the required specification and remains compliant with all standards and regulations. You will also know about the interaction of the other associated integrated technologies and have sufficient knowledge to carry out the maintaining and testing of the process controller system safely and effectively.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment and for taking the necessary safeguards to protect yourself and others in the workplace. You will be required to demonstrate safe working practices throughout.

---

## Learning outcome

The learner will:

- P Performance requirements

## Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 follow the relevant maintenance schedules to carry out the required work
- P3 carry out the maintenance activities within the limits of your personal authority
- P4 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P5 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P6 complete relevant maintenance records accurately and pass them on to the appropriate person
- P7 dispose of waste materials in accordance with safe working practices and approved procedures

---

## Learning outcome

The learner will:

- K Knowledge and understanding

## Assessment criteria

The learner can:

- K1 describe the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility these requirements place on you
- K2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the system being worked on
- K3 explain the isolation procedure which is specific to the process controller system being worked on (such as electrical isolation, locking off switchgear, placing of maintenance warning notices, proving the isolation has been achieved and secured)
- K4 describe the specific health and safety precautions that need to be applied during the maintenance activities, and their effects on others
- K5 explain the classification of different voltage levels and the authority requirements for working on them
- K6 explain what constitutes a hazardous voltage/current and how to recognise victims of electric shock

- K7 describe how to reduce the risks of an electric shock (such as insulated tools, rubber mating and isolating transformers)
- K8 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities, and where this can be obtained
- K9 describe the procedures and precautions to be adopted to eliminate Electrostatic Discharge (ESD) hazards when working with and handling electronic devices
- K10 describe the hazards associated with carrying out maintenance activities on a process controlled integrated system (such as handling fluids, stored pressure/force, electrical supplies, process controller interface, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risks
- K11 explain how to obtain and interpret drawings, charts, specifications, manufacturers' manuals, history/maintenance reports, symbols used on process controller documents, and other documents needed for the maintenance activities
- K12 describe the basic principles of how the system functions, its operation sequence, the working purpose of individual units/components, and how they interact
- K13 describe the devices and systems for storing programmes
- K14 explain the procedures to be applied to storage, location and method of backing up programmes
- K15 describe the basic principles of networking devices together to produce a system
- K16 describe the different types of interface cards, port connections, test card and breakout boards/boxes used and their applications
- K17 explain the numbering system and codes used for identification inputs and outputs
- K18 explain how to search a programme within the process controller for specific elements
- K19 describe the methods used to input data parameters and the codes used
- K20 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance process
- K21 explain company policy on repair/replacement of components during the maintenance activities
- K22 describe the techniques used to dismantle/assemble integrated equipment (such as release of pressures/force, proofmarking to aid re-assembly, plugging exposed pipe/component openings, dealing with soldered joints, screwed, clamped and crimped connections)
- K23 describe the methods of attaching identification marks/labels to removed components or cables to assist with re-assembly
- K24 describe the methods of checking that components are fit for purpose, and the need to replace items such as batteries, boards and other failed items
- K25 describe how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose
- K26 explain the importance of making integrity checks before proving the equipment with the electrical supply on
- K27 explain the generation of maintenance documentation and/or reports on completion of the maintenance activity

- K28 describe the equipment operating and control procedures to be applied during the maintenance activity
- K29 describe how to use lifting and handling equipment in the maintenance activity
- K30 describe the problems that can occur during the maintenance of the process controller system, and how they can be overcome
- K31 explain the organisational procedure to be adopted for the safe disposal of waste of all types of materials
- K32 describe the extent of your own authority and to whom you should report if you have a problem you cannot resolve

## Unit 360

# Maintain process controller equipment within a traction and rolling stock system

## Supporting Information

### ***Unit Range Description***

1. Carry out all of the following during the maintenance activities:
  - 1.1 plan and communicate the maintenance 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 (such as mechanical, electricity, air or fluids)
  - 1.5 provide and maintain safe access and working arrangements for the maintenance area
  - 1.6 warn others in the maintenance area if they are at risk of injury from the system being tested
  - 1.7 carry out the maintenance activities using appropriate techniques and procedures
  - 1.8 reconnect and return the system to service on completion of the maintenance activities
  - 1.9 dispose of waste items in safe and environmentally acceptable manner, and leave the work area in a safe condition
  
