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Pearson Edexcel Level 2 NVQ Diploma in Engineering Maintenance and Installation

Specification

Competence-based qualification

First registration August 2010

Issue 2

Pearson

Edexcel, BTEC and LCCI qualifications

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This specification is Issue 2. Key changes are listed in the summary table on the next page. We will inform centres of any changes to this issue. The latest issue can be found on the Pearson website: qualifications.pearson.com

This qualification was previously known as:

Edexcel Level 2 NVQ Diploma in Engineering Maintenance and Installation (QCF)

The QN remains the same.

References to third party material made in this specification are made in good faith. Pearson does not endorse, approve or accept responsibility for the content of materials, which may be subject to change, or any opinions expressed therein. (Material may include textbooks, journals, magazines and other publications and websites.)

All information in this specification is correct at time of going to publication.

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Summary of Pearson Edexcel Level 2 NVQ Diploma in Engineering Maintenance and Installation specification Issue 2 changes

Summary of changes made between previous issue and this current issue	Page number
All references to QCF have been removed throughout the specification	
Definition of TQT added	1
Definition of sizes of qualifications aligned to TQT	2
TQT value added	6
Guided learning definition updated	17
QCF references removed from unit titles and unit levels in all units	21-701

Earlier issue(s) show(s) previous changes.

If you need further information on these changes or what they mean, contact us via our website at: qualifications.pearson.com/en/support/contact-us.html.

Contents

Introducing Pearson Edexcel NVQ qualifications

What are NVQ qualifications?

National Vocational Qualifications (NVQs) are work-based qualifications that give learners the opportunity to develop and demonstrate their competence in the area of work or job role to which the qualification relates. NVQs are based on the National Occupational Standards (NOS) for the appropriate sector. NOS define what employees, or potential employees, must be able to do and know, and how well they should undertake work tasks and work roles. At Level 2 and above, these qualifications are recognised as the competence component of Apprenticeship Frameworks. Qualifications at Level 1 can be used in Traineeships, which are stepping-stones to Apprenticeship qualifications. NVQs qualifications can also be delivered as stand-alone for those who wish to take a work-based qualification. NVQs qualifications are outcomes-based with no fixed learning programme – allowing flexible delivery that meets the individual learner's needs. They are suitable for those in employment or those who are studying at college and have a part-time job or access to a substantial work placement so that they are able to demonstrate the competencies that are required for work. Most learners will work towards their qualification in the workplace or in settings that replicate the working environment as specified in the assessment requirements/strategy for the sector. Colleges, training centres and/or employers can offer these qualifications provided they have access to appropriate physical and human resources.

Sizes of NVQ/Competence-based qualifications

For all regulated qualifications, Pearson specify a total number of hours that is estimated learners will require to complete and show achievement for the qualification – this is the Total Qualification Time (TQT). The TQT value indicates the size of a qualification. Within the TQT, Pearson identifies the number of Guided Learning Hours (GLH) that we estimate a centre delivering the qualification might provide. Guided learning means activities, such as lessons, tutorials, online instruction, supervised study and giving feedback on performance, that directly involve tutors and assessors in teaching, supervising and invigilating learners. Guided learning includes the time required for learners to complete external assessment under examination or supervised conditions. In addition to guided learning, other required learning directed by tutors or assessors will include private study, preparation for assessment and undertaking assessment when not under supervision, such as preparatory reading, revision and independent research.
As well as TQT and GLH, qualifications can also have a credit value – equal to one tenth of TQT, rounded to the nearest whole number.
TQT and credit values are assigned after consultation with users of the qualifications.

NVQ/Competence-based qualifications are available in the following sizes:

- Award – a qualification with a TQT value of 120 or less (equivalent to a range of 1–12 credits)
- Certificate – a qualification with a TQT value in the range of 121–369 (equivalent to a range of 13–36 credits)
- Diploma – a qualification with a TQT value of 370 or more (equivalent to 37 credits and above).

Qualification title covered by this specification

This specification gives you the information you need to offer the Pearson Edexcel Level 2 NVQ Diploma in Engineering Maintenance and Installation:

Qualification title	Qualification Number (QN)	Accreditation start date
Pearson Edexcel Level 2 NVQ Diploma in Engineering Maintenance and Installation	501/0621/1	01/08/2010

Qualifications eligible and funded for post-16-year-olds can be found on the funding Hub. The Skills Funding Agency also publishes a funding catalogue that lists the qualifications available for 19+ funding.

You should use the Qualification Number (QN), when you wish to seek public funding for your learners. Each unit within a qualification will also have a unique reference number, which is listed in this specification.

The qualification title and unit reference numbers will appear on the learners' final certification document. Learners need to be made aware of this when they are recruited by the centre and registered with Pearson.

Key features of the Pearson Edexcel Level 2 NVQ Diploma in Engineering Maintenance and Installation

This qualification:

- is nationally recognised
- is based on the Semta National Occupational Standards (NOS). The NOS, Assessment Strategy and qualification structure are owned by Semta.

The Pearson Edexcel Level 2 NVQ Diploma in Engineering Maintenance and Installation has been approved as a component for the Semta Apprenticeship framework.

What is the purpose of this qualification?

This qualification is appropriate for employees in the engineering sector working across a broad range of areas. It is designed to assess occupational competence in the workplace where learners are required to demonstrate skills and knowledge to a level required in the engineering sector.

Who is this qualification for?

This qualification is for all learners aged 16 and above who are capable of reaching the required standards.

Pearson's policy is that the qualification should:

- be free from any barriers that restrict access and progression
- ensure equality of opportunity for all wishing to access the qualification.

What are the benefits of this qualification to the learner and employer?

This qualification allows learners to demonstrate competence against National Occupational Standards which are based on the needs of the engineering sector as defined by Semta, the Sector Skills Council. As such it contributes to the development of skilled labour in the sector. The qualification may contribute towards the competence element of an Apprenticeship.

What are the potential job roles for those working towards this qualification?

- Electrical engineer
- Electronics engineer
- Energy and environmental engineering technician
- Engineering maintenance fitter
- Engineering maintenance technician

- Engineering operative
- Telecommunications technician

What progression opportunities are available to learners who achieve this qualification?

This qualification allows learners to demonstrate competence in engineering maintenance and installation at a level required by the Engineering industry. Learners can progress across the level and size of the Engineering competence and knowledge qualifications and into other occupational areas such as team leading and management.

What is the qualification structure for the Pearson Edexcel Level 2 NVQ Diploma in Engineering Maintenance and Installation?

Individual units can be found in the *Units* section. The level and credit value are given on the first page of each unit.

The Total Qualification Time (TQT) for this qualification is 630.

The Guided Learning hours for this qualification are 351.

To achieve this qualification, learners must complete a minimum of 63 credits. Learners must complete all the mandatory units in Group A (15 credits) and then choose one of the following pathways:

1. Mechanical Maintenance (4 units, minimum of 98 credits)
2. Electrical Maintenance (4 units, minimum of 98 credits)
3. Electronic Maintenance (4 units, minimum of 87 credits)
4. Fluid Power Maintenance (4 units, minimum of 98 credits)
5. Services Maintenance (4 units, minimum of 98 credits)
6. Communication-Electronics Maintenance (3 units, minimum of 65 credits)
7. Servicing Stairlifts (4 units, minimum of 86 credits)
8. Servicing Service Lifts (3 units, minimum of 68 credits)
9. Installing Stairlifts (3 units, minimum of 86 credits)
10. Installing Service Lifts (3 units, minimum of 86 credits)
11. Equipment Installation (1 unit, minimum of 48 credits)
12. Installing Lifting Platforms (3 units, minimum of 86 credits)
13. Servicing Lifting Platforms (4 units, minimum of 86 credits)
14. Assistive Technology Systems and Equipment Maintenance (4 units, minimum of 98 credits)

A – Mandatory Group

Learners must complete all the units in Group A.

A/601/5013 – Complying with statutory regulations and organisational safety requirements

Y/601/5102 – Using and interpreting engineering data and documentation

Y/601/5052 – Working efficiently and effectively in engineering

B – Pathway 1: Mechanical Maintenance

B1 – Mandatory units

Learners must complete all the units in Group B1.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

K/600/5674 – Carrying out fault location on mechanical equipment

J/600/5679 – Carrying out maintenance activities on mechanical equipment

B2 – Optional units

Learners must complete a minimum of one unit in Group B2.

F/600/5681 – Restoring mechanical components to usable condition by repair

D/600/5686 – Carrying out scheduled maintenance activities on mechanical equipment

C – Pathway 2: Electrical Maintenance

C1 – Mandatory units

Learners must complete all the units in Group C1.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

M/600/5689 – Carrying out fault location on electrical equipment and circuits

L/600/5697 – Carrying out maintenance activities on electrical equipment

C2 – Optional units

Learners must complete a minimum of one unit in Group C2.

R/600/5703 – Carrying out modifications or rewiring electrical circuits

D/600/5705 – Carrying out scheduled maintenance tasks on electrical equipment

D – Pathway 3: Electronic Maintenance

Learners must complete all the units in Group D.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

T/600/5709 – Carrying out fault location on electronic equipment and circuits

T/600/5712 – Carrying out tests on electronic equipment and circuits

R/600/5717 – Carrying out repairs to electronic equipment

E – Pathway 4: Fluid Power Maintenance

Learners must complete all the units in Group E.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

R/600/5720 – Carrying out fault location on fluid power equipment and circuits

K/600/5724 – Carrying out maintenance activities on fluid power equipment

T/600/5726 – Carrying out scheduled maintenance tasks on fluid power equipment

F – Pathway 5: Services Maintenance

F1 – Mandatory units

Learners must complete all the units in Group F1.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

J/600/5729 – Carrying out fault location on service systems and equipment

J/600/5732 – Carrying out scheduled maintenance tasks on service systems and equipment

F2 – Optional units

Learners must complete a minimum of one unit in Group F2.

R/600/5734 – Carrying out maintenance on water distribution systems and equipment

D/600/5736 – Carrying out maintenance on emergency power generation equipment

K/600/5741 – Carrying out maintenance on workplace environmental control equipment

F/600/5745 – Carrying out maintenance on heating and ventilation equipment

F/600/5759 – Carrying out maintenance on air conditioning and ventilation equipment

H/600/6063 – Carrying out maintenance on gas distribution equipment

M/600/6065 – Carrying out maintenance on compressed air equipment

T/600/6066 – Carrying out maintenance on process control equipment

Y/600/5475 – Carrying out maintenance on instrumentation and control equipment

J/600/5505 – Carrying out maintenance on industrial refrigeration equipment

A/600/5517 – Carrying out maintenance on environmental control equipment

G – Pathway 6: Communication-Electronics Maintenance

G1 – Mandatory units

Learners must complete all the units in Group G1.

D/600/5526 – Carrying out fault location on communication-electronic systems

M/600/5532 – Carrying out scheduled maintenance on communication-electronic systems

G2 – Optional units

Learners must complete a minimum of one unit in Group G2.

R/600/5538 – Carrying out repairs to communication-electronic systems

K/600/5545 – Carrying out modifications to communication-electronic systems

T/600/5550 – Carrying out tests on communication-electronic systems

Y/600/5556 – Carrying out the configuration of communication-electronic systems

H/600/5589 – Assisting in the installation of communication-electronic systems

H – Pathway 7: Servicing Stairlifts

Learners must complete all the units in Group H.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

M/600/5594 – Carrying out fault location on stairlift equipment

L/600/5604 – Carrying out servicing activities on stairlift equipment

D/600/5607 – Restoring stairlifts to service by replacing or repairing components

I – Pathway 8: Servicing Service Lifts

Learners must complete all the units in Group I.

M/600/5613 – Carrying out fault location on service lifts

F/600/5616 – Carrying out servicing of service lift equipment

J/600/5620 – Restoring service lifts to service by replacing or repairing components

J – Pathway 9: Installing Stairlifts

Learners must complete all the units in Group J.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

M/600/5594 – Carrying out fault location on stairlift equipment

Y/600/5623 – Installing stairlifts

K – Pathway 10: Installing Service Lifts

Learners must complete all the units in Group K.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

M/600/5613 – Carrying out fault location on service lifts

M/600/5627 – Installing service lifts

L – Pathway 11: Equipment Installation

Learners must complete a minimum of one unit in Group L.

M/600/5630 – Assisting in the installation of mechanical equipment

F/600/5633 – Assisting in the installation of electrical/electronic equipment

T/600/5399 – Assisting in the installation of equipment to produce an engineered system

M/600/5403 – Assisting in the installation of instrumentation and control equipment

T/600/5404 – Assisting in the installation of fluid power equipment

J/600/5407 – Assisting in the installation of process control equipment

J/600/5410 – Assisting in the installation of emergency electrical power generation equipment

D/600/5414 – Assisting in the installation of environmental pollution control equipment

K/600/5416 – Assisting in the installation of workplace environmental control equipment

T/600/5418 – Assisting in the installation of heating and ventilation equipment

T/600/5421 – Assisting in the installation of air conditioning and ventilation equipment

J/600/5424 – Assisting in the installation of compressed air equipment

L/600/5425 – Assisting in the installation of waste/foul water distribution equipment

D/600/5428 – Assisting in the installation of fresh water distribution equipment

K/600/5433 – Assisting in the installation of refrigeration equipment

M – Pathway 12: Installing Lifting Platforms

Learners must complete all the units in Group M.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

F/600/5437 – Carrying out fault location on lifting platforms

J/600/5438 – Installing lifting platforms

N – Pathway 13: Servicing Lifting Platforms

Learners must complete all the units in Group N.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

F/600/5437 – Carrying out fault location on lifting platforms

R/600/5443 – Carrying out servicing of lifting platforms

M/600/5451 – Restoring lifting platforms to service by replacing or repairing components

O – Pathway 14: Assistive Technology Systems and Equipment Maintenance

Learners must complete all the units in Group O.

D/600/5669 – Handing over and confirming completion of maintenance or installation activities

F/600/5454 – Carrying out fault location activities on assistive technology systems and equipment

L/600/5456 – Carrying out scheduled servicing activities on assistive technology systems and equipment

R/600/5460 – Carrying out maintenance and repair activities on assistive technology systems and equipment

How is the qualification graded and assessed?

The overall grade for the qualification is a 'pass'. The learner must achieve all the required units within the specified qualification structure.

To pass a unit the learner must:

- achieve **all** the specified learning outcomes
- satisfy **all** the assessment criteria by providing sufficient and valid evidence for each criterion
- show that the evidence is their own.

The qualification is designed to be assessed:

- in the workplace or
- in conditions resembling the workplace, as specified in the Assessment Strategy for the sector, or
- as part of a training programme.

Assessment Strategy

The Assessment Strategy for this qualification has been included in *Annexe D*. It has been developed by Semta in partnership with employers, training providers, awarding organisations and the regulatory authorities. The assessment strategy includes details on:

- criteria for defining realistic working environments
- roles and occupational competence of assessors, expert witnesses, internal verifiers and standards verifiers
- quality control of assessment
- evidence requirements.

Evidence of competence may come from:

- **current practice** where evidence is generated from a current job role
- a **programme of development** where evidence comes from assessment opportunities built into a learning/training programme whether at or away from the workplace
- the **Recognition of Prior Learning (RPL)** where a learner can demonstrate that they can meet the assessment criteria within a unit through knowledge, understanding or skills they already possess without undertaking a course of learning. They must submit sufficient, reliable and valid evidence for internal and standards verification purposes. RPL is acceptable for accrediting a unit, several units or a whole qualification
- a **combination** of these.

It is important that the evidence is:

Valid	relevant to the standards for which competence is claimed
Authentic	produced by the learner
Current	sufficiently recent to create confidence that the same skill, understanding or knowledge persist at the time of the claim
Reliable	indicates that the learner can consistently perform at this level
Sufficient	fully meets the requirements of the standards.

Types of evidence

To successfully achieve a unit the learner must gather evidence which shows that they have met the required standard in the assessment criteria. Evidence can take a variety of different forms including the following examples:

- direct observation of the learner's performance by their assessor
- outcomes from oral or written questioning
- products of the learner's work
- personal statements and/or reflective accounts
- outcomes from simulation, where permitted by the assessment strategy
- professional discussion
- assignment, project/case studies
- authentic statements/witness testimony
- expert witness testimony
- reflective accounts
- evidence of Recognition of Prior Learning.

Learners can use one piece of evidence to prove their knowledge, skills and understanding across different assessment criteria and/or across different units. It is, therefore, not necessary for learners to have each assessment criterion assessed separately. Learners should be encouraged to reference the assessment criteria to which the evidence relates.

Evidence must be made available to the assessor, internal verifier and Pearson standards verifier. A range of recording documents is available on the Pearson website qualifications.pearson.com. Alternatively, centres may develop their own.

Additional requirements

The Joint Awarding Body and the SSC Working Practices Group have identified additional requirements that are needed to assess and quality assure qualifications that use NVQ within their title. These requirements are shown in *Annexe C: Additional requirements for qualifications that use the title NVQ*.

Centre recognition and approval

Centre recognition

Centres that have not previously offered Pearson qualifications need to apply for and be granted centre recognition as part of the process for approval to offer individual qualifications. New centres must complete both a centre recognition approval application and a qualification approval application.

Existing centres will be given 'automatic approval' for a new qualification if they are already approved for a qualification that is being replaced by the new qualification and the conditions for automatic approval are met. Centres already holding Pearson approval are able to gain qualification approval for a different level or different sector via Edexcel online.

Approvals agreement

All centres are required to enter into an approvals agreement which is a formal commitment by the head or principal of a centre to meet all the requirements of the specification and any linked codes or regulations. Pearson will act to protect the integrity of the awarding of qualifications, if centres do not comply with the agreement. This could result in the suspension of certification or withdrawal of approval.

Quality assurance

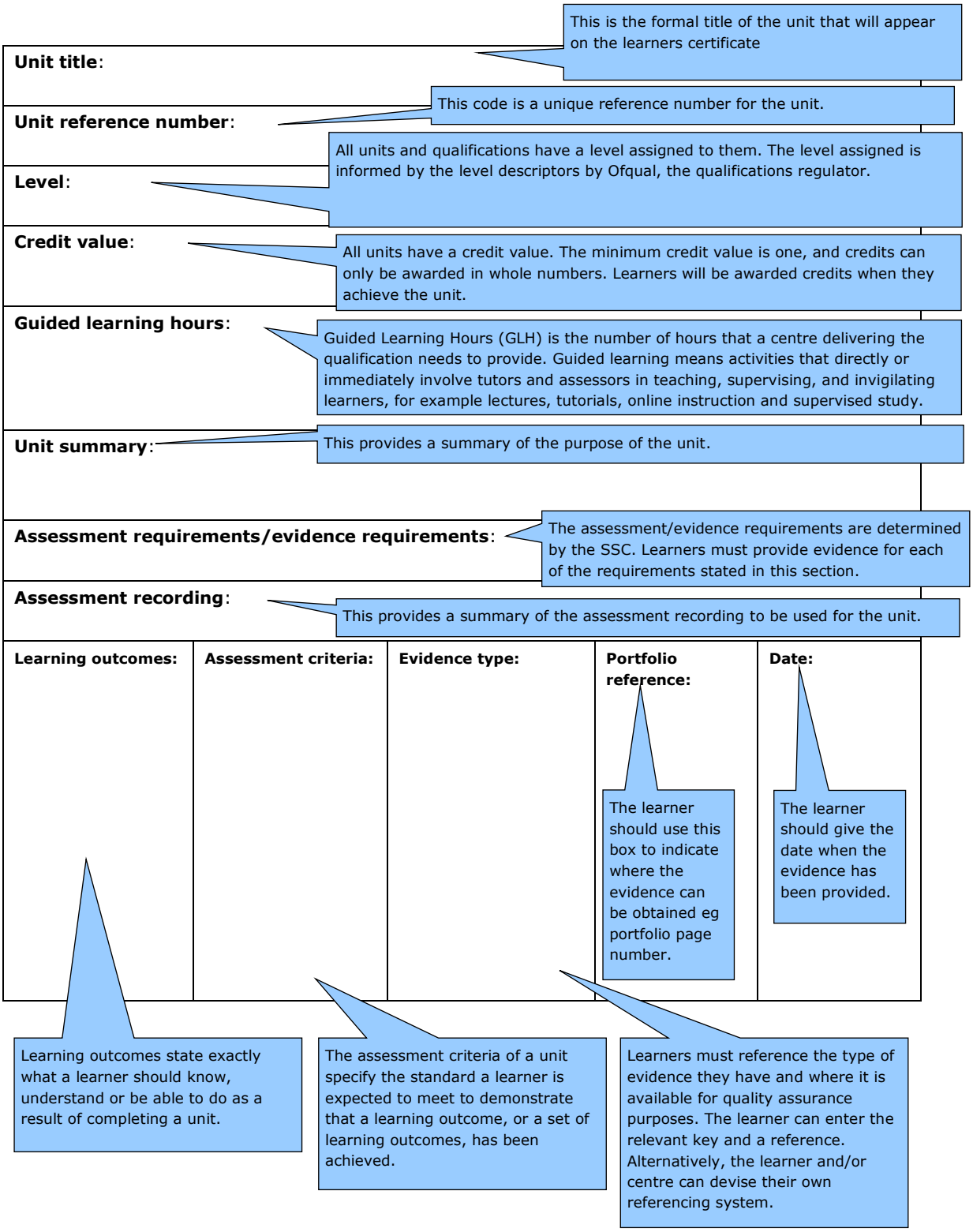
Detailed information on Pearson's quality assurance processes is given in *Annexe A*.

What resources are required?

Each qualification is designed to support learners working in the Engineering sector. Physical resources need to support the delivery of the qualification and the assessment of the learning outcomes and must be of industry standard. Centres must meet any specific resource requirements outlined in *Annexe D: Assessment Strategy*. Staff assessing the learner must meet the requirements within the overarching assessment strategy for the sector.

Unit format

Each unit in this specification contains the following sections.



Units

Unit 1: Complying with statutory regulations and organisational safety requirements

Unit reference number: A/601/5013

Level: 2

Credit value: 5

Guided learning hours: 35

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to deal with statutory regulations and organisational safety requirements. It does not deal with specific safety regulations or detailed requirements, it does, however, cover the more general health and safety requirements that apply to working in an industrial environment.

The learner will be expected 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. The learner will need to be able to identify the relevant qualified first aiders and know the location of the first aid facilities. The learner will have a knowledge and 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. The learner will also need to be fully conversant with their organisation's procedures for fire alerts and the evacuation of premises.

The learner will also 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, the materials and substances that they use, any working practices that do not follow laid-down procedures, and manual lifting and carrying techniques.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Comply with statutory regulations and organisational safety requirements	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: – applying in principle their duties and responsibilities as an individual under the Health and Safety at Work Act – identifying, within their organisation, appropriate sources of information and guidance on health and safety issues, such as: • eye protection and personal protective equipment (PPE) • COSHH regulations • risk assessments – identifying the warning signs and labels of the main groups of hazardous or dangerous substances – complying with the appropriate statutory regulations at all times 1.3 present themselves in the workplace suitably prepared for the activities to be undertaken 1.4 follow organisational accident and emergency procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 comply with emergency requirements, to include: – identifying the appropriate qualified first aiders and the location of first aid facilities – identifying the procedures to be followed in the event of injury to themselves or others – following organisational procedures in the event of fire and the evacuation of premises – identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions of equipment 1.6 recognise and control hazards in the workplace 1.7 identify the hazards and risks that are associated with the following: – their working environment – the equipment that they use – materials and substances (where appropriate) that they use – working practices that do not follow laid-down procedures 1.8 use correct manual lifting and carrying techniques			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 demonstrate one of the following methods of manual lifting and carrying: – lifting alone – with assistance of others – with mechanical assistance 1.10 apply safe working practices and procedures to include: – maintaining a tidy workplace, with exits and gangways free from obstruction – using equipment safely and only for the purpose intended – observing organisational safety rules, signs and hazard warnings – taking measures to protect others from any harm resulting from the work that they are carrying out.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2	Know how to comply with statutory regulations and organisational safety requirements	2.1	describe the roles and responsibilities of themselves and others under the Health and Safety at Work Act, and other 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, Manual Handling Operations Regulations, Provision and Use of Work Equipment Regulations, Display Screen at Work Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations*)			
		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 seven 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			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain what constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, poorly placed equipment, dust and fumes, handling and transporting, contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile, flammable or toxic materials, unshielded processes, working in confined spaces) 2.6 describe their responsibilities for identifying and dealing with hazards and reducing risks in the workplace 2.7 describe the risks associated with their working environment (such as the tools, materials and equipment that they use, spillages of oil, chemicals and other substances, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures) 2.8 describe the processes and procedures that are used to identify and rate the level of risk (such as safety inspections, the use of hazard checklists, carrying out risk assessments, COSHH assessments) 2.9 describe the first aid facilities that exist within their work area and within the organisation in general; the procedures to be followed in the case of accidents involving injury			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 explain what constitute dangerous occurrences and hazardous malfunctions, and why these must be reported even if no-one is 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 with regard to fire fighting procedures; the common causes of fire and what they can do to help prevent them 2.13 describe the protective clothing and equipment that is available for their areas of activity 2.14 explain how to safely lift and carry loads, and the manual and mechanical aids available 2.15 explain how to prepare and maintain safe working areas; the 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.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 2: Using and interpreting engineering data and documentation

Unit reference number: Y/601/5102

Level: 2

Credit value: 5

Guided learning hours: 25

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to make effective use of text, numeric and graphical information, by interpreting and using technical information extracted from documents such as engineering drawings, technical manuals, reference tables, specifications, technical sales/marketing documentation, charts or electronic displays, in accordance with approved procedures. The learner will be required to extract the necessary information from the various documents, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Use and interpret engineering data and documentation	1.1 use the approved source to obtain the required data and documentation 1.2 use the data and documentation and carry out all of the following: – check the currency and validity of the data and documentation used – exercise care and control over the documents at all times – correctly extract all necessary data in order to carry out the required tasks – seek out additional information where there are gaps or deficiencies in the information obtained – deal with or report any problems found with the data and documentation – make valid decisions based on the evaluation of the engineering information extracted from the documents – return all documents to the approved location on completion of the work – complete all necessary work related documentation such as production documentation, installation documentation, maintenance documentation, planning documentation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 correctly identify, interpret and extract the required information 1.4 extract information that includes three of the following: – materials or components required – dimensions – tolerances – build quality – installation requirements – customer requirements – time scales – financial information – operating parameters – surface texture requirements – location/orientation of parts – process or treatments required – dismantling/assembly sequence – inspection/testing requirements – number/volumes required – repair/service methods – method of manufacture			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– weld type and size operations required – connections to be made – surface finish required – shape or profiles – fault finding procedures – safety/risk factors – environmental controls – specific data (such as component data, maintenance data, electrical data, fluid data) – resources (such as tools, equipment, personnel) – utility supply details (such as electricity, water, gas, air) – location of services, including standby and emergency backup systems – circuit characteristics (such as pressure, flow, current, voltage, speed) – protective arrangements and equipment (such as containment, environmental controls, warning and evacuation systems and equipment) – other specific related information 1.5 use the information obtained to ensure that work output meets the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 use information extracted from documents to include one from the following: – drawings (such as component drawings, assembly drawings, modification drawings, repair drawings, welding/fabrication drawings, distribution and installation drawings) – diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit diagrams) – manufacturers manuals/drawings – approved sketches – technical illustrations – photographic representations – visual display screen information – technical sales/marketing documentation – contractual documentation – other specific drawings/documents 1.7 use information extracted from related documentation, to include two from the following: – instructions (such as job instructions, drawing instructions, manufacturers instructions) – specifications (such as material, finish, process, contractual, calibration)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– reference materials (such as manuals, tables, charts, guides, notes) – schedules – operation sheets – service/test information – planning documentation – quality control documents – company specific technical instructions – national, international and organisational standards – health and safety standards relating to the activity (such as COSHH) – other specific related documentation 1.8 deal promptly and effectively with any problems within their control and report those which cannot be solved 1.9 report any inaccuracies or discrepancies in documentation and specifications.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2	Know how to use and interpret engineering data and documentation	2.1	explain what information sources are used for the data and documentation that they use in their work activities			
		2.2	explain how documents are obtained, and how to check that they are current and valid			
		2.3	explain the basic principles of confidentiality (including what information should be available and to whom)			
		2.4	describe the different ways/formats that data and documentation can be presented (such as such as drawings, job instructions product data sheets, manufacturers' manuals, financial spreadsheets, production schedules, inspection and calibration requirements, customer information)			
		2.5	explain how to use other sources of information to support the data (such as electronic component pin configuration specifications, reference charts, standards, bend allowances required for material thickness, electrical conditions required for specific welding rods, mixing ratios for bonding and finishing materials, metal specifications and inspection requirements, health and safety documentation)			
		2.6	describe the importance of differentiating fact from opinion when reviewing data and documentation			
		2.7	describe the importance of analysing all available data and documentation before decisions are made			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the different ways of storing and organising data and documentation to ensure easy access 2.9 describe the procedures for reporting discrepancies in the data or documentation, and for reporting lost or damaged documents 2.10 describe the importance of keeping all data and documentation up to date during the work activity, and the implications of this not being done 2.11 explain the care and control procedures for the documents, and how damage or graffiti on documents can lead to scrapped work 2.12 explain the importance of returning documents to the designated location on completion of the work activities 2.13 explain what basic drawing conventions are used and why there needs to be different types of drawings (such as isometric and orthographic, first and third angle, assembly drawings, circuit and wiring diagrams, block and schematic diagrams) 2.14 explain what types of documentation are used and how they interrelate (such as production drawings, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain the imperial and metric systems of measurement; tolerancing and fixed reference points 2.16 describe the meaning of the different symbols and abbreviations found on the documents that they use (such as surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure and flow characteristics) 2.17 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.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 3: Working efficiently and effectively in engineering

Unit reference number: Y/601/5052

Level: 2

Credit value: 5

Guided learning hours: 25

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to work efficiently and effectively in the work place, in accordance with approved procedures and practices. Prior to undertaking the engineering activity, the learner 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 ensuring that any tools, equipment, materials and other resources required are available and in a safe and usable condition.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Work efficiently and effectively in engineering	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare the work area to carry out the engineering activity 1.3 prepare to carry out the engineering activity, taking into consideration all of the following, as applicable to the work to be undertaken: – the work area is free from hazards and suitably prepared for the activities to be undertaken – any required safety procedures are implemented – any necessary personal protection equipment is obtained and is in a usable condition – tools and equipment required are obtained and checked that they are in a safe and usable condition – all necessary drawings, specifications and associated documentation is obtained – job instructions are obtained and understood – the correct materials or components are obtained – storage arrangements for work are appropriate – appropriate authorisation to carry out the work is obtained			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 check that there are sufficient supplies of materials and/or consumables and that they meet work requirements 1.5 ensure completed products or resources are stored in the appropriate location on completion of the activities 1.6 complete work activities, to include all of the following: – returning tools and equipment – returning drawings and work instructions – completing all necessary documentation accurately and legibly – identifying, where appropriate, any unusable tools, equipment and components – arranging for the safe disposal of waste materials 1.7 tidy up the work area on completion of the engineering activity 1.8 deal promptly and effectively with problems within their control and report those that cannot be resolved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 deal with problems affecting the engineering process, to include two of the following: – materials – tools and equipment – drawings – job specification – quality – people – timescales – safety – activities or procedures 1.10 contribute to organisational procedures for identifying opportunities for improvement to one of the following: – working practices – working methods – quality – safety – tools and equipment – supplier relationships – internal communication – customer service			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– training and development – teamwork – other 1.11 maintain effective working relationships with colleagues to include two of the following: – colleagues within their own working group – people outside their normal working group – line management – external contacts 1.12 review personal training and development as appropriate to the job role 1.13 review personal development objectives and targets to include one of the following: – dual or multi-skilling – training on new equipment/technology – increased responsibility – understanding of company working practices, procedures, plans and policies – other specific requirements.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to work efficiently and effectively in engineering	2.1 describe the safe working practices and procedures to be followed whilst preparing and tidying up their work environment 2.2 describe the correct use of any equipment to protect the health and safety of themselves and their colleagues 2.3 describe the procedure for ensuring that all documentation relating to the work being carried out is available and current, prior to starting the activity 2.4 describe the action that should be taken if documentation received is incomplete and/or incorrect 2.5 describe the procedure for ensuring that all tools and equipment are available prior to undertaking the activity 2.6 describe the checks to be carried out to ensure that tools and equipment are in full working order, prior to undertaking the activity 2.7 describe the action that should be taken if tools and equipment are not in full working order 2.8 describe the checks to be carried out to ensure that all required materials are correct and complete, prior to undertaking the activity 2.9 describe the action that should be taken if materials do not meet the requirements of the activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 explain whom to inform when the work activity has been completed 2.11 describe the information and/or documentation that others will require to confirm that the activity has been completed 2.12 explain what materials, equipment and tools can be re-used 2.13 explain how any waste materials and/or products are transferred, stored and disposed of 2.14 explain where tools and equipment should be stored and located 2.15 describe the importance of maintaining effective working relationships within the workplace 2.16 describe the procedures for dealing with and reporting any problems that can affect working relationships 2.17 describe the importance of making a contribution to improving working practices 2.18 describe the procedure and format for making suggestions for improvements 2.19 describe the benefits for the work area if improvements can be identified 2.20 describe the difficulties that can occur in working relationships			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 describe the regulations that affect how they should be treated at work (such as *Equal Opportunities Act*, *Race and Sex Discrimination*, *Working Time Directive*) 2.22 describe the benefits of continuous personal development 2.23 decribe the training opportunities that are available in the workplace 2.24 describe the importance of reviewing their training and development 2.25 explain with whom to discuss training and development issues 2.26 describe the extent of their own authority and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 4: Handing over and confirming completion of maintenance or installation activities

Unit reference number: D/600/5669

Level: 2

Credit value: 18

Guided learning hours: 35

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to hand over maintained and/or installed equipment, and to confirm that the equipment is now ready to run. Following the maintenance and/or installation activity, the learner will be required to ensure that the equipment is in a safe and operable condition. This will involve checking that all guards/covers and safety devices have been fitted, and that the equipment functions to the required specification.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Hand over and confirm completion of maintenance or installation activities	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out correct handover procedures for one type of equipment/service from the following: – mechanical equipment – electrical equipment – electronic equipment – fluid power equipment – process control/instrumentation and control equipment – engineering services – industrial refrigeration equipment – lift equipment – medical equipment – other specific equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out the handover, either following two of the following maintenance activities: – breakdown – preventative maintenance activity – scheduled servicing – modification to equipment or – on completion of the installation activities 1.4 confirm that the equipment is ready to operate, by carrying out all of the following checks: – the maintenance and/or installation activity has been completed, and the equipment functions correctly – all safety systems or features are functioning correctly – any waste materials, safety barriers and warning signs have been removed (where appropriate) – any auxiliary systems or equipment involved are connected and operable – any environmental controls are operable (where appropriate) – others involved in using the equipment are aware that the equipment is about to be operated/used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 confirm that everyone involved accepts the product or asset is in a satisfactory condition for handover to take place 1.6 clearly identify any unusual features of the condition of the product or asset.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Hand over and confirm completion of maintenance or installation activities (continued)	1.7 make the handover and obtain agreement between everyone involved on the precise moment of transfer of responsibility 1.8 carry out all of the following during the handover procedures: – operate/use the maintained and/or installed equipment in the presence of the appropriate person(s) – confirm that the other person/party accepts that the equipment functions satisfactorily – highlight to the appropriate person any changes in the operating procedure (where appropriate) – inform the appropriate person of any future maintenance activities that may be required – obtain agreement from the other person(s) that they now accept responsibility for the equipment to be returned to service – complete any necessary handover documentation 1.9 carry out handover procedures to one of the following: – production/process operator – supervisor of production/process – maintenance supervisor			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– customer – other specific person 1.10 deal promptly and effectively with problems within their control and report those that they cannot solve 1.11 make sure that clear, accurate and complete records of the handover are made 1.12 complete the relevant paperwork, to include one of the following, and pass it to the appropriate people – job card – maintenance log and action report – other handover paperwork – company reporting procedures.			
2a Know how to hand over and confirm completion of maintenance or installation activities	2.1 describe the health and safety requirements of the area in which the handover is to take place, and the responsibility they place on them 2.2 describe the specific health and safety precautions to be applied during the handover procedure, and their effects on others 2.3 describe the importance of wearing protective clothing and other appropriate safety equipment whilst operating/using the equipment during the handover operations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the checking process to be followed before handing over the equipment (such as all guards/covers have been fitted on moving or rotating parts, the equipment functions correctly) 2.5 describe the correct procedure to be followed when handing over maintained and/or installed equipment 2.6 describe the procedure for involving the appropriate people when operating/using the equipment 2.7 describe the need to highlight, where appropriate, any new, current or changed operating features of the maintained or installed equipment.			
2b Know how to hand over and confirm completion of maintenance or installation activities (continued)	2.8 describe the importance of informing the appropriate person of any future maintenance requirements 2.9 describe the need to confirm that the other person understands how to use/operate the equipment before handing the equipment over to them 2.10 describe the need to ensure that the person they are handing over the equipment to accepts that it is in a satisfactory condition 2.11 describe the organisational documentation procedures to be used with regard to the handover			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 explain how to create and maintain effective working relationships with appropriate people (such as encouraging, helping, politeness, open discussions both ways) 2.13 describe the problems that can occur during handover, and how they can be overcome 2.14 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 5: Carrying out fault location on mechanical equipment

Unit reference number: K/600/5674

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to locate faults on mechanical equipment, in accordance with approved procedures. The learner will be required to locate faults on equipment such as machine tools, gearboxes, portable tools, engines, pumps, process control valves, compressors, process plant, conveyers and elevators, lifting and handling devices, transfer equipment, mechanical structures, workholding devices and other company-specific equipment. The learner will be expected to use a variety of fault location methods and procedures, such as gathering information from the person who reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out fault location on mechanical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault locating activity: – plan the fault location methods and procedures in conjunction with others – obtain and use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for in the fault-finding area – carry out the fault location activities, using approved procedures – identify the fault, and consider appropriate corrective action – in conjunction with others, take actions to resolve the problem			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out fault location on two of the following types of mechanical equipment: – gearboxes – machine tools – lifting and handling devices – transfer equipment – portable power tools – engines – pumps – process control valves – compressors – process plant – workholding devices – conveyers and elevators – mechanical structures – company-specific equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 locate faults that have resulted in two of the following breakdown categories: – intermittent problem – partial failure/out-of-specification output – complete breakdowns 1.5 review and use all relevant information on the symptoms and problems associated with the products or assets 1.6 investigate and establish the most likely causes of the faults 1.7 select, use and apply diagnostic techniques, tools and aids to locate faults using four of the following: – information gathered from the person that reported the fault – fault-finding techniques (such as six-point, half-split, input/output, unit substitution, emergent sequence) – diagnostic aids (such as manuals, flow charts, troubleshooting guides, maintenance records) – inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, loose fittings) – operating (such as manual switching off and on, running equipment, condition of end product)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out fault location on mechanical equipment (continued)	1.8 use two of the following types of instruments to assist in locating faults: – measuring instruments/devices – dial test indicators – torque measuring devices – flow meters – alignment devices – self-diagnostic equipment – pressure/force indicators – other specific test/measurement instruments 1.9 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.10 determine the implications of the fault for other work and for safety considerations 1.11 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault 1.12 record details on the extent and location of the faults in an appropriate format			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 complete one of the following maintenance records, and pass it to the appropriate person: – scheduled maintenance report – corrective maintenance report – company-specific report.			
2a Know how to carry out fault location on mechanical equipment	2.1 describe the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies in the work area 2.3 describe the importance of wearing protective clothing and other appropriate safety equipment during fault location activities 2.4 describe the hazards associated with carrying out fault location on mechanical equipment (such as moving machinery, handling oils and greases, stored pressure/force, misuse of tools), and how they can be minimised 2.5 describe the procedure to be adopted to establish the background of the fault 2.6 explain how to use the various diagnostic aids to help identify the location of the fault			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the various fault location techniques that can be used, and how they are applied (such as half-split, input-to-output, function testing, unit substitution, and equipment self-diagnostics) 2.8 explain how to evaluate sensory information (such as sight, sound, smell, touch) 2.9 explain how to assess evidence and evaluate the possible causes of faults/problems.			
2b Know how to carry out fault location on mechanical equipment (continued)	2.10 explain how to use a range of fault diagnostic equipment to investigate the problem 2.11 describe the care, handling and application of mechanical measuring/test equipment (such as measuring instruments, dial test indicators, flow meters, torque measuring devices, pressure/force detectors) 2.12 explain how to check that mechanical measuring/test equipment is within calibration, and that it is free from damage and defects 2.13 explain how to obtain and interpret information from job instructions and other documents needed in the fault location process (such as drawings, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical symbols)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the basic principles of how the mechanical equipment functions, its operating sequence, the purpose of individual units/components and how they interact 2.15 describe the problems that can occur during the fault location activity, and how they can be minimised 2.16 explain how to evaluate the likely risk to themselves and others, and the effects the fault could have on the overall process or system 2.17 describe the importance of completing the correct documentation following the fault locating activity 2.18 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 6: Carrying out maintenance activities on mechanical equipment

