

**NPTC Level 3 Diploma in  
Work-based Land-based  
Engineering Operations  
(QCF)  
(0059)**



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**Learner guide and logbook**

**501/0399/4**

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A large, stylized sunburst graphic in shades of blue and white, radiating from the center of the page. The graphic is composed of numerous triangular rays of varying lengths and opacities, creating a dynamic, energetic effect.

**LAND-BASED  
MACHINERY**

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Or download from [www.nptc.org.uk](http://www.nptc.org.uk) under the 'Qualifications' tab and then click on 'Land-based Engineering'.

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# NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (0059)

## What is it all about?

You are about to start a programme of work-based training and assessment leading to a nationally recognised qualification, based on the National Occupational Standards for the industry. This learner guide has been written in order to provide you with information and support as you work through to achieving your qualification. As you make progress you will be able to demonstrate that you have the necessary practical skills and the knowledge to do your work effectively and efficiently.

## Introduction

This document contains the information that centres need to offer the following qualifications:

Qualification title and level	City & Guilds qualification number	Ofqual accreditation number	Last registration date	Last certification date
NPTC Level 3 Diploma in Work-based Land-based Engineering Operations	0059-31, 32, 33, 34	501/0399/4	31/08/2013	31/08/2016

Please note that this qualification handbook and assessor guidance details the information for all the routes within the qualification. The following routes are available:

0059-31 NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (Agriculture)

0059-32 NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (Arboriculture/forestry)

0059-33 NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (Ground care)

0059-34 NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (Fixed plant and storage)

## Guided Learning Hours and Credit

Depending on the route chosen, the GLH and credit totals will vary. However, the overall GLH for this qualification is 488 and the credit value is 60, as listed on the National Database of Accredited Qualifications (NDAQ).

## What is the Qualifications and Credit Framework?

OFQUAL have introduced the Qualifications and Credit Framework (QCF) to increase flexibility for learners and employers. It allows learners to build towards a qualification, rather than having to do all of it at the same time. Qualifications may be built up from individual units according to rules of combination. The qualifications and rules of combination (structures) are set out in this handbook. The units are derived from the National Occupational Standards, which are compiled by Lantra SSC, the Sector Skills Council for the Land-based industries.

Delivery and assessment of this qualification is similar to the previous NVQs but there are some administrative changes that centres will need to put in place, such as access to unique learner numbers.

Each unit has been assigned a number of credits and the units will be assessed in the workplace and build up to a Diploma.

## The Qualification

The NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (0059) is a programme of workplace training and assessment leading to a nationally recognised qualification. It aims to:

- meet the needs of learners who work or want to work in the land-based machinery/engineering sector
- allow learners to learn, develop and practise the skills required for employment and/or career progression in the land-based machinery/engineering sector
- replace the following qualification:  
NPTC Level 3 NVQ in Land-based Service Engineering (4025) which expires on 31 December 2010 (QAN 100/2466/9)

## NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (0059)

This qualification will form part of the Advanced Apprenticeship framework for Land-based Engineering Operations. It is a work-related, competence-based qualification. It reflects the skills and knowledge needed to do a job effectively, and shows that a learner is competent in the area of work the qualification represents. The different routes available within this qualification are Agriculture, Arboriculture/forestry, Ground care and Fixed plant and storage.

## Who will be involved?

### The learner

You will need to:

- negotiate and agree an assessment programme with your assessor
- negotiate and develop a personal action plan with dates for review and assessment
- collect the evidence which proves your competence in your job
- organise and reference the evidence in a portfolio
- judge the evidence against the standards of competence to see whether it is adequate to present for assessment
- present the evidence for assessment; this may include:-
  - attending an assessment interview
  - being available to discuss your evidence with the internal and /or external verifier if requested

Later in this guide we will explain how you can identify and collect evidence and how you can prepare for being assessed in your daily work.

### The assessor

- will have experience in your area of work, must be occupationally competent and may be your immediate supervisor or manager or a visiting assessor from a training centre who will visit you a minimum of 3 times to observe you at work
- will be experienced in assessing
- will themselves have achieved a higher qualification or have significant and current experience in the area of assessment. Therefore you may have more than 1 assessor
- can advise you on the planning and organisation of your evidence
- is responsible for making the decisions about your evidence and judging when you are competent.