2. Use appropriate dismantling and re-assembly techniques to deal with two of the following:  
Mechanical components:
  - 2.1 draining and replenishing of fluids
  - 2.2 removing and refitting locking and retaining devices
  - 2.3 removing minor mechanical units/sub-assemblies (such as guards, structures)
  - 2.4 removing major mechanical units (such as gear boxes, compressors, reservoirs)
  - 2.5 proof marking components to aid reassemblyElectrical components:
  - 2.7 isolating the power supply using correct lock-off communication procedure
  - 2.8 disconnecting and re-connecting wires/cables
  - 2.9 removing and replacing major electrical components (such as motors, switch/control gear)
  - 2.10 removing and replacing minor electrical components (such as relays, sensing devices, limit switches)
  - 2.11 removing and replacing wiring supports (such as conduit, trunking, traywork, cable ways, looms)Fluid power components:
  - 2.12 releasing stored pressure
  - 2.13 chocking/supporting cylinders/rams/components

- 2.14 disconnecting/removing hoses / pipes
- 2.15 removing and replacing units/components (such as pumps, valves, actuators)
  
- 3. Carry out six of the following program maintenance activities on the process controller system:
  - 3.1 select and use appropriate programming devices (such as terminals, handheld programmers and personal computers)
  - 3.2 use ladder logic, statement lists, or system flowcharts
  - 3.3 carry out on-line monitoring of systems
  - 3.4 upload data parameters
  - 3.5 update/install program software
  - 3.6 read and save programmes
  - 3.7 interrogate controller memory for stored faults
  - 3.8 interpret system fault log/records
  - 3.9 download data parameters
  - 3.10 analyse downloaded data
  - 3.11 produce back-ups of completed programs
  - 3.12 check controller condition, filters and cooling fans
  - 3.13 reset system and warning codes
  - 3.14 restore controller default settings
  
- 4. Carry out all of the following during the maintenance activities:
  - 4.1 take Electrostatic Discharge (ESD) precautions when working on or close to sensitive components and circuit boards
  - 4.2 proofmark or label removed wires and components
  - 4.3 inspect and/or test components for serviceability
  - 4.5 replace power supplies
  - 4.6 replace peripherals (such as sensors, actuators, relays, switches)
  - 4.7 replace process controller units
  - 4.8 replace back-up batteries (as appropriate)
  - 4.9 torque loading of fasteners and correct fitting of locking devices
  - 4.10 functionally test the system
  
- 6. Complete the paperwork/records from one of the following, and pass it to the appropriate people:
  - 6.1 job cards
  - 6.2 maintenance log or report
  - 6.3 permits to work/formal risk assessment and/or sign on/off procedures
  - 6.4 company-specific documentation
  - 6.5 electronic records
  - 5.4 invertors



## Unit 361

## Maintain traction and rolling stock vehicle trim and fittings

<b>Unit level:</b>	Level 3
<b>GLH:</b>	100

---


**Unit aim:**

This standard identifies the competencies you need to carry out maintenance on traction and rolling stock vehicle trim and fittings in accordance with approved procedures. You will be required to maintain a range of vehicle trim and fittings, such as seats, tables, panels, luggage racks, windows, cubicles. This will also include the removal and replacement of vehicle trim and fittings to gain access for inspections and other systems maintenance activities. The term traction and rolling stock used in this standard applies to passenger, freight and on-track machinery (OTM).

You will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the components to be removed. The maintenance activities will include taking all necessary safeguards to isolate the equipment, support and lift removed and replaced parts, replacing faulty equipment at component or unit level, setting and adjusting replaced components, and leaving the equipment in a safe condition and ready for testing.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with the maintenance activities, tools or equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the work, and that all necessary job/task documentation is completed accurately and legibly. 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 appropriate maintenance procedures techniques and procedures to traction and rolling stock vehicle trim and fittings. You will know about the trim assemblies and sub-assemblies, and their properties, functions and associated defects, in adequate depth to provide a sound basis for carrying out the dismantling and reassembly process safely and effectively. You will also understand the maintenance methods and procedures used, and their application within the vehicle trim and fittings, in sufficient depth to be able to carry out the maintenance activities, correct faults, and ensure that the maintained equipment functions to specification and remains compliant with all standards and regulations. You will also know about the interaction of the other associated systems to the trim/fittings and have sufficient knowledge to carry out the maintenance and testing safely and effectively.