Unit reference number: J/600/5679

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on mechanical equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing or repairing faulty components, in line with company procedures, on a variety of different types of mechanical equipment such as machine tools, gearboxes, portable tools, engines, pumps, process control valves, compressors, process plant, conveyers and elevators, lifting and handling devices, transfer equipment, mechanical structures, workholding devices and other company-specific equipment.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance activities on mechanical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on two of the following types of equipment: – gearboxes – machine tools – lifting and handling devices – process plant – portable power tools – engines – pumps – transfer equipment – process control valves – compressors – conveyers and elevators – mechanical structures – workholding devices – company-specific equipment 1.4 follow the relevant maintenance schedules to carry out the required work			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 maintain mechanical equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards 1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out maintenance activities on mechanical equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out all of the following maintenance activities: – dismantling equipment to the required level – labelling/proof marking of components – checking components for serviceability – replacing all 'lifed' items (such as seals, gaskets) – replacing or repairing damaged/defective components – setting, aligning and adjusting components – tightening fastenings to the required torque – making 'off-load' checks before starting up – replenishing oils, greases or other fluids – functionally testing the maintained equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 maintain and/or replace six of the following types of components: – hoses and connectors – pulleys and belts/wires – chains and sprockets – levers and links – rollers – bearings – seals, and gaskets – shafts – couplings – gears – cams – springs – sub-assemblies/replacement units – structural components (such as guards, fences, supports, housings) – locking and retaining devices (such as keys, pins, screw fasteners) – other specific components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permit to work/formal risk assessment – maintenance log and action report – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out maintenance activities on mechanical equipment	2.1 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 them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with carrying out mechanical maintenance activities (handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise them 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during maintenance process 2.6 explain how to obtain and interpret information from job instructions and other documentation used in the maintenance activities (such as drawings, specifications, manufacturers' manuals, symbols and terminology) 2.7 describe the methods and techniques used to dismantle/assemble mechanical equipment (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.8 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.9 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.10 describe the uses of measuring equipment (such as micrometers, verniers, run-out devices and other measuring devices).			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2b	Know how to carry out maintenance activities on mechanical equipment (continued)	2.11	explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, setting backlash in gears, preloading bearings)			
		2.12	describe the importance of making 'off-load' checks before running the equipment under power			
		2.13	explain 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			
		2.14	describe the importance of maintenance documentation and/or reports following the maintenance activity, and how to generate them			
		2.15	describe the equipment operating and control procedures to be applied during the maintenance activity			
		2.16	explain how to use lifting and handling equipment in the maintenance activity			
		2.17	describe the things that can go wrong when carrying out routine maintenance, and what to do if they occur.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 7: Restoring mechanical components to usable condition by repair

Unit reference number: F/600/5681

Level: 2

Credit value: 23

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to restore mechanical components to usable condition by repair, in accordance with approved procedures. The learner will be required to restore a range of mechanical components and equipment to operational condition, by repairing assemblies/sub-assemblies and components, by reworking the surface, recutting threads, or by the replacement of worn parts. The learner will also be required to select the appropriate equipment to use, based on the nature of the repair, the operations that will need to be carried out and the accuracy to be achieved.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Restore mechanical components to usable condition by repair	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following activities during the repairing activity: – undertake the repairing activities to cause minimal disruption to normal working – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – use the correct issue of drawings, job instructions and procedures – check that tools and equipment to be used are fit for purpose – use correct lifting techniques and equipment (where appropriate), in accordance with health and safety guidelines and procedures – ensure that repaired components are clean, and free from contamination and foreign objects – record the repair, using appropriate methods or documentation – dispose of waste items in a safe and environmentally acceptable manner			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– leave the work area in a safe and tidy condition 1.3 carry out four of the following types of repair: – recondition a unit by replacement of worn components – sleeving of worn components – make a temporary fix – bushing/plugging of worn holes – dressing internal/external threads – rework a fit (such as shimming, packing) – joining/bonding mating surfaces – other specific repair procedures – rework a component finish/shape (using techniques such as filing, scraping, grinding, lapping) 1.4 follow the relevant specifications for the component to be repaired 1.5 prepare the component for repair.			
1b Restore mechanical components to usable condition by repair (continued)	1.6 carry out the repairs within agreed timescale using approved materials and components and methods and procedures 1.7 carry out repairs on mechanical components, using four of the following methods – sawing (hand or band)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– drilling – reaming – grinding (hand or pedestal) – filing – scraping or lapping – tapping/dieing threads – machining (turning, milling) – thermal processes (such as brazing, welding, metal spraying) 1.8 ensure that the repaired component meets the specified operating conditions 1.9 carry out repairs to mechanical equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards 1.10 produce accurate and complete records of all repair work carried out.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2a Know how to restore mechanical components to usable condition by repair	2.1 describe the health and safety requirements of the area in which the repairing activity is to take place, and the responsibility these requirements place on them 2.2 describe the isolation procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the repairing procedure, and their effects on others 2.4 describe the importance of wearing protective clothing and other appropriate safety equipment during the repairing activities 2.5 describe the hazards associated with the repair/restoration operations being carried out (such as sawing (hand, band), drilling, reaming, grinding (hand or machine), filing, scraping or lapping, threading (internal or external), turning, milling and thermal processes), and how they can be minimised 2.6 explain how to obtain and interpret information from job instructions and other documentation used in the repairing activities (such as drawings, specifications, manufacturers' manuals, maintenance schedules symbols and terminology)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the methods, techniques and company procedures to be followed for repairing mechanical equipment 2.8 describe the types of repairs that can be made to components in order to prolong their useful life (such as bushing/plugging of worn holes, recutting threads, joining mating surfaces by thermal process) 2.9 explain how to use a range of hand tools (such as files, scrapers, threading devices).			
2b Know how to restore mechanical components to usable condition by repair (continued)	2.10 explain how to select saw blades (for different materials and different operations) 2.11 describe the types and application of portable power tools that can be used for the repairing operations 2.12 explain how to confirm that portable power tools and extension cables are in a safe and usable condition 2.13 describe the operating requirements of the machine tools and accessories being used (such as guards, workholding devices, speeds and feeds, specific statutory regulations such as *Abrasive Wheels Regulations*) 2.14 explain how to handle and store tools and equipment, safely and correctly 2.15 describe the application of cutting fluids			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 describe the company recording procedures to be used following a repair, and how to apply them 2.17 describe the problems associated with repairing mechanical components, and how to resolve them 2.18 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 8: Carrying out scheduled maintenance activities on mechanical equipment

Unit reference number: D/600/5686

Level: 2

Credit value: 19

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out scheduled maintenance activities on mechanical equipment, in accordance with approved procedures. The learner will be required to carry out scheduled maintenance on a range of mechanical equipment such as machine tools, gearboxes, portable tools, engines, pumps, process control valves, compressors, process plant, conveyers and elevators, lifting and handling devices, transfer equipment, mechanical structures, workholding devices and other company-specific equipment, in order to minimise downtime and ensure that equipment performs at the optimal level and functions to specification.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out scheduled maintenance activities on mechanical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the scheduled maintenance activities: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of drawings and maintenance documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – confirm with the authorised person that the equipment is ready for carrying out the scheduled maintenance – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – carry out the scheduled maintenance tasks, using appropriate techniques and procedures – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out scheduled maintenance activities on two of the following: – gearboxes – machine tools – lifting and handling devices – process plant – portable tools – engines – pumps – transfer equipment – process control valves – compressors – workholding devices – conveyers and elevators – mechanical structures – company-specific equipment 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 carry out the maintenance activities within the limits of their personal authority			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 carry out the maintenance activities in the specified sequence and in an agreed timescale.			
1b Carry out scheduled maintenance activities on mechanical equipment (continued)	1.7 carry out ten of the following scheduled maintenance activities: – removing excessive dirt and grime – making sensory checks (such as sight, sound, smell, touch) – checking equipment for leaks – replacing 'lifed' consumables (such as fluids, gaskets and seals, hoses) – monitoring the condition/deterioration of components (such as bearings, chains, belts, gears, cams, couplings) – checking that any safety equipment or controls are operating correctly – checking the operation of instrumentation (such as gauges, sensors and indicators) – carrying out and/or checking equipment self-analysis data – making adjustments to components and connections – checking/tightening fastenings to the required torque – replenishing oils, greases or other fluids			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– reviewing and checking equipment operation and performance – recording the results of the scheduled maintenance activity – reporting or taking action with regard to any defects that require immediate attention (such as replacing non-'lifed' components) 1.8 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.9 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – specific company documentation – permit to work/formal risk assessment 1.10 maintain mechanical equipment in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards 1.11 dispose of waste materials in accordance with safe working practices and approved procedures.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out scheduled maintenance activities on mechanical equipment	2.1	describe the health and safety requirements of the area in which the scheduled maintenance activities are to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation procedure or permit-to-work procedure that applies to the equipment being maintained			
		2.3	describe the specific health and safety precautions to be applied during the scheduled maintenance activities, and their effects on others			
		2.4	describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities			
		2.5	describe the hazards associated with carrying out scheduled maintenance activities on mechanical equipment (such as handling oils/greases, stored pressure/force, misuse of tools), and how they can be minimised			
		2.6	explain how to obtain and interpret information from job instructions and other documentation used in the maintenance activities (such as drawings, specifications, manufacturers' manuals, servicing schedules, symbols and terminology)			
		2.7	describe the various checks to be carried out during the scheduled maintenance procedure			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the procedure for obtaining the consumables to be used during the scheduled maintenance activity 2.9 describe the methods of checking that components are fit for purpose, and the need to replace 'lifed' items 2.10 explain how to check that any replacement components meet the required specification/operating conditions.			
2b Know how to carry out scheduled maintenance activities on mechanical equipment (continued)	2.11 explain how to make appropriate sensory checks (such as sight, sound, smell and touch) 2.12 describe the appropriate testing instructions to be adopted during the maintenance activity 2.13 explain how to make adjustments to components/assemblies to ensure they function to specification 2.14 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.15 explain how to complete scheduled maintenance records/logs/reports, in accordance with company policy and procedures 2.16 describe the equipment operating and control procedures, and how to apply them in order to carry out scheduled maintenance			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the problems that can occur whilst carrying out the scheduled maintenance tasks, and how they can be avoided 2.18 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 9: Carrying out fault location on electrical equipment and circuits

Unit reference number: M/600/5689

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to locate faults on electrical equipment and circuits, in accordance with approved procedures. The learner will be required to locate faults on electrical equipment, using single, three-phase or direct current power supplies, and which will include control systems, motors and starters, switchgear and distribution panels, control systems, electrical equipment, wiring enclosures and luminaires. The learner will be expected to use a variety of methods and procedures to assist in locating the fault, including gathering information from the person that reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out fault location on electrical equipment and circuits	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault locating activity: – plan the fault location methods and procedures in conjunction with others – use the correct issue of company drawings and maintenance documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as electricity, mechanical, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – carry out the fault location activities, using approved procedures – identify the fault, and consider appropriate corrective action – in conjunction with others, take actions to resolve the problem – leave the work area in a safe and tidy condition			

	1.3 carry out fault location on one of the following types of electrical circuit: – single phase power circuits – direct current power circuits – three-phase power circuits – single phase lighting circuit Plus two of the following types of electrical equipment: – switchgear and distribution panels – electrical plant – luminaries – portable appliances – motors and starters – control systems and components – other specific electrical equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 locate faults that have resulted in two of the following breakdown categories: – intermittent fault – partial failure or reduced performance – complete breakdown 1.5 review and use all relevant information on the symptoms and problems associated with the products or assets 1.6 investigate and establish the most likely causes of the faults 1.7 select, use and apply diagnostic techniques, tools and aids to locate faults using four of the following: – information gathered from the person that reported the fault – fault finding techniques (such as six-point, half-split, input/output, unit substitution, emergent sequence) – diagnostic aids (such as manuals, flow charts, troubleshooting guides, electronic aids, equipment records) – inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, loose fittings) – operating (such as manually switching off and on, RCD test buttons, running the equipment).			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out fault location on electrical equipment and circuits (continued)	1.8 use two of the following types of instruments to assist in locating faults: – multimeter – insulation resistance tester – light meter – portable appliance tester – earth loop impedance tester – other specific test/measurement instruments 1.9 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.10 determine the implications of the fault for other work and for safety considerations 1.11 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault 1.12 record details on the extent and location of the faults in an appropriate format 1.13 complete one of the following maintenance records and pass it to the appropriate person: – scheduled maintenance report – corrective maintenance report – company specific report.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out fault location on electrical equipment and circuits	2.1	describe the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies in the work area			
		2.3	explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation)			
		2.4	describe the importance of wearing protective clothing and other appropriate safety equipment during fault location activities			
		2.5	describe the hazards associated with carrying out fault location activities on electrical equipment (live electrical components, stored energy, misuse of tools), and how they can be minimised			
		2.6	describe the procedure to be adopted to establish the background of the fault			
		2.7	explain how to use the various diagnostic aids to help identify the location of the fault			
		2.8	describe the various fault location techniques that can be used, and how they are applied (such as half-split, input-to-output, function testing, unit substitution, and equipment self-diagnostics)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 explain how to evaluate sensory information (such as by sight, sound, smell, touch) 2.10 explain how to assess evidence and evaluate the possible causes of faults/problems.			
2b Know how to carry out fault location on electrical equipment and circuits (continued)	2.11 explain how to use a range of fault diagnostic equipment to investigate the problem 2.12 describe the care, handling and application of electrical test equipment (such as multimeter, portable appliance tester, earth loop impedance tester, insulation resistance tester) 2.13 explain how to check that electrical test equipment is within calibration, and that it is free from damage and defects 2.14 explain how to use and extract information from drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS 7671/IEE wiring regulations, and other documents needed in the fault location process 2.15 describe the basic principles of how the circuit functions, its operating sequence, the purpose of individual units/components and how they interact 2.16 explain how to evaluate the likely risk to themselves and others, and the effects the fault could have on the overall process or system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the problems that can occur during the fault location activity, and how they can be minimised 2.18 describe the importance of completing the correct documentation following the maintenance activity 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 10: Carrying out maintenance activities on electrical equipment

Unit reference number: L/600/5697

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on electrical equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing or repairing faulty components, in line with company procedures, on electrical equipment that uses single, three-phase or direct current power supplies, and includes equipment such as control systems, motors and starters, switchgear and distribution panels, electrical plant, wiring enclosures and luminaires, portable appliances and other specific electrical equipment.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance activities on electrical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activities: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on two of the following types of electrical equipment: – electrical plant – wiring enclosures – portable appliances – motors and starters – luminaries – switchgear and distribution panels – control systems and components – other specific electrical equipment 1.4 carry out maintenance activities on one of the following types of circuit: – single phase power supplies – three-phase power supplies – direct current power supplies – single phase lighting circuits			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 follow the relevant maintenance schedules to carry out the required work 1.6 maintain electrical equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards 1.7 carry out the maintenance activities within the limits of their personal authority.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out maintenance activities on electrical equipment (continued)	1.8 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.9 carry out all of the following maintenance activities: – isolating and locking-off equipment – disconnecting and reconnecting wires and cables – attaching suitable cable identification markers – removing electrical units/components – checking components for serviceability – replacing damaged/defective components – removing and replacing damaged wires and cables – setting and adjusting replaced components – making 'off-load' checks before powering up – functionally testing the maintained equipment 1.10 maintain and/or replace a range of electrical components, to include six of the following: – cables and connectors – locking and retaining devices – overload protection devices – inverter and servo controllers – relay components – rectifiers			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– capacitors – circuit boards – lighting fixtures – switches or sensors – contactors – encoders or resolvers – batteries – transformers – solenoids – thermistors or thermocouples – other specific components 1.11 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.12 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– company-specific documentation – permit to work/formal risk assessment – maintenance logs and action reports 1.13 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out maintenance activities on electrical equipment	2.1 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 them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to maintenance activities (to include electrical isolation, locking off switchgear, removal of fuses, placing of maintenance warning notices, proving that isolation has been achieved and secured) 2.3 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation) 2.4 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain how to obtain and interpret information from job instructions and other documentation used in the maintenance activities (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology) 2.6 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components 2.7 describe the different types of cabling used in the maintenance activities, and their method of termination 2.8 describe the care, handling and application of electrical measuring instruments 2.9 describe the techniques used to dismantle/assemble electrical equipment (such as unplugging, de-soldering, removal of screwed, clamped and crimped connections) 2.10 describe the methods of removing and replacing cables and wires in wiring enclosures without causing damage to existing cables 2.11 describe the use of IEE wiring, and other, regulations when selecting wires and cables and when carrying out tests on systems.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2b Know how to carry out maintenance activities on electrical equipment (continued)	2.12 describe the methods of attaching identification markers/labels to removed components or cables, to assist with re-assembly 2.13 describe the tools and equipment used in the maintenance activities (such as the use of cable stripping tools, crimping tools, soldering irons and torches, gland connecting tools) 2.14 describe the methods of checking that components are fit for purpose, and the need to replace 'lifed' items (such as seals and gaskets overload protection devices) 2.15 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.16 explain 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 2.17 describe the importance of making 'off-load' checks before proving the equipment with the electrical supply on 2.18 describe the equipment operating and control procedures to be applied during the maintenance activity 2.19 explain how to use appropriate lifting and handling equipment in the maintenance activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 describe the problems that can occur during the maintenance activity, and how they can be overcome 2.21 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.22 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 11: Carrying out modifications or rewiring electrical circuits

Unit reference number: R/600/5703

Level: 2

Credit value: 20

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to modify or rewire electrical circuits and equipment, in accordance with approved procedures. This will involve modifying or rewiring electrical circuits on equipment such as control systems, motors and starters, switchgear and distribution panels, electrical plant, wiring enclosures and luminaires, portable appliances and other specific electrical equipment.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out modifications or rewiring electrical circuits	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the modification or rewiring activities: – undertake the modification/rewiring activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as electricity, mechanical, gas, air or fluids) – provide safe access and working arrangements for the modification area – modify/rewire electrical circuits, using approved techniques and procedures – apply safe working practices and procedures at all times – dispose of waste items in a safe and environmentally acceptable manner			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– leave the work area in a safe and tidy condition 1.3 carry out modification or rewiring activities on one of the following types of circuit: – single phase power supplies – three-phase power supplies – direct current power supplies – single phase lighting circuits 1.4 carry out modification or rewiring activities on three of the following types of electrical equipment: – electrical plant – wiring enclosures – portable appliances – motors and starters – luminaries – switchgear and distribution panels – control systems and components – other specific electrical equipment 1.5 obtain and follow the relevant modification specifications and job instructions 1.6 confirm and agree what modifications are to be carried out to meet the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 prepare the electrical system for the required modification 1.8 carry out the system modification using approved materials, methods and procedures.			
1b Carry out modifications or rewiring electrical circuits (continued)	1.9 carry out four of the following, using appropriate methods and procedures: – replacing cables of different size or length – changing or adding components to panels or sub-assemblies – changing the position or angle of breakout points – adding or removing components from circuits – making changes to looms or mains circuits – changing the route of cables – changing position of electrical units – removing cables – adding cables to existing circuits 1.10 carry out four of the following, using appropriate methods and procedures – terminating mineral and armoured cables – bending and forming conduit – bending and forming trunking and trays – sealing and protecting cable connections			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– making mechanical/screwed/clamped connections – soldering and de-soldering – heat shrinking (such as devices and boots) – crimping (such as tags and pins) – stripping cable insulation/protection – removing cable end fittings – extracting/inserting components – allocating identification markings 1.11 complete the modification within the agreed timescale 1.12 ensure the modified electrical system meets the specified operating conditions 1.13 carry out modifications or rewiring to electrical circuits, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturers' operation range – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards 1.14 produce accurate and complete records of all modification work carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.15 complete one of the following maintenance records, and pass it to the appropriate person: – job cards – company-specific documentation – permit to work/formal risk assessment – maintenance logs and action reports 1.16 deal promptly and effectively with problems within their control and report those that cannot be solved.			
2a Know how to carry out modifications or rewiring electrical circuits	2.1 describe the specific safety precautions and procedures to be observed whilst carrying out the modifications of the electrical circuit (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area in which they are carrying out the modification activities, and the responsibility these requirements place on them 2.3 describe the hazards associated with carrying out modifications of electrical circuits, and how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation) 2.5 describe the personal protective equipment (PPE) and clothing to be worn during the modification activities 2.6 explain how to obtain and interpret information from job instructions and other documentation used in the rewiring or modification activities (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology) 2.7 describe the basic principles of how the system functions, its operating sequence, the working purpose of individual units/components, and how they interact 2.8 describe the different types of cabling (such as multicore cables, single core cables, steel wire armoured (SWA) cables, mineral insulated (MI) cables, screened cables), their fittings and their application 2.9 describe the different types of electrical components (such as plugs, switches, lighting and fittings, junction boxes, consumer units) 2.10 describe the preparations to be undertaken on the equipment, prior to the modification.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2b	Know how to carry out modifications or rewiring electrical circuits (continued)	2.11	explain how to extract and insert new cables in wiring enclosures (such as conduit, trunking and traywork), without causing damage to other cables or components			
		2.12	describe the methods and techniques used for soldering and de-soldering, and the importance of adhering to these procedures			
		2.13	describe the methods and techniques used for crimping and heat shrinking, and the importance of adhering to these procedures			
		2.14	describe the importance of ensuring that the completed circuit is free from foreign objects, and that all terminations are electrically sound and mechanically secure			
		2.15	explain how to conduct any necessary checks to ensure that the completed modification complies with all appropriate standards			
		2.16	explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for their intended purpose			
		2.17	describe the problems that can occur with the modification operations, and how these can be overcome			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the recording documentation to be completed for the activities undertaken 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 12: Carrying out scheduled maintenance tasks on electrical equipment

Unit reference number: D/600/5705

Level: 2

Credit value: 19

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out scheduled maintenance tasks on electrical equipment, in accordance with approved procedures. The learner will be required to carry out maintenance on electrical equipment such as control systems, motors and starters, switchgear and distribution panels, electrical plant, wiring enclosures and luminaires, portable appliances and other specific electrical equipment, in order to minimise downtime, and ensure that the equipment performs at optimal levels and functions to specification.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out scheduled maintenance tasks on electrical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the scheduled maintenance activities: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – confirm with the authorised person that the equipment is ready for carrying out the scheduled maintenance activity – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – carry out the scheduled maintenance tasks, using appropriate techniques and procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out scheduled maintenance tasks on two of the following groups of electrical equipment: – electrical plant – wiring enclosures – portable appliances – motors and starters – luminaries – switchgear and distribution panels – control systems and components – other specific electrical equipment 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain electrical equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – BS7671/IEE wiring regulations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out scheduled maintenance tasks on electrical equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out ten of the following scheduled maintenance activities: – removing excessive dirt and grime – making sensory checks (such as sight, sound, smell, touch) – replacing 'lifed' consumables (such as gaskets, seals, batteries, light bulbs) – monitoring the condition/deterioration of components (such as cables, connectors switches, contactors, safety devices) – checking that any safety equipment or controls are operating correctly – checking the operation of test/measuring equipment (such as instrumentation, sensors and indicators) – carrying out and/or checking equipment self-analysis data – making adjustments to components and/or connections			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– checking/tightening fastenings to the required torque – checking the integrity and security of earth bonding – reviewing and checking equipment operation and performance – recording the results of the scheduled maintenance activity – reporting or taking action with regard to any defects that require immediate attention (such as replacing 'non-lifed' components) 1.9 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.10 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – specific company documentation – permit to work/formal risk assessment 1.11 dispose of waste materials in accordance with safe working practices and approved procedures.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out scheduled maintenance tasks on electrical equipment	2.1	describe the health and safety requirements of the area in which the scheduled maintenance tasks are to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation procedure or permit-to-work procedure that applies to the equipment being maintained			
		2.3	describe the specific health and safety precautions to be applied during the scheduled maintenance tasks, and their effects on others			
		2.4	explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation)			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities			
		2.6	describe the hazards associated with carrying out scheduled maintenance tasks on electrical equipment (such as live electrical components, stored energy, misuse of tools), and how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to obtain and interpret information from job instructions and other documentation used in the maintenance activities (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology) 2.8 describe the various checks to be carried out during the scheduled maintenance procedure 2.9 describe the procedure for obtaining the consumables to be used during the scheduled maintenance activity 2.10 describe the methods of checking that components are fit for purpose, and the need to replace 'lifed' items.			
2b Know how to carry out scheduled maintenance tasks on electrical equipment (continued)	2.11 explain how to check that any replacement components meet the required specification/operating conditions 2.12 explain how to make appropriate sensory checks (such as sight, sound, smell and touch) 2.13 describe the appropriate testing instructions to be adopted during the maintenance activity 2.14 explain how to make adjustments to components/assemblies to ensure they function to specification 2.15 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components, and how they interact			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain how to complete scheduled maintenance records/logs/reports, in accordance with company policy and procedures 2.17 describe the equipment operating and control procedures, and how to apply them in order to carry out scheduled maintenance 2.18 describe the problems that can occur whilst carrying out the scheduled maintenance tasks, and how they can be avoided 2.19 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.20 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 13: Carrying out fault location on electronic equipment and circuits

Unit reference number: T/600/5709

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to locate faults on electronic equipment/circuits, in accordance with approved procedures. The learner will be required to investigate faults on a range of electronic equipment such as power supplies, motor control systems, sensors and actuators circuits, digital circuits and systems, analogue circuits and systems, and hybrid circuits and systems, at assembly or component level. The learner will be expected to use a variety of fault location methods and procedures, such as gathering information from the person who reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment. The learner will be expected to take care that they do not damage the equipment/circuit during the maintenance activities and, where appropriate, the application of electrostatic discharge procedures will be a critical part of their role.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out fault location on electronic equipment and circuits	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault location activity: – plan the fault location methods and procedures in conjunction with others – obtain and use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as electricity, mechanical, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – use grounded wrist straps and other electrostatic discharge (ESD) precautions, where appropriate – disconnect or isolate components or parts of the circuit to confirm the diagnosis, where appropriate			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– carry out the fault location activities using approved procedures – identify the fault, and consider appropriate corrective action – in conjunction with others, take actions to resolve the problem – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out fault location on two of the following types of equipment: – power supply systems (such as switched mode, series regulation, shunt regulation) – motor control systems (such as closed-loop servo/proportional, inverter control) – sensors and actuators (such as linear, rotational, temperature, level, photo-optic, pressure, flow) – digital circuits and systems (such as programmable controller, microprocessor, ROM/RAM, logic gates) – analogue circuits and systems (such as frequency modulation/demodulation, amplifiers, filters, oscillators)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– hybrid circuits and systems (such as analogue to digital converters (ADC), d-to-a converters (DAC)) 1.4 locate faults that have resulted in two of the following breakdown categories: – intermittent action or circuit failure – partial failure or reduced performance – complete breakdown 1.5 review and use all relevant information on the symptoms and problems associated with the products or assets 1.6 investigate and establish the most likely causes of the faults 1.7 select, use and apply diagnostic techniques, tools and aids to locate faults using four of the following: – information gathered from the person who reported the fault – fault finding techniques (such as six point, half-split, input/output, unit substitution, emergent sequence) – diagnostic aids (such as manuals, flow charts, troubleshooting guides, electronic aids, equipment records)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, poor joints) – operating (such as manually switching off and on, test buttons, running the equipment).			
1b Carry out fault location on electronic equipment and circuits (continued)	1.8 use two of the following types of instruments to assist in locating faults: – multimeter – signal generator – oscilloscope – logic probe – signal tracer – other specific test/measurement instruments 1.9 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.10 determine the implications of the fault for other work and for safety considerations 1.11 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault 1.12 record details on the extent and location of the faults in an appropriate format			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 complete one of the following maintenance records, and pass it to the appropriate person: – scheduled maintenance report – corrective maintenance report – other company-specific report.			
2a Know how to carry out fault location on electronic equipment and circuits	2.1 describe the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies in the work area 2.3 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation) 2.4 describe the importance of wearing protective clothing and other appropriate safety equipment during fault location activities 2.5 describe the hazards associated with carrying out fault location activities on electronic equipment (live electrical components, stored energy, misuse of tools), and how they can be minimised 2.6 describe the procedure to be adopted to establish the background of the fault			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to use the various diagnostic aids to help identify the location of the fault 2.8 describe the various fault location techniques that can be used, and how they are applied (such as half-split, input-to-output, function testing, unit substitution, and equipment self-diagnostics) 2.9 explain how to evaluate sensory information (such as sight, sound, smell, touch) 2.10 explain how to assess evidence and evaluate the possible causes of faults/problems 2.11 explain how to use a range of fault diagnostic equipment to investigate the problem.			
2b Know how to carry out fault location on electronic equipment and circuits (continued)	2.12 describe the care, handling and application of electrical test equipment (such as multimeter, signal generator, logic probe, signal tracer and oscilloscope) 2.13 describe the precautions to be taken to prevent electrostatic discharge (ESD) damage to electronic circuits and components (such as the use of wrist straps, special packaging and handling areas) 2.14 explain how to use a range of fault diagnostic equipment to investigate the problem 2.15 explain how to check that electronic test equipment is within calibration and that it is free from damage and defects			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain how to obtain and interpret information from job instructions and other documentation used in the maintenance activities (such as drawings, specifications, history/maintenance reports manufacturers' manuals, BS7671/IEE regulations, symbols and terminology) 2.17 describe the functions of different types of electronic components (analogue or digital), and their operation 2.18 explain how to evaluate the likely risk to themselves and others, and the effects the fault could have on the overall process or system 2.19 describe the problems that can occur during the fault location activity, and how they can be minimised 2.20 describe the importance of completing the correct documentation, following the maintenance activity 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 14: Carrying out tests on electronic equipment and circuits

Unit reference number: T/600/5712

Level: 2

Credit value: 20

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out inspections and tests on electronic equipment and circuits, in accordance with approved procedures. The learner will be required to carry out defined and documented tests on a range of electronic equipment such as power supplies, alarm and protection circuits, motor control systems, sensors and actuator circuits, digital circuits and systems, analogue circuits and systems, and hybrid circuits and systems, in order to assess their functionality and performance in relationship to the specification.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out tests on electronic equipment and circuits	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the testing activities: – plan the testing methods and procedures in conjunction with others, prior to beginning the testing – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment – ensure that safe access and working arrangements have been provided for the test area – carry out the testing activities, using appropriate techniques and procedures – ensure that test equipment is within calibration dates			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– take electrostatic discharge (ESD) precautions when handling sensitive components and circuit boards – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out tests on two of the following types of electronic equipment: – power supplies (such as switched mode, series regulation, shunt regulation) – motor control systems (such as closed loop servo/proportion control, inverter control) – sensor/actuator circuit (such as linear, rotational, temperature, photo-optic, flow, level, pressure) – digital circuit (such as process control, microprocessor, logic devices, display devices) – signal processing circuit (such as frequency modulating/demodulating, amplifiers, filters) – alarms and protection circuits – ADC and DAC hybrid circuits 1.4 follow the appropriate procedures for use of tools and equipment to carry out the required tests			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 carry out tests using a range of tools and test equipment, to include two of the following: – oscilloscope – ammeter – logic analyser – logic probe – signal tracer – signal generator – multimeter – automatic test equipment – computer-aided diagnostic equipment – special purpose testing equipment – temperature measuring devices 1.6 set up and carry out the tests using the correct procedures and within agreed timescales.			
1b Carry out tests on electronic equipment and circuits (continued)	1.7 carry out tests on electronic equipment and components, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's specifications – customer requirements – BS, ISO and/or BSEN standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out eight of the following tests/measurements, as applicable to the equipment being tested: – logic states – DC voltage/current levels – AC voltage/current levels – clock/timer switching – pulse width/rise time – open/short circuit – resistance – heat dissipation – frequency modulation/demodulation – performance of circuit – condition of assemblies and components – signal noise/interference levels 1.9 record the results of the tests in the appropriate format 1.10 complete one of the following records, and pass it to the appropriate person: – job cards – maintenance logs and action reports – company-specific test documentation			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
		1.11	review the results and carry out further tests if necessary.			
2a	Know how to carry out tests on electronic equipment and circuits	2.1	describe the health and safety requirements of the area in which the testing activity is to take place, and the responsibility these requirements place on them			
		2.2	describe their responsibilities under regulations relevant to the electronic testing activities being undertaken			
		2.3	describe the isolation and lock-off procedure or permit-to-work procedure that applies to the testing activities (electrical isolation, locking off switchgear, removal of fuses, placing of warning notices, proving that isolation has been achieved and secured)			
		2.4	describe the specific safety precautions to be taken when carrying out formal inspection, safety and circuit testing of electronic equipment			
		2.5	describe the hazards associated with testing electronic equipment and circuits, and with the equipment that is used, and how these hazards can be minimised			
		2.6	describe the importance of wearing protective clothing, and other appropriate safety equipment, during the testing activities			
		2.7	describe the importance of keeping the work area clean, tidy and free from waste and surplus materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain how the testing activities may affect the work of others, and the procedure for informing them of the work to be carried out 2.9 describe the procedures and precautions to be adopted to eliminate/protect against electrostatic discharge (ESD) 2.10 explain how to obtain and interpret information from job instructions, drawings, circuit diagrams, specifications, manufacturers' manuals, test procedures and other documents needed to carry out the tests.			
2b Know how to carry out tests on electronic equipment and circuits (continued)	2.11 describe the basic principles of how the electronic circuit functions, its operating sequence, the function/purpose of individual units/components, and how they interact 2.12 explain how to set up and apply the appropriate test equipment 2.13 explain how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and have been configured correctly for their intended purpose 2.14 explain how to ensure the test equipment has been correctly calibrated 2.15 describe the various testing methods and procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain how to assess test results, and make comparison with the specification 2.17 describe the environmental control requirements and company operating procedures relating to functional testing 2.18 describe the documentation required, and the procedures to be followed, at the conclusion of the testing 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 15: Carrying Out Repairs to Electronic Equipment

Unit reference number: R/600/5717

Level: 2

Credit value: 23

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out repairs on electronic equipment, in accordance with approved procedures. The learner will be required to carry out repairs on a range of electronic equipment, such as power supplies, motor control systems, alarm and protection circuits, sensors and actuator circuits, digital circuits and systems, analogue circuits and systems, and hybrid circuits and systems. This will involve dismantling, removing and replacing faulty items at board and component level, on a variety of different types of electronic assemblies and sub-assemblies.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out repairs to electronic equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the repair activities: – confirm the type and level of repair to be carried out – undertake the repair activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment – ensure that safe access and working arrangements have been provided in the work area – take electrostatic discharge (ESD) precautions when handling sensitive components and circuit boards – leave the work area in a safe and tidy condition 1.3 carry out repair activities on two of the following types of electronic equipment: – power supplies (such as switched mode, series regulation, shunt regulation) – alarms and protection circuits – ADC and DAC hybrid circuits			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 follow the relevant maintenance schedules to carry out the required work 1.5 carry out repairs to electronic equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturers' operation range – BS, ISO and/or BSEN standards 1.6 carry out the maintenance activities within the limits of their personal authority			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 carry out the maintenance activities in the specified sequence and in an agreed timescale.			
1b Carry out repairs to electronic equipment (continued)	1.8 carry out all of the following maintenance techniques and procedures during the repair activities: – removing excessive dirt and grime – dismantling/disconnecting equipment to the required level – checking the condition/deterioration of components – making adjustments to components and/or connections – re-assembling of units or sub-assemblies – reviewing and checking the equipment operation and/or performance – reporting or actioning any other defects that require immediate attention 1.9 repair and/or replace a range of electronic components, to include six of the following: – cables and connectors – printed circuit boards – transformers – fixed resistors – variable resisitors			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– capacitors – rectifiers – thermistors – transistors – diodes – sensors – heat sinks – protection devices – decoders – regulators – encoders or resolvers – inverters or servo controllers – analogue or digital integrated circuits 1.10 use the correct joining/connecting techniques to deal with three of the following types of connection: – push-fit connectors – soldering or desoldering – clip assemblies – threaded connections – crimped connections – zero insertion force (zif) connectors			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– adhesive joints/assemblies – edge connectors 1.11 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.12 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – repair log/report – company specific documentation 1.13 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out repairs to electronic equipment	2.1 describe the health and safety requirements of the area in which the repair activity is to take place, and the responsibility these requirements place on them 2.2 describe their responsibilities under regulations that apply to the electronic repair activities being undertaken			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the repair activities and the electronic equipment or circuits being worked on (electrical isolation, locking off switchgear, removal of fuses, placing maintenance warning notices, proving that isolation has been achieved and secured) 2.4 describe the importance of wearing protective clothing and other appropriate safety equipment during the repair activities 2.5 describe the hazards associated with repairing electronic equipment, and with the materials, tools and equipment that are used (such as live electrical components, capacitor discharge), and how these can be minimised 2.6 describe the importance of keeping the work area clean and tidy, and free from waste and surplus materials 2.7 explain how the repair activities may affect the work of others, and the procedure for informing them of the work to be carried out 2.8 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 explain how to obtain and extract information from job instructions, drawings and data (such as circuit diagrams, specifications, manufacturers manuals, test procedures and other documents needed to carry out repairs) 2.10 describe the basic principles of how the electronic circuit functions, and its operating sequence 2.11 explain how to check that the replacement components meet the required specification/operating conditions (such as values, tolerance, current-carrying capacity, ambient temperatures) 2.12 describe the methods of removing and replacing the faulty components from the equipment (such as unplugging, de-soldering, removal of screwed, clamped, edge connected, zero insertion force, and crimped connections).			
2b Know how to carry out repairs to electronic equipment (continued)	2.13 describe the importance of removing faulty components without causing damage to other components, wiring or the surrounding structure 2.14 describe the methods of attaching identification marks/labels to removed components or connections, in order to assist with re-assembly 2.15 describe the tools and equipment used in the repair activities (including the use of wire-stripping tools, crimping tools, soldering irons, insertion devices and connecting tools)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain how to check that tools and equipment are free from damage or defects, that they are in a safe and usable condition, and that they are configured correctly for the intended purpose 2.17 describe the sequence for reconnecting the equipment, and the checks to be made prior to restoring power (such as checking components for correct polarity, ensuring that there are no exposed conductors, cable insulation is not damaged, all connections are mechanically and electrically secure, casings are free from loose screws, there are no wire ends or solder blobs that could cause short circuits, and all fuses/protection devices are installed) 2.18 describe the importance of making 'off-load' checks before proving the equipment with the electrical supply on 2.19 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.20 describe the documentation and/or reports to be completed following the repair activity, and the importance of ensuring that these reports are completed accurately and legibly 2.21 describe the problems that can occur with the repair activity, and how they can be overcome			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 describe the organisational procedures to be adopted for the safe disposal of waste of all types of materials 2.23 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 16: Carrying out fault location on fluid power equipment and circuits