### The internal verifier

- is appointed by the centre where you are registered
- is responsible for maintaining the quality of assessment within the centre by checking the assessment decisions made by assessors
- will have experience in your area of work and must be occupationally competent
- will themselves have achieved a higher qualification or have significant and current experience in the area of assessment to allow them to act as an internal verifier.

### The external verifier

- is appointed by City & Guilds to ensure that all assessments undertaken in your centre are fair, valid, consistent and that your centre meets the required national standard
- will make regular visits to your centre to observe assessments and examine portfolios of evidence
- makes regular reports to City & Guilds confirming what happens with assessment practice in your centre.

## **The expert witness**

Wherever possible, the evidence which you produce should be witnessed. For example your assessor, line manager or colleagues may witness an activity or authenticate a document as being your own work.

## **Witness status**

Witnesses fall into three main categories of experience:

1. Occupational expert and D32/D33 or A1/A2 assessor who is familiar with the standards
2. D32/D33 or A1/A2 assessor without occupational competence
3. Occupational expert who is familiar with the standards.

In some circumstances it may be possible to accept witness testimony from a non-occupational expert, e.g. for evidence for a non-vocationally specific skill such as dealing with clients, validating a competition result. In these cases, the following two categories of witness may be valid:

4. Occupational expert who is not familiar with the standards
5. Non-expert not familiar with the standards, e.g. a customer.

## **Why do you need witnesses?**

It is important to demonstrate that the evidence was produced by you under the circumstances described. The witness is therefore able to observe and report on your performance on tasks which produce evidence towards the work-based qualification. The job of the expert witness is to report to the assessor their observations of your performance. The assessor will then judge whether the evidence is sufficient.

## **How do you involve a witness?**

The key to this is planning. In many cases someone, for example a colleague, may naturally be involved with your work and so be able to witness and authenticate evidence. However, if the work is usually unobserved, you might arrange for someone to be present (where practical) to observe your performance. Alternatively where you are working directly with or for a customer, you might ask the customer to act as a witness.

## **What do they have to do?**

After observing your work, the witness will need to write a short statement describing what you actually did. The witness should be aware of assessment criteria for the activity and the evidence requirements which are explained in the qualification handbook. As you will be aware of the standards and the evidence you require, you may decide to write out the statement yourself and ask your witness to read it and sign if they agree with it.

You may also provide statements for yourself, e.g. to justify why you produced a product in a particular way, but this would usually need to be augmented by supplementary evidence such as a work sheet or witness statement from a customer.

A Witness Status List and a Witness Statement Form have been included in the portfolio builder pack for you to photocopy and use.

You must ensure that each witness is recorded with a sample signature in the Witness Status List. Only the approved assessor is qualified to judge the evidence. The job of the expert witness is to report to the assessor their observations of the learner's performance.



### **How will my competence be assessed?**

Occupational competence can be described as the consistent demonstration of skill, knowledge and understanding, to the standard specified by the assessment criteria for each unit of the work-based qualification. Each unit relates to competence in a different area of activity within a job.

Assessment of your competence will be based upon realistic work place situations, performing purposeful and recognisable tasks which will require a combination of skills and related knowledge.

### **What is evidence?**

Evidence is what you will need to provide in order to prove your competence, your ability to do the job and so meet the standards. You can draw on past experience to provide such evidence as well as collecting evidence from your current job. Your evidence will need to be filed and indexed in a portfolio. You will need to map your evidence to the assessment criteria and present it for assessment when you think each unit is complete.

Most assessment for your work-based qualification will be carried out by your assessor judging the evidence about tasks you have carried out. There are five basic sources of evidence and you may collect evidence from all of them:

### **Performance at work**

Observation in the workplace is an essential source of evidence. Your assessor may watch you working and assess your performance against the unit.

Assessment guidance and examples of evidence have been provided for each assessment criteria in the unit. Evidence may also be provided by witness statements, work records, job sheets, or a diary of your work. In this case, you need to match the evidence provided by witnesses against the unit. Although evidence can be provided by witnesses, no unit of your work-based qualification can be signed off as complete without the involvement of a qualified assessor to judge the evidence presented.