You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment and taking the necessary safeguards to protect yourself and others in the workplace. You will be required to demonstrate safe working practices throughout.

Notes To display competence in this standard, it is necessary to both remove and replace components of traction and rolling stock vehicle trim and fittings. You must remove components; however, you may fit a replacement component where the original was previously removed by another person.

---

### Learning outcome

The learner will:

P Performance requirements

### Assessment criteria

The learner can:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 follow the relevant maintenance schedules to carry out the required work
- P3 carry out the maintenance activities, within the limits of your personal authority
- P4 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P5 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P6 remove and replace the required components, using approved tools and techniques
- P7 take suitable precautions to prevent damage to components and the surrounding structure
- P8 complete relevant maintenance records accurately and pass them on to the appropriate person
- P9 dispose of waste materials in accordance with safe working practices and approved procedures

---

### Learning outcome

The learner will:

K Knowledge and understanding

### Assessment criteria

The learner can:

- K1 describe the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility these requirements place on you
- K2 explain the isolation and lock-off procedure or permit-to-work procedure that applies to the maintenance carried out (such as electrical isolation, locking off switchgear, placing of maintenance warning notices, proving the isolation has been achieved and secured)
- K3 describe the specific health and safety precautions to be applied during the maintenance activity, and their effects on others
- K4 explain the classification of different voltage levels and the authority requirements for working on them
- K5 describe what constitutes a hazardous voltage/current and how to recognise victims of electric shock
- K6 describe how to reduce the risks of an electric shock (such as insulated tools, rubber matting and isolating transformers)
- K7 explain the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities
- K8 describe the hazards associated with removing vehicle trim and fittings, and with the tools and equipment used (such as lifting and handling, misuse of tools) and how to minimise them and reduce any risks
- K9 explain how to obtain and interpret drawings, charts, specifications, manufacturers' manuals, history/maintenance reports and other documents needed for the maintenance activities
- K10 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance
- K11 describe company policy on repair/replacement of components during the maintenance activities
- K12 explain the sequence to be adopted for dismantling and reassembling the equipment, to both sub-assembly and individual component level
- K13 describe the techniques used to remove trim and fitting components from the vehicle, without damage to integrated components or surrounding structure
- K14 describe the methods of attaching identification marks/labels to removed components to assist with re-assembly
- K15 explain the torque loading and locking devices requirements for the maintained components
- K16 explain the importance of applying Electrostatic Discharge (ESD) procedures when working on sensitive equipment or devices
- K17 explain which various mechanical fasteners will need to be removed and replaced and their method of removal and replacement (such as threaded fasteners, special securing devices)
- K18 describe the various types of electrical connector that are used, methods of unlocking, orientation indicators and locating and locking in of the connections
- K19 describe the methods of lifting, handling and supporting the components/equipment during the maintenance activities
- K20 explain the importance of ensuring that any exposed electrical connectors or pipe ends are correctly covered/protected

- K21 explain the need to correctly label and store components that require repair or overhaul and to check that replacement components have the correct part/identification markings
- K22 describe how to reconnect trim and fittings into the vehicle (such as the use of gaskets/seals and jointing/sealing compounds; ensuring correct tightness of pipe fittings, eliminating stress on pipework and cable connections; carrying out visual checks of all components)
- K23 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as seats, mechanisms, settings travel and working clearance)
- K24 explain why electrical bonding is critical and why it must be both mechanically and electrically secure
- K25 explain the generation of maintenance documentation and/or reports on completion of the maintenance activity
- K26 describe the equipment operating and control procedures to be applied during the maintenance activity
- K27 describe the problems that can occur during the maintenance activity and how these can be overcome
- K28 explain the organisational procedure to be adopted for the safe disposal of waste of all types of material
- K29 describe the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

**Unit 361**

**Maintain traction and rolling stock vehicle  
trim and fittings**

Supporting Information

*Unit Range Description*

## Appendix 1 Relationships to other qualifications

### *Links to other qualifications*

Centres are responsible for checking the different requirements of all qualifications they are delivering and ensuring that candidates meet requirements of all units/qualifications.