Unit reference number: R/600/5720

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to locate faults on fluid power equipment and circuits, on mobile or static plant, in accordance with approved procedures. The learner will be required to investigate faults on fluid power equipment such as pneumatic, hydraulic and vacuum devices, both at unit and component level. The learner will be expected to use a variety of fault location methods and procedures, such as gathering information from the person who reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out fault location on fluid power equipment and circuits	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault location activity: – plan the fault location methods and activities in conjunction with others – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – adhere to company specific contamination and control procedures at all times – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – carry out the fault location activities, using approved procedures – identify the fault, and consider appropriate corrective action			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– in conjunction with others, take actions to resolve the problem – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out fault location on one of the following types of fluid power system: – pneumatic system – hydraulic system – vacuum system To include six of the following fluid power components: – pumps – pistons – spools – valves – actuators – motors – bearings – reservoirs/storage devices – accumulators – pressure intensifiers			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– compressors – receivers – gaskets and seals – pipework and hoses/tubing – switches – sensors – lubricators/filters – regulators – other specific components 1.4 find faults that have resulted in two of the following breakdown categories: – intermittent problem – partial failure or reduced performance – complete breakdown 1.5 review and use all relevant information on the symptoms and problems associated with the products or assets 1.6 investigate and establish the most likely causes of the faults 1.7 select, use and apply diagnostic techniques, tools and aids to locate faults using four of the following: – information gathered from the person who reported the fault			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– fault-finding techniques (such as six-point, half-split, input/output, unit substitution, emergent sequence) – diagnostic aids (such as manuals, flow charts, troubleshooting guides, maintenance records) – inspecting (such as checking for damage, wear/deterioration, leaks, loose fittings and connections) – operating (such as timing, sequence, movement) – sequence charts – functional diagrams.			
1b Carry out fault location on fluid power equipment and circuits (continued)	1.8 use two of the following types of instruments to assist in locating faults: – measuring devices/meters – pressure indicators – flow indicators – self-diagnostic equipment – contamination monitoring and analysing devices 1.9 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.10 determine the implications of the fault for other work and for safety considerations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault 1.12 record details on the extent and location of the faults in an appropriate format 1.13 complete one of the following maintenance records, and pass it to the appropriate person: – scheduled maintenance report – other company specific report – corrective maintenance report.			
2a Know how to carry out fault location on fluid power equipment and circuits	2.1 describe the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies in the work area 2.3 describe the importance of wearing protective clothing and other appropriate safety equipment during fault location activities 2.4 describe the hazards associated with carrying out fault location activities on fluid power equipment (such as handling fluids, stored pressure/force, misuse of tools, using practices that do not follow laid-down procedures), and how they can be minimised 2.5 describe the importance of following the correct de-contamination procedure			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions and other documents needed in the fault location process (such as drawings, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical symbols) 2.7 describe the procedure to be adopted to establish the background of the fault 2.8 explain how to use the various diagnostic aids to help identify the location of the fault 2.9 describe the various fault location techniques that can be used, and how they are applied (such as half-split, input-to-output, function testing, unit substitution, equipment self-diagnostics and fault cause remedy) 2.10 explain how to evaluate sensory information (sight, sound, smell, touch).			
2b Know how to carry out fault location on fluid power equipment and circuits (continued)	2.11 explain how to assess evidence and evaluate the possible causes of faults/problems 2.12 explain how to use a range of fault diagnostic equipment to investigate the problem 2.13 describe the care, handling and application of mechanical measuring/test equipment (such as measuring instruments, pressure and flow indicators and self-diagnostic equipment)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain how to check that fluid power measuring/test equipment is within current calibration dates, and that it is free from damage and defects 2.15 describe the basic principles of how the fluid power equipment functions, and the operation and application, of the various units and components 2.16 describe the problems that can occur during the fault location activity, and how they can be minimised 2.17 explain how to evaluate the likely risk to themselves and others, and the effects the fault could have on the overall process or system 2.18 describe the importance of completing the correct documentation following the fault locating activity 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 17: Carrying out maintenance activities on fluid power equipment

Unit reference number: K/600/5724

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on fluid power equipment, on mobile or static plant, in accordance with approved procedures. This will involve dismantling, removing and replacing or repairing faulty components on hydraulic, pneumatic or vacuum equipment, and will include components such as pumps, valves, actuators, sensors, regulators, compressors, pipes and hoses, and other specific fluid power equipment.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance activities on fluid power equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – adhere to company specific contamination and control procedures at all times – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on one of the following types of fluid power equipment: – pneumatic – hydraulic – vacuum 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain fluid power equipment, in accordance with one of the following: – organisational guidelines and codes of practice (such as BFPA guidance documentation) – equipment manufacturers' operation range – BS, ISO and/or BSEN standards 1.6 carry out the maintenance activities within the limits of their personal authority.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out maintenance activities on fluid power equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 maintain and/or replace six of the following fluid power system components: – pumps – pistons – spools – valves – actuators – motors – bearings			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– reservoirs – accumulators – pressure intensifiers – compressors – receivers – gaskets and seals – pipework and hoses/tubing – switches – sensors – lubricators/filters – regulators – valve solenoid – other specific components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 carry out eight of the following maintenance activities, as applicable to the equipment being maintained: – chocking/supporting rams/components – releasing stored pressure – draining and removing fluids (as applicable) – disconnecting/removing hoses, pipes and hoses/tubing – proof marking/labelling of removed components – checking components for serviceability – replacing all 'lifed' items (such as seals, filters, gaskets, hoses) – tightening fastenings to the required torque – priming and bleeding the system (where applicable) – removing and replacing units/components – setting, aligning and adjusting replaced components – making 'off-load' checks before re-pressurising the system – functional/performance testing of the maintained system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – maintenance log and action report – permit to work/formal risk assessment – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out maintenance activities on fluid power equipment	2.1	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 them			
		2.2	describe the isolation procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be taken during the maintenance activities, and their effects on others			
		2.4	describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities			
		2.5	describe the importance of following the de-contamination procedure			
		2.6	describe the hazards associated with carrying out maintenance activities on fluid power equipment (such as handling fluids, stored pressure/force, misuse of tools), and how these can be minimised			
		2.7	describe the regulations and codes of practice that apply to working with fluid power equipment			
		2.8	explain how to obtain and interpret information from job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities 2.10 describe the recognition of contaminants, the problems they can create, and the effects and likely symptoms of contamination in the system 2.11 describe the techniques used to dismantle/assemble fluid power equipment (such as release of pressures/force, proof marking, extraction).			
2b Know how to carry out maintenance activities on fluid power equipment (continued)	2.12 describe the need to establish the cleanliness level of oil in the hydraulic reservoirs 2.13 describe the procedures to be followed to correctly fill hydraulic reservoirs 2.14 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.15 describe the basic principles of how the fluid power equipment functions, and the operation and application, of the various units and components 2.16 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose 2.17 describe the generation of documentation and/or reports following the maintenance activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the equipment operating and control procedures to be applied during the maintenance activity 2.19 explain how to use lifting and handling equipment, safely and correctly in the maintenance activity 2.20 describe the problems associated with the maintenance activity, and how they can be overcome 2.21 describe the procedure to be adopted for the safe disposal of waste of all types of materials 2.22 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 18: Carrying out scheduled maintenance tasks on fluid power equipment

Unit reference number: T/600/5726

Level: 2

Credit value: 19

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out scheduled maintenance tasks on fluid power equipment on mobile or static plant, in accordance with approved procedures. The learner will be required to carry out maintenance on pneumatic, hydraulic or vacuum equipment, which will include equipment and components such as pumps, cylinders, valves, actuators, pipework and hoses, switches and sensors, in order to minimise down time, and to ensure that the equipment performs at optimal levels and functions to specification.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out scheduled maintenance tasks on fluid power equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the scheduled maintenance tasks: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – adhere to company specific contamination and control procedures at all times – confirm with the authorised person that the equipment is ready for carrying out the scheduled maintenance – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– carry out the scheduled maintenance tasks, using appropriate techniques and procedures – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out scheduled maintenance tasks on one of the following types of fluid power equipment: – pneumatic equipment – hydraulic equipment – vacuum equipment 1.4 carry out scheduled maintenance tasks on four of the following: – pumps – pipework and hoses/tubing – compressors – sensors/switches – storage devices (such as reservoirs, receivers, accumulators) – mechanical control devices (such as valves, actuators, motors) – valve solenoid – other specific system components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 follow the relevant maintenance schedules to carry out the required work 1.6 maintain fluid power equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards.			
1b Carry out scheduled maintenance tasks on fluid power equipment (continued)	1.7 carry out the maintenance activities within the limits of their personal authority 1.8 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.9 carry out ten of the following scheduled maintenance activities: – removing excessive dirt and grime – making sensory checks (such as sight, sound, smell, touch) – checking equipment for leaks – replacing 'lifed' consumables (such as gaskets and seals, hoses) – monitoring the condition/deterioration of components (such as actuators, mechanical control devices, pipework)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– checking that any safety equipment or controls are operating correctly (such as switches and sensors) – checking the operation of instrumentation (such as gauges and indicators) – carrying out and/or checking equipment self-analysis data – making adjustments to components and connections – checking/tightening fastenings to the required torque – replenishing oils, greases or other fluids – reviewing and checking the equipment operation and performance – recording the results of the scheduled maintenance activity – reporting or taking action with regard to any defects that require immediate attention (such as replacing non-'lifed' components) 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – specific company documentation – permit to work/formal risk assessment 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out scheduled maintenance tasks on fluid power equipment	2.1 describe the health and safety requirements of the area in which the scheduled maintenance tasks are to take place, and the responsibility these requirements place on them 2.2 describe the isolation procedure or permit-to-work procedure that applies to the equipment being maintained 2.3 describe the specific health and safety precautions to be applied during the scheduled maintenance tasks, and their effects on others 2.4 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities 2.5 describe the hazards associated with carrying out scheduled maintenance on fluid power equipment (such as handling oils/greases, stored pressure/force, misuse of tools), and how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and extract information from job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 describe the various checks to be carried out during the scheduled maintenance procedure 2.8 describe the importance of following correct decontamination procedures 2.9 describe the procedure for obtaining the consumables to be used during the scheduled maintenance activity 2.10 describe the methods of checking that components are fit for purpose, and the need to replace 'lifed' items 2.11 explain how to check that any replacement components meet the required specification/operating conditions.			
2b Know how to carry out scheduled maintenance tasks on fluid power equipment (continued)	2.12 explain how to make appropriate sensory checks (such as sight, sound, smell and touch) 2.13 describe the appropriate testing instructions to be adopted during the maintenance activity 2.14 explain how to make adjustments to components/assemblies to ensure they function to specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components, and how they interact 2.16 explain how to complete scheduled maintenance records/logs/reports, in accordance with company policy and procedures 2.17 describe the importance of recording any adjustments and modifications to the system and the implications if this is not carried out 2.18 describe the equipment operating and control procedures, and how to apply them in order to carry out scheduled maintenance 2.19 describe the problems that can occur whilst carrying out the scheduled maintenance tasks, and how they can be avoided 2.20 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 19: Carrying out fault location on service systems and equipment

Unit reference number: J/600/5729

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to locate faults on services, and service equipment and systems, in accordance with approved procedures. The learner will be required to locate faults on service equipment and systems, such as fresh or foul water, environmental control, emergency power generation, heating and ventilation, gas distribution, process control, instrumentation control, and refrigeration, at sub-assembly and/or component level. The learner will be expected to use a variety of fault location methods and procedures, such as gathering information from the person who reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out fault location on service systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault location activities: – plan fault location methods and procedures in conjunction with others, prior to beginning the work – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – provide safe access and working arrangements for the maintenance area – carry out the fault location activities, using approved procedures – disconnect or isolate components or parts of the system, when appropriate, to confirm the diagnosis			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– identify the fault, and consider appropriate corrective action – in conjunction with others, take actions to resolve the problem – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out fault location on one of the following types of services equipment, to sub-assembly or component level: – fresh water – foul water – compressed air – refrigeration – environmental control – emergency power generation – gas distribution – instrumentation and control – heating and ventilation – air conditioning and ventilation – process control			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 locate faults that have resulted in two of the following breakdown categories: – intermittent problem – partial failure or reduced performance – complete breakdowns 1.5 review and use all relevant information on the symptoms and problems associated with the products or assets 1.6 investigate and establish the most likely causes of the faults 1.7 select, use and apply diagnostic techniques, tools and aids to locate faults using four of the following: – information gathered from the person who reported the fault – fault-finding techniques (such as six-point, half-split, input/output, unit substitution, emergent sequence) – diagnostic aids (such as manuals, flow charts, troubleshooting guides, maintenance records) – inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, loose fittings) – operating (such as manually switching off and on, running equipment, condition of end product).			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out fault location on service systems and equipment (continued)	1.8 use two of the following types of instruments to assist in locating faults: – mechanical measuring equipment (such as measuring instruments, dial test indicators, torque instruments) – electrical/electronic measuring instruments (such as multimeter, logic probes, temperature meters, analysers) – fluid test equipment (such as flow testing devices/meters, pressure testers, contamination testers) 1.9 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.10 determine the implications of the fault for other work and for safety considerations 1.11 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault 1.12 record details on the extent and location of the faults in an appropriate format 1.13 complete one of the following maintenance records, and pass it to the appropriate person: – scheduled maintenance report – corrective action report – company-specific documentation.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out fault location on service systems and equipment	2.1	describe the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies in the work area			
		2.3	describe the importance of wearing protective clothing and other appropriate safety equipment during fault location activities			
		2.4	describe the hazards associated with carrying out fault location activities on services and systems (such as such as handling fluids, stored pressure/force, electrical contact, process controller interface, using faulty or damaged tools and equipment, using practices that do not follow laid-down procedures), and how they can be minimised			
		2.5	describe the procedure to be adopted to establish the background of the fault			
		2.6	explain how to use the various diagnostic aids to help identify the location of the fault			
		2.7	describe the various fault location techniques that can be used, and how they are applied (such as half-split, input-to-output, function testing, unit substitution, and equipment self-diagnostics)			
		2.8	explain how to evaluate sensory information (such as sight, sound, smell, touch)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 explain how to assess evidence and evaluate the possible causes of faults/problems.			
2b Know how to carry out fault location on service systems and equipment (continued)	2.10 explain how to use a range of fault diagnostic equipment to investigate the problem 2.11 describe the care, handling and application of measuring/test equipment (such as mechanical measuring instruments, electrical measuring instruments, test rigs and pressure and flow devices) 2.12 explain how to check that measuring/test equipment is within calibration and that it is free from damage and defects 2.13 explain how to obtain and interpret information from job instructions and other documents needed in the fault location process (such as drawings, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical symbols) 2.14 describe the basic principles of how the service equipment functions, its operating sequence, the purpose of individual units/components and how they interact 2.15 describe the problems that can occur during the fault location activity, and how they can be minimised 2.16 explain how to evaluate the likely risk to themselves and others, and the effects the fault could have on the overall process or system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the importance of completing the correct documentation, following the maintenance activity 2.18 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 20: Carrying out scheduled maintenance tasks on service systems and equipment

Unit reference number: J/600/5732

Level: 2

Credit value: 19

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out scheduled maintenance tasks on service systems and equipment, such as water distribution, waste/foul water, environmental control, refrigeration, heating and ventilation, air conditioning and ventilation, gas distribution, compressed air, process control, and instrumentation and control, in order to minimise downtime, and to ensure that the equipment performs at optimal levels and functions to specification.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out scheduled maintenance tasks on service systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the scheduled maintenance activities: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – confirm with the authorised person that the equipment is ready for carrying out the scheduled maintenance – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – carry out the scheduled maintenance tasks using appropriate techniques and procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out scheduled maintenance tasks on one of the following services or systems: – fresh water distribution – waste water – environmental control – process control – gas distribution – refrigeration – compressed air – emergency power generation – heating and ventilation – air conditioning and ventilation – instrumentation and control			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain services or systems equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards 1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out scheduled maintenance tasks on service systems and equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out ten of the following scheduled maintenance activities: – removing excessive dirt and grime – making sensory checks (such as sight, sound, smell, touch) – checking equipment for leaks – replacing 'lifed' consumables (such as fluids, gaskets and seals, hoses) – monitoring the condition/deterioration of components (such as bearings, pipework, cables, valves, sensors, couplings) – checking that any safety equipment or controls are operating correctly – checking the operation of instrumentation (such as gauges and indicators) – carrying out and/or checking equipment self-analysis data			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– making adjustments to components and connections – tightening fastenings to the required torque – replenishing oils, greases or other fluids – reviewing and checking equipment operation and performance – recording the results of the scheduled maintenance activity – reporting or taking action with regard to any defects that require immediate attention (such as replacing non-'lifed' components) 1.9 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.10 complete relevant maintenance records accurately, to include one of the following and pass them on to the appropriate person: – job cards – specific company documentation – permit to work/formal risk assessment 1.11 dispose of waste materials in accordance with safe working practices and approved procedures.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out scheduled maintenance tasks on service systems and equipment	2.1	describe the health and safety requirements of the area in which the scheduled maintenance tasks are to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation procedure or permit-to-work procedure that applies to the equipment being maintained			
		2.3	describe the specific health and safety precautions to be applied during the scheduled maintenance tasks, and their effects on others			
		2.4	describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities			
		2.5	describe the hazards associated with carrying out scheduled maintenance tasks on services and systems (such as handling oils/greases, stored pressure/force, misuse of tools), and how they can be minimised			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed in the maintenance process (such as drawings, specifications, manufacturers' manuals)			
		2.7	describe the various checks to be carried out during the scheduled maintenance procedure			
		2.8	describe the procedure for obtaining the consumables to be used during the scheduled maintenance activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the methods of checking that components are fit for purpose, and the need to replace 'lifed' items 2.10 explain how to check that any replacement components meet the required specification/operating conditions.			
2b Know how to carry out scheduled maintenance tasks on service systems and equipment (continued)	2.11 explain how to make appropriate sensory checks (such as sight, sound, smell and touch) 2.12 describe the appropriate testing instructions to be adopted during the maintenance activity 2.13 explain how to make adjustments to components/assemblies to ensure they function to specification 2.14 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components, and how they interact 2.15 explain how to complete scheduled maintenance records/logs/reports, in accordance with company policy and procedures 2.16 describe the equipment operating and control procedures, and how to apply them in order to carry out scheduled maintenance 2.17 describe the problems that can occur whilst carrying out the scheduled maintenance tasks, and how they can be avoided			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 21: Carrying out maintenance on water distribution systems and equipment

Unit reference number: R/600/5734

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on fresh/foul water distribution systems and equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing or repairing faulty or damaged components, in line with company procedures on water distribution systems, such as mains cold water (drinkable), hot water supplies, cold down service and non-mains supplies (river, well), waste/foul and storm water supplies.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on water distribution systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on one of the following types of water systems: – mains cold water (drinkable) – hot water supplies – cold down service – waste/foul – non-mains supplies – storm water 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain water distribution systems, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards 1.6 carry out the maintenance activities within the limits of their personal authority.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out maintenance on water distribution systems and equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out all of the following maintenance activities: – dismantling equipment to required level – labelling/proof marking of components – checking components for serviceability – replacing all 'lifed' items (such as seals, gaskets) – replacing or repairing damaged/defective components – setting, aligning and adjusting components – tightening fastenings to the required torque – making checks before re-connecting the supply – functionally testing the maintained equipment 1.9 maintain and/or replace six of the following water distribution components: – valves – couplings/connectors – wet and dry risers – pumps – dosing plant – filters – motors			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– heaters – pump chambers – cylinders – tanks – gaskets and seals – gauges/indicators – manifolds – traps – sensors – switches – faucets – control devices – electrical wiring/connectors – ancillary equipment (such as sinks, toilets) – macerators – pipework (such as copper, lead, clay, iron, plastic) 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permits to work/formal risk assessment – maintenance log and action report – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out maintenance on water distribution systems and equipment	2.1 describe the health and safety requirements of the area in which the maintenance activity is to take place 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others (to include the Water Regulations Advisory Scheme (WRAS), the Prevention and Control of Legionellosis, and Safe Working in Confined Spaces) 2.4 describe the hazards associated with carrying out maintenance activities on water distribution equipment and systems, and how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.6 explain how to obtain and interpret information from job instructions and other documents needed for the maintenance activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations) 2.7 describe the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.8 describe the sequence to be adopted for the dismantling/reassembly of various types of assemblies 2.9 describe the methods and techniques used to dismantle/assemble water distribution equipment (such as release of water/pressures/force, bonding, extraction, pressing, alignment) 2.10 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals, gaskets, washers)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 describe the basic principles of how the system functions, its operating sequence, the working purpose of individual units/components and how they interact.			
2b Know how to carry out maintenance on water distribution systems and equipment (continued)	2.12 describe the applications of different types of pipework systems (such as copper, plastic, lead, iron and clay) 2.13 describe the different types of couplings and their fittings (such as tees, bends, branches) 2.14 describe the equipment and tools used to bend, form and thread pipework 2.15 describe the methods of treating water systems 2.16 describe the applications of the different pipework and equipment cleaning procedures (such as rod, water jet, solvents) 2.17 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.18 explain how to check that tools and equipment are free from damage or defects, and are in a safe and usable condition 2.19 describe the generation of maintenance documentation and/or reports, following the maintenance activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 describe the problems associated with the maintenance activity, and how they can be overcome 2.21 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.22 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Internal verifier signature: _____ Date: _____
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Unit 22: Carrying out maintenance on emergency power generation equipment

Unit reference number: D/600/5736

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on emergency power generation equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty or damaged components, in line with company procedures, on a variety of emergency power generation equipment, including engine/primary power source, the generator, the electrical load connection, and the appropriate control equipment.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on emergency power generation equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on two of the following types of emergency power generation equipment: – turbine alternator sets – piston engine alternator sets – generators – governors – control gear – voltage regulators – batteries and chargers – mechanical protection equipment – electrical protection equipment 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain emergency power generation equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's guidelines – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards 1.6 carry out the maintenance activities within the limits of their personal authority.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out maintenance on emergency power generation equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out all of the following maintenance activities: – testing the system for leaks – dismantling equipment to required level – tightening fasteners to the required torque – checking components for serviceability – replacing damaged/defective components – setting, aligning and adjusting replaced components – checking the correct operation of all safety devices – marking/labelling of components – making 'off-load' checks before starting up – replenishing oil, coolant or grease – replacing all 'lifed' items (such as batteries, lamps) – functionally testing the completed system 1.9 maintain and/or replace six of the following types of components: – engine components (such as valves, shell bearings) – turbine components – bearings and seals – clutches and brakes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– drive mechanisms (such as gears, chains, pulleys and belts) – transmission items (such as shafts, couplings) – fuel supply components (such as pumps, injectors, pipes) – ignition (such as plugs, heaters, burners) – cooling equipment (such as radiators, pumps, hoses) – lubrication components (such as pumps, filters, pipes) – exhaust systems – speed governing components – control panel components (such as breakers, contactors) – annunciators/alarms – voltage regulators – relays and solenoids – sensors – switches and switch gear – electrical cables – overload protection devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– safety devices – pressure relief valves – meters/gauges (such as temperature, pressure, speed) – test systems (manual or automatic) – temperature control components (such as thermostat, thermocouples, thermistors) – electronic components (such as circuit boards, timers, transducers) – noise reduction/attenuation 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permit to work/formal risk assessment – maintenance log and action report – company specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out maintenance on emergency power generation equipment	2.1	describe the health and safety requirements of the area in which the maintenance activity is to take place			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies to the equipment being maintained			
		2.3	describe the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others			
		2.4	describe the hazards associated with carrying out maintenance activities on emergency power generation equipment/systems (such as moving machinery, hot components, stored pressure/force, live electrical connections, handling oils and coolants, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how they can be minimised			
		2.5	describe the importance of wearing the correct personal and environmental protection equipment, and other appropriate safety equipment, during the maintenance process			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions and other documents needed for the maintenance activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations) 2.7 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.8 explain why electrical earthing and bonding is critical, and why it must be both mechanically and electrically secure 2.9 describe the sequence to be adopted for the dismantling/reassembly of various types of assemblies 2.10 describe the methods and techniques used to dismantle/assemble emergency power generation equipment (such as removing bolted components and assemblies, removing components requiring pressure, unplugging, de-soldering, removal of screwed, clamped and crimped connections) 2.11 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as batteries, lamps, seals and gaskets)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 explain how to make adjustments to components/assemblies to ensure that they function correctly.			
2b Know how to carry out maintenance on emergency power generation equipment (continued)	2.13 describe the methods of removing and replacing components and units, without damaging the system and infrastructure 2.14 describe the use of electrical measuring equipment (such as multimeters and resistance testers) 2.15 describe the methods of testing the equipment and systems for leaks, and the tools and equipment that can be used 2.16 describe the types of coolants and antifreeze agents; quantities used; and methods of flushing and filling the system 2.17 explain how to check that tools and equipment are free from damage or defects, and are in a safe and usable condition 2.18 describe the importance of maintenance documentation and/or reports following the maintenance activity, and how to generate them 2.19 describe the equipment operating and control procedures to be applied during the maintenance activity 2.20 explain how to use lifting and handling equipment correctly and safely in the maintenance activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 describe the problems associated with the maintenance activity, and how they can be overcome 2.22 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.23 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 23: Carrying out maintenance on workplace environmental control equipment

Unit reference number: K/600/5741

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on workplace environmental control equipment and systems, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty components, in line with company procedures, on environmental control systems such as heating and ventilation, air conditioning and ventilation, chillers, lighting, lifts, building/room access, fire systems, intruder alarm and CCTV systems.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on workplace environmental control equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on one of the following workplace environmental control systems: – heating and ventilation – air conditioning and ventilation – intruder/alarm systems – lighting – CCTV system – chillers – lift control – fire systems – building/room access – other specific system 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain environmental control equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out maintenance on workplace environmental control equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out all of the following maintenance activities: – dismantling equipment to the appropriate level – setting, aligning and adjusting replaced components – checking components for serviceability – replacing all 'lifed' items (such as batteries, lamps) – replacing damaged/defective components – marking/labelling of components – tightening fasteners to the required torque – making 'off-line' checks before starting up – functionally testing the completed system 1.9 maintain and/or replace six of the following environmental control equipment components: – relays – inverters – actuators			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– valves – sensors – switches – thermostats – dampers – motor starters – vents/diffuser – electrical cables – network cables – contactors – printers – solenoids – circuit boards – thermocouples – batteries – transformers – uninterruptible power supplies – timers – interlocks – overload protection devices – PC and associated equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permit to work/formal risk assessment – maintenance log and action report – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out maintenance on workplace environmental control equipment	2.1 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 them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to maintenance activities (electrical isolation, locking off switchgear, removal of fuses, placing of maintenance warning notices, proving that isolation has been achieved and secured)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation) 2.4 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities 2.5 explain how to obtain and interpret information from job instructions and other documents needed for the maintenance activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations) 2.6 describe the sequence to be adopted for the dismantling/reassembly of various types of assemblies 2.7 describe the methods and techniques used to dismantle/assemble workplace environmental control equipment (such as unplugging, de-soldering removal of screwed, clamped and crimped connections) 2.8 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as batteries, lamps, seals and gaskets)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 explain how to make adjustments to components/assemblies to ensure that they function correctly.			
2b Know how to carry out maintenance on workplace environmental control equipment (continued)	2.10 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.11 describe the methods of removing and replacing components and units, without damaging the system and infrastructure 2.12 explain 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 their intended purpose 2.13 describe the generation of maintenance documentation and/or reports following the maintenance activity 2.14 describe the equipment operating and control procedures to be applied during the maintenance activity 2.15 explain how to use lifting and handling equipment correctly and safely in the maintenance activity 2.16 describe the problems associated with the maintenance activity, and how they can be overcome			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.18 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 24: Carrying out maintenance on heating and ventilation equipment

Unit reference number: F/600/5745

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on a heating and ventilation system, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty or damaged components, in line with company procedures, on heating and ventilation equipment, which will include one of the following primary heating sources: gaseous, liquid, solid fuel, electricity and renewable energy. The learner will be expected to apply a variety of dismantling and assembly methods and techniques, such as proof marking/labelling of components to aid the reassembly, dismantling components requiring pressure techniques, torque loading, and setting, aligning and adjusting components.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on heating and ventilation equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on one of the following types of primary energy heat source systems: – liquid – gaseous – solid fuel – renewable energy – electrical 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain heating and ventilation systems, in accordance with one of the following: – organisational codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – BS7671/IEE wiring regulations 1.6 carry out the maintenance activities within the limits of their personal authority.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out maintenance on heating and ventilation equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out all of the following maintenance techniques and procedures: – setting, aligning and adjusting components – dismantling equipment to the required level – proof marking/labelling of components – checking components for serviceability – replacing all 'lifed' items (such as batteries and lamps) – tightening fastenings to the required torque – testing the system for leaks – making 'off-line' checks before starting up – lubricating components – functionally testing the maintained system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 maintain and/or replace six of the following heating/ventilation components: – fans – blowers – pumps – calorifiers – ductwork – dampers – vents/diffuser – valves – motors			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– heat exchanger – couplings – condenser – manifolds/flanges – pipework – gaskets and seals – strainers/filters – gauges/indicators – insulation – switches – sensors – control devices – safety devices – silencers – heater batteries – electrical wiring/components – local heating system (such as radiators, in-line duct heaters, skirting heating, fan coil, convectors, storage pipe heaters and air handling units)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permit to work/formal risk assessment – maintenance log and action report – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out maintenance on heating and ventilation equipment	2.1 describe the health and safety requirements of the area in which the maintenance activity is to take place 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with carrying out maintenance activities on heating and ventilation equipment (such as stored pressure/force/fluids, hot surfaces, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise them 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.6 explain how to obtain and interpret information from job instructions and other documents needed for the maintenance activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations) 2.7 describe the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities 2.8 describe the sequence to be adopted for the dismantling/reassembly of various types of assemblies 2.9 describe the methods and techniques used to dismantle/assemble heating and ventilation equipment (release of pressures/force/fluids, proof marking, extraction, pressing, alignment)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets).			
2b Know how to carry out maintenance on heating and ventilation equipment (continued)	2.11 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.12 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.13 describe the typical building design temperatures (such as for offices, factories (light and heavy work) warehouses and canteens) 2.14 explain 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 their intended purpose 2.15 describe the generation of maintenance documentation and/or reports following the maintenance activity 2.16 describe the equipment operating and control procedures to be applied during the maintenance activity 2.17 explain how to use lifting and handling equipment correctly and safely in the maintenance activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the problems associated with the maintenance activity, and how they can be overcome 2.19 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.20 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 25: Carrying out maintenance on air conditioning and ventilation equipment

Unit reference number: F/600/5759

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on air conditioning and ventilation equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty or damaged components, in line with company procedures, on air conditioning equipment and ventilation systems such as air generation, distribution and control systems. The learner will be expected to apply a variety of dismantling and assembly methods and techniques, such as proof marking/labelling of components to aid the reassembly, dismantling components requiring pressure techniques, torque loading, and setting, aligning and adjusting components.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on air conditioning and ventilation equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on two of the following types of equipment: – remote air conditioning generation – local air conditioning distribution – air conditioning control 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain air conditioning and ventilation systems, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – BS7671/IEE wiring regulations 1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out maintenance on air conditioning and ventilation equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out all of the following maintenance activities: – testing the system for leaks – dismantling equipment to the appropriate level – setting, aligning and adjusting components – checking components for serviceability			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– replacing damaged/defective components – marking/labelling of components – tightening fasteners to the required torque – making 'off-line' checks before starting up – functionally testing the completed system – replacing all 'lifed' items (such as batteries, lamps) 1.9 maintain and/or replace six of the following air conditioning components: – motors – chiller batteries – pumps – humidifiers – chilled beams – condensers – evaporators – ducting/trunking – dampers – vents/diffusers – valves – filters			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– pipework – couplings – fans – manifolds/flanges – silencers/attenuators – gaskets and sealants – gauges/indicators – sensors – switches – battery heaters – thermostats – insulation – electrical connectors – electrical components – wiring safety devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permit to work/formal risk assessment – maintenance log and action report – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out maintenance on air conditioning and ventilation equipment	2.1	describe the health and safety requirements of the area in which the maintenance activity is to take place			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the maintenance process, and their effects on others (including the Prevention and Control of Legionellosis, and Safe Working in Confined Spaces)			
		2.4	describe the hazards associated with carrying out maintenance activities on air conditioning equipment (handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions and other documents needed for the maintenance activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations) 2.7 describe the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.8 describe the sequence to be adopted for the dismantling/reassembly of various types of assemblies 2.9 describe the methods and techniques used to dismantle/assemble air conditioning equipment (such as release of pressures/force/fluid, proof marking, extraction, pressing, alignment) 2.10 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.11 explain how to make adjustments to components/assemblies to ensure that they function correctly.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2b Know how to carry out maintenance on air conditioning and ventilation equipment (continued)	2.12 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.13 describe the correct operating ranges (including temperature and pressure of secondary heating sources (air and water)) 2.14 describe the typical building design temperatures (such as for offices, factories (light and heavy work) warehouses and canteens) 2.15 explain 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 their intended purpose 2.16 describe the generation of maintenance documentation and/or reports following the maintenance activity 2.17 describe the equipment operating and control procedures to be applied during the maintenance activity 2.18 explain how to use lifting and handling equipment correctly and safely in the maintenance activity 2.19 describe the problems associated with the maintenance activity, and how they can be overcome			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 26: Carrying out maintenance on gas distribution equipment

Unit reference number: H/600/6063

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on gas distribution systems and equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty or damaged components, in line with company procedures, on gas distribution systems such as mains, cylinder and tanked gases. The learner will be expected to cover a range of maintenance activities, such as labelling of components to aid the assembly, dismantling components requiring pressure techniques, torque loading, and setting, aligning and adjusting components, using appropriate techniques and procedures.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on gas distribution equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out maintenance on gas distribution equipment (continued)	1.3 carry out maintenance activities on one of the following types of gas distribution system: – mains – tanks – cylinders 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain gas distribution systems, in accordance with one of the following: – equipment manufacturer's operation range – organisational guidelines and codes of practice – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards 1.6 carry out the maintenance activities within the limits of their personal authority 1.7 carry out the maintenance activities in the specified sequence and in an agreed timescale 1.8 carry out all of the following maintenance activities: – testing the system for leaks – dismantling equipment to the appropriate level – setting, aligning and adjusting components – checking components for serviceability			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– replacing all 'lifed' items (such as batteries, filters) – marking/labelling of components – tightening fasteners to the required torque – making 'off-line' checks before starting up – functionally testing the completed system – replacing damaged/defective components 1.9 maintain and/or replace six of the following gas distribution components: – motors – valves – pipework – gaskets and seals – boosters – filters – couplings – manifolds – storage devices – regulators – meters – couplings			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– manifolds – storage devices – regulators – meters – gauges/indicators – switches – sensors – supporting devices – electrical wiring – safety devices 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permit to work/formal risk assessment – maintenance log and action report – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out maintenance on gas distribution equipment	2.1	describe the health and safety requirements of the area in which the maintenance activity is to take place			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies to the gas system being maintained			
		2.3	describe the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others			
		2.4	describe the hazards associated with carrying out maintenance activities on gas systems (such as fire, explosion, respiratory problems, stored pressure, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed for the maintenance activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities 2.8 describe the importance of following the correct procedures for purging and de-commissioning components 2.9 describe the sequence to be adopted for the dismantling/reassembly of various types of gas assemblies 2.10 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.11 explain how to make adjustments to components/assemblies to ensure that they function correctly.			
2b Know how to carry out maintenance on gas distribution equipment (continued)	2.12 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.13 describe the methods used to label and identify different pipework systems (including colour coding and warning signs) 2.14 describe the different types and applications of measuring and monitoring equipment used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain 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 their intended purpose 2.16 describe the generation of maintenance documentation and/or reports following the maintenance activity 2.17 describe the equipment operating and control procedures to be applied during the maintenance activity 2.18 explain how to use lifting and handling equipment correctly and safely in the maintenance activity 2.19 describe the problems associated with the maintenance activity, and how they can be overcome 2.20 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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(*if sampled*)

Unit 27: Carrying out maintenance on compressed air equipment

Unit reference number: M/600/6065

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on compressed air systems and equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty or damaged components, in line with company procedures, on a variety of compressed air equipment, such as compressed air generation, distribution and control systems. The learner will be expected to cover a range of maintenance activities, such as proof marking/labelling of components to aid the assembly, dismantling components requiring pressure techniques, torque loading, and setting, aligning and adjusting components, using appropriate techniques and procedures.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on compressed air equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on two of the following types of equipment: – compressed air generation – compressed air distribution – compressed air control 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain compressed air systems equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards 1.6 carry out the maintenance activities within the limits of their personal authority.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out maintenance on compressed air equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed timescale 1.8 carry out all of the following maintenance activities: – testing the system for leaks – dismantling equipment to the appropriate level – setting, aligning and adjusting components – checking components for serviceability – replacing all 'lifed' items (such as filters) – marking/labelling of components – tightening fasteners to the required torque – making 'off-line' checks before starting up – functionally testing the completed system – replacing damaged/defective components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 maintain and/or replace six the following compressed air equipment and components: – pumps – receivers – driers – motors – pistons – valves – reservoirs – couplings – rigid pipe – vanes – filters – regulators – compressors – silencers – manifolds – sensors – lubricators – separation units			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– flexible pipe/hoses – gauges/indicators – gaskets and sealants – control equipment – electrical connectors – monitoring equipment – switches – electrical wiring – safety devices 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permit to work/formal risk assessment – maintenance log and action report – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out maintenance on compressed air equipment	2.1	describe the health and safety requirements of the area in which the maintenance activity is to take place			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies to the compressed air equipment/system being worked on			
		2.3	describe the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others			
		2.4	describe the hazards associated with carrying out maintenance activities on compressed air equipment (handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed for the maintenance activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities 2.8 describe the sequence to be adopted for the dismantling/reassembly of various types of assemblies used on compressed air equipment 2.9 describe the methods and techniques used to dismantle/assemble compressed air equipment (release of pressures/force/fluid, proof marking, extraction, pressing, alignment) 2.10 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets).			
2b Know how to carry out maintenance on compressed air equipment (continued)	2.11 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.12 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.13 explain 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 their intended purpose			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the generation of maintenance documentation and/or reports following the maintenance activity 2.15 describe the equipment operating and control procedures to be applied during the maintenance activity 2.16 explain how to use lifting and handling equipment correctly and safely in the maintenance activity 2.17 describe the problems associated with the maintenance activity, and how they can be overcome 2.18 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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(*if sampled*)