### **Performance of specially set tasks**

You may be asked to undertake a particular activity, e.g. a simulated task, project or case study, sometimes in a college or other training environment.

### **Questioning**

Questioning may be written or oral, usually occurring as a result of an observed assessment. Your assessor will ask you questions to make sure you have the necessary knowledge and understanding to carry out your job activities to the required standard.

### **Historical evidence**

You may have done things in the past which are applicable to your work-based qualification. These may be used as evidence, provided that they are sufficiently current and relevant to the qualification standard, e.g. a relevant qualification. This is sometimes known as Accreditation of Prior Learning (APL).

## Simulation

Simulation should only be used where it is difficult to collect evidence through a real work situation, the real work environment or within an acceptable time frame. Simulations will usually deal with contingencies such as unexpected problems, emergencies or other incidents, which will not necessarily occur frequently.

## Background evidence and previous experience

It is useful to include a copy of your CV, a copy of your previous or current job description, any previous certificates which relate to this qualification.

You can also include performance evidence from previous experiences and achievement

- CV
- Job descriptions
- Certificates
- Records of achievement
- Accounts of experience
- Case studies or projects from previous work
- Licences
- Records of courses attended
- Staff appraisals
- Products
- Endorsements
- Employer references

If you wish to bring forward a large amount of evidence from past experience, please discuss this with your assessor to help you plan the presentation of this evidence.

## Observed performance and products of performance

Work is a natural source of evidence and if your work includes the activities described in the assessment criteria for any of the units of the work-based qualification, then your assessor can readily observe you to judge your competence. If the activity covered by a unit is rare and is not likely to occur during the assessment period, then your assessor may advise you to use an alternative source of evidence or arrange a simulated activity for you.

Often there are products from work activities which maybe used as a valuable source of evidence, for example:

- Letters relating to work
- Completed Forms
- Job Sheets
- Plans
- Diaries
- Completed projects, case studies or assignments that are part of your work
- Finished or end products
- Witness statements about your work
- Contact with clients
- Memos
- Reports
- Logbooks
- Checklists
- Tape recordings
- Visual aids/photographs/videos
- Authenticated reports from appropriate personnel, e.g. line managers
- Staff appraisals
- References received
- Witness Statements from clients

## Supplementary evidence

In addition to direct observation of your work activities and judging the evidence provided by products of this work and witness testimony, it will be necessary for your assessor to seek supplementary evidence.

This may be done by asking you to:

- provide answers to oral or written questions
- attend a professional discussion
- complete written tests
- provide a written personal account to support other evidence.

## Publications and resources

City & Guilds provides the following publications and resources specifically for this qualification.

To access these documents, go to the NPTC website [www.nptc.org.uk](http://www.nptc.org.uk). Click on 'Qualifications' and then click on 'Land-based Engineering'. The documents can be found under 0059 NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (QCF).

Description	How to access
<b>Qualification handbook and assessor guidance</b> This provides the structures of the qualifications and guidance for assessors on the evidence requirements for each unit.	<a href="http://www.nptc.org.uk">www.nptc.org.uk</a>
<b>Learner guide and logbook</b> This provides guidance for learners and evidence summary sheets for the units within the qualification. It is expected that centres will use these forms. If centres devise or customise alternative forms, including paper-based or electronic methods, they must be approved by the external verifier before they are used by learners and assessors at the centre.	<a href="http://www.nptc.org.uk">www.nptc.org.uk</a>
<b>Portfolio builder pack for learners and assessors</b> This has a series of recording forms that may be helpful for centres and learners to use. The forms are generic and may be used for any City & Guilds work-based qualification.	<a href="http://www.nptc.org.uk">www.nptc.org.uk</a>
<b>Information guide for centres</b>	<a href="http://www.nptc.org.uk">www.nptc.org.uk</a>
<b>Product briefing sheet</b>	<a href="http://www.nptc.org.uk">www.nptc.org.uk</a>

## NPTC Level 3 Diploma in Work-based Land-based Engineering Operations 0059-31 to 34

### Unit specifications

All units available are listed below. The rule of combination for the qualification is detailed separately.