### *Literacy, language, numeracy and ICT skills development*

This [these] qualification[s] can develop skills that can be used in the following qualifications:

- Functional Skills (England) – see [www.cityandguilds.com/functionalskills](http://www.cityandguilds.com/functionalskills)
- Essential Skills (Northern Ireland) – see [www.cityandguilds.com/essentialskillsni](http://www.cityandguilds.com/essentialskillsni)
- Essential Skills Wales – see [www.cityandguilds.com/esw](http://www.cityandguilds.com/esw)

## Appendix 2 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the Centres and Training Providers homepage on [www.cityandguilds.com](http://www.cityandguilds.com).

*Centre Manual - Supporting Customer Excellence* contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification, as well as updates and good practice exemplars for City & Guilds assessment and policy issues.

Specifically, the document includes sections on:

- The centre and qualification approval process
- Assessment, internal quality assurance and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal quality assurance
- External quality assurance.

*Our Quality Assurance Requirements* encompasses all of the relevant requirements of key regulatory documents such as:

- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

*Access to Assessment & Qualifications* provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information on such things as:

- **Walled Garden:** how to register and certificate candidates on line
- **Events:** dates and information on the latest Centre events
- **Online assessment:** how to register for e-assessments.

*Centre Guide – Delivering International Qualifications* contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification.

Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre

- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

## Appendix 3 Useful contacts

### UK learners

General qualification information

E: [learnersupport@cityandguilds.com](mailto:learnersupport@cityandguilds.com)

---

### International learners

General qualification information

E: [intcg@cityandguilds.com](mailto:intcg@cityandguilds.com)

---

### Centres

Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results

E: [centresupport@cityandguilds.com](mailto:centresupport@cityandguilds.com)

---

### Single subject qualifications

Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change

E: [singlesubjects@cityandguilds.com](mailto:singlesubjects@cityandguilds.com)

---

### International awards

Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports

E: [intops@cityandguilds.com](mailto:intops@cityandguilds.com)

---

### Walled Garden

Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems

E: [walledgarden@cityandguilds.com](mailto:walledgarden@cityandguilds.com)

---

### Employer

Employer solutions, Mapping, Accreditation, Development Skills, Consultancy

E: [business@cityandguilds.com](mailto:business@cityandguilds.com)

---

### Publications

Logbooks, Centre documents, Forms, Free literature

---

Every effort has been made to ensure that the information contained in this publication is true and correct at time of publication. However, City & Guilds products and services are subject to continuous development and improvement, and the right is reserved to change products and services from time to time. City & Guilds cannot accept responsibility for any loss or damage arising from the use of information in this publication.

If you have a complaint, or any suggestions for improvement about any of the services that we provide, email: [feedbackandcomplaints@cityandguilds.com](mailto:feedbackandcomplaints@cityandguilds.com)

## About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. We offer over 500 qualifications across 28 industries through 8500 centres worldwide and award around two million certificates every year. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

## City & Guilds Group

The City & Guilds Group is a leader in global skills development. Our purpose is to help people and organisations to develop their skills for personal and economic growth. Made up of City & Guilds, City & Guilds Kineo, The Oxford Group and ILM, we work with education providers, businesses and governments in over 100 countries.

## Copyright

The content of this document is, unless otherwise indicated, © City & Guilds Limited and may not be copied, reproduced or distributed without prior written consent. However, approved City & Guilds centres and candidates studying for City & Guilds qualifications may photocopy this document free of charge and/or include a PDF version of it on centre intranets on the following conditions:

- centre staff may copy the material only for the purpose of teaching candidates working towards a City & Guilds qualification, or for internal administration purposes
- candidates may copy the material only for their own use when working towards a City & Guilds qualification

The Standard Copying Conditions (see the City & Guilds website) also apply.

Please note: National Occupational Standards are not © City & Guilds Limited. Please check the conditions upon which they may be copied with the relevant Sector Skills Council.

Published by City & Guilds, a ~~company registered in England and Wales (company number 16513878)~~.

### City & Guilds

---

1 Giltspur Street

---

London EC1A 9DD

---

[www.cityandguilds.com](http://www.cityandguilds.com)

---