Unit 28: Carrying out maintenance on process control equipment

Unit reference number: T/600/6066

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities to process control equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty peripheral components and process controller units, in line with company policy on process control equipment, such as fixed I/O, rack mount and modular systems. The learner will also need to be able to load and download process control programs, check them for errors, make authorised edits, and create and maintain back-up copies of completed programs.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on process control equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activities: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on one of the following types of process controller equipment: – fixed input/output (I/O) – modular – rack mount 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain process control equipment, in accordance with one of the following: – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards – organisational guidelines and codes of practice – equipment manufacturer's operation range 1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out maintenance on process control equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed timescale 1.8 carry out four of the following program maintenance activities on the process control system: – use appropriate programming devices (such as terminals, hand-held programmers and personal computers)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– edit programs by computer-based authoring (to include subroutines) – produce back-ups of completed programs – make approved edits to lines of logic – load, read and save programs – force contacts on and off – carry out on-line monitoring of programs – use 'on' and 'off-line' programming – use single-step mode of operation 1.9 carry out all of the following maintenance activities: – take electrostatic discharge (ESD) precautions when handling components and circuit boards – proof mark or label removed wires and components – replace peripheral devices (such as sensors, actuators, relays, switches) – replace components (such as power supplies, circuit boards and controller units) – check components for serviceability – use program 'full-run' modes of operation – replace back-up batteries – functionally test the system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – maintenance log and action report – permit to work/formal risk assessment – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out maintenance on process control equipment	2.1 describe the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility they place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the process control system being worked on 2.3 describe the specific health and safety precautions to be applied during the maintenance activity, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation) 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities, and where this can be obtained 2.6 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) 2.7 describe the hazards associated with carrying out maintenance activities on process control systems (electrical supplies, process controller interface, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how they can be minimised 2.8 explain how to obtain and interpret information from job instructions and other documents needed for the maintenance activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations) 2.9 describe the basic principles of how the system functions, and its operating sequence			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 describe the devices and systems for storing programmes 2.11 explain how to search the user program within the process controller for specific elements 2.12 describe the techniques involved in editing, and the procedure to be followed for 'on' and 'off-line' programming.			
2b Know how to carry out maintenance on process control equipment (continued)	2.13 describe the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance process 2.14 describe the techniques used to dismantle/assemble equipment (release of pressures/force, proof marking to aid assembly, plugging exposed pipe/component openings, dealing with soldered joints, screwed, clamped and crimped connections) 2.15 describe the methods of attaching identification marks/labels to removed components or cables, to assist with reassembly 2.16 describe the methods of checking that components are fit for purpose, and the need to replace batteries, boards and other failed items			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 explain 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 their intended purpose 2.18 describe the importance of making 'off-load' checks before proving the equipment with the electrical supply on 2.19 describe the generation of maintenance documentation and/or reports following the maintenance activity 2.20 describe the equipment operating and control procedures to be applied during the maintenance activity 2.21 explain how to use lifting and handling equipment correctly and safely in the maintenance activity 2.22 describe the problems that can occur during the maintenance of the process control system, and how they can be overcome 2.23 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

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Unit 29: Carrying out maintenance on instrumentation and control equipment

Unit reference number: Y/600/5475

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities to instrumentation and control equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing instruments and faulty peripheral components on instrumentation and control equipment, such as pressure, flow, level and temperature instruments, fiscal monitoring equipment, fire and gas detection and alarm systems, industrial weighing systems, speed measurement and control systems, vibration monitoring equipment, nucleonics and radiation measurement, telemetry systems and emergency shutdown systems.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on instrumentation and control equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activities: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on one of the following types of instrumentation and control system: – fire detection and alarm system – gas detection and alarm system – emergency shutdown systems – speed measurement/control system – fluid measurement/control system – noise and vibration monitoring/control systems – nucleonic and radiation systems – telemetry systems – temperature measurement/control systems – weight measurement/control systems 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain installation and control systems in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out maintenance on instrumentation and control equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed timescale 1.8 carry out all of the following maintenance activities: – making all required isolations (such as process, electrical, pneumatic) – taking electrostatic discharge (ESD) precautions (where appropriate) – disconnecting supply/signal connections – removing instruments from the system – dismantling equipment to the required level – labelling/marking of components – checking components for serviceability – replacing all 'lifed' items (such as seals, gaskets) – setting, aligning and adjusting components – tightening fastenings to the required torque – re-connect instrumentation pipework and power supply – check signal transmission is satisfactory – functionally testing the maintained equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– replacing or repairing damaged/defective components (such as electrical, mechanical and back-up batteries) 1.9 use two of the following types of instrumentation test and calibration equipment: – signal sources – standard test gauges – analogue and digital meters – digital pressure indicators – calibrated flow meters – special-purpose test equipment – pressure sources – comparators – manometers – current injection devices – calibrated weights – logic probes – temperature baths – workshop potentiometers – dead weight testers – insulation testers			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permits to work/formal risk assessment – maintenance log and action report – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out maintenance on instrumentation and control equipment	2.1 describe the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility they place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the system and instruments being worked on, and how to check that any stored energy in pipework and instruments has been released 2.3 describe the specific health and safety precautions to be applied during the maintenance process, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation) 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities, and where this can be obtained 2.6 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) 2.7 describe the hazards associated with carrying out maintenance activities on instrumentation and control systems (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 they can be minimised 2.8 explain how to obtain and interpret information from job instructions and other documents needed for the maintenance activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the basic principles of operation of the instrumentation being maintained, and its operating sequence 2.10 describe the reasons for making sure that control systems are isolated or put into manual control, and that appropriate trip locks or keys are inserted, before removing any sensors or instruments from the system 2.11 describe the correct way of fitting instruments to avoid faulty readings (such as caused by head correction, poor flow past the sensor, blockages, incorrect wiring, poor insulation or incorrect materials).			
2b Know how to carry out maintenance on instrumentation and control equipment (continued)	2.12 explain how to carry out visual checks of the instruments (such as security of joints and physical damage) 2.13 describe the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance process 2.14 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)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 describe the methods of attaching identification marks/labels to removed components or cables, to assist with reassembly 2.16 describe the methods of checking that components are fit for purpose, and the need to replace batteries, boards and other failed items 2.17 explain 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 their intended purpose 2.18 describe the generation of maintenance documentation and/or reports following the maintenance activity 2.19 describe the equipment operating and control procedures to be applied during the maintenance activity 2.20 describe the problems that can occur during the maintenance of the instrumentation and control system, and how they can be overcome 2.21 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.22 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

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(*if sampled*)

Unit 30: Carrying out maintenance on industrial refrigeration equipment

Unit reference number: J/600/5505

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on industrial refrigeration equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty components, such as compressors, evaporative condensers, evaporators, safety control devices, valves, refrigerant metering devices, sensors, switches, thermostats, meters, thermocouples, timers, interlocks, electrical components and wiring.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on industrial refrigeration equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on one of the following types of refrigeration equipment: – compression types using air cooled condensers – compression types using water cooled condensers – air conditioning cooling plant – compression types using secondary refrigerants 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 maintain industrial refrigeration equipment, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – BS7671/IEE wiring regulations 1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out maintenance on industrial refrigeration equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out all of the following maintenance activities: – assisting in charging and evacuating the system – checking the system for leaks			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dismantling equipment to the required level – marking/labelling of components – checking components for serviceability – replacing 'lifed' items (such as lamps, seals, gaskets) – replacing damaged/defective components – setting, aligning and adjusting components – checking correct operation of all safety devices – checking the operation of all valves – tightening fasteners to the required torque – functionally testing the completed system 1.9 maintain and/or replace six of the following refrigeration equipment components: – motors – evaporators – compressors – relays – sensors – switches – thermostats – thermocouples			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– vents/diffusers – electrical cables – overload protection devices – circuit boards – electronic components – safety devices – evaporative condensers – pressure relief valves – gauges (such as temperature, humidity, pressure) – transformers – uninterruptible power supplies – interlocks 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permit to work/formal risk assessment – maintenance log and action report			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out maintenance on industrial refrigeration equipment	2.1 describe the health and safety requirements of the area in which the maintenance activity is to take place 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the refrigeration equipment being maintained 2.3 describe the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others 2.4 describe the hazards associated with carrying out maintenance activities on refrigeration equipment/systems (such as stored pressure/force, lack of good ventilation, live electrical connections, handling liquid or vapour refrigerants, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how they can be minimised 2.5 describe the handling and storing of gas cylinders and equipment; the safe handling, storing and disposal of refrigerants; methods of determining the contents in cylinders in order to allow complete charging			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.7 explain how to obtain and interpret information from job instructions and other documents needed for the maintenance activities (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations) 2.8 describe the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities 2.9 describe the sequence to be adopted for the dismantling/reassembly of various types of assemblies 2.10 describe the methods and techniques used to dismantle/assemble refrigeration equipment (unplugging, de-soldering, removal of screwed, clamped and crimped connections, removing bolted components and assemblies) 2.11 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such lamps, seals and gaskets)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.13 describe the basic principles of how compression type refrigeration systems function, their operating sequence, the working purpose of individual units/components and how they interact.			
2b Know how to carry out maintenance on industrial refrigeration equipment (continued)	2.14 describe the system operating pressures and temperatures, and the relationship between refrigerant gas pressures and temperatures 2.15 describe the methods of removing and replacing components and units, without damaging the system and infrastructure 2.16 describe the methods of testing equipment and systems for leaks (such as liquid bubble testing, treated paper, halide torch, sulphur candles, electronic instruments or automatic detection equipment), and the tools and equipment that can be used 2.17 describe the types and application of primary and secondary refrigerants, and methods of purging and charging the system using liquid and vapour refrigerants 2.18 describe the use of vacuum pumps, pressure gauges, compound gauges, flow gauges and indicators			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 explain 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 their intended purpose 2.20 describe the generation of maintenance documentation and/or reports following the maintenance activity 2.21 describe the equipment operating and control procedures to be applied during the maintenance activity 2.22 explain how to use lifting and handling equipment correctly and safely in the maintenance activity 2.23 describe the problems associated with the maintenance activity, and how they can be overcome 2.24 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.25 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Unit 31: Carrying out maintenance on environmental control equipment

Unit reference number: A/600/5517

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out corrective maintenance activities on fixed and portable environmental control equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing or repairing faulty components, in line with company procedures, on environmental control equipment such as air pollution, effluent treatment, noise and vibration control, waste and used product storing or recycling equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance on environmental control equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activity: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of drawings, job instructions and procedures – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the maintenance area – re-connect and return the equipment to service on completion of the maintenance activities – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out maintenance activities on one of the following types of environmental control equipment: – air pollution control equipment (such as decarbonisation (CO2 reduction), de-nitrification, deodorising, desulphurisation, dust collectors, smoke filters, scrubbers, and removal of refrigerant gases) – effluent treatment equipment (such as aerobic and anaerobic biochemical treatment, filter screens and presses, liquid separators, waste oil treatment, sewage treatment, industrial waste water treatment) – noise and vibration equipment (such as vibration prevention and isolation, noise attenuation and acoustic enclosures) – waste and used product handling, storing and recycling equipment (such as appliance recycling, battery recycling, incinerators, ash handling, heat recovery, shredders and crushers, conveyors and sorters, compaction) 1.4 follow the relevant maintenance schedules to carry out the required work			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 maintain environmental control equipment, in accordance with one of the following (as appropriate to the equipment being maintained): – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – BS7671/IEE wiring regulations 1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out maintenance on environmental control equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out all of the following maintenance activities: – dismantling equipment to the required level – marking/labelling of components – checking components for serviceability – replacing 'lifed' items (such as filters, seals, gaskets) – replacing damaged/defective components – setting, aligning and adjusting components – checking the correct operation of all safety devices – replenishing oils, greases or other fluids – tightening fasteners to the required torque			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– functionally testing the completed system 1.9 maintain and/or replace six of the following environmental control mechanical components: – actuators – bearings – burners – pipework – couplings – geared drives – conveyor belts – dampers – chains and sprockets – levers and linkages – pulleys and belts – seals and gaskets – containment booms – enclosures and guards – exhaust components – lubrication components – mechanical isolators – mechanical overloads			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– flow measurement and control – pollution samplers – sorting screens – noise attenuation devices – filters (individual) – safety devices – pumps – valves – storage tanks – fasteners – gauges – spill kits Or maintain and/or replace six of the following environmental control electrical components: – wires and cables – switches and contactors – circuit boards – electrical isolators – electrical trips – motor starters			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– flow measurement devices – infra-red monitoring devices – interlocks – inverters – level floats and indicators – meters – relays – pollution samplers – resistors – safety devices – switchgear – sensors solenoids – switches – thermistors – thermocouples – thermostats – timers – transducers – transformers			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permit to work/formal risk assessment – maintenance log and action report – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out maintenance on environmental control equipment	2.1 describe the health and safety requirements of the area in which the maintenance activity is to take place 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the environmental control equipment being maintained 2.3 describe the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with carrying out maintenance activities on environmental control equipment (including the use of lubricants, cleaning materials, power tools, the use and misuse of hand tools, and the consequences of not following laid-down good-practice maintenance procedures), and how they can be minimised 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.6 describe the associated hazardous substances, their monitoring and exposure limits 2.7 explain how to obtain and interpret information from job instructions and other documentation used in the maintenance activities (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology) 2.8 describe the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities 2.9 describe the sequence to be adopted for the dismantling/reassembly of various types of assemblies			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 describe the methods and techniques used to dismantle/assemble environmental control equipment (unplugging, de-soldering, removal of screwed, clamped and crimped connections, removing bolted components and assemblies) 2.11 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as filters, seals and gaskets).			
2b Know how to carry out maintenance on environmental control equipment (continued)	2.12 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.13 describe the basic principles of how environmental control systems function, their operating sequence, the working purpose of individual units/components and how they interact 2.14 describe the methods of removing and replacing components and units, without damaging the system and infrastructure 2.15 explain 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 their intended purpose 2.16 describe the generation of maintenance documentation and/or reports following the maintenance activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the equipment operating and control procedures to be applied during the maintenance activity 2.18 explain how to use lifting and handling equipment correctly and safely in the maintenance activity 2.19 describe the problems associated with the maintenance activity, and how they can be overcome 2.20 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 32: Carrying out fault location on communication-electronic systems

Unit reference number: D/600/5526

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to locate faults on communication-electronic systems, in accordance with approved procedures. The learner will be required to locate faults on a range of communication-electronic systems, sub-systems, assemblies or components at line replacement unit (LRU) level. The learner will be expected to use a variety of fault location methods and procedures, such as gathering information from the person who reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the system. The learner will be expected to take care that they do not damage the system during the maintenance activities and, where appropriate, the application of electrostatic discharge (ESD) procedures will be a critical part of their role.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out fault location on communication-electronic systems	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault location activity: – plan fault location methods and procedures in conjunction with others – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – ensure that safe access and working arrangements has been provided for the maintenance area – use grounded wrist straps and other electrostatic discharge (ESD) precautions, where appropriate – disconnect or isolate components or parts of the circuit to confirm diagnosis, where appropriate – carry out the fault location activities, using approved procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– identify the fault, and consider appropriate corrective action – in conjunction with others, take actions to resolve the problem – dispose of waste items in a safe and environmentally acceptable manner – leave work area in a safe and tidy condition 1.3 carry out fault location on two communication-electronic systems, sub-systems, assemblies or components to LRU level (at least one of which must be selected from group A): Note: Any of the items below can be identified as a system, sub-system or assembly in its own right Group A – Communication electronics – transmitters (such as HF, VHF, UHF, microwave) – transceivers (such as HF, VHF, UHF, microwave) – receivers (such as HF, VHF, UHF, microwave) – signal processing (analogue) (such as radar anti-clutter, comms audio, and AGC stages) – signal processing (digital) (such as digital MTI, multiplexers, AGC) – aerial systems (such as phased arrays, long wire and parabolic reflectors)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– transmission lines (such as optical fibres, co-axial, baluns, twin wire, waveguide) – display systems (such as CRT, Plasma, TFT, TV Tab) – man-machine interface (such as IS/ICT equipment or peripherals: keypads, keyboards, microphones) – electro-optical systems (such as cameras, thermal imaging, targeting systems) – hydraulic-electrical systems (such as hydraulic motors, HSUs, and actuators) – cryptographic systems (such as data encryption and de-encryption) – built-in test equipment – data network systems (such as LANs, WANs) – data network interfaces (such as switch, router, bridging networks) – any other identifiable electronic system, sub-system, assemblies or components to LRU level Group B - Associated equipment – environmental control systems (such as temperature, humidity, vibration, shock, alarm and protection) – electro-mechanical systems (such as servos, motors, relays, complex switches)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– power generation systems (such as fixed/transportable AC/DC generators, batteries)phase distribution panels) – power supply control systems (such as voltage/current, series shunt regulator/stabiliser) – hybrid systems (such as ADC, DAC) 1.4 locate faults that have resulted in two of the following breakdown categories: – intermittent action or a system failure – partial failure or reduced performance – complete breakdown 1.5 review and use all relevant information on the symptoms and problems associated with the products or assets 1.6 investigate and establish the most likely causes of the faults.			
1b Carry out fault location on communication-electronic systems (continued)	1.7 select, use and apply diagnostic techniques, tools and aids to locate faults using four of the following methods: – information gathered from the person who reported the fault – fault finding techniques (such as six point, half-split, input/output, unit substitution, emergent sequence, function testing)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– diagnostic aids (such as manuals, flow charts, troubleshooting guides, electronic aids, equipment records, software based aids) – inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, poor joints, incorrect seating) – operating (such as manually switching off and on, test buttons, running equipment) – equipment self-diagnostics 1.8 use two of the following types of instruments to assist in locating the faults: – stabilised power supplies – oscilloscope – multimeter – logic probe – current tracer – signal generator – other specific test equipment 1.9 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.10 determine the implications of the fault for other work and for safety considerations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault 1.12 record details on the extent and location of the faults in an appropriate format 1.13 complete one of the following maintenance records, and pass it to the appropriate person: – scheduled maintenance report – corrective maintenance report – other company-specific report.			
2a Know how to carry out fault location on communication-electronic systems	2.1 describe the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies in the work area 2.3 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation) 2.4 describe the importance of wearing protective clothing and other appropriate safety equipment during fault location activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the hazards associated with carrying out fault location activities on communication electronic equipment (such as live electrical components, stored energy, misuse of tools), and how they can be minimised 2.6 describe the procedure to be adopted to establish the background of the fault 2.7 explain how to use the various diagnostic aids to help identify the location of the fault 2.8 describe the various fault location techniques that can be used, and how they are applied (such as half-split, input-to-output, function testing, unit substitution, and equipment self-diagnostics) 2.9 explain how to evaluate sensory information (sight, sound, smell, touch) 2.10 explain how to assess evidence and evaluate the possible causes of faults/ploblems			
2b Know how to carry out fault location on communication-electronic systems (continued)	2.11 describe the care, handling and application of electrical test equipment 2.12 describe the precautions to be taken to prevent electrostatic discharge (ESD) damage to electronic circuits and components (such as use of wrist straps, special packaging and handling areas) 2.13 explain how to use a range of fault diagnostic equipment to investigate the problem			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain how to check that the electronic test equipment is within calibration, and that it is free from damage and defects 2.15 explain how to obtain and interpret information from job instructions and other documents needed in the fault location process (such as drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, BS7671/IEE wiring regulations) 2.16 describe the functions of different types of electronic components (analogue or digital), and their operation 2.17 describe the problems that can occur during the fault location activity, and how they can be minimised 2.18 describe the importance of completing the correct documentation, following the maintenance activity 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 33: Carrying out scheduled maintenance on communication-electronic systems

Unit reference number: M/600/5532

Level: 2

Credit value: 19

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out scheduled maintenance on communication-electronic systems, in accordance with approved procedures. The learner will be required to carry out scheduled maintenance tasks on a range of communication-electronic systems, sub-systems or assemblies. The learner will need to carry out the maintenance activities to minimise downtime, and to ensure that the maintained system performs at the required level and functions to specification.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out scheduled maintenance on communication-electronic systems	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activities: – undertake the maintenance activities to cause minimal disruption to normal working – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm with the authorised person that the equipment is ready for carrying out the scheduled maintenance – ensure the safe isolation of equipment – ensure that safe access and working arrangements have been provided for the maintenance area – carry out the scheduled maintenance tasks, using appropriate techniques and procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– re-connect and return the equipment to service on completion of the maintenance activities – leave the work area in a safe and tidy condition 1.3 carry out scheduled maintenance activities on two communication-electronic systems, sub-systems or assemblies (at least one of which must be selected from group A): Note: Any of the items below can be identified as a system, sub-system or assembly in its own right Group A – Communication-electronic – transmitters (such as HF, VHF, UHF, microwave) – transceivers (such as HF, VHF, UHF, microwave) – receivers (such as HF, VHF, UHF, microwave) – signal processing (analogue) (such as radar anti-clutter, comms audio and AGC stages) – signal processing (digital) (such as digital MTI, multiplexers, AGC) – aerial systems (such as phased arrays, long wire and parabolic reflectors) – transmission lines (such as optical fibres, co-axial, baluns, twin wire, waveguide) – display systems (such as CRT, plasma, TFT, TV tab)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– man-machine interface (such as IS/ICT equipment or peripherals: keypads, keyboards, microphones) – electro-optical systems (such as cameras, thermal imaging, targeting systems) – hydraulic-electrical systems (such as hydraulic motors, HSUs and actuators) – cryptographic systems (such as data encryption and de-encryption) – built-in test equipment – data network systems (such as LANs, WANs) – data network interfaces (such as switch, router, bridging networks) – any other identifiable electronic system, sub-system or assemblies Group B – Associated equipment – environmental control systems (such as temperature, humidity, vibration, shock, alarm and protection) – electro-mechanical systems (such as servos, motors, relays, complex switches) – power generation systems (such as fixed/transportable AC/DC generators, batteries) – power distribution systems (such as single phase/3-phase distribution panels)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– power supply control systems (such as voltage/current series/shunt regulator/stabiliser) – hybrid systems (such as ADC, DAC) 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 ensure that the maintained system meets one of the following quality and accuracy standards: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – Ministry of Defence (MOD) standards 1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out scheduled maintenance on communication-electronic systems (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.8 carry out ten of the following scheduled maintenance activities: – removing excessive dirt or grime – making sensory checks (such as sight, sound, smell or touch) – visual examination and testing of a system against the maintenance schedule – replacing 'lifed' consumables			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– monitoring the condition/deterioration of components (such as connectors switches, contactors, safety devices) – carrying out system self-analysis checks – making routine adjustments – carrying out leak checks on connections (where appropriate) – testing the system operation – recording the results of the maintenance activity, and reporting any identified or potential defects – checking the condition of cables – checking the integrity of connections – making insulation resistance checks – recording the results of the scheduled maintenance activity – reporting or taking action with regard to any defects that require immediate attention (such as replacing non-'lifed' components) 1.9 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 complete relevant maintenance records accurately, to include all of the following, and pass them on to the appropriate person: – job cards – maintenance log and action report – permit to work/formal risk assessment – company-specific documentation 1.11 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out scheduled maintenance on communication-electronic systems	2.1 describe the health and safety requirements of the area in which the scheduled maintenance activity is to take place, and the responsibility they place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies to the scheduled maintenance activities (electrical isolation, locking off switch gear, removal of fuses, placing maintenance warning notices, proving the isolation has been achieved and secured) 2.3 describe the isolation procedures unique to communication-electronic systems, sub-systems or assemblies 2.4 describe the specific health and safety precautions needed to be applied during the scheduled maintenance procedure and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the hazards associated with carrying out scheduled maintenance activities on communication-electronic systems, sub-systems or assemblies (such as exposure to live conductors, misuse of tools), and how they can be minimised 2.6 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities 2.7 explain how the maintenance activities may effect the work of others, and the procedure for informing them of the work to be carried out 2.8 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) 2.9 explain how to obtain and interpret information from job instructions and other documentation used in the maintenance activities (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology) 2.10 describe the maintenance schedules and methods to be followed in order to comply with company procedures for scheduled maintenance.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2b	Know how to carry out scheduled maintenance on communication-electronic systems (continued)	2.11	describe the various checks to be carried out during the scheduled maintenance procedure			
		2.12	explain how to make sensory checks (by sight, sound, smell or touch)			
		2.13	describe the company policy on repair/replacement of systems, sub-systems and assemblies during the scheduled maintenance process			
		2.14	describe the methods of checking that systems, sub-systems and assemblies are fit for purpose, and the need to replace 'lifed' items (such as batteries)			
		2.15	explain how to make adjustments to systems, sub-systems and assemblies to ensure they function correctly			
		2.16	describe the generation of maintenance documentation and/or reports following the maintenance activity			
		2.17	describe the simple problems that can occur during the scheduled maintenance activity, and how they can be overcome			
		2.18	describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials			
		2.19	describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 34: Carrying out repairs to communication-electronic systems

Unit reference number: R/600/5538

Level: 2

Credit value: 23

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out repairs on communication-electronic systems, in accordance with approved procedures. The learner will be required to carry out repairs on a range of communication-electronic systems, sub-systems, assemblies or components. This will involve dismantling equipment to unit level, making any required repairs, and removing and replacing faulty items on a variety of different types of electronic systems, sub-systems and assemblies.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out repairs to communication-electronic systems	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the repair activities: – confirm the type and level of repair to be carried out – undertake the repair activities to cause minimal disruption to normal working – use the correct issue of company and/or manufacturers' drawings and documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment – ensure that safe access and working arrangements have been provided in the work area – carry out the repair activities using appropriate techniques and procedures – take electrostatic discharge (ESD) precautions when handling sensitive components and circuit boards – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out repair and replacement activities on three of the following types of communication-electronic systems, sub-systems, assemblies or components to LRU level (at least two of which must be selected from group A): Note: Any of the items below can be identified as a system, sub-system or assembly in its own right Group A – Communication-electronic – transmitters (such as HF, VHF, UHF, microwave) – transceivers (such as HF, VHF, UHF, microwave) – receiver (such as HF, VHF, UHF, microwave) – signal processing (analogue) (such as radar anti-clutter, comms audio and AGC stages) – signal processing (digital) (such as digital MTI, multiplexers, AGC) – aerial systems (such as phased arrays, long wire and parabolic reflectors) – transmission lines (such as optical fibres, co-axial, baluns, twin wire, waveguide) display systems (such as CRT, Plasma, TFT, TV Tab) – man-machine interface (such as IS/ICT equipment or peripherals: keypads, keyboards, microphones) – electro-optical systems (such as cameras, thermal imaging, targeting systems)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– hydraulic-electrical systems (such as hydraulic motors, HSUs, and actuators) – cryptographic systems (such as data encryption and de-encryption) – built-in test equipment – data network systems (such as LANs, WANs) – data network interfaces (such as switch, router, bridging networks) – any other identifiable electronic system, sub-system or assemblies to LRU level Group B – Associated equipment – environmental control systems (such as temperature, humidity, vibration, shock, alarm and protection) – electro/mechanical systems (such as servos, motors, relays, complex switches) – power generation systems (such as fixed/transportable AC/DC generators, batteries) – power distribution systems (such as single phase/3-phase distribution panels) – power supply control systems (such as voltage/current, series/shunt regulator/stabiliser) – hybrid systems (such as ADC, DAC)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 follow the relevant maintenance schedules to carry out the required work 1.5 carry out repairs to communication-electronic systems, in accordance with one of the following: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards. – Ministry of Defence (MOD) 1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out repairs to communication-electronic systems (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed timescale 1.8 carry out all of the following repair/replacement activities: – applying electrostatic discharge (ESD) precautions – preparation of areas for repairing – disconnection/dismantling of required LRUs – replacement of faulty LRUs – carrying out all necessary repairs – re-assembly of LRUs in line with specification – functionally check the completed equipment – making any adjustments required.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 use the correct joining/connecting techniques to deal with three of the following types of connection: – push-fit connectors – soldering or de-soldering – clip assemblies – threaded connections – crimped connections – zero insertion force (ZIF) connectors – adhesive joints/assemblies – edge connectors – insulation displacement connections (IDC)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – permit to work/formal risk assessment – maintenance logs and action reports – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out repairs to communication-electronic systems	2.1	describe the health and safety requirements of the area in which the repair activity is to take place, and the responsibility these requirements place on them			
		2.2	describe their responsibilities under regulations that apply to the electronic repair activities being undertaken			
		2.3	describe the isolation and lock-off procedure or permit-to-work procedure that applies to the repair activities (electrical isolation, locking off switchgear, removal of fuses, placing maintenance warning notices, proving that isolation has been achieved and secured)			
		2.4	describe the importance of wearing protective clothing and other appropriate safety equipment during the repair activities			
		2.5	describe the hazards associated with repairing electronic communication equipment, and with the materials, tools and equipment that are used (such as live electrical components, capacitor discharge), and how these can be minimised			
		2.6	describe the importance of keeping the work area clean and tidy, and free from waste and surplus materials			
		2.7	explain how the repair activities may affect the work of others, and the procedure for informing them of the work to be carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) hazards 2.9 explain how to obtain and interpret information from job instructions and other documents needed to carry out the repairs (such as drawings, circuit diagrams, specifications, manufacturers' manuals, test procedures) 2.10 describe the basic principles of how the electronic circuit functions 2.11 describe the organisational policy on the repair or replacement of faulty components during the repair process 2.12 explain how to check that the replacement units/components meet the required specification/operating conditions.			
2b Know how to carry out repairs to communication-electronic systems (continued)	2.13 describe the methods of removing and replacing the faulty units/components from the equipment (unplugging, de-soldering, removal of screwed, clamped, edge connected, zero insertion force, and crimped connections) 2.14 describe the importance of removing faulty components, without causing damage to other components, wiring, or the surrounding structure 2.15 describe the methods of attaching identification marks/labels to removed components or connections, in order to assist with re-assembly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 describe the tools and equipment used in the repair activities (including the use of wire-stripping tools, crimping tools, soldering irons, insertion devices and connecting tools) 2.17 explain how to check that tools and equipment are free from damage or defects, that they are in a safe and usable condition, and are configured correctly for the intended purpose 2.18 describe the sequence for reconnecting the equipment, and the checks to be made prior to restoring power (checking components for correct polarity, ensuring that there are no exposed conductors, cable insulation is not damaged, all connections are mechanically and electrically secure, casings are free from loose screws, there are wire ends or solder blobs that could cause short circuits, and that all fuses/protection devices are installed) 2.19 describe the importance of making 'off-load' checks before proving the equipment with the electrical supply on 2.20 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.21 describe the documentation and/or reports to be completed following the repair activity, and the importance of ensuring that these reports are completed accurately and legibly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 describe the problems that can occur with the repair activity, and how they can be overcome 2.23 describe the organisational procedures to be adopted for the safe disposal of waste of all types of materials 2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 35: Carrying out modifications to communication-electronic systems

Unit reference number: K/600/5545

Level: 2

Credit value: 20

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to modify communication-electronic systems, sub-systems or assemblies, in accordance with approved procedures. The learner will be required to carry out defined and documented modifications to communication-electronic systems, sub-systems or assemblies, in accordance with modification leaflets, latest issue drawings and standards. The learner will be expected to remove and replace cables, add new cables and change the route of cables. The learner will also be expected to modify LRUs (line replacement units) within communication-electronic systems.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out modifications to communication-electronic systems	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the modification activity: – obtain and use the correct issue of company and/or manufacturers' documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment – ensure that safe access and working arrangements for the work area have been provided – modify ground electronic systems, using approved techniques and procedures – apply safe working practices and procedures at all times – leave the work area in a safe and tidy condition 1.3 carry out modification activities on two communication-electronic systems, sub-systems or assemblies to LRU level (at least one of which must be selected from group A):			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	Note: Any of the items below can be identified as a system, sub-system or assembly in its own right Group A – Communication-electronic – transmitters (such as HF, VHF, UHF, microwave) – transceivers (such as HF, VHF, UHF, microwave) – receivers (such as HF, VHF, UHF, microwave) – signal processing (analogue) (such as radar anti-clutter, comms audio and AGC stages) – signal processing (digital) (such as digital MTI, multiplexers, AGC) – aerial systems (such as phased arrays, long wire and parabolic reflectors) – transmission lines (such as optical fibres, co-axial, baluns, twin wire, waveguide) – display systems (such as CRT, plasma, TFT, TV tab) – man-machine interface (such as IS/ICT equipment or peripherals: keypads, keyboards, microphones) – electro-optical systems (such as cameras, thermal imaging, targeting systems) – hydraulic-electrical systems (such as hydraulic motors, HSUs and actuators)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– cryptographic systems (such as data encryption and de-encryption) – built-in test equipment – data network systems (such as LANs, WANs) – data network interfaces (such as switch, router, bridging networks) – any other identifiable electronic system, sub-system or assemblies Group B - Associated equipment – environmental control systems (such as temperature, humidity, vibration, shock, alarm and protection) – electro-mechanical systems (such as servos, motors, relays, complex switches) – power generation systems (such as fixed/transportable AC/DC generators, batteries) – power distribution systems (such as single phase/3-phase distribution panels) – power supply control systems (such as voltage/current series/shunt regulator/stabiliser) – hybrid systems (such as ADC, DAC) 1.4 follow the relevant modification schedule to carry out the required work			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 produce modifications which comply with one of the following standards: – customer standards and requirements – company standards and requirements – BS, ISO and/or BSEN standards – Ministry of Defence (MOD) – manufacturers' standards and requirements 1.6 carry out the modification activities within the limits of their personal authority.			
1b Carry out modifications to communication-electronic systems (continued)	1.7 carry out the modification activities in the specified sequence and in an agreed timescale 1.8 carry out four of the following types of modification: – removing cables – adding cables – changing routes of cables – making changes to looms – making changes to LRUs – adding or removing LRUs – altering settings – upgrading mechanical systems – upgrading electrical systems			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– upgrading electronic systems – upgrading information technology systems – improving equipment safety – improving personal safety – improving equipment performance 1.9 carry out four of the following processes during the modification activities: – soldering and de-soldering – heat shrinking (devices or boots) – crimping – stripping – removing cable end fittings – changing components (including software) – repositioning units – removing cable protection – making mechanical/screwed/clamped connections – allocating identification markings – changing LRUs 1.10 report any instances where the modification activities cannot be fully met or where there are identified defects outside the planned schedule			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 complete relevant modification records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – maintenance log and action report – modification record – permit to work/formal risk assessment – company-specific documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			
2a Know how to carry out modifications to communication-electronic systems	2.1 describe the specific safety precautions and procedures to be observed whilst carrying out the modification to ground communication-electronic systems (including any specific regulations or codes of practice related to the activities, equipment or materials) 2.2 describe the health and safety requirements of the area in which the modification is to take place, and the responsibility these requirements place on them 2.3 describe the personal protective equipment and clothing to be worn during the modification activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with carrying out fault location activities on communication-electronic systems (live electrical components, stored energy, misuse of tools), and how they can be minimised 2.5 explain how to obtain and interpret information from job instructions and other documents needed in the modification activities (such as drawings, specifications, physical layouts, charts, manufacturers' manuals, history/maintenance reports, graphical electrical symbols) 2.6 explain how to identify the components to be used; component identification systems (codes and component orientation indicators) 2.7 describe the preparations to be undertaken on the system, prior to carrying out the modification 2.8 describe the methods and techniques to be used for soldering and de-soldering, and the importance of adhering to them 2.9 describe the methods and techniques to be used for crimping and heat shrinking, and the importance of adhering to them 2.10 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) 2.11 describe the basic operation of the communication-electronic system, sub-system and assembly being modified.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2b Know how to carry out modifications to communication-electronic systems (continued)	2.12 describe the different types of cable protection, and reasons for using each type 2.13 describe the various mechanical fasteners that will be used, and their method of installation 2.14 describe the importance of using the specified fasteners for the modification, and why they must not use substitutes 2.15 describe the quality control procedures to be followed during the modification operations 2.16 explain how to conduct any necessary checks to ensure the accuracy and quality of the modification 2.17 explain how to recognise defects (such as misalignment, ineffective fasteners, foreign object damage or contamination) 2.18 describe the problems that can occur with the modification operations, and how these can be overcome 2.19 describe the organisational procedures to be adopted for the safe disposal of waste of all types of materials 2.20 describe the documentation and/or reports to be completed following the modification activity, and the importance of ensuring that these reports are completed accurately and legibly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 describe the organisational policy on modification and how the process should be undertaken 2.22 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 36: Carrying out tests on communication-electronic systems

Unit reference number: T/600/5550

Level: 2

Credit value: 20

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out checks and tests on communication-electronic systems, in accordance with approved procedures. The learner will be required to carry out defined and documented tests on a range of communication-electronic systems, sub-systems, assemblies or components, at line replacement unit (LRU) level, to assess their functionality and performance in relationship to the specification. The learner will be required to carry out checks and tests, which will include voltage and current levels, resistance values, waveform, clock/timer switching, pulse width/rise time, open/short circuit, logic state, frequency modulation/demodulation, and signal-to-noise ratio/interference levels. The learner will be expected to take care that they do not damage the systems during the maintenance activities and, where appropriate, the application of electrostatic discharge (ESD) procedures will be a critical part of their role.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out tests on communication-electronic systems	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the testing activities: – plan the testing methods and procedures in conjunction with others, prior to undertaking the work – obtain and use the correct issue of company and/or manufacturers' testing documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment – ensure that safe access and working arrangements have been provided for the test area – carry out the testing activities, using appropriate techniques and procedures – ensure that all test equipment is within calibration date – take electrostatic discharge (ESD) precautions when handling sensitive components – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out tests on two of the following types of communication-electronic systems, sub-systems, assemblies or components, to LRU level (at least one of which must be selected from group A): Note: Any of the items below can be identified as a system. sub system or assembly in its own right Group A – Communication-electronic – transmitters (such as HF, VHF, UHF, microwave) – transceivers (such as HF, VHF, UHF, microwave) – receivers (such as HF, VHF, UHF, microwave) – signal processing (analogue) (such as radar anti-clutter, comms audio and AGC stages) – signal processing (digital) (such as digital MTI, multiplexers, AGC) – aerial systems (such as phased arrays, long wire and parabolic reflectors) – transmission lines (such as optical fibres, co-axial, baluns, twin wire, waveguide) – display systems (such as CRT, Plasma, TFT, TV Tab) – man-machine interface (such as IS/ICT equipment or peripherals: keypads, keyboards, microphones) – electro-optical systems (such as cameras, thermal imaging, targeting systems)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– hydraulic-electrical systems (such as hydraulic motors, HSUs, actuators) – cryptographic systems (such as data encryption and de-encryption) – built-in test equipment – data network systems (such as LANs, WANs) – data network interfaces (such as switch, router, bridging networks) – any other identifiable electronic system, sub-system or assemblies to LRU level Group B – Associated equipment – environmental control systems (such as temperature, humidity, vibration, shock, alarm and protection) – electro/mechanical systems (such as servos, motors, relays, complex switches) – power generation systems (such as fixed/transportable AC/DC generators, batteries) – power distribution systems (such as single phase/3-phase distribution panels) – power supply control systems (such as voltage/current, series/shunt regulator/stabiliser) – hybrid systems (such as ADC, DAC)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 follow the appropriate procedures for use of tools and equipment to carry out the required tests 1.5 carry out tests using a range of tools and test equipment, to include four of the following: – oscilloscope – ammeter – logic analyser – Q meter – current tracer – signal generator – multimeter – computer aided diagnostic equipment – special-purpose testing equipment – other specific test equipment – temperature testing devices – power meters – valve tester – spectrum analyser – time domain reflectometer – frequency counter – protocol analyser			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– breakout box – automatic test equipment 1.6 set up and carry out the tests using the correct procedures and within agreed timescales.			
1b Carry out tests on communication-electronic systems (continued)	1.7 carry out six of the following testing activities, as applicable to the equipment being tested: – logic states – DC voltage/current levels – AC voltage/current levels – clock/timer switching – pulse width/rise time – open/short circuit – resistance – heat dissipation – frequency modulation/demodulation – performance of system, sub-system or assembly – conditions of assemblies and components – signal noise/interference levels			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out all of all the following checks to ensure the accuracy and quality of the tests carried out: – the test equipment is correctly calibrated – test equipment used is appropriate for the tests being carried out – test procedures to be used are up to date and follow laid-down procedures – test equipment is operated within its specification range 1.9 record the results of the tests in the appropriate format 1.10 provide a record/report of the test outcomes, using one of the following: – preventative maintenance log/report – company-specific reporting procedure – inspection schedule – specific test report 1.11 review the results and carry out further tests if necessary.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out tests on communication-electronic systems	2.1	describe the health and safety requirements of the area in which the testing activity is to take place, and the responsibility they place on them			
		2.2	describe their responsibilities under regulations relevant to the communication-electronic testing activities being undertaken			
		2.3	describe the isolation and lock-off procedure or permit-to-work procedure that applies to the testing activities (electrical isolation, locking off switch gear, removal of fuses, placing maintenance warning notices, proving that isolation has been achieved and secured)			
		2.4	describe the isolation procedures unique to communication-electronic systems			
		2.5	describe the specific safety precautions to be taken when carrying out formal inspection, safety checking and testing of communication-electronic equipment			
		2.6	describe the hazards associated with testing communication-electronic systems and with the equipment that is used, and how these can be minimised			
		2.7	describe the importance of wearing protective clothing and other appropriate safety equipment during the testing activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the importance of keeping the work area clean and tidy, and free from waste and surplus materials 2.9 explain how the testing activities may effect the work of others, and the procedure for informing them of the work to be carried out.			
2b Know how to carry out tests on communication-electronic systems (continued)	2.10 describe the procedures and precautions to be adopted to eliminate electrostatic discharge (ESD) 2.11 explain how to obtain and interpret information from job instructions and other documents needed to carry out the test (such as drawings, circuit diagram, specifications, manufacturers' manuals, test procedures) 2.12 explain how to determine suitable test points within a system, sub-system or assembly 2.13 explain how to set up and apply the appropriate test equipment 2.14 explain how to determine the calibration state of the equipment, and the actions to be taken if equipment is out of calibration 2.15 explain how to check that tools and equipment are free from damage or defect, are in a safe and useable condition, and are configured correctly for their intended purpose			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 describe the various testing methods and procedures, and how to apply them to different operating conditions 2.17 describe the documentation required, and the procedures to be followed at the conclusion of the testing 2.18 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 37: Carrying out the configuration of communication-electronic systems