Accreditation unit reference	City & Guilds unit number	Unit Title	Level	Credit Value
L/601/5307	301	Recognise and Reduce Risks in the Land-based Engineering Work Area	3	5
F/600/3400	302	Understand and Follow Organisational Procedures within Land-based Engineering Establishments	2	5
Y/600/3435	303	Provide Customer Care within Land-based Engineering Operations	2	5
A/600/3430	304	Land-based Engineering Operations – Use Calculations	2	5
D/600/3436	305	Land-based Engineering Operations – Perform Thermal Joining Processes	3	10
H/600/3437	306	Land-based Engineering Operations – Service and Repair Engines and Components	3	10
K/600/3438	307	Service and Repair Suspension Systems on Land-based Equipment	3	5
M/600/3439	308	Maintain Electronic Control and Monitoring Systems on Land-based Equipment	3	10
H/600/3440	309	Service and Repair Hydraulic Systems and Components on Land-based Equipment	3	5
K/600/3441	310	Service and Repair Pneumatic Systems and Components for Land-based Equipment	3	5
M/600/3442	311	Service and Repair Powershift, Hydrostatic and CVT Transmissions on Land-based Equipment	3	10
L/601/5310	312	Refrigerant Handling	3	2
F/601/5305	313	Service and Repair of Land-based Air Conditioning, Climate Control and Refrigeration Plant and Equipment	3	3
T/600/3443	314	Monitor the Handover and Installation of Land-based Equipment	3	5
A/600/3444	315	Inspect and Test Land-based Machinery and Equipment	3	10

## Rules of combination for the NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (0059)

<b>0059-31 NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (Agricultural)</b>	
Rules for achievement of qualification	All learners must complete all mandatory units (301-304, 306, 308, 309, 311 and 315), plus a minimum of 5 credits from (305, 307, 310, 312-314), for the pathway. A total of 70 credits are required. Learners completing the Advanced Apprenticeship should complete the following additional modules: 501, 502 and 600.

<b>0059-32 NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (Arboriculture/forestry)</b>	
Rules for achievement of qualification	All learners must complete all mandatory units (301-304, 306, 308, 309 and 315), plus a minimum of 5 credits from (305, 307 and 310-314), for the pathway. A total of 60 credits is required. Learners completing the Advanced Apprenticeship should complete the following additional modules: 501, 502 and 600.

<b>0059-33 NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (Ground care)</b>	
Rules for achievement of qualification	All learners must complete all mandatory units (301-304, 306, 308, 309, 311 and 315), plus a minimum of 5 credits from (305, 307, 310, 312-314), for the pathway. A total of 70 credits is required. Learners completing the Advanced Apprenticeship should complete the following additional modules: 501, 502 and 600.

<b>0059-34 NPTC Level 3 Diploma in Work-based Land-based Engineering Operations (Fixed plant and storage)</b>	
Rules for achievement of qualification	All learners must complete all mandatory units (301-304, 308-310, 311 and 312-315), plus a minimum of 15 credits from (305-307 and 311), for the pathway. A total of 75 credits is required. Learners completing the Advanced Apprenticeship should complete the following additional modules: 501, 502 and 600.

## **Learners completing the NPTC Level 3 Diploma in Work-based Land-based Engineering Operations as part of the Advanced Apprenticeship framework**

Learners who are completing the NPTC Level 3 Diploma in Work-based Land-based Engineering Operations as part of the Advanced Apprenticeship framework are required to undertake an independent assessment in the form of two short answer written tests and an assignment. The tests may be taken three times a year. Exam dates are available on the Walled Garden. The tests cover the underpinning knowledge elements of the units included within the tests. Test specifications are on the following page.

The assignment and marking criteria can be found in the 0059 NPTC Level 3 Diploma in Work-based Land-based Engineering Operations assignment guide.

Centres will be required to provide Lantra SSC with evidence that the short answer written tests and assignment has been achieved before certification takes place.

### **Appeals and Equal opportunities**

Centres must have their own auditable, appeals procedure. If a learner is not satisfied with the examination conditions or a learner feels that the opportunity for examination is being denied, the Centre Manager should, in the first instance, address the problem. If, however, the problem cannot be resolved, City & Guilds will arbitrate and an external verifier may be approached to offer independent advice. All appeals must be clearly documented by the Centre Manager and made available to the external verifier or City & Guilds if advice is required.

Should occasions arise when centres are not satisfied with any aspect of the external verification process, they should contact Verification Services at City & Guilds.

Access to the qualification is open to all, irrespective of gender, race, creed, age or special needs. The Centre Manager should ensure that no learner is subjected to unfair discrimination on any grounds in relation to access to assessment and to the fairness of the assessment. QCA requires City & Guilds to monitor centres to check whether equal opportunities policies are being adhered to.

For learners with particular requirements, centres should refer to City & Guilds' policy document *The application of reasonable adjustments and special considerations in vocational qualifications*, which is available from [www.nptc.org.uk](http://www.nptc.org.uk)

## **The units**

As units are signed off as completed, the record of units achieved proforma should be updated

## **How to use the Evidence Recording Sheets**

There is a column alongside the assessment criteria. In this Qualification handbook this column is used for assessor guidance. In the Learner's Guide this column is used for recording the evidence. Records of direct observation may be written directly into this column or, if the evidence is on a separate document, The reference of where the evidence can be found should be entered here. If the evidence is cross reference to elsewhere in the Learner Guide and Logbook then the reference to where it may be found should be inserted. For underpinning knowledge criteria, the answers may be written in directly or completed on a separate page which can be referenced in the normal way.

Below is an example of how a recording sheet may look, with entries by the learner, the supervisor and the assessor. Although several people may enter information here, it remains the responsibility of the assessor to judge the evidence presented is sufficient, authentic and valid.

## Exemplar unit

TITLE	Maintain and develop personal performance	Learner's name Tom Goodboy
LEVEL	2	
CREDIT LEVEL	2	
UAN	F/502/1689	
<p>The aim of this unit is to provide the learner with the knowledge and skills to be able to agree and develop their own personal performance with an appropriate person.</p> <p>The learner will maintain and develop personal performance with regard to:</p> <p>(i) working to targets and completing specific tasks</p> <p>(ii) quality of work</p> <p>Evidence from a staff appraisal or review is appropriate, where targets are set and agreed.</p> <p>Relationship to National Occupational Standards : CU5.1</p>		

Learner Outcomes	Assessment Criteria	For inserting direct evidence or referencing to where the evidence can be found
The learner will:	The learner can:	
1. Maintain personal performance	1.1 Identify current competence and areas for development using relevant techniques and processes	Current competence was identified via self assessment and discussion at appraisal interview on 25 <sup>th</sup> June 2008. Identified that updating on current legislation and first aid training are required. See evidence ref 1
	1.2 Carry out work in accordance with responsibilities and organisational requirements	Tom is carrying out his duties to the high standard required by the company. He understands company policies and procedures for setting out work, the standard of work required and meeting targets agreed with customers. He arrives on site with required PPE and clean company uniform, giving a good impression of the company to customers. AB  25 <sup>th</sup> September 2008. Visited Tom on site at 36 High Street. He was fully aware of what the job entailed. His work site was tidy and the customer was very satisfied with the work accomplished so far. ANO



## Exemplar unit

2. Develop personal performance	2.1 Agree personal performance and targets with an appropriate person	Personal targets set on 25 <sup>th</sup> June 2008. See evidence ref 1
	2.2 Review performance and progress regularly and use the outcome to plan future development activities	Performance is reviewed every 3 months. See update 30 <sup>th</sup> September 2008. Evidence ref 2
	2.3 Seek advice from an appropriate person if clarification is required concerning specific tasks	Tom asked about access to neighbouring land when working on the boundary at 46 Church Lane on 14 <sup>th</sup> July 2008. AB  Tom asked for clarification of the order of work at 25 Common Lane on 30 <sup>th</sup> August 2008 AB
	2.4 Seek constructive feedback and advice from others and use it to help maintain and improve performance	Feedback from June has been acted on. Tom has improved his timekeeping since his appraisal. He is working in a more methodical way since our discussion, so that his work area is tidier and safer for Tom and the customers. It also gives a better impression of the company.  Although Tom works well on his own initiative, Tom seeks feedback from me if ever he is unsure what is required of him. Alan Boss 20 <sup>th</sup> October 2008
3. Know how to develop personal performance	3.1 State own limits of responsibility in relation to specific tasks and activities	I have to arrive at the customer's address at the specified time and behave in a manner that gives a good impression to customers. I have to work tidily and steadily and do the jobs in the right order and do them how Joe and Alan have shown me. I have to avoid causing any unnecessary damage to the site and clear up any mess promptly. On longer jobs, I have to make sure I am not leaving hazards unguarded overnight.