Unit reference number: Y/600/5556

Level: 2

Credit value: 20

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out configuration tasks on communication-electronic systems, in accordance with approved procedures. The learner will be required to configure a range of communication-electronic systems, sub-systems or assemblies into a communication-electronic system. The learner will need to carry out the configuration activities to ensure that the system, sub-system or assembly performs to specified levels.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out the configuration of communication-electronic systems	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all the following during the configuration activities: – obtain and use the correct issue of company publications and/or manufacturers' documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – configure communication-electronic systems, using approved methods and techniques – apply safe working practices and procedures at all times – leave the work area in a safe and tidy condition 1.3 configure systems that contain at least two communication-electronic sub-systems or assemblies (at least one of which must be selected from group A): Note: Any of the items below can be identified as a sub-system or assembly in its own right Group A – Communication-electronic – transmitters (such as HF, VHF, UHF, microwave)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– transceivers (such as HF, VHF, UHF, microwave) – receivers (such as HF, VHF, UHF, microwave) – signal processing (analogue) (such as radar anti-clutter, comms audio and AGC stages) – signal processing (digital) (such as digital MTI, multiplexers, AGC) – aerial systems (such as phased arrays, long wire and parabolic reflectors) – transmission lines (such as optical fibres, co-axial, baluns, twin wire, waveguide) – display systems (such as CRT, plasma, TFT, TV tab) – man-machine interface (such as IS/ICT equipment or peripherals: keypads, keyboards, microphones) – electro-optical systems (such as cameras, thermal imaging, targeting systems) – hydraulic-electrical systems (such as hydraulic motors, HSUs and actuators) – cryptographic systems (such as data encryption and de-encryption) – built-in test equipment – data network systems (such as LANs, WANs)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– data network interfaces (such as switch, router, bridging networks) – system software – any other identifiable electronic sub-system or assemblies to LRU level Group B – Associated equipment – environmental control systems (such as temperature, humidity, vibration, shock, alarm and protection) – electromechanical systems (such as servos, motors, relays, complex switches) – power generation systems (such as fixed/transportable AC/DC generators, batteries) – power distribution systems (such as single phase/3-phase distribution panels) – power supply control systems (such as voltage/current series/shunt regulator/stabiliser) – hybrid systems (such as ADC, DAC) 1.4 follow all relevant setting up and operating specifications for the products or assets being configured 1.5 follow the defined procedures and set up the equipment correctly ensuring that all operating parameters are achieved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 configure systems using a range of tools and equipment, to include four of the following: – oscilloscope – ammeter – logic analyser – Q meter – current tracer – signal generator – multimeter – computer aided diagnostic equipment – special-purpose testing equipment – other specific equipment – temperature testing devices – power meters – valve tester – spectrum analyser – time domain reflectometer – frequency counter – protocol analyser – breakout box			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 adjust the systems using six of the following, as applicable to the equipment being configured: – automatic test equipment – software – logic states – DC voltage/current levels – AC voltage/current levels – clock/timer switching – pulse width/rise time – open/short circuit – resistance – heat dissipation – frequency modulation/demodulation – performance of system, sub-system or assembly – conditions of assemblies and components – signal noise/interference levels.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out the configuration of communication-electronic systems (continued)	1.8 deal promptly and effectively with problems within their control and report those that cannot be solved 1.9 check that the configuration is complete and that the equipment operates to specification 1.10 carry out all of the following checks during the configuration process: – system location and security are correct – system earth bonding is correct – all connections are correctly made (mechanical and electrical) – the system powers up correctly – the system powers down correctly 1.11 ensure that the configured system meets all of the following quality and accuracy standards: – the system operates to specifications – any potential defects are identified and reported to the appropriate authority for further action – all relevant documentation is completed accurately and legibly – the system is formally accepted by the end user 1.12 complete all relevant documentation accurately and legibly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 provide a record/report of the configuration outcome(s), using one of the following: – job card – company-specific reporting procedure – specific configuration report.			
2a Know how to carry out the configuration of communication-electronic systems	2.1 describe the specific safety practices and procedures that they need to observe when configuring communication-electronic systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain how to recognise and deal with victims of electric shock (to include methods of safely removing victims from the power source and methods of first aid resuscitation) 2.3 describe the health and safety requirements of the work area where they are carrying out the activities, and the responsibility these requirements place on them 2.4 describe the hazards associated with configuring communication-electronic systems, and how they can be minimised 2.5 describe the personal protective equipment that they need to use during the configuration activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions and other documentation used for the configuration activity (such as drawings, standards, operating specifications) 2.7 describe the components to be configured, and their basic function within the particular communications-electronic systems 2.8 describe the quality control procedures to be followed during the configuration process.			
2b Know how to carry out the configuration of communication-electronic systems (continued)	2.9 describe the techniques used to check the position, alignment and security of the components in a communication-electronic system 2.10 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.11 explain how to conduct any necessary basic checks and adjustments to the equipment, to ensure the system integrity, functionality, accuracy and quality 2.12 describe the various system operating procedures and their specific configuration requirements 2.13 describe the tools and equipment used in the configuration process, and their calibration/care and control procedures 2.14 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the configuration process			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 describe the recording documentation to be completed for the configuration activities undertaken 2.16 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 38: Assisting in the installation of communication-electronic systems

Unit reference number: H/600/5589

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of communication-electronic systems, in accordance with approved procedures. The learner will be required to use appropriate installation publications, orders and specifications to install the various systems, sub-systems or assemblies. The learner will be expected to assist in the positioning, alignment and connection of the electronic-communications systems, sub-systems or assemblies in their correct locations, using the specified or appropriate techniques.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of communication-electronic systems	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation activity: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of systems that contain three communication-electronic sub-systems or assemblies (at least two of which must be selected from group A): Note: Any of the items below can be identified as a system, sub system or assembly in its own right Group A – Communication-electronic – transmitters (such as HF, VHF, UHF, microwave) – transceivers (such as HF, VHF, UHF, microwave) – receivers (such as HF, VHF, UHF, microwave) – signal processing (analogue) (such as radar anti-clutter, comms audio and AGC stages) – signal processing (digital) (such as digital MTI, multiplexers, AGC) – aerial systems (such as phased arrays, long wire and parabolic reflectors) – transmission lines (such as optical fibres, co-axial, baluns, twin wire, waveguide) – display systems (such as CRT, Plasma, TFT, TV Tab) – man-machine interface (such as IS/ICT equipment or peripherals: keypads, keyboards, microphones) – electro-optical systems (such as cameras, thermal imaging, targeting systems)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– hydraulic-electrical systems (such as hydraulic motors, HSUs, and actuators) – cryptographic systems (such as data encryption and de-encryption) – built-in test equipment – data network systems (such as LANs, WANs) – data network interfaces (such as switch, router, bridging networks) – any other identifiable electronic system, sub-system or assemblies to LRU level Group B – Associated equipment – environmental control systems (such as temperature, humidity, vibration, shock, alarm and protection) – electro/mechanical systems (such as servos, motors, relays, complex switches) – power generation systems (such as fixed/transportable AC/DC generators, batteries) – power distribution systems (such as single phase/3-phase distribution panels) – power supply control systems (such as voltage/current, series shunt regulator/stabiliser) – hybrid systems (such as ADC, DAC)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 follow all relevant instructions/documentation for the installation being carried out 1.5 produce installations which comply with one of the following standards: – customer standards and requirements – company standards and requirements – BS, ISO and/or BSEN standards – Ministry of Defence (MOD) – manufacturer's standards and requirements 1.6 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition 1.7 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques 1.8 use all of the following installation methods and techniques: – levelling and aligning – earth bonding – taking electrostatic discharge (ESD) precautions – securing and locking.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Assist in the installation of communication-electronic systems (continued)	1.9 make three of the following types of mechanical securing connections: – nuts and bolts – locking devices – screws – torque load bolts – quick-release fasteners 1.10 make three of the following types of electrical connection: – co-axial – D10 – screened – quad – data cable – free plugs and sockets – earth bonding points – fibre-optic 1.11 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 dispose of waste items in a safe and environmentally acceptable manner 1.14 assist in the completion of installation documentation 1.15 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people: – job cards – specific deployment/installation report – build records – specific company documentation.			
2a Know how to assist in the installation of communication-electronic systems	2.1 describe the specific safety practices and procedures that they need to observe when assisting with the installation of communication-electronic systems (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the health and safety requirements of the work area where they are carrying out the installation activities, and the responsibility these requirements place on them 2.3 describe the hazards associated with installing communication-electronic systems, and how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the personal protective equipment that they need to use during the installation activities 2.5 explain how to obtain and interpret information from job instructions and other documentation used in the installation activities (such as drawings, quality control procedures and specifications used for installation) 2.6 describe the components, communication-electronic systems, sub-systems and assemblies to be installed 2.7 describe the various mechanical fasteners that will be used, and their method of installation 2.8 describe the importance of using the specified fasteners for the particular installation, and why they must not substitute others 2.9 describe the torque loading requirements on the fasteners, and what to do if these loadings are exceeded or not achieved 2.10 describe the quality control procedures to be followed during the installation operations 2.11 describe the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2b Know how to assist in the installation of communication-electronic systems (continued)	2.12 describe the techniques used to position, align, adjust and secure the components of the communications-electronic systems, without damage 2.13 describe the methods of lifting, handling and supporting the components/equipment during the installation activities 2.14 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.15 describe the procedure for the safe disposal of waste materials 2.16 explain how to conduct any necessary checks to ensure the system integrity, functionality, accuracy and quality of the installation 2.17 describe the tools and equipment used in the installation activities, and their calibration/care and control procedures 2.18 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities 2.19 describe the problems that can occur with the installation operations, and how these can be overcome			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 describe the recording documentation to be completed for the installation activities undertaken 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 39: Carrying out fault location on stairlift equipment

Unit reference number: M/600/5594

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out efficient and effective location of faults on stairlift equipment, in accordance with approved procedures. The learner will be required to investigate faults on a range of AC or DC powered stairlifts, including straight, curved and hinged. The learner will be expected to use a variety of fault location methods and procedures, such as gathering information from the person who reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out fault location on stairlift equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault locating activity: – undertake the fault location methods and procedures to cause minimal disruption to the customer – obtain and use the correct issue of company and/or manufacturers' drawings and documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as electricity, mechanical) – provide safe access and working arrangements for the fault maintenance area – carry out the fault location activities, using approved procedures – identify the fault, and consider appropriate corrective action take actions to resolve the problem (in conjunction with others, where appropriate)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out fault location on all of the following AC or DC powered stairlifts: – straight – curved – hinged 1.4 locate faults that have resulted in two of the following breakdown categories: – intermittent action or circuit failure – partial failure/reduced performance – complete breakdown 1.5 review and use all relevant information on the symptoms and problems associated with the products or assets 1.6 investigate and establish the most likely causes of the faults			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 select, use and apply diagnostic techniques, tools and aids to locate faults using four of the following: – information gathered from the person who reported the fault, including the customer – fault finding techniques (such as six point, half-split, input/output, unit substitution) – diagnostic aids (such as manuals, flow charts, troubleshooting guides, maintenance records) – inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, loose fittings) – operating (such as manually switching off and on, running the equipment).			
1b Carry out fault location on stairlift equipment (continued)	1.8 use three of the following types of instruments to aid fault location: – mechanical measuring instruments/devices – multimeter – continuity tester – insulation resistance tester – self-diagnostic systems – other specific test equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.10 determine the implications of the fault for other work and for safety considerations 1.11 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault 1.12 record details on the extent and location of the faults in an appropriate format 1.13 provide a record of the outcomes of the fault location using one of the following: – service record card – job card/corrective action report – company-specific documentation.			
2a Know how to carry out fault location on stairlift equipment	2.1 describe the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on them 2.2 describe the isolation procedures to be applied when installing or servicing stairlift equipment 2.3 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid and resuscitation)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the importance of wearing protective clothing and other appropriate safety equipment during fault location activities 2.5 describe the hazards associated with carrying out fault location activities on stairlift equipment (such as live electrical components, stored energy, misuse of tools), and how they can be minimised 2.6 explain how to use the various diagnostic aids to help identify the location of the fault 2.7 describe the various fault location techniques that can be used, and how they are applied (such as half-split, function testing, unit substitution, and equipment self-diagnostics) 2.8 explain how to evaluate sensory information (such as sight, sound, smell, touch) 2.9 explain how to assess evidence and evaluate the possible causes of faults/problems.			
2b Know how to carry out fault location on stairlift equipment (continued)	2.10 explain how to use a range of fault diagnostic equipment to investigate the problem 2.11 describe the care, handling and application of measuring/test equipment (such as mechanical and electrical measuring instruments) 2.12 explain how to check that measuring/test equipment is within calibration, and that it is free from damage and defects			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 explain how to obtain and interpret information from job instructions, drawings, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical symbols, and other documents needed in the fault location process 2.14 describe the basic principles of how stairlift equipment functions, its operating sequence, the purpose of individual units/components and how they interact 2.15 describe the problems that can occur during the fault location activity, and how they can be minimised 2.16 describe the importance of completing the correct documentation following the maintenance activity 2.17 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 40: Carrying out servicing activities on stairlift equipment

Unit reference number: L/600/5604

Level: 2

Credit value: 19

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out the servicing of stairlifts, in accordance with approved procedures. This will involve inspection and adjustment, dismantling, removing and replacing faulty components, in line with company procedures, on a variety of different types of stairlifts such as straight, curved and hinged, and operated by AC or DC power supplies. The learner will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning and adjusting components, torque loading components and making 'off-load' checks before starting up the stairlifts.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out servicing activities on stairlift equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the servicing activity: – undertake the servicing activities to cause minimal disruption to the customer – provide the customer with a briefing, prior to carrying out the servicing activity – review the customer's comments – obtain and use the correct issue of drawings, job instructions and procedures – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity) – ensure safe access and working arrangements for the servicing area – carry out the servicing activities, using appropriate techniques and procedures – reinstate and return the stairlifts to service on completion of the servicing activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– ensure that any potential defects are identified and reported for further action – leave the work area in a safe and tidy condition 1.3 carry out servicing activities on all of the following types AC or DC powered stairlifts: – straight – curved – hinged 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 ensure that the serviced stairlift complies with all of the following, as appropriate to the equipment being serviced: – organisational guidelines and codes of practice – equipment manufacturer's operation range – customers requirements – BS, ISO BSEN standards 1.6 carry out the maintenance activities within the limits of their personal authority 1.7 carry out the maintenance activities in the specified sequence and in an agreed timescale.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out servicing activities on stairlift equipment (continued)	1.8 carry out all of the following servicing activities: – dismantling equipment to the appropriate level – make sensory checks (such as sight ,sound, smell, touch) – checking continuity of protective conductors – setting, aligning and adjusting components – tightening fastenings to the required torque – remove excess dirt and grime – applying lubrication – functionally testing the completed system 1.9 check all of the following for operational safety, security and condition, in line with manufacturers' specifications: – mains switch – safety gear – overspeed governor – safety sensitive edges/pads – safety interlocks – hinged rail – swivel seat – footrest and springs – carriage motor gearbox and brake			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– overload devices/fuses – seatbelts – charging system – circuit protection devices (such as residual current device (RCD), and earth leakage circuit breaker (ELCB)) – levelling devices (mechanical or electrical) – hinge/swivel motor (where appropriate) – limit switches (slow, stop and final) – chair, landing and auxiliary controls 1.10 check all of the following for damage, wear, security and condition, in line with manufacturers' specifications: – rail – rollers – upholstery – trailing cable – wiring looms – batteries – rack and pinion – fixing of rail to stairs – warning labels			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– fixing of chair to carriage – chains and sprockets (where appropriate) – printed circuit boards (PCBs) 1.11 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.12 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – service record card – job card/corrective action report – company specific documentation 1.13 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out servicing activities on stairlift equipment	2.1 describe the health and safety requirements of the area in which the servicing activity is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and/or lock-off or permit-to-work procedures that applies 2.3 describe the specific health and safety precautions to be applied during the servicing procedure, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with carrying out stairlift servicing activities (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down servicing procedures), and how to minimise them 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the servicing activity 2.6 explain how to obtain and interpret information from job instructions and other documents needed in the servicing process (such as drawings, specifications, manufacturers' manuals) 2.7 describe the operational safety checks that are applied, and the importance of following them correctly during servicing activities 2.8 describe the methods and techniques used to service stairlift equipment (such as visual examination, dismantling equipment, replacing damaged/defective components, setting, aligning and adjusting and functionally testing) 2.9 describe the methods of checking that components are fit for purpose, and how to identify defects and wear characteristics			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact.			
2b Know how to carry out servicing activities on stairlift equipment (continued)	2.11 describe the uses of mechanical and electrical measuring devices 2.12 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel and running and sliding conditions) 2.13 describe the importance of making visual checks before running the equipment under power 2.14 explain 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 2.15 describe the importance of servicing documentation and/or reports following the servicing activity, and how to complete them 2.16 describe the equipment operating and control procedures to be applied during the servicing activity 2.17 explain how to apply manual handling techniques when servicing stairlifts			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the things that can go wrong when carrying out servicing of stairlifts, and what to do if they occur 2.19 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.20 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 41: Restoring stairlifts to service by replacing or repairing components

Unit reference number: D/600/5607

Level: 2

Credit value: 23

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to restore stairlifts to usable condition by component repair or replacement, in accordance with approved procedures. The learner will be required to restore a variety of different types of stairlifts, such as straight, curved and hinged, to operational condition, by repairing or replacing assemblies/sub-assemblies and components. The learner will also be required to select the appropriate equipment to use, based on the nature of the activity and the operations that will need to be carried out.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Restore stairlifts to service by replacing or repairing components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the repair/replacement activity: – undertake the activities to cause minimal disruption to the customer – provide the customer with a briefing, prior to carrying out the repair/replacement activity – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) – provide safe access and working arrangements for the maintenance area – carry out the repair/replacement activities, using appropriate techniques and procedures – reinstate and return the stairlifts to service on completion of the activities – ensure that any potential defects are identified and reported for further action			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 replace or repair all of the following components: – carriage motor/gearbox – trailing cable – carriage rollers Plus eight more from the following: – printed circuit boards (PCBs) – wiring loom – batteries (such as carriage/hinge) – safety devices (such as switches, interlocks, fuses) – controls (such as landing call button, infra-red, radio) – overspeed governors – cable reeling drum and brushes – ropes/chains – linkages – charging components/units – safety gear – hinge/swivel motor			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– circuit protection devices (RCD or ELCB) – sprockets and/or gears – seatbelts – springs (footrest or swivel) – gas struts – pulleys – indicator lights/units – upholstery 1.4 follow the relevant specifications for the component to be repaired 1.5 repair or replace stairlift components, in accordance with all of the following, as appropriate to the equipment being repaired: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – customer requirements 1.6 prepare the component for repair			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Restore stairlifts to service by replacing or repairing components (continued)	1.7 carry out the repairs within agreed timescale using approved materials and components and methods and procedures 1.8 carry out all of the following during the replacement or repairing activities: – dismantling equipment to the appropriate level – removal of excess dirt and grime – fitting, aligning and adjusting repaired or replaced units/components – tightening fastenings to the required torque – ensuring that working clearances are met – applying lubrication – ensuring that components are clear of obstruction and are guarded, where appropriate – making sensory checks (sight, sound, smell, touch) – checking that all safety devices are operative – functionally testing the completed system 1.9 ensure that the repaired component meets the specified operating conditions 1.10 produce accurate and complete records of all repair work carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 complete one of the following servicing records, and pass it to the appropriate person: – service record card – job card/corrective action report – company-specific documentation.			
2a Know how to restore stairlifts to service by replacing or repairing components	2.1 describe the health and safety requirements of the area in which the repairing or replacing activity is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and/or lock-off or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the repair/replacement procedure, and their effects on others 2.4 describe the importance of wearing protective clothing and other appropriate safety equipment during repairing activities 2.5 describe the hazards associated with carrying out stairlift repairs (handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down servicing procedures), and how to minimise them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain where to obtain, and how to interpret job instructions and other relevant documents used in the maintenance activities (such as drawings, specifications, manufacturers' manuals, maintenance schedules) 2.7 describe the methods, techniques and company procedures to be followed for restoring stairlifts to service 2.8 describe the inspection and safety checks required, and the importance of following them correctly during replacement/repairing activities 2.9 describe the methods and techniques used to dismantle/assemble stairlift equipment (such as visual examination, dismantling equipment, replacing damaged/defective components, setting, aligning and adjusting and functionally testing) 2.10 describe the methods of checking that components are fit for purpose, and how to identify defects and wear characteristics 2.11 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2b	Know how to restore stairlifts to service by replacing or repairing components (continued)	2.12	describe the uses of mechanical and electrical measuring devices			
		2.13	explain how to make adjustments to components/assemblies to ensure that they function correctly (such as working clearance, setting travel, running and sliding conditions)			
		2.14	describe the importance of making visual checks before running the equipment under power			
		2.15	explain 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			
		2.16	describe the importance of completing replacement/repair documentation correctly			
		2.17	describe the equipment operating and control procedures to be applied during the repair/replacement activity			
		2.18	explain how to apply manual handling techniques when restoring stairlifts to service			
		2.19	describe the things that can go wrong when repairing or replacing stairlift components, and what to do if they occur			
		2.20	describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 42: Carrying out fault location on service lifts

Unit reference number: M/600/5613

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out efficient and effective location of faults on service lifts, in accordance with approved procedures. The learner will be expected to locate faults on service lifts such as traction, hydraulic, and direct drive. The learner will be expected to use a variety of fault location methods and procedures, such as gathering information from the person who reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out fault location on service lifts	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault finding activity: – undertake the fault location process to cause minimal disruption to the customer – obtain and use the correct issue of company and/or manufacturers' drawings and documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as electricity, mechanical) – provide safe access and working arrangements for the fault finding area – carry out the fault location activities, using approved procedures – identify the fault, and consider appropriate corrective action – take actions to resolve the problem (in conjunction with others, where appropriate)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out fault location on one of the following types of service lift: – hydraulic – direct drive – traction 1.4 locate faults that have resulted in two of the following breakdown categories: – intermittent problem – partial failure or reduced performance – complete breakdown 1.5 review and use all relevant information on the symptoms and problems associated with the products or assets 1.6 investigate and establish the most likely causes of the faults 1.7 select, use and apply diagnostic techniques, tools and aids to locate faults using four of the following: – information gathered from the person who reported the fault, including the customer – fault finding techniques (such as six point, half-split, input/output, unit substitution,)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– diagnostic aids (such as manuals, flow charts, troubleshooting guides, maintenance records) – inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, loose fittings) – operating (such as manually switching off and on, running the equipment).			
1b Carry out fault location on service lifts (continued)	1.8 use three of the following types of test equipment to aid fault location: – measuring instruments / devices – multimeter – continuity tester – insulation resistance tester – self-diagnostic systems – other specific test equipment 1.9 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.10 determine the implications of the fault for other work and for safety considerations 1.11 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 record details on the extent and location of the faults in an appropriate format 1.13 provide a record of the outcomes of the fault location, using one of the following: – step-by-step outcome analytical report – service record card – company-specific documentation – corrective action report.			
2a Know how to carry out fault location on service lifts	2.1 describe the health and safety requirements of the area in which they are carrying out the fault finding investigation, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid and resuscitation) 2.4 describe the safe working practices for lifts (as described in BS7255) 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during fault location activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the hazards associated with carrying out fault location activities on service lift equipment (live electrical components, stored energy, misuse of tools), and how they can be minimised 2.7 explain how to use the various diagnostic aids to help identify the location of the fault 2.8 describe the various fault location techniques that can be used, and how they are applied (such as half-split, function testing, unit substitution, and equipment self-diagnostics) 2.9 explain how to evaluate sensory information (sight, sound, smell, touch).			
2b Know how to carry out fault location on service lifts (continued)	2.10 explain how to assess evidence and evaluate the possible causes of faults/problems 2.11 explain how to use a range of fault diagnostic equipment to investigate the problem 2.12 describe the care, handling and application of measuring/test equipment (such as mechanical and electrical measuring instruments) 2.13 explain how to check that measuring/test equipment is within calibration, and that it is free from damage and defects			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain how to obtain and interpret information from job instructions and other documents needed in the fault location process (such as drawings, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical symbols) 2.15 describe the basic principles of how service lift equipment functions, its operating sequence, the purpose of individual units/components and how they interact 2.16 describe the problems that can occur during the fault location activity, and how they can be minimised 2.17 describe the importance of completing the correct documentation following the maintenance activity 2.18 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 43: Carrying out servicing of service lift equipment

Unit reference number: F/600/5616

Level: 2

Credit value: 19

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out servicing activities of service lifts, in accordance with approved procedures. This will involve inspection and adjustment, dismantling, removing and replacing faulty components, in line with company procedures, on a range of service lifts such as traction, hydraulic, and direct drive. The learner will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid re-assembly, setting, aligning and adjusting components, and to carry out the relevant checks before starting up the service lift.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out servicing of service lift equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the servicing activity: – undertake the servicing activities to cause minimal disruption to the customer – obtain and use the correct issue of drawings, job instructions and procedures – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity) – ensure safe access and working arrangements for the servicing area – follow the approved service lift servicing schedule – reinstate and return the service lift to service on completion of activities – ensure that any potential defects are identified and reported for further action – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 carry out servicing activities on one of the following types of service lift: – hydraulic – direct drive – traction 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 carry out the servicing operations, in accordance with all of the following standards, as appropriate to the equipment being serviced: – organisational guidelines and codes of practice – equipment manufacturer's operating range – BS, ISO and/or BSEN standards – customer requirements 1.6 carry out the maintenance activities within the limits of their personal authority 1.7 carry out the maintenance activities in the specified sequence and in an agreed timescale.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Carry out servicing of service lift equipment (continued)	1.8 check twelve of the following for operational safety, security and condition, in line with manufacturers' specifications: – overspeed governor – motor/gearbox – slack chain devices – brake system – anti-creep system – safety gear – floor selection system – door locking mechanism – door gear – hydraulic rams – safety locks/interlocks – switches (such as pressure and limit) – shutter suspension system – valve block – lift run-bys/overtravels – residual current devices (RCD)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 check ten the following for damage, wear, security and condition, in line with manufacturers' specifications: – diverters – traction sheave – controllers – retiring ramps – car doors – push buttons/indicators – lift structure – cabling (such as shaft and trailing) – balance weight and rope attachments – guide shoes/rollers – lifting ropes – equalising devices – chains and sprockets – warning notices – hydraulic hoses – car interior – guides/racks and fixings – rack and pinion drive			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 carry out all of the following servicing techniques: – visual examination of the complete system – dismantling equipment to the appropriate level – proof marking/labelling of components – checking components for serviceability – setting, aligning and adjusting components – electrical continuity – make sensory checks (sight, sound, smell, touch) – tightening fastenings to the required torque – making 'off-load' checks before starting up – removing excess dirt and grime – replenishing oils and/or greases – functionally testing the completed system 1.11 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 complete relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: – job cards – company report – service log and action report – company-specific documentation 1.13 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out servicing of service lift equipment	2.1 describe the health and safety requirements of the area in which the servicing activity is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the servicing procedure, and their effects on others 2.4 describe the hazards associated with carrying out the servicing of service lifts (handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down servicing procedures), and how to minimise them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the servicing process 2.6 explain how to obtain and interpret information from job instructions and other documents needed in the servicing process (such as drawings, specifications, manufacturers' manuals, servicing schedules) 2.7 describe the inspection and safety checks that are applied, and the importance of following them exactly during servicing operations 2.8 describe the methods of checking that components are fit for purpose, and how to identify defects and wear characteristics 2.9 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.10 describe the different drive systems, their operation, and associated components.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2b Know how to carry out servicing of service lift equipment (continued)	2.11 describe the uses of mechanical and electrical measuring devices 2.12 explain how to make adjustments to components/assemblies to ensure that they function correctly (setting working clearance, setting travel, running and sliding conditions) 2.13 describe the importance of making checks before running the equipment under power 2.14 explain 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 2.15 describe the importance of servicing documentation and/or reports following the servicing activity, and how to generate them 2.16 describe the equipment operating and control procedures to be applied during the servicing activity 2.17 describe the things that can go wrong when carrying out servicing of service lifts, and what to do if they occur 2.18 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 44: Restoring service lifts to service by replacing or repairing components

Unit reference number: J/600/5620

Level: 2

Credit value: 23

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to restore service lifts to usable condition by repairing or replacing components, in accordance with approved procedures. The learner will be required to restore a range of service lifts, such as traction, hydraulic, and direct drive to operational condition, by repairing or replacing assemblies/sub-assemblies and components. The learner will also be required to select the appropriate equipment to use, based on the nature of the repair, and the operations to be carried out.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Restore service lifts to service by replacing or repairing components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following activities during the repair/replacement activity: – undertake the activities to cause minimal disruption to the customer – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electricity, air or fluids) – provide safe access and working arrangements for the maintenance area – carry out the repair/replacement activities, using appropriate techniques and procedures – reinstate and return the service lift to service on completion of the repair/replacement activities – ensure that any potential defects are identified and reported for further action – record the repair/replacement, using appropriate methods or documentation – dispose of waste items in a safe and environmentally acceptable manner			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– leave the work area in a safe and tidy condition 1.3 replace or repair four of the following components: – motor – gearbox – lift controller equipment – hydraulic pump unit – lifting ropes/chains – hydraulic valves, hoses and connectors Plus six from the following: – electrical wiring and cables – solenoids – safety devices (switches, interlocks, fuses) – landing/car shutter suspension cords – traction sheave/sprocket – brakes – ram seals – safety gear – guides and fixings – guide shoes/rollers – overspeed governors			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– residual current devices (RCD) – floor selection systems – printed circuit boards (PCBs) – controls (landing call stations) 1.4 follow the relevant specifications for the component to be repaired 1.5 carry out repair or replacement of service lift components, in accordance with all of the following standards, as appropriate to the equipment being repaired: – organisational guidelines and codes of practice – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – customer requirements.			
1b Restore service lifts to service by replacing or repairing components (continued)	1.6 prepare the component for repair 1.7 carry out the repairs within agreed timescale using approved materials and components and methods and procedures 1.8 carry out all of the following replacement or repair activities: – dismantling equipment to the appropriate level – removing excess dirt and grime			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– fitting, aligning and adjusting repaired or replaced units/components – tightening fastenings to the required torque – ensuring that working clearances are met – applying lubrication – ensuring that components are clear of obstruction, and are guarded, where appropriate – making sensory checks (sight, sound, smell, touch) – checking that all safety devices are operative – functionally testing the completed system 1.9 ensure that the repaired component meets the specified operating conditions 1.10 produce accurate and complete records of all repair work carried out 1.11 complete one of the following servicing records, and pass it to the appropriate person – job cards – company-specific report – service log and action report.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to restore service lifts to service by replacing or repairing components	2.1	describe the health and safety requirements of the area in which the repair or replacement activity is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the repair/replacement procedure, and their effects on others			
		2.4	describe the importance of wearing protective clothing and other appropriate safety equipment during repair/replacement activities			
		2.5	describe the hazards associated with carrying out service lift repairs (handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down servicing procedures), and how to minimise them			
		2.6	explain where to obtain, and how to interpret job instructions and other relevant documents used in the maintenance activities (such as drawings, specifications, manufacturers' manuals, maintenance schedules)			
		2.7	describe the methods, techniques and company procedures to be followed for repairing/replacing components for service lifts			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the inspection and safety checks that are applied, and the importance of following them exactly during replacement/repair operation 2.9 describe the methods and techniques used to dismantle/assemble service lift equipment (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.10 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items such as seals and gaskets.			
2b Know how to restore service lifts to service by replacing or repairing components (continued)	2.11 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.12 describe the uses of mechanical and electrical measuring devices 2.13 explain how to make adjustments to components/assemblies to ensure that they function correctly (setting working clearance, setting travel, running and sliding conditions) 2.14 describe the importance of making checks before running the equipment under power 2.15 explain how to check that tools and equipment are free from damage or defects, and are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 describe the importance of preparing documentation and/or reports following the replacement/repairing activity, and how to generate them 2.17 describe the equipment operating and control procedures to be applied during the repair/replacement activity 2.18 explain how to use lifting and handling equipment in the repair/replacement process 2.19 describe the things that can go wrong when carrying out repairs to service lifts, and what to do if they occur 2.20 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 45: Installing stairlifts

Unit reference number: Y/600/5623

Level: 2

Credit value: 42

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to install stairlifts, in accordance with approved procedures. This will require the learner to survey the site for the proposed installation, and to make any necessary arrangements to have the required installation tools, and any specified components and site services available, so that the installation can be carried out safely and efficiently. The learner will be required to install a variety of stairlifts, including straight, curved and hinged, operated by AC or DC power supplies.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Install stairlifts	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following before installing the stairlift equipment: – check that the site is accessible and is free from obstructions or hazards – check that installation documentation is complete and current (such as, drawings, instructions, manufacturer's data, settings and other documentation) – confirm that the appropriate electrical supply is available – check that the required installation consumables are available – check that safety and environmental conditions have been met – confirm that the site has been suitably prepared for the installation to take place – check that consignment contents are correct to the customer specification/order, and are free from damage – outline the installation process with the customer			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– undertake the installation to cause minimal disruption to the customer 1.3 install all of the following AC or DC powered stairlifts: – straight – curved – hinged 1.4 install all of the following stairlift components/sub-assemblies – rails (such as fixings for wood, metal or concrete staircase) – carriage assembly – chair assembly – rail furniture (such as charging ramps, stopping/slowing ramps) – stairlift controls (such as hard wired, radio controlled, infrared) – electrical wiring, cables and enclosures 1.5 follow all relevant drawings and specifications for the installation being carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's installation specification – customer requirements – company standards and procedures – BS, ISO and/or BSEN standards 1.7 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.8 use two of the following during the installation activities: – straight edges – mechanical measuring instruments/devices – electrical measuring devices – plumb lines and taut wires – levels – tapes/rules 1.9 install, position and secure the equipment and components in accordance with the specification.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Install stairlifts (continued)	1.10 carry out all of the following activities during the installation: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of services during installation (such as mechanical, electricity) – provide safe access and working arrangements for the installation area – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe condition and free from foreign object debris – prepare components and assemblies for installation 1.11 apply installation methods and techniques, to include five of the following: – marking out of locating and securing positions – positioning equipment – aligning equipment – levelling equipment – shimming and packing – fixing by using adhesives and sealants – securing by using mechanical fixings			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– securing by using masonry fixings – applying screw fastener locking devices 1.12 make both of the following connections to the installed equipment: – mechanical connections – electrical connections 1.13 ensure that all necessary connections to the equipment are complete 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved 1.15 deal with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.16 check that the installation is complete and that all components are free from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.17 carry out checks and adjustments, to include: – testing to ensure that the equipment operates to the installation specification Plus six more from the following: – checking level and alignment – electrical continuity – electrical insulation resistance – mains voltage and polarity – battery voltage and condition – continuity of protective conductors – stall current and running current overloads – making visual checks for completeness and freedom from damage – making sensory checks (sight, sound, smell, touch) – ensuring that moving parts are clear of obstruction, and are guarded – ensuring that locking devices are fitted to fasteners (as appropriate)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.18 complete two of the following installation records, and pass it to the appropriate person: – user guide – installation work sheet – company-specific documentation.			
2a Know how to install stairlifts	2.1 describe the specific safety practices and procedures that they need to observe when installing stairlifts (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the procedures to be carried out before starting work on the installation (such as complying with any risk assessments and other health and safety requirements) 2.3 describe the health and safety requirements of the work area where they are carrying out the installation activities, and the responsibility these requirements place on them 2.4 describe the hazards associated with installing stairlifts, and with the tools and equipment used, and how they can be minimised 2.5 describe the personal protective equipment that they need to use for the installation activities, and where it can be obtained			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions and other documentation used in the installation activities (such as installation drawings, standards, quality control procedures and specifications) 2.7 describe the stairlift equipment to be installed, its function and operating procedures 2.8 describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this 2.9 describe the various mechanical fasteners that will be used, and their method of installation (including, threaded fasteners, special securing devices, special fixing devices) 2.10 describe the different stairlift power supplies and associated control systems 2.11 describe the procedures for ensuring that they have the correct tools, equipment, and fasteners for the installation activities 2.12 describe the types of tools and instruments used to position, secure and align the equipment (such as spanners, wrenches, levelling and measuring devices).			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2b	Know how to install stairlifts (continued)	2.13	describe the techniques used to position, align, level, adjust and secure the stairlift equipment			
		2.14	describe the methods of lifting, handling and supporting the stairlift equipment during the installation activities			
		2.15	describe the methods of connecting mechanical devices (such as carriage, chair, rail and rail furniture)			
		2.16	describe the methods and techniques used to connect stairlift equipment to power supplies			
		2.17	explain why electrical bonding is critical, and why it must be both mechanically and electrically secure			
		2.18	describe the procedure for the safe disposal of waste materials			
		2.19	describe the measuring equipment used to check and adjust the installed equipment			
		2.20	explain how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy and quality of the installation (including the fitting of covers to all moving parts and electrical connections)			
		2.21	describe the tools and equipment used in the installation activities, and their calibration/care and control procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 describe the problems that can occur with the installation operations, and how these can be overcome 2.23 describe the documentation to be completed for the installation activities, and who to pass them to 2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 46: Installing service lifts