## Exemplar unit

	3.2 State who to obtain advice from in relation to specific tasks and activities	Straight forward tasks, I refer to my colleague Joe. More complex things to my supervisor Alan.
	3.3 List the correct procedures for obtaining advice	Initially I ask my colleague Joe, who has been here 5 years, then my supervisor Alan, if Joe can't help. If Alan cannot advise me he tells me where to find the advice or finds out the answer for me.
	3.4 State the risks involved in not obtaining advice where specific tasks and activities are unclear	Safety may be put at risk or the job might not be done how the company or customer wants it to be done
	3.5 Describe how to determine and agree development needs and personal targets	We do this formally at appraisal meeting and 3 monthly reviews. I fill in a self assessment form and then discuss this with Alan.
	3.6 State why personal performance should be reviewed	So that I can improve in my job and advance my career. So that the company has well trained staff that can meet customers' needs and expectations.

## Exemplar unit

### Learner's signature

I confirm that the evidence above is all my own work

**Tom Goodboy** ..... Date 31<sup>st</sup> October 2008.

**Assessor's name**    **A.N.Other** .....

I confirm that the evidence for this unit is complete and meets the requirements for validity, authenticity and sufficiency.

Signed **A N Other** .....Date 31<sup>st</sup> October 2008.

### Internal verifier's signature (if sampled)

.....Date.....

In the example above, Alan Boss is the learner's supervisor, Anthony Other is the assessor and Tom Goodboy is the learner. All 3 can complete sections of the Learner's logbook. Supplementary evidence needs to be referenced as in previous NVQ qualifications. Eg in the example above the learner's Appraisal current skills and action plan would be referenced as Evidence 1. The update form from 30<sup>th</sup> September would be evidence ref 2.

Guidance on the unit is given at the top. Any items of scope are dealt with within the assessment criteria: they do not have to be recorded separately. Alan Boss, and anyone else except the learner and the assessor, would need to complete a line on the Witness status list.

## Unit 301

TITLE	Recognise and Reduce Risks in the Land-based Engineering Work Area	Learner's name
LEVEL	3	
CREDIT LEVEL	5	
UAN	L/601/5307	

The aim and purpose of this unit is to provide the learner with the knowledge and skills and understanding to recognise and reduce risks within a land based engineering work environment.

Relationship to National Occupational Standards: This unit directly relates to O29NLEO1

Learner Outcomes	Assessment Criteria	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
The learner will:	The learner can:		
1. Be able to recognise and reduce risks in the land-based engineering work area	1.1 Identify and evaluate health and safety and environmental hazards and their associated risks in the work area in line with best practice	Identify those who may be at an increased level of risk in the workplace  Evaluate the effectiveness of the measures used to control risks	
	1.2 Assess the effects of attitude, knowledge and experience upon perception of risk in the workplace		
	1.3 Define the term 'so far as is reasonably practicable'		
	1.4 Carry out risk assessment	A task specific and/or work area (health and safety and/or environmental) and report the significant findings as required by law clarifying levels of risk and recommended actions	

## Unit 301

<p>2. Understand how to recognise and reduce risk within the land based engineering work area</p>	<p>2.1 Describe activities in the workplace that give rise to significant risks to health and safety and the environment</p>	<ul style="list-style-type: none"> <li>i) workplace environment</li> <li>ii) work practices</li> <li>Slip, trip and falls</li> <li>Falling objects</li> <li>Entrapment</li> <li>Asphyxiation/inhalation</li> <li>Noise levels</li> <li>Physical limitations</li> <li>Hazardous materials</li> <li>Fire and /or explosion</li> <li>Exposure times</li> <li>Ventilation and extraction</li> <li>PPE and its limitations</li> <li>Climatic conditions</li> <li>Lone working</li> <li>Stored energy</li> </ul>	
		<ul style="list-style-type: none"> <li>i) atmospheric contamination</li> <li>ii) water course contamination</li> <li>iii) soil contamination</li> <li>iv) leakage and spillages</li> <li>v) storage and disposal of products and materials</li> <li>vi) mixing, dilution and / or neutralisation of chemicals</li> <li>vii) selection of environmentally friendly materials</li> <li>viii) Working practices</li> <li>Give examples of changes in work practices and the environment that could increase risk</li> </ul>	

## Unit 301

	2.2 Explain why certain individuals or groups maybe at an increased level of risk and how this can be addressed	Explain how attitude, knowledge and experience influence the perception of risk	
	2.3 Explain the hierarchy of risk control measures	Explain the five steps to risk assessment as advocated by the HSE	
	2.4 Summarise the legislative requirements regulating health and safety and environmental risk assessments	State who should be informed in relation to risk assessment findings  Explain sources of information on health and safety and environmental legislation and implementing best practice	

## Unit 301

### Learner's signature

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### Assessor's name

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## Unit 302

TITLE	Understand and Follow Organisational Procedures within Land-based Engineering Establishments	Learner's name
LEVEL	2	
CREDIT LEVEL	5	
UAN	F/600/3400	
<p>The aim of this unit is to provide the learner with the knowledge, and skills required to understand and follow organisational procedures required by the job role Pre-delivery is not exclusive to new equipment</p> <p>Relationship to National Occupational Standards: This unit directly relates to 029NLE02</p>		

Learner Outcomes The learner will:	Assessment Criteria The learner can:	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
1. Be able to follow organisational procedures	1.1 Follow organisational, departmental and task procedures required of the job role		
	1.2 Complete administrative tasks and record technical information	In line with company and manufacturers and suppliers requirements i) job cards ii) parts requisitions iii) service records iv) warranty records	
	1.3 Prepare and organise to carry out tasks required by the job role		



## Unit 302

	1.4	Locate, access, download, file and store electronic software and copy technical documentation	<ul style="list-style-type: none"> <li>i) service manuals</li> <li>ii) operators manuals</li> <li>iii) service information and history</li> <li>iv) diagnostic information</li> </ul>	
2. Know the organisational procedures required by the job role	2.1	Describe the structure of a given land-based organisation covering: <ul style="list-style-type: none"> <li>i) levels of responsibility and authority</li> <li>ii) methods of communication</li> <li>iii) organisational procedures</li> </ul>	Health and safety <ul style="list-style-type: none"> <li>i) Environmental responsibilities</li> <li>ii) human resource procedures</li> <li>iii) internal and external communications</li> <li>iv) Quality standards</li> <li>v) Efficiency and effectiveness</li> <li>vi) Customer confidentiality</li> </ul>	
	2.2	Describe the procurement, storage, retail and transport of parts	<ul style="list-style-type: none"> <li>i) ordering procedures</li> <li>ii) parts location and identification</li> <li>iii) Quality procedures</li> </ul>	
	2.3	Describe how to complete and process internal and supplier documentation	<ul style="list-style-type: none"> <li>i) timesheets,</li> <li>ii) job cards,</li> <li>iii) parts requisitions,</li> <li>iv) unit records, e.g. engine hours, mileage, etc</li> <li>v) service records</li> <li>vi) Serial numbers</li> <li>vii) Warranty and quality control</li> </ul>	

## Unit 302

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## Unit 303

TITLE	Provide Customer Care within Land-based Engineering Operations	Learner's name
LEVEL	2	
CREDIT LEVEL	5	
UAN	Y/600/3435	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required to provide customer care to customers using land based engineering services		
Relationship to National Occupational Standards: This unit directly relates to 029NLEO 3		

Learner Outcomes The learner will:	Assessment Criteria The learner can:	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
1. Be able to apply customer care principles	1.1 Project the appropriate level of professionalism, personal appearance conduct and behaviour		
	1.2 Communicate information to customers using appropriate methods	Accurately	
	1.3 Describe the importance of meeting customers' expectations		
	1.4 Respect customer and corporate confidentiality		
2. Know how to apply customer care principles	2.1 Describe how to promote a positive image of yourself, colleagues, the organisation and its products and services	State why customer care is important and the components that contribute to customer satisfaction and dissatisfaction	