Unit reference number: M/600/5627

Level: 2

Credit value: 42

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to install service lifts, in accordance with approved procedures. This will require the learner to survey the site for the proposed installation, and to make any necessary arrangements to have the required installation tools, and any specified components and site services, available so that the installation can be carried out safely and efficiently. The learner will be required to install service lifts such as traction, hydraulic or direct drive.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Install service lifts	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following before installing service lift equipment: – check that the site is accessible and is free from obstructions or hazards – check that the installation documentation is complete and current (such as drawings, instructions, manufacturer's data, settings and other documentation) – confirm that the appropriate electrical supply is available – check that the required installation consumables are available – check that safety and environmental conditions have been met – confirm that the site has been suitably prepared for the installation to take place – check that consignment contents are correct to the customer specification/order, and are free from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– outline the installation process with the customer – undertake the installation to cause minimal disruption to the customer 1.3 install one of the following types of service lift: – hydraulic – direct drive – traction 1.4 install all of the following service lift components/subassemblies: – structures/guide brackets – machine support steelwork/bedplates – drive systems (such as traction, hydraulic or direct drive) – electrical wiring (cables, wiring, wiring enclosures) – landing and car entrances – lifting ropes and/or chains – guides and fixings – car assembly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– safety devices – lift controller – floor selection system – ancillary equipment (such as warning signs, company specific options) 1.5 follow all relevant drawings and specifications for the installation being carried out 1.6 produce installations which comply with all of the following standards, as appropriate to the equipment being installed: – equipment manufacturer's installation specification – BS, ISO and/or BSEN standards – customer requirements – company standards and procedures 1.7 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use three of the following tools during the installation activities: – straight edges – alignment devices (spirit level, laser equipment) – measuring instruments (electrical, mechanical) – plumb lines – tapes and measures – self-diagnostic equipment 1.9 install, position and secure the equipment and components in accordance with the specification.			
1b Install service lifts (continued)	1.10 carry out all of the following activities during the installation: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of services during installation (such as mechanical, electricity) – provide safe access and working arrangements for the installation area – dispose of waste items in a safe and environmentally acceptable manner			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– leave the work area in a safe condition and free from foreign object debris – prepare components and assemblies for installation 1.11 apply installation methods and techniques, to include five of the following: – marking out of locating and securing positions – positioning equipment – aligning equipment – levelling equipment – shimming and packing – securing by using mechanical fixings – fixing by using adhesives and sealants – securing by using masonry fixings – applying screw fastener locking devices – routeing and securing wires and cables 1.12 make two of the following connections to the installed equipment: – mechanical connections – electrical connections – fluid power connections			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 ensure that all necessary connections to the equipment are complete 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved 1.15 deal with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.16 check that the installation is complete and that all components are free from damage 1.17 carry out checks and adjustments, to include: – testing to ensure that the equipment operates to the installation specification Plus six more of the following: – checking level and alignment – electrical continuity – electrical insulation resistance – mains voltage and polarity – stall current and running current – overload			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– earth continuity – making visual checks for completeness and freedom from damage – making sensory checks (sight, sound, smell, touch) – ensuring that moving parts are clear of obstruction, and are guarded – ensuring that locking devices are fitted to fasteners (as appropriate) 1.18 complete the relevant paperwork, to include all of the following, and pass it to the appropriate person: – user guide – installation work sheet – company-specific documentation.			
2a Know how to install service lifts	2.1 describe the specific safety practices and procedures that they need to observe when installing service lifts (including any specific legislation, safe working practices for lifts (such as BS7255), regulations/codes of practice for the activities, equipment or materials)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 describe the procedures to be carried out before starting work on the installation (such as complying with any risk assessments and other health and safety requirements) 2.3 describe the health and safety requirements of the work area where they are carrying out the installation activities, and the responsibility these requirements place on them 2.4 describe the hazards associated with installing service lifts, and with the tools and equipment used, and how they can be minimised 2.5 describe the personal protective equipment that they need to use for the installation activities, and where replacements can be obtained if supplied personal protective equipment becomes worn or damaged 2.6 explain how to obtain and interpret information from job instructions and other relevant documentation used in the installation (such as installation drawings, standards, quality control procedures and specifications) 2.7 describe the equipment to be installed, its operating procedures and function			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this 2.9 describe the various mechanical fasteners that will be used, and their method of installation (including, threaded fasteners, special securing devices, masonry fixing devices) 2.10 describe the procedures for ensuring that they have the correct tools, equipment, and fasteners for the installation activities.			
2b Know how to install service lifts (continued)	2.11 describe the types of tools and instruments used to position, secure and align the equipment (such as spanners, wrenches, levelling and alignment devices, measuring devices) 2.12 describe the techniques used to position, align, level, connect, adjust and secure the equipment 2.13 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.14 describe the methods of connecting equipment to power supplies 2.15 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain how to dispose of waste items in an environmentally safe acceptable manner, and leave the work area in a safe condition 2.17 explain how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy and quality of the installation (including the fitting of covers to all moving parts and electrical connections) 2.18 describe the tools and equipment used in the installation activities, and their calibration/care and control procedures 2.19 describe the problems that can occur with the installation operations, and how these can be overcome 2.20 describe the documentation to be completed for the activities, and who to pass them to 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 47: Assisting in the installation of mechanical equipment

Unit reference number: M/600/5630

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of mechanical equipment, in accordance with approved procedures. The learner will be required to assist in the installation of a range of mechanical equipment such as machine tools, conveyors, elevators, processing plant, engines, lifting and handling equipment, and structures like hoppers and large storage vessels.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of mechanical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the mechanical equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris 1.3 assist in the installation of one of the following types of mechanical equipment: – machine tools – industrial compressors			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– conveyors – turbines – elevators – processing plant – hoppers or large storage vessels – lifting and handling equipment – engines – other equipment (specify) – process control equipment (such as large valves and actuating mechanisms, pumps) 1.4 follow all relevant instructions/documentation for the installation being carried out 1.5 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operating range – BS, ISO and/or BSEN standards – customer (contractual) standards and requirements – company standards and procedures 1.6 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 use two of the following during the installation activities: – straight edges and feeler gauges – tapes and rules – engineers' levels – measuring instruments (such as electrical, mechanical, fluid power) – plumb lines and taut wires – self-diagnostic equipment – dial test indicators – laser alignment equipment 1.8 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Assist in the installation of mechanical equipment (continued)	1.9 carry out the installation by applying five of the following methods and techniques: – marking out of locating and securing positions – drilling and hole preparation – fitting inserts (such as rag bolts or expanding bolts) – positioning equipment – aligning equipment – levelling equipment – shimming and packing – fitting anti-vibration mountings – securing by using mechanical fixings – applying screw fastener locking devices – make installation connections (such as mechanical, electrical, fluid power, utilities)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 assist in the movement and positioning of equipment, using two of the following: – slings – cranes – fork lift – portable lifting devices – block and tackle – rollers/skates – hoists – jacks – manual handling and moving loads 1.11 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 carry out five the following checks and adjustments on the installed equipment: – fill/replenish fluids, oil, or grease – check level and/or alignment – ensure that locking devices are fitted to fasteners (as appropriate) Plus assist in carrying out two of the following: – setting working clearance – tensioning – pressurising the system – testing that the equipment operates to the installation specification – checking torque settings of fasteners – making sensory checks (sight, sound, smell, touch) 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.15 assist in using fault location methods and techniques on installed equipment, to include using one of the following: – diagnostic aids (such as manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as six point, half-split, unit substitution) – functional testing the installation/running equipment self-diagnostics 1.16 dispose of waste items in a safe and environmentally acceptable manner 1.17 assist in the completion of installation documentation to include one of the following: – installation records – company-specific documentation – job card			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to assist in the installation of mechanical equipment	2.1	describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			
		2.4	describe the hazards associated with installing mechanical equipment, and with the tools and equipment used, and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			
		2.6	explain how to obtain and interpret information from job instructions and other documentation used in the installation activities (such as installation drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology)			
		2.7	describe the basic principle of operation of the equipment being installed			
		2.8	describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the various mechanical fasteners that will be used, and their method of installation (such as threaded fasteners, special securing devices, masonry fixing devices) 2.10 describe the procedures for ensuring that they have the correct tools, equipment, and fasteners for the installation activities 2.11 describe the types of tools and instruments used to position, secure and align the equipment (such as spanners, wrenches, crowbars, torque wrenches, engineers levels, alignment telescopes and laser devices) 2.12 describe the techniques used to position, align, level and adjust the equipment.			
2b Know how to assist in the installation of mechanical equipment (continued)	2.13 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.14 describe the methods of connecting to mechanical power transmission devices (such as belt and chain drives, couplings, clutches and brakes) 2.15 describe the methods of connecting equipment to service supplies (such as electrical, fluid power, compressed air oil and fuel supplies) 2.16 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.17 describe the procedure for the safe disposal of waste materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 explain how to identify installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage, or contamination) 2.19 describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected 2.20 describe the problems that can occur with the installation operations, and how these can be overcome 2.21 describe the fault-finding techniques to be used if the equipment fails to operate correctly 2.22 describe the recording documentation to be completed for the activities undertaken 2.23 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 48: Assisting in the installation of electrical/electronic equipment

Unit reference number: F/600/5633

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of electrical/electronic equipment, in accordance with approved procedures. The learner will be required to assist in the installation of various electrical power supplies, such as single phase, three-phase, direct current and low voltage. The installation will also include fitting and connecting a range of electrical components, such as switchgear and distribution panels, motors and starters, control systems, safety devices, luminaires, and wiring enclosures. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment, or the installation of simple, self-contained items of equipment requiring minimal installation.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of electrical/electronic equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the electrical/electronic equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of six of the following electrical modules/components: – switchgear – alarm devices – programmable controllers – power factor correction devices – motors and starters – luminaries – panels or sub-assemblies – control devices – communication equipment – cable connectors – encoders or resolvers – conduit – bus bars – safety devices – emergency/standby batteries – overload protection devices – sensors and actuators – electronic modules/units – trunking			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– traywork – other electrical equipment (specify) 1.4 assist in the connection of equipment to two of the following types of electrical supply: – single phase – direct current – three phase – low voltage (up to 115V) 1.5 follow all relevant instructions/documentation for the installation being carried out 1.6 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards – customer (contractual) standards and requirements – company standards and procedures 1.7 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use two of the following instruments during the installation activities: – multimeter – insulation resistance tester – earth-loop impedance tester – other specific test equipment 1.9 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques.			
1b Assist in the installation of electrical/electronic equipment (continued)	1.10 carry out four of the following installation methods and techniques: – marking out the location of components/modules – positioning and securing equipment and components – securing by using mechanical fixings – drilling and hole preparation – levelling and/or alignment – securing by using masonry fixings – making installation connections (such as mechanical, electrical, fluid power, utilities)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 carry out four of the following cable termination activities: – stripping cable insulation/protection – routeing and securing wires and cables – terminating cables and wires – making mechanical/screwed/clamped connections – soldering and de-soldering – attaching suitable cable identification – heat shrinking (devices and boots) – crimping (such as tags and pins) – sealing and protecting cable connections – adding cable end fittings 1.12 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.13 carry out three the following checks on the installed equipment: – making visual checks for completeness and freedom from damage – polarity – insulation resistance values – earth-loop impedance			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– continuity 1.14 deal promptly and effectively with problems within their control and report any that cannot be solved 1.15 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.16 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as six point, half-split, unit substitution) – functional testing the installation/running equipment self-diagnostics			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.17 dispose of waste items in a safe and environmentally acceptable manner 1.18 assist in the completion of installation documentation to include one of the following: – installation records – company-specific documentation – job card.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to assist in the installation of electrical/electronic equipment	2.1	describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			
		2.4	describe the hazards associated with installing electrical/electronic equipment, and with the tools and equipment used, and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			
		2.6	explain how to obtain and interpret information from job instructions and other documentation used in the installation activities (such as installation drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology)			
		2.7	describe the basic principle of operation of the equipment/circuits being installed			
		2.8	describe the different types of cabling used in the maintenance activities, and their methods of termination			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the care, handling and application of electrical measuring instruments (such as multimeter, resistance tester, earth-loop impedance tester) 2.10 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.11 explain how to check that components meet the required specification/operating conditions (such as values, tolerance, current carrying capacity, voltage rating, power rating, working temperature range) 2.12 describe the techniques used to terminate electrical equipment (such as plugs, soldering, screwed, clamped and crimped connections) 2.13 describe the methods of attaching markers/labels to components or cables, to assist with identification 2.14 describe the tools and equipment used in the installation activities (such as cable stripping tools, crimping tools, soldering irons and torches, gland connecting tools) 2.15 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.16 explain how to check tools and equipment are free from damage or defects, are in a safe and usable condition.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2b Know how to assist in the installation of electrical/electronic equipment (continued)	2.17 describe the importance of making 'off-load' checks before proving the equipment with the electrical supply on 2.18 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.19 describe the calibration/care and control procedures for tools and equipment 2.20 describe the problems that can occur with the installation operations, and how these can be overcome 2.21 describe the fault-finding techniques to be used if the equipment fails to operate correctly 2.22 describe the recording documentation to be completed for the activities undertaken 2.23 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 49: Assisting in the installation of equipment to produce an engineered system

Unit reference number: T/600/5399

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of equipment to produce an engineered system, in accordance with approved procedures. The learner will be required to assist in the installation of a range of equipment, all of which encompass an integrated system involving two or more of the following interactive technologies: mechanical, electrical, fluid power or process controller. Typical systems will include automated equipment such as robots, pick-and-place devices, stacking devices, automated systems, transfer equipment, processing plant, and material handling devices such as jigs and fixtures with fluid power and electrical mechanisms attached. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment, or the installation of items of equipment that are simple, self-contained items requiring minimal installation. It does, however, include the connection of sub-assemblies where these have been broken down for transportation purposes.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of equipment to produce an engineered system	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the engineered system: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of an engineered system, which includes installing equipment for two of the following interactive technologies: (a) installing mechanical equipment/components: assist in carrying out all of the following: – installing mechanical equipment (such as machine tools, processing plant, turbines engines transfer equipment) – levelling equipment – aligning and securing sub-assemblies and units – connecting units (such as shafts, couplings, belt and chain drives) Plus one of the following: – setting and adjusting drive mechanisms (such as shafts and couplings, belt and chain drives) – setting and adjusting operating mechanisms (such as levers, linkages, cams and followers) – setting and adjusting control mechanisms (such as clutches and brakes)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	(b) installing electrical and electronic equipment/ components: assist in carrying out all of the following: – installing electrical equipment (such as switch gear and distribution panels, motors and starters, luminaires) – attaching suitable cable identification (such as colour coding or numbering systems) – installing wiring enclosures/cable protection systems (such as conduit, trunking and tray work) – installing, routeing and securing wires and cables (such as PVC, mineral and armoured cables) Plus one of the following: – terminating cables to electrical components – terminating cables to main distribution centre (c) installing fluid power components: assist in carrying out all of the following: – installing fluid power equipment (such as compressors, pumps, accumulators, storage reservoirs and receivers) – installing fluid power components (such as cylinders, valves, sensors, actuators, filters and regulators)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– installing rigid and flexible pipework and hoses – connecting components to pipework, using appropriate fittings – dressing and securing piping and hoses (d) installing process controller components: assist in carrying out all of the following: – installing process controllers or sequential controllers (such as PLCs, data communication links) – installing and connecting wires and cables to components – installing input/output interfacing – installing program logic peripherals (such as modems, PC peripheral devices) – checking and confirming that signal measurement and transmission are satisfactory (e) installing instrumentation and control components: assist in carrying out all of the following: – installing instrumentation and control equipment (such as pressure, flow, level, temperature, speed, weight, vibration) – installing and connecting peripherals (such as sensors, actuators, relays, switches)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– installing and connecting process pipework Plus one of the following: – connecting electrical/pneumatic supply to instruments/sensors – connecting signal transmission supply to instruments/sensors – checking and confirming that signal measurement and transmission are satisfactory 1.4 follow all relevant instructions/documentation for the installation being carried out.			
1b Assist in the installation of equipment to produce an engineered system (continued)	1.5 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – BS7671/IEE wiring regulations – customer (contractual) standards and requirements – company standards and procedures 1.6 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 use two of the following groups of instruments during the installation activities: – alignment devices (such as plumb lines, spirit levels, inclinometers, laser equipment) – linear measuring devices (such as tapes, dial test indicators, micrometers, verniers, feeler gauges) – electrical measuring equipment (such as multimeter, continuity tester, insulation resistance, earth loop impedance tester) – fluid/power testing equipment (such as pressure or flow testing devices, speed or temperature measurement) 1.8 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques 1.9 apply installation methods and techniques, to include four of the following: – marking out positions of all equipment – drilling and preparing holes – aligning and levelling equipment – shimming and packing – securing by using mechanical fixings (nuts and bolts) – securing by using adhesives			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– applying screw fastener locking devices – fitting anti-vibration mountings – moving and positioning equipment, using appropriate lifting and handling equipment – securing by using masonry fixings (such as rag bolts or expanding bolts) 1.10 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.11 carry out all of the following checks and adjustments as appropriate to the equipment being installed: – making visual checks of the installation, for completeness and freedom from damage – topping up fluid/oil reservoirs – ensuring that all bolts are correctly torqued, and that locking devices are fitted to fasteners – ensuring that all pipe connections are correctly made, secure and leak free – ensuring that all moving parts are clear of obstructions and are guarded – making sensory checks of the system (sight, sound, smell, touch)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	Plus assist in carrying out two of the following: – testing that the system operates to the installation specification – confirm that the correct software has been installed – ensuring that all electrical connections are correctly made, earth bonding is secure and connections covered 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.14 assist in using fault location methods and techniques on the installation, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as six point, half-split, unit substitution) – functional testing the installation/running equipment self-diagnostics			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.15 dispose of waste items in a safe and environmentally acceptable manner 1.16 assist in the completion of installation documentation 1.17 complete the relevant paperwork, to include one of the following, and pass it to the appropriate people: – installation records – company-specific documentation – job card.			
2a Know how to assist in the installation of equipment to produce an engineered system	2.1 describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others 2.4 describe the hazards associated with installing equipment to form an engineered system, and with the tools and equipment used, and how they can be minimised 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions and other documentation used in the installation activities (such as installation drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology) 2.7 describe the basic principles of how the system functions, and its operating sequence 2.8 describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this 2.9 describe the methods of drilling holes in masonry for rag bolts and expanding bolts (including use of grouting and adhesives) 2.10 describe the various mechanical fasteners that will be used, and their method of installation 2.11 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.12 describe the methods of levelling and aligning the equipment, and the types of tools, instruments and techniques used 2.13 describe the methods of connecting to mechanical power transmission devices (such as shafts, couplings belt and chain drives)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the different types of cabling used in the installation activities, and their methods of termination 2.15 describe the different types of wiring enclosures that are used (to include conduit, trunking and traywork systems).			
2b Know how to assist in the installation of equipment to produce an engineered system (continued)	2.16 describe the installation and termination of a range of electrical components (such as plugs, switches, sockets, lighting and fittings) 2.17 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.18 describe the care, handling and application of ohmmeters, multimeters and other electrical measuring instruments 2.19 describe the methods of assembling and installing pipework, hoses and fittings 2.20 explain how to recognise a range of fluid power components 2.21 explain how to identify the contaminants and the problems they can create, and the effects and likely symptoms of contamination in the system 2.22 explain how to identify the process instrumentation and associated peripherals (such as pressure, flow, temperature)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.23 explain how to identify the PLC systems and associated peripheral devices (such as input/output (I/O) devices) 2.24 explain how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy and quality of the installation (including the fitting of guards to all moving parts, and covers on electrical connections) 2.25 explain how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage) 2.26 describe the problems that can occur with the installation operations, and how these can be overcome 2.27 describe the fault-finding techniques to be used if the equipment fails to operate correctly 2.28 describe the recording documentation to be completed for the activities undertaken 2.29 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 50: Assisting in the installation of instrumentation and control equipment

Unit reference number: M/600/5403

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of instrumentation and control equipment, in accordance with approved procedures. The learner will be required to assist in the installation of a range of instrumentation and control equipment such as pressure, flow, level, and temperature monitoring and control equipment, fiscal monitoring equipment, fire and gas detection and alarm equipment, industrial weighing equipment, speed measurement and control equipment, vibration monitoring equipment, nucleonics and radiation measurement, analysers, recorders and indicators, telemetry equipment and emergency shutdown equipment. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of instrumentation and control equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the instrumentation and control equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of one of the following types of instrumentation and control equipment: – pressure monitoring/control – flow monitoring/control – level monitoring/control – temperature monitoring/control – weight monitoring/control – fiscal metering – fire detection and alarm – gas detection and alarm – emergency shutdown – speed measurement – speed control – vibration monitoring/control – nucleonic and radiation – analysers – recorders and indicators – telemetry equipment – control equipment (such as indexing, positioning, sequencing)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 follow all relevant instructions/documentation for the installation being carried out 1.5 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards – customer (contractual) standards and requirements – company standards and procedures 1.6 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition 1.7 assist in using two of the following types of instrumentation test and calibration equipment: – signal sources – standard test gauges – analogue and digital meters – digital pressure indicators – calibrated flow meters – special purpose test equipment – pressure sources			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– comparators – manometers – current injection devices – calibrated weights – logic probes – temperature baths – workshop potentiometers – dead weight testers – insulation testers 1.8 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques 1.9 carry out all of the following installation methods and techniques: – positioning and securing equipment/components – making mechanical connections – proof marking/labelling of wires or components – installing and connecting process pipework – tightening fastenings to the required torque – making installation connections (such as mechanical, electrical, fluid power, utilities)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– taking electrostatic discharge (ESD) precautions when handling components/circuit boards (as appropriate) Plus assist in carrying out two of the following: – installing electrical/electronic components – setting, calibrating and adjusting instruments – installing and connecting peripherals (such as sensors, actuators, relays, switches, back-up batteries) – connecting the electrical/pneumatic supply to instruments/sensors – connecting the signal transmission supply to instruments/sensors.			
1b Assist in the installation of instrumentation and control equipment (continued)	1.10 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.11 carry out all of the following checks and adjustments, as appropriate to the equipment being installed: – making visual checks for completeness and freedom from damage – making sensory checks (sight, sound, smell, touch) – checking the system for leaks			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– checking security of connections/terminations Plus assist in carrying out two more from the following: – checking signal transmission (electrical, electronic, pneumatic, mechanical) – confirming that signal measurement and transmission are satisfactory – final start-up of the system and removal of any trip defeats – testing that the equipment operates to the installation specification 1.12 deal promptly and effectively with problems within your control and report those that cannot be solved 1.13 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.14 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– fault finding techniques (such as six point, half-split, unit substitution) – function testing the installation/running equipment self-diagnostics 1.15 dispose of waste items in a safe and environmentally acceptable manner 1.16 assist in the completion of installation documentation 1.17 complete the relevant paperwork, to include one of the following, and pass it to the appropriate people: – installation records – company-specific documentation – job card.			
2a Know how to assist in the installation of instrumentation and control equipment	2.1 describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with installing equipment, and with the tools and equipment used, and how they can be minimised 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during installation process 2.6 explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology) 2.7 describe the basic principles of how the equipment functions, and its operating sequence 2.8 describe the reasons for making sure that control systems are isolated or put into manual control, and that appropriate trip locks or keys are inserted, before removing any sensors or instruments from the system 2.9 describe the identification of instrument sensors (including how to identify their markings, calibration information, component values, operating parameters and working range) 2.10 describe the correct way of fitting instruments to avoid faulty readings (caused by head correction, poor flow past the sensor, blockages, incorrect wiring, poor insulation, or incorrect materials).			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2b	Know how to assist in the installation of instrumentation and control equipment (continued)	2.11	explain how to carry out visual checks of the instruments (checking for leaks, security of joints and physical damage)			
		2.12	describe the methods of attaching identification marks/labels to components or cables			
		2.13	describe the methods of connecting equipment to service supplies (such as electrical, fluid power, compressed air oil and fuel supplies)			
		2.14	explain why electrical bonding is critical, and why it must be both mechanically and electrically secure			
		2.15	describe the procedure for the safe disposal of waste materials			
		2.16	explain how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage, or contamination)			
		2.17	describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected			
		2.18	describe the problems that can occur with the installation operations, and how these can be overcome			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the fault finding techniques to be used if the equipment fails to operate correctly 2.20 describe the recording documentation to be completed for the activities undertaken 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 51: Assisting in the installation of fluid power equipment

Unit reference number: T/600/5404

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of fluid power equipment, on mobile or static plant, in accordance with approved procedures. The learner will be required to assist in the installation of a range of fluid power equipment, such as hydraulic, pneumatic or vacuum. This will involve the installation of components and units such as pumps, valves, actuators, sensors, intensifiers, regulators, compressors, pipes and hoses, and other specific fluid power equipment. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of fluid power equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the fluid power equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of one of the following types of fluid power systems: – pneumatic – hydraulic – vacuum 1.4 follow all relevant instructions/documentation for the installation being carried out 1.5 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – customer (contractual) standards and requirements – company standards and procedures 1.6 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 use three of the following types of equipment during the installation activities: – pressure testing devices – flow testing devices – mechanical measuring devices – bleeding devices – alignment devices – electrical measuring devices – timing devices – fluid sampling device – flushing blocks/rigs 1.8 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques 1.9 assist in the installation of six of the following fluid power components: – rigid pipework – filters – reservoirs/storage receivers – compressors – accumulators			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– lubricators – gaskets and seals – regulators – pumps – receivers – switches – hoses/tubing – cylinders – valves – actuators – sensors – pressure intensifiers – other (specify).			
1b Assist in the installation of fluid power equipment (continued)	1.10 carry out the installation by applying five of the following methods and techniques: – marking out of locating and securing positions – drilling and hole preparation – positioning equipment/components – aligning pipework and connections – dressing and securing piping and hoses			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– connect wires and cables – securing by using mechanical fixings – securing by using masonry fixings – applying screw fastener locking devices – applying hose/cable clips and fasteners – making installation connections (such as mechanical, electrical, fluid power, utilities) 1.11 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.12 carry out all of the following checks and adjustments, as appropriate to the equipment being installed: – leak checks – making 'off-load' checks – checking level and alignment – making visual checks for completeness and freedom from damage – making sensory checks (sight, sound, smell, touch) – ensuring any moving parts are clear of obstruction and/or are guarded			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	Plus assist in carrying out two of the following: – filling the system using the correct cleanliness control procedures – setting system pressure/flow – pressurising the system – line pressure checks – flow checks – check the sequencing of the system – ensuring that locking devices are fitted to fasteners (where appropriate) – testing to ensure that the equipment operates to the installation specifications 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved 1.14 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial system malfunction – complete malfunction of the system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.15 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides, circuit diagrams, function diagrams) – fault finding technique (such as six point, half-split, unit substitution, fault cause remedy, sequence chart) – function testing the installation/running equipment self-diagnostics 1.16 dispose of waste items in a safe and environmentally acceptable manner 1.17 assist in the completion of installation documentation to include one of the following: – installation records (such as test and system performance data) – company-specific documentation – job card.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to assist in the installation of fluid power equipment	2.1	describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			
		2.4	describe the hazards associated with installing fluid power equipment, and with the tools and equipment used, and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, symbols and terminology)			
		2.7	describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this			
		2.8	describe the methods of drilling holes for rag bolts and expanding bolts (including the use of grouting and adhesives)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the various mechanical fasteners that will be used, and their method of installation (including threaded fasteners, dowels, special securing devices, masonry fixing devices) 2.10 describe the basic principles of how the equipment functions, and its operating sequence 2.11 explain how to identify the various components that are to be installed (such as valves, cylinders, actuators, sensors, pumps) 2.12 explain how to determine the direction of flow through components, and their position within the system 2.13 describe the application and fitting of seals 2.14 explain how to identify the contaminants and the problems they can create, and the effects and likely symptoms of contamination in the system.			
2b Know how to assist in the installation of fluid power equipment (continued)	2.15 describe the techniques used to ensure the safe and correct start-up of the system 2.16 describe the techniques used to ensure that correct checks are made on the system 2.17 describe the techniques used to fault-find the system 2.18 describe the procedures to follow to fill the hydraulic reservoirs correctly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the need to establish the cleanliness level of oil in the hydraulic reservoirs 2.20 describe the techniques used during the setting and testing of the fluid power equipment (such as controlled release of pressures/force, checking for correct actuator and valve movement, checking the correct sequencing) 2.21 describe the procedures for ensuring that they have the correct tools, equipment and consumables for the installation activities 2.22 describe the types of tools and instruments used to position, secure and connect the equipment (such as spanners, pipe benders, torque wrenches, alignment devices, pressure testing devices) 2.23 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.24 describe the methods of connecting equipment to service supplies (such as electrical, fluid power, compressed air, oil and any fuel supplies) 2.25 describe the procedure for the safe disposal of waste materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.26 describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected 2.27 describe the completion of documentation for the activities undertaken 2.28 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 52: Assisting in the installation of process control equipment

Unit reference number: J/600/5407

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of process control equipment, in accordance with approved procedures. The learner will be required to assist in the installation of a range of process control equipment, which typically includes process controllers or sequential controllers (such as programmable logic controllers (PLCs), or equipment controlled by personal computers (PCs)), and which are working in an integrated system involving two or more of the following interactive technologies: mechanical, electrical or fluid power. The learner will also install peripheral components and communication links, and assist with the loading/downloading of process controller programs, check them for errors, and create back-up copies of completed programs. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of process control equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the process controller equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of one of the following types of process control systems: – monitoring system – safety system – diagnostic system – combination system – process/product control system – business management system 1.4 assist in the installation of one of the following process controllers: – fixed I/O units – rack mount controller units – modular controller units 1.5 follow all relevant instructions/documentation for the installation being carried out 1.6 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS7671/IEE wiring regulations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– BS, ISO and/or BSEN standards – company standards and procedures – customer (contractual) standards and requirements 1.7 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition 1.8 use three of the following instruments during the installation activities: – multimeter – watt meter – voltmeter – ammeter – insulation resistance tester – earth-loop impedance tester – other specific test equipment 1.9 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Assist in the installation of process control equipment (continued)	1.10 assist in the installation of one of the following: – electrical wires and cables – trunking and traywork – conduit Plus assist in the installation/connection of three of the following: – sensors – actuators – switches – motor starters – modems – printers – PC peripheral devices – panels and sub-assemblies – signal transmission components/cables – overload protection devices 1.11 apply installation methods and techniques, to include five of the following: – marking out of locating and securing positions – drilling and hole preparation – fitting inserts (such as rag bolts or expanding bolts)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– positioning equipment – connecting wires and cables – securing by using mechanical fixings – securing by using masonry fixings – levelling and alignment equipment – making installation connections (such as mechanical, electrical, fluid power, utilities) 1.12 carry out four of the following cable termination activities: – terminating armoured cables – terminating mineral cables – sealing and protecting cable connections – making mechanical/screwed/clamped connections – soldering and de-soldering – attaching suitable cable identification – routeing and securing wires and cables – heat shrinking (devices and boots) – crimping (tags and pins) – stripping cable insulation/protection – adding cable end fittings			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.14 carry out all of the following checks and adjustments, as appropriate to the equipment being installed: – making sensory checks (sight, sound, smell) – making 'off-load' checks – making visual checks for completeness and freedom from damage – ensuring that moving parts are clear of obstruction and/or are guarded Plus assist in carrying out two of the following: – checking signal transmission – checking the security of connections/terminations – confirming that the correct software has been installed – testing to ensure that the equipment operates to the installation specification – final start-up of the system and removal of any trip defeats 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.16 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.17 assist in using fault location methods and techniques on the installed equipment to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as six point, half-split, unit substitution) – function testing the installation/running equipment self-diagnostics 1.18 dispose of waste items in a safe and environmentally acceptable manner 1.19 assist in the completion of installation documentation to include one of the following: – installation records – company-specific documentation – job card.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to assist in the installation of process control equipment	2.1	describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			
		2.4	describe the hazards associated with installing process control equipment, and with the tools and equipment used, and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology)			
		2.7	describe the methods of drilling holes for rag bolts and expanding bolts (including the use of grouting and adhesives)			
		2.8	describe the various mechanical fasteners that will be used, and their method of installation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the procedures for ensuring that they have the correct tools, equipment, and fasteners for the installation activities 2.10 describe the types of tools, instruments and techniques used to position align, level, secure and adjust the equipment 2.11 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.12 describe the basic principles of how the system functions, and its operating sequence 2.13 describe the techniques used to connect PLC equipment (plugs, soldering, screwed, clamped and crimped connections) 2.14 describe the use of BS7671/IEE wiring, and other, regulations when selecting wires and cables, and when carrying out tests on systems 2.15 describe the devices and systems for storing programs.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2b	Know how to assist in the installation of process control equipment (continued)	2.16	describe the different types of interface cards			
		2.17	describe the numbering system and codes used for identification of inputs and outputs			
		2.18	explain how to interpret a program within the process controller for specific elements			
		2.19	explain how to make adjustments to components to ensure that they function correctly			
		2.20	explain why electrical bonding is critical, and why it must be both mechanically and electrically secure			
		2.21	explain how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy and quality of the installation (including the fitting of guards to all moving parts and covers on electrical connections)			
		2.22	explain how to recognise installation defects (such as dry connections, communication difficulties, ineffective fasteners, foreign object damage or contamination)			
		2.23	describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components are correctly covered/protected			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.24 describe the problems that can occur with the installation operations, and how these can be overcome 2.25 describe the fault-finding techniques to be used if the equipment fails to operate correctly 2.26 describe the recording documentation to be completed for the activities undertaken 2.27 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

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(*if sampled*)

Unit 53: Assisting in the installation of emergency electrical power generation equipment

Unit reference number: J/600/5410

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of emergency electrical power generation equipment, in accordance with approved procedures. The learner will be required to assist in the installation of a range of emergency electrical power generation equipment, such as turbine alternator sets, piston engine sets, and generators. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of emergency electrical power generation equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the emergency electrical power generation equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of one of the following types of emergency power generation equipment: – turbine alternator sets – piston engine alternator sets – generators 1.4 follow all relevant instructions/documentation for the installation being carried out 1.5 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – customer (contractual) standards and requirements – company standards and procedures 1.6 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition 1.7 use two of the following instruments during the installation activities: – straight edges and feeler gauges – engineers' levels – dial test indicators			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– electrical meters – plumb lines and taut wires – alignment telescopes – laser equipment – mechanical measuring devices 1.8 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques 1.9 apply five of the following installation methods and techniques: – marking out of locating and securing positions – drilling and hole preparation – fitting inserts (such as rag or expanding bolts) – positioning equipment – making installation connections (such as mechanical, electrical, fluid power, utilities) – aligning equipment – levelling equipment – shimming and packing – fitting anti-vibration mountings – securing by using mechanical fixings – applying screw fastener locking devices.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Assist in the installation of emergency electrical power generation equipment (continued)	1.10 assist in the movement and positioning of equipment, using two of the following: – slings – cranes – fork lift – portable lifting devices – block and tackle – rollers/skates – hoists – jacks – manual handling and moving loads 1.11 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.12 carry out all of the following checks and adjustments, as appropriate to the equipment being installed: – checking level and alignment – making 'off-load' checks – checking consumables (oil, water, fuel) – making visual checks for completeness and freedom from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– checking the security of connections (mechanical, electrical, service supplies) – making sensory checks (sight, sound, smell, touch) – ensuring that moving parts are clear of obstruction, and are guarded – ensuring that locking devices are fitted to fasteners (where appropriate) Plus assist in carrying out three more from the following: – testing to ensure that the equipment operates to the installation specification – checking for the correct operation of all safety devices – adjusting settings and working clearances – testing the system for leaks – checking electrical integrity – checking torque settings of fasteners – checking automatic/power failure switching system 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.15 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as six point, half-split, unit substitution) – function testing the installation/running equipment self-diagnostics 1.16 dispose of waste items in a safe and environmentally acceptable manner 1.17 assist in the completion of installation documentation to include one of the following: – installation records – company-specific documentation – job card.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to assist in the installation of emergency electrical power generation equipment	2.1	describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			
		2.4	describe the hazards associated with installing emergency electrical power generation equipment, and with the tools and equipment used, and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology)			
		2.7	describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the methods of drilling holes for rag bolts and expanding bolts (including the use of grouting and adhesives) 2.9 describe the various mechanical fasteners that will be used, and their method of installation (including, threaded fasteners, dowels, special securing devices, masonry fixing devices) 2.10 describe the torque loading requirements on the fasteners, and what to do if these loadings are exceeded or not achieved 2.11 describe the procedures for ensuring that they have the correct tools, equipment, and fasteners for the installation activities 2.12 describe the techniques and types of tools and instruments used to position, align, level, adjust and secure the equipment (such as spanners, wrenches, crowbars, torque wrenches, engineers' levels, alignment telescopes and laser devices).			
2b Know how to assist in the installation of emergency electrical power generation equipment (continued)	2.13 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.14 describe the methods of connecting to mechanical power transmission devices 2.15 describe the methods of connecting equipment to service supplies (such as electrical, fluid power, compressed air, oil and fuel supplies)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 describe the basic principles of how the equipment functions, and its operating sequence 2.17 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.18 describe the procedure for the safe disposal of waste materials 2.19 explain how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage or contamination) 2.20 describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected 2.21 describe the problems that can occur with the installation operations, and how these can be overcome 2.22 describe the fault finding techniques to be used if the equipment fails to operate correctly 2.23 describe the recording documentation to be completed for the activities undertaken 2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 54: Assisting in the installation of environmental pollution control equipment

Unit reference number: D/600/5414

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of environmental pollution control equipment, in accordance with approved procedures. The learner will be required to assist in the installation of equipment for an environmental pollution control system, which could be air pollution control equipment (such as decarbonisation (CO2 reduction), denitrification, deodorising, desulphurisation, dust collectors, smoke filters, scrubbers, and removal of refrigerant gases); effluent treatment equipment (such as aerobic and anaerobic biochemical treatment, filter screens and presses, liquid separators, waste oil treatment, sewage treatment, industrial waste water treatment); noise and vibration equipment (such as vibration prevention and isolation, noise attenuation and acoustic enclosures); waste and used product handling, storing and recycling equipment (such as appliance recycling, battery recycling, incinerators, ash handling, heat recovery, shredders and crushers, conveyors and sorters, compaction). This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of environmental pollution control equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the environmental pollution control equipment: – adhere to risk assessment, COSHH and other relevant safety standards – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of one of the following types of environmental pollution control equipment: – air pollution control equipment (such as decarbonisation (CO2 reduction), denitrification, deodorising desulphurisation, dust collectors, smoke filters, scrubbers, and removal of refrigerant gases) – effluent treatment equipment (such as aerobic and anaerobic biochemical treatment, filter screens and presses, liquid separators, waste oil treatment, sewage treatment, industrial waste water treatment) – noise and vibration equipment (such as vibration prevention and isolation, noise attenuation and acoustic enclosures) – waste and used product handling, storing and recycling equipment (such as appliance recycling, battery recycling, incinerators, ash handling, heat recovery, shredders and crushers, conveyors and sorters, compaction) 1.4 assist in the installation of eight of the following components: – annunciator – distribution board			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– switch gear – instrumentation – pipework and hoses – safety device – monitoring device – couplings or linkages – relays or solenoids – actuators – mechanical drives – burners – containment booms – floor baseplates – gear boxes – motors – sensors – cables and wires – wiring enclosures – switches			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– ducting – pumps – safety devices – motor and starter – control panel – building management device 1.5 follow all relevant instructions/documentation for the installation being carried out 1.6 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS and/or ISO standards – customer standards and requirements – company standards and procedures – IEE wiring regulations 1.7 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use three of the following instruments during the installation activities: – straight edges and feeler gauges – engineers' levels – dial test indicators – mechanical measuring instruments (such as rule, tape) – electrical measuring instruments (such as multimeter) – fluid power measuring equipment (such as pressure, flow) – plumb lines/taut wires – alignment telescopes – laser equipment – self-diagnostic equipment – theodolite – vibration transducer 1.9 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Assist in the installation of environmental pollution control equipment (continued)	1.10 apply installation methods and techniques to include five of the following: – marking out of locating and securing positions – drilling and hole preparation – fitting inserts (such as rag or expanding bolts) – positioning the equipment – making installation connections (such as mechanical, electrical, fluid power, utilities) – aligning equipment – levelling equipment – shimming and packing – fitting anti-vibration mountings – securing by using mechanical fixings – applying screw fastener locking devices 1.11 assist in the movement and positioning of equipment, using two of the following: – slings – cranes – fork lift – portable lifting devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– block and tackle – rollers/skates – hoists – jacks – manual handling 1.12 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.13 carry out all of the following checks, and make corrections/adjustments as appropriate: – making 'on-load' checks – checking level and alignment – lubrication effects – checking for leaks – making sensory checks (sight, sound, smell, touch) – ensuring that dangerous areas are properly guarded – checking torque settings of fasteners			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	Plus assist in carrying out two of the following checks: – assembly fits – mechanical integrity – electrical integrity – temperature levels – system pressures and flows – speeds and feeds – vibration levels – testing to ensure that the equipment meets the requirements of the installation 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved 1.15 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.16 assist in using fault location methods and techniques on the installed equipment, to include one of the following:			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as six point, half-split, unit substitution) – function testing the installation/running equipment self-diagnostics 1.17 dispose of waste items in a safe and environmentally acceptable manner 1.18 assist in the completion of installation documentation to include one of the following: – installation records – company-specific documentation – job card			
2a Know how to assist in the installation of environmental pollution control equipment	2.1 describe the specific safety practices and procedures that are to be observed when installing environmental pollution control equipment (including the related legislation, regulations and recommendations such as the Water Regulations Advisory Scheme (WRAS), The Prevention and Control of Legionellosis, and Safe Working in Confined Spaces, CE supply of machinery regulations)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the installation procedure, and to the particular plant and site installation details 2.4 describe the hazards associated with installing environmental pollution control equipment, and with the tools and equipment used, and how they can be minimised 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the installation 2.6 explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology) 2.7 describe the basic principles of how the equipment functions, and its operating sequence 2.8 describe the methods and techniques used to position, assemble, align and secure the plant and equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the methods of making holes for floor fixing bolts (including the use of various fittings, grouting and adhesives) 2.10 describe the various mechanical fasteners that will be used, and their method of installation (including, threaded fasteners, special securing devices, masonry fixing devices) 2.11 describe the procedures for ensuring that they have the correct tools, equipment, and fasteners for the installation activities 2.12 describe the methods of lifting, handling and supporting the equipment			
2b Know how to assist in the installation of environmental pollution control equipment (continued)	2.13 describe the checks, tests, corrections and adjustments to ensure proper equipment safety, integrity, operation and accuracy 2.14 describe the connecting of equipment to external supplies (such as electric, air, water and gas) 2.15 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.16 describe the procedure for the safe disposal of waste materials 2.17 identify defects (such as leaks, misalignment, component looseness, damage, or contamination)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the importance of ensuring that the completed installation is left in a safe, clean and damage-free state 2.19 describe the dangers of leaving any exposed potential energy sources (these must be made safe) 2.20 describe the typical problems that can occur during the installation, and how these can be overcome 2.21 describe the fault finding techniques to be used if the equipment fails to operate correctly 2.22 describe the recording documentation to be completed for the activities undertaken 2.23 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve			

Learner name: _____ Date: _____

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(*if sampled*)

Unit 55: Assisting in the installation of workplace environmental control equipment

Unit reference number: K/600/5416

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of workplace environmental control equipment, in accordance with approved procedures. The learner will be required to assist in the installation of equipment that will control or monitor a number of different systems, including heating and ventilation, air conditioning and ventilation units, chillers, boilers, lighting, lifts, building/room access, fire systems and CCTV systems. The installation will also include sensors, actuators, switches, motor starters, electrical and network cables, thermostats, electronic meters, safety systems/devices, monitoring equipment, inverters, uninterruptible power supplies, control panels, printed circuit boards, controller units, computer systems, peripheral devices and environmental monitoring and targeting software.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of workplace environmental control equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the workplace environmental control equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris 1.3 assist in the installation of equipment for workplace environmental control systems that control/monitor two of the following: – heating and ventilation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– air conditioning and ventilation – boilers – lighting – CCTV – chillers – lift control – fire systems – intruder/alarm systems – building/room access – other specific system 1.4 assist in the installation of one of the following: – trunking and traywork – electrical cables – network cables Plus assist with the installation of five of the following: – motor starters – vents/diffusers – switches – sensors – thermostats			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– electronic meters – heating elements – actuators – electronic control panels – circuit protection devices – safety systems – overload protection devices – annunciation panel – printed circuit boards – monitoring equipment – modems – building management system (BMS) remote PC – BMS controller units – BMS terminal (PC, server) – PC peripheral devices – monitoring/targeting software – inverters – uninterruptible power supplies 1.5 follow all relevant instructions/documentation for the installation being carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 produce installations which comply with all of the following, as applicable to the equipment being installed: – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – company standards and procedures – customer standards and requirements 1.7 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition 1.8 use three of the following instruments during the installation activities: – multimeter – watt meter – voltmeter – ammeter – insulation resistance tester – light meter – earth-loop impedance tester – continuity tester – phase orientation tester – self-diagnostic software – other specific test equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques.			
1b Assist in the installation of workplace environmental control equipment (continued)	1.10 apply installation methods and techniques, to include five of the following: – marking out of locating and securing positions – drilling and hole preparation – fitting inserts (such as rag bolts or expanding bolts) – positioning the equipment – levelling the equipment – connecting wires and cables – securing by using mechanical fixings – securing by using masonry fixings – applying cable clips and ties – making installation connections (such as mechanical, electrical, fluid power, utilities) 1.11 carry out five of the following installation activities: – terminating mineral and armoured cables – bending and forming conduit – bending and forming trunking and trays – sealing and protecting cable connections			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– making mechanical/screwed/clamped connections – attaching suitable cable identification – attach equipment identification labels/markers – heat shrinking (devices and boots) – crimping (tags and pins) – stripping cable insulation/protection – removing cable end fittings – extracting/inserting components – routeing and securing wires and cables – soldering and de-soldering 1.12 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.13 carry out all of the following checks and adjustments, as appropriate to the equipment being installed: – making visual checks for completeness and freedom from damage – making sensory checks (sight, sound, smell, touch) – checking the security of connections/terminations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– checking the system for leaks Plus assist with three more from the following: – checking signal transmission (electrical, electronic, pneumatic, mechanical) – confirming that signal measurement and transmission are satisfactory – checking and modifying software programs – final start-up of the system and removal of any trip defeats – testing that the equipment operates to the installation specification 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved 1.15 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.16 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– fault finding techniques (such as six point, half-split, unit substitution) – function testing the installation/running equipment self-diagnostics 1.17 dispose of waste items in a safe and environmentally acceptable manner 1.18 assist in the completion of installation documentation to include one from the following: – installation records – company-specific documentation – job card.			
2a Know how to assist in the installation of workplace environmental control equipment	2.1 describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others 2.4 describe the hazards associated with installing workplace environmental control equipment, and with the tools and equipment used, and how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the installation process 2.6 explain how to obtain and interpret information from drawings and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology) 2.7 describe the procedures for ensuring that they have the correct tools, equipment and fasteners for the installation activities 2.8 describe the types of tools and instruments used to position, secure and align the equipment 2.9 describe the techniques used to position, align, level, adjust and secure the equipment 2.10 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.11 describe the basic principles of how the equipment functions, and its operating sequence 2.12 describe the techniques used to assemble electrical equipment (plugs, soldering, screwed, clamped and crimped connections).			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2a Know how to assist in the installation of workplace environmental control equipment (continued)	2.13 describe the use of IEE wiring, and other, regulations when selecting wires and cables, and when carrying out tests on systems 2.14 explain how to make adjustments to components to ensure that they function correctly 2.15 describe the methods of connecting equipment to service supplies (such as electrical, fluid power, compressed air, gas and water supplies) 2.16 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.17 describe the devices and systems for storing programs 2.18 explain how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy and quality of the installation 2.19 explain how to recognise installation defects (such as leaks, poor seals, misalignment, foreign object damage or contamination) 2.20 describe the problems that can occur with the installation operations, and how these can be overcome 2.21 describe the fault finding techniques to be used if the equipment fails to operate correctly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 describe the recording documentation to be completed for the activities undertaken 2.23 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 56: Assisting in the installation of heating and ventilation equipment

Unit reference number: T/600/5418

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of heating and ventilation equipment, in accordance with approved procedures. The learner will be required to assist in the installation of a range of heating and ventilation equipment, which will include one of the following primary heating sources such as gaseous, liquid, solid fuel, electricity and renewable energy. This will also include the installation of motors, fans, pumps, valves, couplings, ducting and trunking, heaters, filters, and control devices such as thermostats and switches. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of heating and ventilation equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the heating and ventilation equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of equipment for one of the following types of heating and ventilation system: – liquid – gaseous – solid fuel – renewable energy – electrical 1.4 assist in the installation of eight of the following components: – pipework – boiler – motors – fans – blowers – pumps – calorifiers – gauges/indicators – regulators – sensors and actuators – condenser – valves			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– control devices – radiators – safety devices – ducting/trunking – electrical wiring and connectors – electrical components – other components (specify) 1.5 follow all relevant instructions/documentation for the installation being carried out 1.6 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – BS7671/IEE wiring regulations – customer (contractual) standards and requirements – company standards and procedures 1.7 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use five of the following instruments during the installation activities: – alignment devices – electrical measuring instruments – mechanical measuring instruments – emission testing devices – temperature sensing devices – flow testing devices – pressure sensing and monitoring devices – flushing and bleeding devices 1.9 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques.			
1b Assist in the installation of heating and ventilation equipment (continued)	1.10 apply installation methods and techniques, to include five of the following: – marking out of locating and securing positions – drilling and hole preparation – positioning equipment/components – aligning pipes, connections, ducting and equipment – dressing and securing piping and hoses			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– making installation connections (such as mechanical, electrical, fluid power, utilities) – fitting anti-vibration mountings – securing by using mechanical fixings – securing by using masonry fixings – applying screw fastener locking devices – applying hose/cable clips and fasteners – levelling the equipment 1.11 assist in the movement and positioning of equipment, using two of the following: – slings – cranes – fork lift – portable lifting devices – block and tackle – rollers/skates – hoists – jacks – manual handling and moving loads			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.13 carry out all of the following checks and adjustments, as appropriate to the equipment being installed: – setting working clearance – leak testing – making 'off-load' checks – checking level and alignment – making visual checks for completeness and freedom from damage – making sensory checks (sight, sound, smell, touch) – ensuring that moving parts are clear of obstruction and are guarded Plus assist with four more from the following: – flow checks – pressurising system – line pressure tests – checking torque settings of fasteners – ensuring that locking devices are fitted to fasteners (where appropriate)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– testing that the equipment operates to the installation specification 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved 1.15 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.16 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as six point, half-split, unit substitution) – function testing the installation/running equipment self-diagnostics 1.17 assist in the completion of installation documentation to include one of the following: – installation records – company-specific documentation – job card.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to assist in the installation of heating and ventilation equipment	2.1	describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			
		2.4	describe the hazards associated with installing heating and ventilation equipment, and with the tools and equipment used, and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology)			
		2.7	describe the basic principles of how the equipment functions, and its operating sequence			
		2.8	describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the methods of drilling holes for rag bolts and expanding bolts (including the use of grouting and adhesives) 2.10 describe the various mechanical fasteners that will be used, and their method of installation (including, threaded fasteners, special securing devices, masonry fixing devices) 2.11 describe the procedures for ensuring that they have the correct tools, equipment, and fasteners for the installation activities 2.12 describe the techniques used to position, align, level, adjust and secure the equipment.			
2b Know how to assist in the installation of heating and ventilation equipment (continued)	2.13 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.14 describe the methods of connecting equipment to service supplies (such as electrical, compressed air, oil and fuel supplies) 2.15 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.16 describe the procedure for the safe disposal of waste materials 2.17 explain how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy and quality of the installation (including the fitting of guards to all moving parts and covers on electrical connections)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 explain how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage or contamination) 2.19 describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected 2.20 describe the problems that can occur with the installation operations, and how these can be overcome 2.21 describe the fault finding techniques to be used if the equipment fails to operate correctly 2.22 describe the recording documentation to be completed for the activities undertaken 2.23 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 57: Assisting in the installation of air conditioning and ventilation equipment

Unit reference number: T/600/5421

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of air conditioning and ventilation systems equipment, in accordance with approved procedures. The learner will be required to assist in the installation of a range of air conditioning and ventilation equipment, which will include air generation, distribution and control systems. This will also include the installation of motors, fans, pumps, ducting and trunking, heaters, safety devices, sensors and activators, and control devices. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of air conditioning and ventilation equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the air conditioning and ventilation equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of equipment for two of the following types of air conditioning and ventilating system: – remote air conditioning generation – local air conditioning distribution – air conditioning control 1.4 assist in the installation of eight of the following air conditioning equipment components: – pipework – motors – chillers – pumps – humidifiers – condensers – fans – evaporators – sensors and actuators – control devices – regulators – heaters – ducting/trunking			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– electrical wiring/connectors – electrical components – valves – safety devices – filters – gauges/indicators – other (specify) 1.5 follow all relevant instructions/documentation for the installation being carried out 1.6 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – BS7671/IEE wiring regulations – customer (contractual) standards and requirements – company standards and procedures 1.7 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use three of the following instruments during the installation activities: – alignment devices – electrical measuring instruments – mechanical measuring instruments – emission testing devices – temperature sensing devices – flow testing devices – pressure sensing and monitoring devices – flushing and bleeding devices 1.9 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques.			
1b Assist in the installation of air conditioning and ventilation equipment (continued)	1.10 apply installation methods and techniques, to include five of the following: – marking out of locating and securing positions – drilling and hole preparation – positioning of equipment/components – aligning pipes, connections, ducting and equipment – dressing and securing piping and hoses			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– making installation connections (such as mechanical, electrical, fluid power, utilities) – levelling the equipment – fitting anti-vibration mountings – securing by using mechanical fixings – securing by using masonry fixings – applying screw fastener locking devices – applying hose/cable clips and fasteners 1.11 assist in the movement and positioning of equipment, using two of the following: – slings – cranes – fork lift – portable lifting devices – block and tackle – rollers – hoists – jacks – manual handling and moving loads 1.12 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 carry out all of the following checks and adjustments, as appropriate to the equipment being installed: – setting working clearance – leak testing – making 'off-load' checks – checking level and alignment – making visual checks for completeness and freedom from damage – making sensory checks (sight, sound, smell, touch) – ensuring that moving parts are clear of obstruction and are guarded Plus assist with four of the following: – pressurising the system – line pressure tests – flow checks – checking torque settings of fasteners – ensuring that locking devices are fitted to fasteners (as appropriate) – testing that the equipment operates to the installation specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 deal promptly and effectively with problems within their control and report those that cannot be solved 1.15 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.16 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as six point, half-split, unit substitution) – function testing the installation/running equipment self-diagnostics 1.17 dispose of waste items in a safe and environmentally acceptable manner 1.18 assist in the completion of installation documentation to include one of the following: – installation records – company-specific documentation – job card.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to assist in the installation of air conditioning and ventilation equipment	2.1	describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			
		2.4	describe the hazards associated with installing air conditioning and ventilation equipment, and with the tools and equipment used, and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology)			
		2.7	describe the basic principles of how the equipment functions, and its operating sequence			
		2.8	describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the methods of drilling holes for rag bolts and expanding bolts (including the use of grouting and adhesives) 2.10 describe the various mechanical fasteners that will be used, and their method of installation (including, threaded fasteners, special securing devices, masonry fixing devices) 2.11 describe the procedures for ensuring that they have the correct tools, equipment and fasteners for the installation activities 2.12 describe the techniques used to position, align, level, adjust and secure the equipment.			
2b Know how to assist in the installation of air conditioning and ventilation equipment (continued)	2.13 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.14 explain how to make adjustments to components to ensure that they function correctly 2.15 describe the methods of connecting equipment to service supplies (such as electrical, fluid power, compressed air, oil and fuel supplies) 2.16 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.17 describe the procedure for the safe disposal of waste materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 explain how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy and quality of the installation (including the fitting of guards to all moving parts and covers on electrical connections) 2.19 explain how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage, or contamination) 2.20 describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected 2.21 describe the problems that can occur with the installation operations, and how these can be overcome 2.22 describe the fault finding techniques to be used if the equipment fails to operate correctly 2.23 describe the recording documentation to be completed for the activities undertaken 2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 58: Assisting in the installation of compressed air equipment

Unit reference number: J/600/5424

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of compressed air equipment and systems, in accordance with approved procedures. The learner will be required to assist in the installation of a range of compressed air equipment, which will include compressed air generation, distribution and control systems. This will also include installing system components such as pumps, driers, motors, regulators, compressor components, sensors, pipework and hoses, filters, electrical wiring, gaskets and seals. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of compressed air equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the compressed air equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of equipment for two of the following types of compressed air system: – compressed air generation – compressed air distribution – compressed air control 1.4 assist in the installation of eight of the following compressed air system components: – pipework – hoses – pumps – driers – motors – compressors – silencers – actuators – regulators – valves – control equipment – gauges/indicators – manifolds – monitoring equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– filters – sensors – lubricators – safety devices – electrical wiring and connectors – electrical components – gaskets and seals – other components (specify) 1.5 follow all relevant instructions/documentation for the installation being carried out 1.6 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – BS7671/IEE wiring regulations – customer (contractual) standards and requirements – company standards and procedures 1.7 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use three of the following instruments during the installation activities: – alignment devices – measuring devices (mechanical and electrical) – pressure sensing and monitoring devices – temperature sensing devices – flow testing devices 1.9 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques.			
1b Assist in the installation of compressed air equipment (continued)	1.10 apply installation methods and techniques, to include five of the following: – marking out of locating and securing positions – drilling and hole preparation – positioning equipment/components – aligning pipes, ducting and equipment – making installation connections (such as mechanical, electrical, fluid power, utilities) – dressing and securing piping and hoses – fitting anti-vibration mountings – securing by using mechanical fixings – securing by using masonry fixings – applying screw fastener locking devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 assist in the movement and positioning of equipment, using two of the following: – slings – cranes – fork lift – portable lifting devices – block and tackle – rollers – hoists – jacks – manual handling and moving loads 1.12 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.13 carry out all of the following checks and adjustments, as appropriate to the equipment being installed: – topping up fluid/oil reservoirs – making 'off-load' checks – checking level and alignment – making visual checks for completeness and freedom from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– making sensory checks (sight, sound, smell, touch) – ensuring that moving parts are clear of obstruction, and are guarded Plus assist with four more from the following: – setting working clearances – tensioning – pressurising the system – making line pressure tests – checking torque settings of fasteners – ensuring that locking devices are fitted to fasteners (as appropriate) – functionally testing to ensure that the equipment operates correctly 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved 1.15 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.16 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as six point, half-split, unit substitution) – function testing the installation/running equipment self-diagnostics 1.17 assist in the completion of installation documentation to include one of the following: – installation records – company-specific documentation – job card.			
2a Know how to assist in the installation of compressed air equipment	2.1 describe the health and safety requirements of the area in which the installation activity is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			

Learning outcomes	Assessment criteria		Evidence type	Portfolio reference	Date
	2.4	describe the hazards associated with installing compressed air equipment, and with the tools and equipment used, and how they can be minimised			
	2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			
	2.6	explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology)			
	2.7	describe the basic principles of how the equipment functions, and its operating sequence			
	2.8	describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this			
	2.9	describe the methods of drilling holes for rag bolts and expanding bolts (including the use of grouting and adhesives)			
	2.10	describe the various mechanical fasteners that will be used, and their method of installation (including, threaded fasteners, dowels, special securing devices, masonry fixing devices)			
	2.11	describe the procedures for ensuring that they have the correct tools, equipment, and fasteners for the installation activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the types of tools and instruments used to position, secure and align the equipment (such as spanners, wrenches, crowbars, torque wrenches, engineers' levels, alignment telescopes and laser devices) 2.13 describe the techniques used to position, align, level, adjust and secure the equipment.			
2b Know how to assist in the installation of compressed air equipment (continued)	2.14 describe the methods of lifting, handling and supporting the equipment during the installation activities (to include chain and rope hoists, pull-lifts/tirfors, rollers and skates, high lifts and the use of levers and crowbars) 2.15 describe the correct pipes, hoses and other equipment to accommodate the various pressure ranges 2.16 explain how to make adjustments to components to ensure that they function correctly 2.17 describe the methods of connecting equipment to service supplies (such as electrical, fluid power, compressed air oil and fuel supplies) 2.18 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.19 describe the procedure for the safe disposal of waste materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 explain how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy and quality of the installation (including the fitting of guards to all moving parts and covers on electrical connections) 2.21 explain how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage or contamination) 2.22 describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected 2.23 describe the fault finding techniques to be used if the equipment fails to operate correctly 2.24 describe the recording documentation to be completed for the activities undertaken 2.25 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 59: Assisting in the installation of waste/foul water distribution equipment

Unit reference number: L/600/5425

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of waste/foul water distribution systems and equipment, in accordance with approved procedures. The learner will be required to assist in the installation of a range of water distribution equipment such as foul, storm and waste/effluent water systems. The installation will also include fitting and connecting the correct types of pipework and other ancillary equipment such as pumps, valves, motors and couplings. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of waste/foul water distribution equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the waste/foul water distribution equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – confirm that all required installation consumables are available – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of equipment for one of the following types of waste water distribution system: – waste/effluent – foul water – storm water 1.4 install and connect two of the following types of pipe: – plastic – iron – copper – clay 1.5 follow all relevant instructions/documentation for the installation being carried out 1.6 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS, ISO and/or BSEN standards – company standards and procedures – customer (contractual) standards and requirements 1.7 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use two of the following instruments during the installation activities: – alignment devices – levelling devices – multimeter – measuring devices – pressure testing devices – flow testing devices 1.9 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques.			
1b Assist in the installation of waste/foul water distribution equipment (continued)	1.10 assist in the fitting of six of the following components/equipment during installation: – couplings/connectors – pumps – motors – sensors and switches – traps and filters – dosing plant – macerators – interceptors			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– gates and valves – manifolds – gauges/indicators – faucets and outlets – tanks – control devices – gaskets and seals – electrical wiring and connectors – ancillary drainage equipment (such as from sinks, toilets, showers) 1.11 apply installation methods and techniques, to include five of the following: – marking out of locating and securing positions – drilling and hole preparation – positioning of equipment – connecting equipment to pipework – aligning and securing piping and flexible hoses – levelling and securing equipment – securing by using mechanical fixings – securing by using masonry fixings – securing by using adhesives (glues or cements)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– using correct lifting and handling equipment – making installation connections (such as mechanical, electrical, fluid power, utilities) 1.12 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.13 carry out three the following checks and adjustments, as appropriate to the equipment being installed: – making visual checks for completeness and freedom from damage – making sensory checks (sight, sound, smell, touch) – ensuring that moving parts are clear of obstruction and are guarded – checking level and alignment – checking for leaks Plus assist with both of the following: – flow check – functionally testing that the equipment operates correctly 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.15 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.16 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as half-split, input-to-output, unit substitution) – function testing the installation/running equipment self-diagnostics 1.17 assist in the completion of installation documentation to include one of the following: – installation records – company-specific documentation – job card.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to assist in the installation of waste/foul water distribution equipment	2.1	describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others (to include the Water Regulations Advisory Scheme (WRAS), The Prevention and Control of Legionellosis, and Safe Working in Confined Spaces)			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			
		2.4	describe the hazards associated with installing waste/foul water distribution equipment, and with the tools and equipment used, and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, symbols and terminology)			
		2.7	describe the basic principles of how the equipment functions, and its operating sequence			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this 2.9 describe the methods of securing to masonry, and the use of mechanical fasteners, joint compounds and adhesives 2.10 describe the techniques used to position, align, level, adjust and secure the pipework and equipment 2.11 describe the importance of orientation and flow of certain components/equipment 2.12 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.13 describe the types and applications of the different types of pipework systems (such as copper, plastic, lead, iron, clay).			
2b Know how to assist in the installation of waste/foul water distribution equipment (continued)	2.14 describe the applications of the different types of couplings, and how to make watertight connections between pipes and other components 2.15 describe the types of contaminants in water systems, and the associated problems they can cause 2.16 describe the applications of the different pipework and equipment cleaning procedures (rod, water jet, solvents)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 explain how to make adjustments to components, to ensure that they function correctly 2.18 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.19 describe the procedure for the safe disposal of waste materials 2.20 explain how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage or contamination) 2.21 describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected 2.22 describe the problems that can occur with the installation operations, and how these can be overcome 2.23 describe the fault finding techniques to be used if the equipment fails to operate correctly 2.24 describe the recording documentation to be completed for the activities undertaken 2.25 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 60: Assisting in the installation of fresh water distribution equipment

Unit reference number: D/600/5428

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of fresh water distribution systems and equipment, in accordance with approved procedures. The learner will be required to assist in the installation of a range of fresh water equipment, such as mains cold water (drinkable), hot water supplies, cold down service and non-mains supplies (river, well). The installation will also include fitting and connecting the correct types of pipework, pumps, valves, couplings, and other ancillary components and equipment. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of fresh water distribution equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following activities during the installation: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of equipment for one of the following types of fresh water distribution system: – mains cold water – cold down service – non-mains supplies – hot water supplies 1.4 assist in the installation and connection of two of the following types of pipe: – plastic – clay – iron – copper 1.5 assist in the fitting of eight of the following components/equipment during the installation: – couplings/connectors – pumps – motors – heaters – traps and filters			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– wet and dry risers – cylinders and tanks – dosing plant – gates and valves – gauges/indicators – manifolds – sensors and switches – faucets and outlets – control devices – gaskets and seals – electrical wiring and connectors – ancillary equipment (such as sinks, toilets, showers) 1.6 follow all relevant instructions/documentation for the installation being carried out 1.7 produce installations which comply with all of the following, as appropriate to the equipment being installed: – equipment manufacturer's operation range – BS, ISO and/or BSEN standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– company standards and procedures – customer (contractual) standards and requirements 1.8 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition 1.9 use three of the following instruments during the installation activities: – alignment devices – measuring devices – pressure testing devices – flow testing devices – bleeding equipment – multimeter			
1b Assist in the installation of fresh water distribution equipment (continued)	1.10 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques 1.11 apply installation methods and techniques, to include five of the following: – marking out of locating and securing positions – drilling and hole preparation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– positioning of equipment – connecting equipment to pipework – aligning and securing piping and flexible hoses – levelling and securing equipment – securing by using mechanical fixings – securing by using masonry fixings – securing by using adhesives (glues or cements) – using correct lifting and handling equipment – making installation connections (such as mechanical, electrical, fluid power, utilities) 1.12 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification 1.13 carry out five of the following, as appropriate to the equipment being installed: – topping up fluid reservoirs – checking level and alignment – checking for leaks – pressurising the system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– making visual checks for completeness and freedom from damage – making sensory checks (sight, sound, smell, touch) – ensuring that moving parts are clear of obstruction and are guarded – functionally testing that the equipment operates correctly 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved 1.15 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.16 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– fault finding techniques (such as half-split, input-to-output, unit substitution) – function testing the installation/running equipment self-diagnostics 1.17 dispose of waste items in a safe and environmentally acceptable manner 1.18 assist in the completion of installation documentation to include one from one of the following: – installation records – company-specific documentation – job card.			
2a Know how to assist in the installation of fresh water distribution equipment	2.1 describe the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others (to include the Water Regulations Advisory Scheme (WRAS), The Prevention and Control of Legionellosis, and Safe Working in Confined Spaces) 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with installing fresh water distribution equipment, and with the tools and equipment used, and how they can be minimised 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during the installation 2.6 explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, symbols and terminology) 2.7 describe the basic principles of how the equipment functions, and its operating sequence 2.8 describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this 2.9 describe the methods of securing to masonry, and the use of mechanical fasteners, joint compounds and adhesives 2.10 describe the techniques used to position, align, level, adjust and secure the pipework and equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 describe the importance of orientation and flow of certain components/equipment 2.12 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.13 describe the types and applications of the different pipework systems (such as copper, plastic, lead, iron, clay)			
2b Know how to assist in the installation of fresh water distribution equipment (continued)	2.14 describe the applications of the different types of couplings, and how to make watertight connections between pipes and other components 2.15 describe the types of contaminants in water systems, and the associated problems they can cause 2.16 describe the applications of the different pipework and equipment cleaning procedures (rod, water jet, solvents) 2.17 explain how to make adjustments to components, to ensure that they function correctly 2.18 describe the methods of connecting equipment to service supplies (such as electrical, fluid power, compressed air, oil and fuel supplies)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.20 describe the procedure for the safe disposal of waste materials 2.21 explain how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage or contamination) 2.22 describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected 2.23 describe the problems that can occur with the installation operations, and how these can be overcome 2.24 describe the fault finding techniques to be used if the equipment fails to operate correctly 2.25 describe the recording documentation to be completed for the activities undertaken 2.26 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 61: Assisting in the installation of refrigeration equipment

Unit reference number: K/600/5433

Level: 2

Credit value: 48

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of refrigeration equipment, in accordance with approved procedures. The learner will be required to assist in the installation of a range of refrigeration equipment, which will include compression types using air cooled, water cooled condensers, and secondary refrigerants, also air conditioning cooling plants. This will also include motors, compressors, evaporative condensers, evaporators, safety control devices, valves, refrigerant metering devices, sensors, switches, thermostats, meters, thermocouples, timers, interlocks, electrical components and wiring, electronic boards and components, controller units, computer equipment and peripheral devices. This unit does not involve maintenance/repair type activities, such as removal and replacement of existing equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Assist in the installation of refrigeration equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the refrigeration equipment: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – confirm that authorisation to carry out the installation activities has been given – check that safe access and working arrangements for the installation area have been provided – confirm that services have been safely isolated, ready for the installation (such as mechanical, electricity, gas, air or fluids) – check that all required installation consumables are available – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 assist in the installation of equipment for one of the following types of refrigeration equipment: – compression types using air cooled condensers – compression types using water cooled condensers – compression types using secondary refrigerants – air conditioning cooling plant 1.4 assist with the fitting of eight of the following components/equipment during the installation: – pipework – motors – evaporative condensers – evaporators – compressors – sensors and actuators – interlocks – vents/diffusers – monitoring equipment – safety devices – uninterruptible power supplies – hoses and connectors			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– gaskets and seals – PC peripheral devices – electrical wiring and connections – software – gauges and indicators (such as temperature, humidity, pressure) – electronic modules/components 1.5 follow all relevant instructions/documentation for the installation being carried out 1.6 produce installations which comply with all of the following, as appropriate to the equipment being installed: – company standards and procedures – equipment manufacturer's operation range – customer (contractual) standards and requirements – BS7671/IEE wiring regulations – BS, ISO and/or BSEN standards 1.7 use the correct tools and equipment for the installation operations, and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use three of the following instruments during the installation activities: – alignment devices – pressure testing devices – temperature measuring devices – leak testing devices – multimeter – filling and bleeding devices 1.9 assist in the installation, positioning and securing of the equipment, using appropriate methods and techniques			
1b Assist in the installation of refrigeration equipment (continued)	1.10 apply installation methods and techniques, to include five of the following: – marking out of locating and securing positions – drilling and hole preparation – positioning of equipment – aligning and securing pipes, hoses ducting and equipment – levelling of equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– installing wiring conduit and enclosures – securing by using mechanical fixings – securing by using masonry fixings – applying screw fastener locking devices – making installation connections (such as mechanical, electrical, fluid power, utilities) 1.11 assist with the movement and positioning of equipment, using two of the following: – slings – cranes – fork lift – portable lifting devices – block and tackle – rollers – hoists – jacks – manual handling and moving loads 1.12 carry out and/or assist in checking the installation, and make any adjustments in accordance with the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 assist in carrying out eight the following, as appropriate to the equipment being installed: – purging the equipment of all air (such as with dry nitrogen) – making sensory checks (sight, sound, smell, touch) – making visual checks for completeness and freedom from damage – adding refrigeration lubricants – pumping down a system – liquid charging of a system – using flushing lines and equipment – vapour charging of a system – functionally testing that the equipment operates correctly – carrying out pressure leak test – setting pressure cut-outs – setting expansion valves – setting thermostats and controls 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.15 assist in dealing with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.16 assist in using fault location methods and techniques on the installed equipment, to include one of the following: – diagnostic aids (such as company records/history, manufacturers' manuals, fault analysis charts, troubleshooting guides) – fault finding techniques (such as half-split, input-to-output, unit substitution) – function testing the installation/running equipment self-diagnostics 1.17 assist in the completion of installation documentation 1.18 complete the relevant paperwork, to include one of the following, and pass it to the appropriate people: – installation records – company-specific documentation – job card.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to assist in the installation of refrigeration equipment	2.1	describe the specific safety practices and procedures that they need to observe when installing refrigeration equipment (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the installation procedure, and their effects on others			
		2.4	describe the hazards associated with installing refrigeration equipment, and with the tools and equipment used, and how they can be minimised			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the installation			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed in the installation process (such as drawings, specifications, manufacturers' manuals, BS7671/IEE regulations, symbols and terminology)			
		2.7	describe the basic principles of how the equipment functions, and its operating sequence			
		2.8	describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the methods of securing to masonry, and the use of mechanical fasteners, joint compounds and adhesives 2.10 describe the techniques, tools and instruments used to position, align, level, adjust and secure the equipment 2.11 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.12 describe the types of primary and secondary refrigerants, and methods of purging and charging the system.			
2b Know how to assist in the installation of refrigeration equipment (continued)	2.13 describe the methods of testing equipment and systems for leaks 2.14 explain 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 their intended purpose 2.15 explain how to make adjustments to components to ensure that they function correctly 2.16 describe the methods of connecting equipment to service supplies (such as electrical, fluid, compressed air, oil and fuel supplies) 2.17 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the procedure for the safe disposal of waste materials 2.19 explain how to recognise installation defects (such as leaks, poor seals, misalignment, ineffective fasteners, foreign object damage or contamination) 2.20 describe the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected 2.21 describe the problems that can occur with the installation operations, and how these can be overcome 2.22 describe the fault finding techniques to be used if the equipment fails to operate correctly 2.23 describe the recording documentation to be completed for the activities undertaken 2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 62: Carrying out fault location on lifting platforms

Unit reference number: F/600/5437

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out efficient and effective location of faults on powered lifting platforms, in accordance with approved procedures. The learner will be expected to use a variety of fault location methods and procedures, such as gathering information from the person who reported the fault, using recognised fault finding techniques and diagnostic aids, measuring, inspecting and operating the equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out fault location on lifting platforms	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault finding activity: – undertake the fault location process to cause minimal disruption to the customer – obtain and use the correct issue of company and/or manufacturers' drawings and documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as electrical, mechanical) – provide safe access and working arrangements for the area where the fault finding is taking place – carry out the fault location activities, using approved procedures – identify the fault or faults, and consider appropriate corrective action – take actions to resolve the problem (in conjunction with others, where appropriate)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 locate faults that have resulted in two of the following breakdown categories: – intermittent problem – partial failure or reduced performance – complete breakdown 1.4 review and use all relevant information on the symptoms and problems associated with the product or asset 1.5 investigate and establish the most likely causes of the fault or faults 1.6 select, use and apply diagnostic techniques, tools and aids to locate faults using all of the following: – information gathered from the person who reported the fault(s), including the customer – fault finding techniques (such as six point, half-split, input/output, unit substitution) – diagnostic aids (such as manuals, flowcharts, troubleshooting guides, maintenance records)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, loose fittings) – operating (such as manually switching off and on, running the equipment).			
1b Carry out fault location on lifting platforms (continued)	1.7 use three of the following types of test equipment to aid fault location: – measuring instrument/devices – multimeter – continuity tester – insulation resistance tester – self diagnostic systems – other specific test equipment 1.8 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.9 determine the implications of the fault or faults for other work and for safety considerations 1.10 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault or faults 1.11 record details on the extent and location of the fault or faults in an appropriate format			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 provide a record of the outcomes of the fault location, using one of the following: – company-specific documentation – service record card – step-by-step outcome analytical report – corrective action report.			
2a Know how to carry out fault location on lifting platforms	2.1 describe the health and safety requirements of the area in which they are carrying out the fault finding investigation, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies 2.3 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid and resuscitation) 2.4 describe the safe working practices for lifts (as described in BS7255) 2.5 describe the importance of wearing protective clothing and other appropriate safety equipment during fault location activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the hazards associated with carrying out fault location activities on lifting platforms (such as live electrical components, stored energy, misuse of tools), and how they can be minimised 2.7 explain how to obtain and interpret information from job instructions and other documents needed in the fault location process (such as drawings, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical symbols) 2.8 describe the basic principles of how the lifting platform functions, its operating sequence, the purpose of the individual units/components and how they interact 2.9 explain how to use the various diagnostic aids to help identify the location of the fault.			
2b Know how to carry out fault location on lifting platforms (continued)	2.10 describe the various fault location techniques that can be used, and how they are applied (such as six point, half-split, input/output, unit substitution) 2.11 explain how to evaluate sensory information (sight, sound, smell, touch) 2.12 explain how to assess evidence and evaluate the possible causes of faults/problems 2.13 explain how to use a range of diagnostic equipment to investigate the problem			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the care, handling and application of measuring/test equipment (such as mechanical and electrical measuring instruments) 2.15 explain how to check that the measuring/test equipment is within calibration, and that it is free from damage and defects 2.16 describe the problems that can occur during the fault location activity, and how they can be minimised 2.17 describe the importance of completing the correct documentation following the fault diagnostic activity 2.18 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 63: Installing lifting platforms

Unit reference number: J/600/5438

Level: 2

Credit value: 42

Guided learning hours: 161

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to install powered lifting platforms, in accordance with approved procedures. This will require the learner to check the site for the proposed installation, and to ensure that the required installation tools and any specified components and site services are available, so that the installation can be carried out safely and efficiently. The learner will then be expected to install the lifting platform and check that it operates satisfactorily. This unit does not involve assembly-type activities, such as fitting bearings and/or gears into a gearbox or the installation of items of equipment that are simple, self-contained items requiring minimal installation. It does, however, include the connection of sub-assemblies (where these have been broken down for transportation purposes).

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Install lifting platforms	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following before installing the lifting platform: – check that the site is accessible and is free from obstructions or hazards – check that the installation documentation is complete and current (such as drawings, instructions, manufacturer's data, settings and other documentation) – confirm that the appropriate electrical supply is available – check that the required installation consumables are available – check that safety and environmental conditions have been met – confirm that the site has been suitably prepared for the installation to take place – check that consignment contents are correct to the customer specification/order, and are free from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– outline the installation process with the customer – undertake the installation in such a way as to cause minimal disruption to the customer 1.3 install seven of the following lifting platform components/subassemblies: – shaft structures – guides – aperture frames – hydraulic system (such as power pack, valves, springs, ram, piping) – traction system (such as AC, DC and ropes) – carriage assembly (such as doors, gates, ramp, lighting, safety devices) – track trolley (such as chassis, interlocks and trim) – bridging steps – electrical controls (such as safety devices, landing controls, remote controls, carriage controls) – ancillary equipment (such as warning signs, company specific options)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 follow all relevant drawings and specifications for the installation being carried out 1.5 produce installations that comply with one of the following, as appropriate to the equipment being installed: – equipment manufacturer's installation specification – customer requirements – company standards and procedures – BS, ISO and/or BSEN standards 1.6 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.7 use three of the following tools during the installation activities: – straight edges – alignment devices (such as spirit level, laser equipment) – measuring instruments (such as electrical, mechanical) – plumb lines – tapes and measures – self-diagnostic equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 install, position and secure the equipment and components in accordance with the specification.			
1b Install lifting platforms (continued)	1.9 carry out all of the following activities during the installation: – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – prepare components and assemblies for installation – ensure the safe isolation of services during installation (such as hydraulic, mechanical, electrical) – provide safe access and working arrangements for the installation area – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe condition and free from foreign object debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 apply installation methods and techniques, to include six of the following: – marking out of locating and securing positions – positioning the equipment – aligning the equipment – levelling the equipment – shimming and packing – securing by using mechanical fixings – fixing by using adhesives and sealants – securing by using masonry fixings – applying screw fastener locking devices – routeing and securing wires and cables 1.11 ensure that all necessary connections to the equipment are complete 1.12 make the following connections to the installed equipment: – connections to power supply Plus two more from the following: – mechanical connections – electrical component connections – fluid power connections			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 deal promptly and effectively with problems within their control and report those that cannot be solved 1.14 deal with two of the following conditions during the installation process: – installations with no faults – partial equipment malfunction – complete malfunction of equipment 1.15 check that the installation is complete and that all components are free from damage 1.16 carry out checks and adjustments, to include: – testing to ensure that the equipment operates to the installation specification Plus six more of the following: – checking level and alignment – electrical continuity – electrical insulation resistance – mains voltage and polarity – stall current and running current – overloads – earth continuity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– making visual checks for completeness and freedom from damage – making sensory checks (sight, sound, smell, touch) – ensuring that moving parts are clear of obstruction, and are guarded – ensuring that locking devices are fitted to fasteners (as appropriate) 1.17 complete the relevant paperwork, to include all of the following, and pass it to the appropriate person: – product user guide/maintenance guide – installation work sheet – company-specific documentation – test and examination certification – customer handover documentation (acceptance cert).			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to install lifting platforms	2.1	describe the specific safety practices and procedures that they need to observe when installing lifting platforms (including any specific legislation, safe working practices for lifts (such as BS7255), regulations/codes of practice for the activities, equipment or materials)			
		2.2	describe the procedures to be carried out before starting work on the installation (such as complying with any risk assessments and other health and safety requirements)			
		2.3	describe the health and safety requirements of the work area where they are carrying out the installation activities, and the responsibility these requirements place on them			
		2.4	describe the hazards associated with installing lifting platforms, and with the tools and equipment used, and how they can be minimised			
		2.5	describe the personal protective equipment that they need to use for the installation activities, and where replacements can be obtained if supplied personal protective equipment becomes worn or damaged			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions and other relevant documentation used in the installation (such as installation drawings, standards, quality control procedures and specifications) 2.7 describe the lifting platform equipment to be installed, its operating procedures and function 2.8 describe the different drive systems, their operation, and associated components (such as traction, hydraulic, screwdriver, airbag) 2.9 describe the methods of marking out the site for positioning the equipment, and the tools and equipment used for this 2.10 describe the various mechanical fasteners that will be used (including, threaded fasteners, special securing devices, masonry fixing devices), and their method of installation 2.11 describe the procedures for ensuring that they have the correct tools, equipment, and fasteners for the installation activities.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2b Know how to install lifting platforms (continued)	2.12 describe the types of tools and instruments used to position, secure and align the equipment (such as spanners, wrenches, levelling and alignment devices, measuring devices) 2.13 describe the techniques used to position, align, level, connect, adjust and secure the equipment 2.14 describe the methods of lifting, handling and supporting the equipment during the installation activities 2.15 describe the methods of connecting equipment to power supplies 2.16 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.17 explain how to dispose of waste items in an environmentally safe acceptable manner, and how to leave the work area in a safe condition 2.18 explain how to conduct any necessary checks to ensure the equipment integrity, functionality, accuracy and quality of the installation (including the fitting of covers to all moving parts and electrical connections) 2.19 describe the tools and equipment used in the installation activities, and their calibration/care and control procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 describe the problems that can occur with the installation operations, and how these can be overcome 2.21 describe the documentation to be completed for the activities, and to whom to pass them 2.22 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 64: Carrying out servicing of lifting platforms

Unit reference number: R/600/5443

Level: 2

Credit value: 19

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out servicing activities of powered lifting platforms, in accordance with approved procedures. This will involve inspection and adjustment, dismantling, removing and replacing faulty components, in line with company procedures, on a range of lifting platforms such as traction, hydraulic, and direct drive. The learner will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid re-assembly, setting, aligning and adjusting components, and to carry out the relevant checks before starting up the lifting platform.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out servicing of lifting platforms	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the servicing activity: – undertake the servicing activities in such a way as to cause minimal disruption to the customer – use the correct issue of drawings, job instructions and servicing procedures – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as hydraulic, mechanical, electrical) – ensure safe access and working arrangements for the servicing area – follow the approved lifting platform servicing schedule – reinstate and return the lifting platform to service on completion of activities – ensure that any potential defects are identified and reported for further action – leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the servicing operations, in accordance with all of the following, as appropriate to the equipment being serviced: – organisational guidelines and codes of practice – equipment manufacturer's operating range – customer requirements – BS, ISO and BSEN standards 1.5 carry out the maintenance activities within the limits of their personal authority 1.6 carry out all of the following servicing techniques: – visual examination of the complete system – dismantling equipment to the appropriate level – proof marking/labelling of components – checking components for serviceability – setting, aligning and adjusting components – electrical continuity and insulation checks – make sensory checks (sight, sound, smell, touch) – tightening fastenings to the required torque			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– making 'off-load' checks before starting up – removing excess dirt and grime – replenishing oils and/or greases – functionally testing the completed system.			
1b Carry out servicing of lifting platforms (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed timescale 1.8 check eight of the following for operational safety, security and condition, in line with manufacturers' specifications: – overspeed governor – drive gear – rope/pulley system – levelling devices – safety edges – safety gear – guide shoes and linkages – landing controls – remote controls – doors/gates – hydraulic system (such as pump, valves, hoses and reservoir)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– safety devices – interlocks and key switches – emergency lowering devices – door locks 1.9 check ten of the following for damage, wear, security and condition, in line with manufacturers' specifications: – pulleys – drums – controls – ramps – panels – push buttons/indicators – isolator – seat – communication equipment – trim – chassis – motor – lifting ropes – trailing cable			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– guide bracket and fixings – lighting – warning notices/labelling (incl. SWL or maximum load notice) – hydraulic hoses – fire/smoke seals – battery backup 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete the relevant maintenance records accurately, including one of the following, and pass them on to the appropriate person – job card – company report – service log or report 1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out servicing of lifting platforms	2.1	describe the health and safety requirements of the area in which the servicing activity is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the servicing procedure, and their effects on others			
		2.4	describe the hazards associated with carrying out the servicing of lifting platforms (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down servicing procedures), and how to minimise them			
		2.5	describe the importance of wearing protective clothing and other appropriate safety equipment during the servicing process			
		2.6	explain how to obtain and interpret information from job instructions and other documents needed in the servicing process (such as drawings, specifications, manufacturers' manuals, servicing schedules)			
		2.7	describe the inspection and safety checks that are applied, and the importance of following them exactly during servicing operations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the methods of checking that components are fit for purpose, and how to identify defects and wear characteristics 2.9 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact.			
2b Know how to carry out servicing of lifting platforms (continued)	2.10 describe the different drive systems, their operation, and associated components (such as traction, hydraulic, screwdriver, airbag) 2.11 describe the uses of mechanical and electrical measuring devices 2.12 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, running and sliding conditions) 2.13 describe the importance of making checks before running the equipment under power 2.14 explain 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 2.15 describe the importance of completing servicing documentation and/or reports following the servicing activity, and how to generate them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 describe the equipment operating and control procedures to be applied during the servicing activity 2.17 describe the things that can go wrong when carrying out servicing of lifting platforms, and what to do if they occur 2.18 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.19 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 65: Restoring lifting platforms to service by replacing or repairing components

Unit reference number: M/600/5451

Level: 2

Credit value: 23

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to restore powered lifting platforms to usable condition by repairing or replacing components, in accordance with approved procedures. The learner will be required to restore a range of lifting platforms, such as traction, hydraulic, and direct drive, to operational condition by repairing or replacing assemblies/sub-assemblies and components. The learner will also be required to select the appropriate equipment to use, based on the nature of the repair, and the operations to be carried out.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Restore lifting platforms to service by replacing or repairing components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the repair/replacement activity: – undertake the activities in a way that causes minimal disruption to the customer – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electrical, air or fluids) – provide safe access and working arrangements for the maintenance area – carry out the repair/replacement activities, using appropriate techniques and procedures – reinstate and return the lifting platform to service on completion of the repair/replacement activities – ensure that any potential defects are identified and reported for further action – record the repair/replacement, using appropriate methods or documentation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 follow the relevant specifications for the component to be repaired 1.4 carry out repair or replacement of lifting platform components, in accordance with all of the following standards, as appropriate to the equipment being repaired: – organisational guidelines and codes of practice – equipment manufacturer's operation range – customer requirements – BS, ISO and/or BSEN standards 1.5 prepare the component for repair 1.6 carry out the repairs within agreed timescale using approved materials and components and methods and procedures.			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1b Restore lifting platforms to service by replacing or repairing components (continued)	1.7 replace or repair four of the following lifting platform components: – hydraulic pump unit – electrical motor – lift controller equipment – rope/pulley system – door gates (such as manual or automatic) – hydraulic components (such as valves, hoses and connections) Plus eight more from the following: – electrical wiring and cables – solenoids – safety devices (such as switches, interlocks, fuses) – pulleys and drums – brakes – ramps – seats – trim – chassis – panels			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– aperture – fire/smoke seals – bridging steps – overspeed governors – sling drive – ropes – guide shoes/rollers – guides and fixings – residual current devices – safety gear – printed circuit boards (PCBs) – controls (landing call stations) – push buttons/indicators – interlocks/key switches 1.8 carry out all of the following replacement or repair activities: – dismantling equipment to the appropriate level – removing excess dirt and grime – fitting, aligning and adjusting repaired or replaced units/components – tightening fastenings to the required torque			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– ensuring that working clearances are met – applying lubrication – ensuring that components are clear of obstruction, and are guarded, where appropriate – making sensory checks (sight, sound, smell, touch) – checking that all safety devices are operative – functionally testing the completed system 1.9 ensure that the repaired component meets the specified operating conditions 1.10 produce accurate and complete records of all repair work carried out 1.11 complete one of the following servicing records, and pass it to the appropriate person – job card – company report – service log or report.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to restore lifting platforms to service by replacing or repairing components	2.1	describe the health and safety requirements of the area in which the repair or replacement activity is to take place, and the responsibility these requirements place on them			
		2.2	describe the isolation and lock-off procedure or permit-to-work procedure that applies			
		2.3	describe the specific health and safety precautions to be applied during the repair/replacement procedure, and their effects on others			
		2.4	describe the importance of wearing protective clothing and other appropriate safety equipment during repair/replacement activities			
		2.5	describe the hazards associated with carrying out repairs on lifting platforms (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down servicing procedures), and how to minimise them			
		2.6	explain where to obtain, and how to interpret job instructions and other relevant documents used in the repair/replacement activities (such as drawings, specifications, manufacturers' manuals, maintenance schedules)			
		2.7	describe the methods, techniques and company procedures to be followed for repairing/replacing components for lifting platforms			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the inspection and safety checks to be applied, and the importance of following them exactly during replacement/repair operation 2.9 describe the methods and techniques used to dismantle/assemble lifting platform equipment (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.10 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items such as seals and gaskets.			
2b Know how to restore lifting platforms to service by replacing or repairing components (continued)	2.11 describe the basic principles of how the lifting platform functions, its operating sequence, the working purpose of individual units/components and how they interact 2.12 describe the uses of mechanical and electrical measuring devices 2.13 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, running and sliding conditions) 2.14 describe the importance of making checks before running the lifting platform under power			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain how to check that tools and equipment are free from damage or defects, and are in a safe and usable condition 2.16 describe the importance of preparing documentation and/or reports following the replacement/repairing activity, and how to generate them 2.17 describe the equipment operating and control procedures to be applied during the repair/replacement activity 2.18 explain how to use lifting and handling equipment in the repair/replacement process 2.19 describe the things that can go wrong when carrying out repairs to lifting platforms, and what to do if they occur 2.20 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.21 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 66: Carrying out fault location activities on assistive technology systems and equipment

Unit reference number: F/600/5454

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to locate faults on assistive technology systems and equipment, in accordance with approved procedures. The learner will be required to locate faults on equipment such as manual and powered wheelchairs, buggies and scooters, postural support systems, hoists, personal communication aids, walking aids, adjustable beds, pressure relief and distribution equipment, telecare alarm systems, aids for daily living, environmental control systems, associated battery charging systems for assistive technology systems and equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out fault location activities on assistive technology systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault locating activity: – plan the fault location methods and procedures in conjunction with others – use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the safe isolation of equipment (such as mechanical, electrical, gas, air or fluids) – ensure that safe access and working arrangements have been provided for in the area where the fault finding is taking place – carry out the fault location activities, using approved procedures – identify the fault(s), and consider appropriate corrective action – in conjunction with others, take actions to resolve the problem(s)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out fault location on two of the following types of assistive technology system and equipment: – manual wheelchairs, buggies and wheeled commodes – powered wheelchairs and scooters – powered aids for daily living (such as bath lifts, riser and recliner chairs) – pressure redistribution and relief devices (such as alternating pressure cushions, mattresses and overlays) – environmental control systems (such as telephones, intercom systems, remote controlled equipment) – walking aids and other non powered aids for daily living (such as kitchen aids, grab rails and shower seats) – posture support systems (such as modular and custom made) – hoists			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– personal communication aids – adjustable beds – telecare alarm systems 1.4 locate faults that have resulted in two of the following breakdown categories: – intermittent problem – partial failure – complete breakdowns 1.5 review and use all relevant information on the symptoms and problems associated with the product or asset 1.6 investigate and establish the most likely causes of the fault or faults.			
1b Carry out fault location activities on assistive technology systems and equipment (continued)	1.7 select, use and apply diagnostic techniques, tools and aids to locate faults using four of the following: – information gathered from the person that reported the fault – fault finding techniques (such as six point, half-split, input/output, unit substitution) – diagnostic aids (such as service manuals and records, troubleshooting guides, equipment diagnostics) – instruments (such as multimeter, mechanical measuring devices, portable appliance tester)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, loose fittings) – operating/using equipment (such as manual switching off and on, operating/using equipment, test buttons) 1.8 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.9 determine the implications of the fault or faults for other work and for safety considerations 1.10 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault or faults 1.11 record details on the extent and location of the fault or faults in an appropriate format 1.12 complete one of the following maintenance records, and pass it to the appropriate person: – scheduled maintenance report – corrective maintenance report – other company-specific report.			

Learning outcomes		Assessment criteria		Evidence type	Portfolio reference	Date
2a	Know how to carry out fault location activities on assistive technology systems and equipment	2.1	describe the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on them			
		2.2	describe the statutory and advisory documentation relating to medical devices (such as Medical Devices Regulations, British and European standards, regulatory agency guidance and safety warnings)			
		2.3	describe the statutory documentation relating to lifting equipment and electrical safety checks (such as the lifting operations and lifting regulations and portable appliance testing)			
		2.4	describe the appropriate working practices, and the need to respect the patient and carer in the patient environment, at home or in the community (where appropriate)			
		2.5	describe the importance of reporting any 'adverse incidents' with the equipment to the regulatory authority			
		2.6	describe the isolation and lock-off procedure or permit-to-work procedure that applies in the work area			
		2.7	describe the importance of wearing protective clothing and other appropriate safety equipment during fault location activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the hazards associated with carrying out fault location on assistive technology systems and equipment (such as moving parts, handling oils and greases, stored pressure/force, misuse of tools), and how they can be minimised 2.9 describe the procedure to be adopted to establish the background of the fault(s) 2.10 explain how to use the various diagnostic aids to help identify the location of the fault(s) 2.11 describe the various fault location techniques that can be used, and how they are applied (such as six point, half-split, input/output, unit substitution) 2.12 explain how to evaluate sensory information (such as sight, sound, smell, touch).			
2b Know how to carry out fault location activities on assistive technology systems and equipment (continued)	2.13 explain how to assess evidence and evaluate the possible causes of faults/problems 2.14 explain how to use a range of fault diagnostic equipment to investigate the problem(s) 2.15 describe the importance of carrying out electrical safety tests on medical equipment, and the implications if this is not carried out (where appropriate) 2.16 describe the care, handling and application of mechanical measuring/test equipment (such as measuring instruments, dial test indicators, flow meters, torque measuring devices, pressure/force detectors)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 explain how to check that measuring/test equipment is within calibration, and that it is free from damage and defects 2.18 explain how to obtain and interpret information from job instructions and other documents needed in the fault location process (such as drawings, charts, specifications, manufacturers' manuals, history/servicing reports, graphical symbols) 2.19 describe the basic principles of how the assistive technology system and equipment functions, its operating sequence, the purpose of individual units/components and how they interact 2.20 describe the problems that can occur during the fault location activity, and how they can be minimised 2.21 explain how to evaluate the likely risk to themselves and others, and the effects the fault(s) could have on the overall process or system 2.22 describe the importance of completing the correct documentation following the fault location activity 2.23 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

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Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 67: Carrying out scheduled servicing activities on assistive technology systems and equipment

Unit reference number: L/600/5456

Level: 2

Credit value: 19

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out scheduled servicing activities on assistive technology systems and equipment, in accordance with approved procedures. The learner will be required to carry out scheduled servicing on a range of assistive technology systems and equipment such as manual and powered wheelchairs, buggies and scooters, postural support systems, hoists, personal communication aids, walking aids, adjustable beds, pressure relief and distribution equipment, telecare alarm systems, aids for daily living, environmental control systems, associated battery charging systems for assistive technology systems and equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out scheduled servicing activities on assistive technology systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the scheduled servicing activities: – undertake the servicing activities in such a way as to cause minimal disruption to normal working – use the correct issue of drawings and servicing documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the correct equipment decontamination procedure has been adhered to before and after the maintenance activity (where appropriate) – confirm with the authorised person that the equipment is ready for carrying out the scheduled servicing – ensure the safe isolation of equipment (such as mechanical, electrical, gas, air or fluids) – ensure that safe access and working arrangements have been provided for the servicing area			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– carry out the scheduled servicing tasks, using appropriate techniques and procedures – dispose of waste items in a safe and environmentally acceptable manner – leave the work area in a safe and tidy condition 1.3 carry out scheduled servicing activities on two of the following: – manual wheelchairs, buggies and wheeled commodes – powered wheelchairs and scooters – powered aids for daily living (such as bath lifts, riser and recliner chairs) – pressure redistribution and relief devices (such as alternating pressure cushions, mattresses and overlays) – environmental control systems (such as telephones, intercom systems, remote controlled equipment) – walking aids and other non powered aids for daily living (such as kitchen aids, grab rails and shower seats) – posture support systems (such as modular and custom made) – hoists			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– telecare alarm systems – adjustable beds – personal communication aids 1.4 follow the relevant servicing schedules to carry out the required work 1.5 carry out servicing of assistive technology systems and equipment in accordance with both of the following: – organisational guidelines and codes of practice – equipment manufacturer's servicing information 1.6 carry out the servicing activities within the limits of their personal authority.			
1b Carry out scheduled servicing activities on assistive technology systems and equipment (continued)	1.7 carry out the servicing activities in the specified sequence and in an agreed timescale 1.8 carry out all of the following scheduled servicing activities: – monitoring the condition/deterioration of components – reviewing and checking equipment function and/or operation – recording the results of the scheduled servicing activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– reporting or taking action with regard to any defects that require immediate attention (such as replacing non-'lifed' components) Plus six more from the following: – removing excessive dirt and grime – removing any covers, casings or guarding – making visual checks (such as sight, sound, smell, touch) – replacing 'lifed' consumables (such as labels, covers, seals, hoses, connectors, switches, batteries) – checking that any safety equipment or controls are operating correctly – checking the operation of instrumentation (such as gauges, sensors and indicators) – making adjustments to components and connections – checking/tightening fastenings to the required torque – replenishing greases or other fluids (where appropriate) – carrying out electrical safety tests using the appropriate equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 report any instances where the servicing activities cannot be fully met or where there are identified defects outside the planned schedule 1.10 complete the relevant servicing records accurately, to include one of the following, and pass them on to the appropriate person: – job card – specific company documentation – permit to work/formal risk assessment 1.11 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out scheduled servicing activities on assistive technology systems and equipment	2.1 describe the health and safety, infection control and de-contamination requirements of the work area and equipment being serviced, and the responsibility these requirements place on them 2.2 describe the appropriate working practices, and the need to respect the patient and carer in the patient environment, at home or in the community (where appropriate) 2.3 describe the statutory and advisory documentation relating to medical devices (such as Medical Devices Regulations, British and European standards, regulatory agency guidance and safety warnings)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the statutory documentation relating to lifting equipment and electrical safety checks (such as the lifting operations and lifting regulations and portable appliance testing) 2.5 describe the importance of reporting any 'adverse incidents' with the equipment to the regulatory authority 2.6 describe the isolation procedure or permit-to-work procedure that applies to the equipment being serviced 2.7 describe the specific health and safety precautions to be applied during the scheduled servicing activities, and their effects on others 2.8 describe the importance of wearing protective clothing and other appropriate safety equipment during the servicing activities 2.9 describe the hazards associated with carrying out scheduled servicing activities on assistive technology systems and equipment (such as handling greases, stored pressure/force, misuse of tools), and how they can be minimised 2.10 explain how to obtain and interpret information from job instructions and other documentation used in the servicing activities (such as drawings, specifications, manufacturers' manuals, servicing schedules, symbols and terminology)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 describe the various checks to be carried out during the scheduled servicing procedure 2.12 describe the procedure for obtaining the consumables to be used during the scheduled servicing activity.			
2b Know how to carry out scheduled servicing activities on assistive technology systems and equipment (continued)	2.13 describe the methods of checking that components are fit for purpose, and the need to replace 'lifed' items 2.14 describe the importance of carrying out electrical safety tests on medical equipment, and the implications if this is not carried out (where appropriate) 2.15 explain how to check that any replacement components meet the required specification/operating conditions 2.16 explain how to make appropriate sensory checks (such as sight, sound, smell and touch) 2.17 describe the appropriate testing instructions to be adopted during the servicing activity 2.18 explain how to make adjustments to components/assemblies to ensure that they function to specification 2.19 describe the basic principles of how the assistive technology equipment functions, its operating sequence, the working purpose of individual units/components and how they interact			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 explain how to complete scheduled servicing records/logs/reports, in accordance with company policy and procedures 2.21 describe the equipment operating and control procedures, and how to apply them in order to carry out scheduled servicing 2.22 describe the problems that can occur whilst carrying out the scheduled servicing tasks, and how they can be avoided 2.23 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 68: Carrying out maintenance and repair activities on assistive technology systems and equipment

Unit reference number: R/600/5460

Level: 2

Credit value: 35

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out maintenance activities on assistive technology systems and equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing or repairing faulty components, in line with company procedures, on a variety of different types of assistive technology systems and equipment, such as manual and powered wheelchairs, buggies and scooters, postural support systems, hoists, personal communication aids, walking aids, adjustable beds, pressure relief and distribution equipment, telecare alarm systems, aids for daily living, environmental control systems, associated battery charging systems for assistive technology systems and equipment.

Assessment Requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the 'Semta Assessment Strategy'. Detailed information is given in *Annexe D*.

Assessment recording

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1a Carry out maintenance and repair activities on assistive technology systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance activities: – plan the maintenance activities so as to minimise disruption to normal working – use the correct issue of company and/or manufacturers' drawings and maintenance documentation – adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations – ensure the correct equipment decontamination procedure has been adhered to before and after the maintenance activity (where appropriate) – provide safe access and working arrangements for the maintenance area – ensure that the equipment is safe to work on before carrying out maintenance activities – carry out the maintenance activities, using appropriate techniques and procedures – return the equipment to service on completion of the maintenance activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– dispose of waste items in a safe and environmentally acceptable manner, and leave the work area in a safe condition 1.3 carry out maintenance activities on two of the following types of assistive technology systems and equipment: – manual wheelchairs, buggies and wheeled commodes – powered wheelchairs and scooters – powered aids for daily living (such as bath lifts, riser and recliner chairs) – pressure redistribution and relief devices (such as alternating pressure cushions, mattresses and overlays) – environmental control systems (such as telephones, intercom systems, remote controlled equipment) – walking aids and other non powered aids for daily living (such as kitchen aids, grab rails and shower seats) – posture support systems (such as modular and custom made) – hoists			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– personal communication aids – adjustable beds – telecare alarm systems 1.4 follow the relevant maintenance schedules to carry out the required work 1.5 service assistive technology equipment to one or more of the following quality and accuracy standards: – organisational guidelines and codes of practice – equipment manufacturer's instructions – equipment meets CE marking and, where appropriate, BS7671/IEE wiring regulations 1.6 carry out the maintenance activities within the limits of their personal authority.			
1b Carry out maintenance and repair activities on assistive technology systems and equipment (continued)	1.7 carry out the maintenance activities in the specified sequence and in an agreed timescale 1.8 carry out twelve of the following maintenance activities, as applicable to the equipment being maintained: – isolating the equipment – checking components for serviceability – dismantling/disconnecting equipment to the appropriate level – checking the condition of warning labels			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– tightening fastenings to the required torque – disconnecting and reconnecting wires and cables – checking cable identification markers – removing electrical/electronic units/components – removing mechanical units/components – replacing damaged/defective/missing components – repairing damaged or defective components – soldering and de-soldering – replacing all 'lifed' items – setting and adjusting components – replacing or checking lubricants – making visual checks before functional testing or powering up – carrying out electrical safety tests using the appropriate equipment – functionally testing the maintained equipment 1.9 replace or repair a range of components, to include ten of the following: – cables and connectors – electronic modules – overload protection devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– power supplies – actuators – timers – display/indication units – bulbs or LEDs – locking and retaining devices – posture belts – switches – sensors – transformers – motors – hydraulic units – drive belts – pulleys – seals – valves – pumps – bearings – gauges – brake assemblies – foot supports			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– control leavers – interface devices – wheels – hoses/pipework – battery chargers – seating – posture supports – pressure relief covers, interlinings or mattresses lifting slings – structural components (such as bed or wheelchair frames) – guards or casings – upholstery 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete the relevant maintenance records accurately, to include all of the following, and pass them on to the appropriate person – job cards – servicing logs or reports – other specific documentation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 dispose of waste materials in accordance with safe working practices and approved procedures.			
2a Know how to carry out maintenance and repair activities on assistive technology systems and equipment	2.1 describe the health and safety, infection control and de-contamination requirements of the work area and equipment being maintained, and the responsibility these requirements place on them 2.2 describe the statutory and advisory documentation relating to medical devices (such as Medical Devices Regulations, British and European standards, regulatory agency guidance and safety warnings) 2.3 describe the statutory documentation relating to lifting equipment and electrical safety checks (such as the lifting operations and lifting regulations and portable appliance testing) 2.4 describe the appropriate working practices, and the need to respect the patient and carer in the patient environment, at home or in the community (where appropriate) 2.5 describe the importance of reporting any 'adverse incidents' with equipment, to the regulatory authority			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the hazards associated with carrying out maintenance activities on assistive technology systems and equipment (such as handling oils, greases, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise them 2.7 describe the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.8 explain how to obtain and interpret information from job instructions and other documentation used in the maintenance activities (such as drawings, specifications, manufacturers' manuals, BS 7671/IEE regulations, symbols and terminology) 2.9 describe the isolation procedure that applies to the maintenance activities (such as electrical isolation, removal of fuses) 2.10 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals, sensors, batteries and belts) 2.11 describe the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the care and use of measuring or diagnostic equipment (such as mechanical measuring devices, electrical measuring instruments, and other specific measuring or testing devices).			
2b Know how to carry out maintenance and repair activities on assistive technology systems and equipment (continued)	2.13 describe the techniques used to dismantle/reassemble mechanical/electromechanical equipment (such as mechanical fittings, unplugging, de-soldering, removal of crimped connections) 2.14 describe the methods of removing and replacing components without causing damage to the equipment or other components 2.15 explain how to make adjustments to components/assemblies to ensure that they function correctly 2.16 describe the importance of making visual checks before using or operating the equipment 2.17 describe the importance of carrying out electrical safety tests on medical equipment, and the implications if this is not carried out 2.18 explain 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			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the importance of completing maintenance documentation and/or reports following the maintenance activity, and how to generate them 2.20 describe the equipment operating and control procedures to be applied during the maintenance activity 2.21 explain how to use lifting and handling equipment in the maintenance activity 2.22 describe the things that can go wrong when carrying out routine maintenance, and what to do if they occur 2.23 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.24 describe the extent of their own responsibility and to whom they should report if they have any problems that they cannot resolve.			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Further information

To get in touch with us visit our 'Contact us' pages:

- Edexcel, BTEC and Pearson Work Based Learning contact details: qualifications.pearson.com/en/support/contact-us.html
- books, software and online resources for UK schools and colleges: www.pearsonschoolsandfecolleges.co.uk

Key publications

- *Adjustments for candidates with disabilities and learning difficulties, Access and Arrangements and Reasonable Adjustments, General and Vocational qualifications* (Joint Council for Qualifications (JCQ))
- *Supplementary guidance for reasonable adjustments and special consideration in vocational internally assessed units* (Pearson)
- *General and Vocational qualifications, Suspected Malpractice in Examination and Assessments: Policies and Procedures* (JCQ)
- *Equality Policy* (Pearson)
- *Recognition of Prior Learning Policy and Process* (Pearson)
- *UK Information Manual* (Pearson)
- *Pearson Edexcel NVQs, SVQs and competence-based qualifications – Delivery Requirements and Quality Assurance Guidance* (Pearson)

All of these publications are available on our website: qualifications.pearson.com

Further information and publications on the delivery and quality assurance of NVQ/Competence-based qualifications are available at our website on the Delivering BTEC pages. Our publications catalogue lists all the material available to support our qualifications. To access the catalogue and order publications, please go to the resources page of our website.

Useful publications

Related information and publications include:

- *Centre Handbook for Pearson NVQs and Competence-based Qualifications* published annually
- functional skills publications – specifications, tutor support materials and question papers
- the current Pearson publications catalogue and update catalogue.

Pearson publications concerning the Quality Assurance System and the internal and standards verification of vocationally related programmes can be found on the Pearson website.

NB: Some of our publications are priced. There is also a charge for postage and packing. Please check the cost when you order.

How to obtain National Occupational Standards

Semta (Head Office)
14 Upton Road
Watford
WD18 0JT

Telephone: 01923 238441
Fax: 01923 256086
Email: customerservices@semta.org.uk

Professional development and training

Pearson supports UK and international customers with training related to NVQ and BTEC qualifications. This support is available through a choice of training options offered in our published training directory or through customised training at your centre.

The support we offer focuses on a range of issues including:

- planning for the delivery of a new programme
- planning for assessment and grading
- developing effective assignments
- building your team and teamwork skills
- developing student-centred learning and teaching approaches
- building functional skills into your programme
- building effective and efficient quality assurance systems.

The national programme of training we offer can be viewed on our website (qualifications.pearson.com). You can request customised training through the website or by contacting one of our advisers in the Training from the Pearson team via Customer Services to discuss your training needs.

The training we provide:

- is active
- is designed to be supportive and thought provoking
- builds on best practice
- may be suitable for those seeking evidence for their continuing professional development.

Annexe A: Quality assurance

Key principles of quality assurance

- A centre delivering Pearson qualifications must be a Pearson recognised centre and must have approval for qualifications that it is offering.
- The centre agrees as part of gaining recognition to abide by specific terms and conditions around the effective delivery and quality assurance of assessment; the centre must abide by these conditions throughout the period of delivery.
- Pearson makes available to approved centres a range of materials and opportunities to exemplify the processes required for effective assessment and provide examples of effective standards. Approved centres must use the guidance on assessment to ensure that staff who are delivering Pearson qualifications are applying consistent standards.
- An approved centre must follow agreed protocols for: standardisation of assessors; planning, monitoring and recording of assessment processes; internal verification and recording of internal verification processes; and for dealing with special circumstances, appeals and malpractice.

Quality assurance processes

The approach to quality assured assessment is made through a partnership between a recognised centre and Pearson. Pearson is committed to ensuring that it follows best practice and employs appropriate technology to support quality assurance process where practicable. Therefore, the specific arrangements for working with centres will vary. Pearson seeks to ensure that the quality assurance processes that it uses do not place undue bureaucratic processes on centres and works to support centres in providing robust quality assurance processes.

The learning outcomes and assessment criteria in each unit within this specification set out the standard to be achieved by each learner in order to gain the qualification. Pearson operates a quality assurance process, which is designed to ensure that these standards are maintained by all assessors and verifiers.

For the purposes of quality assurance all individual qualifications and units are considered as a whole. Centres offering these qualifications must be committed to ensuring the quality of the units and qualifications they offer, through effective standardisation of assessors and internal verification of assessor decisions. Centre quality assurance and assessment processes are monitored by Pearson.

The Pearson quality assurance processes will involve:

- gaining centre recognition and qualification approval if a centre is not currently approved to offer Pearson qualifications
- annual visits to centres by Pearson for quality review and development of overarching processes and quality standards. Quality review and development visits will be conducted by an Pearson quality development reviewer
- annual visits by occupationally competent and qualified Pearson Standards Verifiers for sampling of internal verification and assessor decisions for the occupational sector
- the provision of support, advice and guidance towards the achievement of National Occupational Standards.

Centres are required to declare their commitment to ensuring quality and appropriate opportunities for learners that lead to valid and accurate assessment outcomes. In addition, centres will commit to undertaking defined training and online standardisation activities.

Annexe B: Centre certification and registration

Pearson Standards Verifiers will provide support, advice and guidance to centres to achieve Direct Claims Status (DCS). Pearson will maintain the integrity of Pearson NVQs through ensuring that the awarding of these qualifications is secure. Where there are quality issues identified in the delivery of programmes, Pearson will exercise the right to:

- direct centres to take actions
- limit or suspend certification
- suspend registration.

The approach of Pearson in such circumstances is to work with the centre to overcome the problems identified. If additional training is required, Pearson will aim to secure the appropriate expertise to provide this.

What are the access arrangements and special considerations for the qualification in this specification?

Centres are required to recruit learners to Pearson qualifications with integrity.

Appropriate steps should be taken to assess each applicant's potential and a professional judgement should be made about their ability to successfully complete the programme of study and achieve the qualification. This assessment will need to take account of the support available to the learner within the centre during their programme of study and any specific support that might be necessary to allow the learner to access the assessment for the qualification. Centres should consult Pearson's policy on learners with particular requirements.

Pearson's policy on access arrangements and special considerations for Pearson qualifications aims to enhance access to the qualifications for learners with disabilities and other difficulties (as defined by the 2010 Equality Act) without compromising the assessment of skills, knowledge, understanding or competence. Please refer to *Access Arrangements, Reasonable Adjustments and Special Consideration for General and Vocational Qualifications* for further details. qualifications.pearson.com

Annexe C: Additional requirements for qualifications that use the title NVQ

Contents

Purpose of document

1 The purpose of this document is to make clear what additional requirements are needed to assess and quality assure qualifications that use the title NVQ.

2 When an SSC/SSB and awarding organisation wants to use the title NVQ in the naming of a qualification, the awarding organisation is required to make sure this qualification is assessed and quality assured in accordance with these additional requirements and other requirements described in the SSC/SSB assessment strategy.

3 The aims of these additional requirements are to

- ensure that all competence based qualifications that use the title NVQ are
  - assessed consistently
  - quality assured consistently
- maintain the integrity of qualifications that use the title NVQ
- establish the NVQ brand
- keep bureaucracy associated with assessment and quality assurance of qualifications that use the title NVQ to a minimum.

Background

4 [1] "At the heart of an NVQ is the concept of occupational competence; the ability to perform to the standards required in employment across a range of circumstances and to meet changing demands. NVQs are first and foremost about what people can do. They go beyond technical skills to include planning, problem solving, dealing with unexpected occurrences, working with other people and applying the knowledge and understanding that underpins overall competence".

5 NVQs are based entirely on National Occupational Standards (NOS) developed by an SSC/SSB, which describe the competence needed in an occupational role.

6 Qualifications that use the title NVQ must comply with the rules of combination determined by the SSC/SSB. Awarding organisations are not allowed to develop another qualification that does not use the title NVQ, if it uses the same rules of combination as a qualification that does use the title NVQ.

7 The Qualification Framework offers increased flexibility in the way occupational competence can be assessed and demonstrated. Qualifications that use the title NVQ in the title are just one way of assessing and demonstrating occupational competence. SSCs/SSBs are free to work with their awarding organisations to agree what qualifications will be used to assess occupational competence. Qualifications that use the title NVQ, are not a preferred method for assessing occupational competence and all accredited qualifications have equal status.

8 When developing a qualification, including qualifications that use the title NVQ, an awarding organisation must be a recognised awarding organisation and must meet the *Qualification Requirements in the Regulatory Arrangements for the Qualifications Framework*, published by The Office of the Qualifications and Examinations Regulator (Ofqual) in August 2008.

9 The qualification regulators confirmed that a group of SSCs and SSBs would be free to develop specific, additional requirements about the way in which qualifications that use the title NVQ will be assessed and quality assured. For those recognised awarding organisations that want to assess occupational competence through the use of qualifications that use the title NVQ, it has been agreed by SSCs and SSBs that the following additional requirements must be met.

[1] NCVQ's NVQ Criteria and Guidance 1995.

Additional requirements for qualifications that use the title NVQ

Introduction

10 Qualifications that use the title NVQ must be assessed and quality assured in accordance with the following additional requirements.

Assessment Requirements

11 When a qualification uses the title NVQ, awarding organisations are required to make sure their recognised assessment centres understand how learners are to be assessed.

12 Assessment methodologies must meet the assessment strategy developed in partnership between the relevant SSC or SSB and awarding organisations for the qualification. The assessment strategy must be published and made available separately and will include the requirements for assessment of qualifications that use the title NVQ. The assessment criteria for each unit will be part of the units that make up the qualification.

13 Learners must complete real work activities in order to produce evidence to demonstrate they have met the NOS and are occupationally competent.

14 When a learner cannot complete a real work activity, simulation is allowed.

15 Simulation is allowed when

- a learner is required to complete a work activity that does not occur on a regular basis and therefore opportunities to complete a particular work activity do not easily arise
- a learner is required to respond to a situation that rarely occurs, such as responding to an emergency situation
- the safety of a learner, other individuals and/or resources will be put at risk.

16 When simulation is used, assessors must be confident that the simulation replicates the workplace to such an extent that learners will be able to fully transfer their occupational competence to the workplace and real situations.

17 Units that must not be assessed by simulation must be identified by the SSC/SSB in the assessment strategy for the qualification or family of qualifications.

18 Learners must be assessed by assessors

- who are occupationally competent in the occupational areas they are assessing where they have sufficient and relevant technical/occupational competence in the unit, at or above the level of the unit being assessed and as defined by the assessment strategy for that qualification
- [2]who must hold or be working towards a suitable assessor qualification to confirm they understand assessment and how to assess learners
- must be fully conversant with the unit(s) against which the assessments and verification are to be undertaken.

19 All assessors must carry out assessment to the standards specified in the A units.

[2] Currently an assessor could hold unit A1 and/or unit A2. Or from the past unit D32 and/or unit D33. SSCs also identify other suitable equivalent qualifications.

20 All assessment decisions made by a trainee assessor must be checked by a qualified assessor or an assessor recognised by an awarding organisation.

21 Trainee assessors must have a plan, which is overseen by the recognised assessment centre, to achieve the relevant assessor qualification(s) within an agreed timescale.

Quality assurance requirements

22 When a qualification uses the title NVQ, awarding organisations are required to make sure their recognised assessment centres understand how the qualification will be quality assured.

23 Qualifications that use the title NVQ, must be verified

- internally by an internal verifier, who is accountable to the assessment centre
- externally by an external verifier, who is accountable to the awarding organisation or an agent of the awarding organisation.

24 With reference to internal verification, internal verifiers must

- [3]hold or be working towards a suitable internal verifier qualification to confirm they understand how to internally verify assessments
- have sufficient and relevant technical/occupational familiarity in the unit(s) being verified
- be fully conversant with the standards and assessment criteria in the units to be assessed
- understand the awarding organisation's quality assurance systems and requirements for this qualification.

25 Trainee internal verifiers must have a plan, which is overseen by the recognised assessment centre, to achieve the internal verifier qualification within an agreed timescale.

26 With reference to external verification, external verifiers must

- [4]hold or be working towards a suitable external verification qualification to confirm they understand and are able to carry out external verification
- have no connections with the assessment centre, in order to maintain objectivity
- have sufficient and relevant technical/occupational understanding in the unit(s) being verified
- be fully conversant with the standards and performance criteria in the units to be assessed
- understand the awarding organisation's quality assurance systems for this qualification.

27 Trainee external verifiers must have a plan, which is overseen by the awarding organisation, to achieve the external verifier qualification within an agreed timescale.

[3] Currently an internal verifier needs to hold unit V1. Or from the past unit D34. SSCs also identify other suitable equivalent qualifications.

[4] Currently an external verifier needs to hold unit V2. Or from the past unit D35.

28 Awarding organisations must decide the frequency of external monitoring activities. Any decision must be based on

- the risks associated with a qualification that is designed to help a learner demonstrate occupational competence
- an evaluation of the centre's performance and past record.

29 Awarding organisations will have in place suitably constituted audit processes, which are supported by naturally occurring quality assurance and monitoring systems that already exist in workplace assessment environments.

Annexe D: Assessment Strategy

The Semta Assessment Strategy will be available on the Pearson website, alongside the full specification on the Engineering NVQ/Competence page.

November 2017

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