## Unit 303

	2.2	Describe how to communicate with the customer politely, respectfully and effectively	Including written or verbal updating, taking and passing on messages, supplying information, confirmation of actions, being assertive or compliant	
	2.3	Describe how to recognise different behaviours in customers		
	2.4	State the limits of your authority and responsibility when dealing with customers		
	2.5	State the reasons why customer and corporate confidentiality must be respected		

## Unit 303

### Learner's signature

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### Assessor's name

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## Unit 304

TITLE	Land-based Engineering Operations – Use Calculations	Learner's name
LEVEL	2	
CREDIT LEVEL	5	
UAN	A/600/3430	
The aim of this unit is to provide the learner with the knowledge and skills required to use calculations to support land based engineering principles		
Relationship to National Occupational Standards: This unit directly relates to 029NLE07		

Learner Outcomes	Assessment Criteria	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
The learner will:	The learner can:		
1. Be able to use calculations to support engineering principles	1.1 Use ratios and units of measurement to express values	i) transmissions ii) engine iii) hydraulic iv) pneumatic v) electrical and machine performance including: <ul style="list-style-type: none"> <li>• power</li> <li>• energy</li> <li>• torque</li> <li>• force</li> <li>• specific gravity</li> <li>• pressure</li> <li>• velocity</li> <li>• acceleration</li> <li>• deceleration</li> <li>• reduction ratios</li> <li>• friction</li> <li>• density</li> <li>• flow</li> <li>• resistance</li> <li>• load</li> <li>• current</li> <li>• noise</li> </ul>	

## Unit 304

	1.2 Use conversion factors to convert measurement values from one unit of measurement to another		
	1.3 Calculate/measure: i) areas ii) weights iii) volumes iv) angles v) low rates and speeds vi) scaling		
	1.4 Use physical and theoretical methods to establish measurements where relevant	fuel consumption oil consumption torque reserve lifting force	
	1.5 Verify by calculation the calibration of machinery and equipment		

## Unit 304

<p>2. Know how to use calculations to support engineering principles</p>	<p>2.1 Identify units of measurement used to express values</p>	<p>vi) transmissions vii) engine viii) hydraulic ix) pneumatic x) electrical and machine performance including:</p> <ul style="list-style-type: none"><li>• power</li><li>• energy</li><li>• torque</li><li>• force</li><li>• specific gravity</li><li>• pressure</li><li>• velocity</li><li>• acceleration</li><li>• deceleration</li><li>• reduction ratios</li><li>• friction</li><li>• density</li><li>• flow</li><li>• resistance</li><li>• load</li><li>• current noise</li></ul>	
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## Unit 304

	2.2	State how to use conversion tables	and the conversion factors for calculations	
	2.3	Define the mathematical formulas for: i) area ii) volume iii) circumference	Outline the principles of: <ul style="list-style-type: none"> <li>• Ohms Law</li> <li>• Newton's Law of Motion</li> <li>• Boyle's Law</li> <li>• Pascal's Law</li> </ul>	
	2.4	State the relationship between speed and torque		
	2.5	Describe how to calculate power, torque, force, consumption and application rates		
	2.6	Describe the methods and equipment required to carry out a measuring task and the factors that can distort measurements		
			Describe the methods used to check calibration / application rates	
			Describe the power ratings (BHP or KW) and what they represent including ECE, DIN, SAE	
	2.7	Describe how to measure: i) speed ii) velocity iii) acceleration iv) deceleration v) coefficient of friction	Describe how to calculate speed from ratios and input or output speed	

## Unit 304

### Learner's signature

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### Assessor's name

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## Unit 305

TITLE	Land-based Engineering Operations – Perform Thermal Joining Processes	Learner's name
LEVEL	3	
CREDIT LEVEL	10	
UAN	D/600/3436	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required to safely carry out thermal joining processes		
Relationship to National Occupational Standards: This unit directly relates to 029NLE09		

Learner Outcomes The learner will:	Assessment Criteria The learner can:	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
1. Be able to perform thermal joining	1.1 Prepare the workplace and equipment to carry out a thermal joining process	To include safe shut down of equipment	
	1.2 Set up equipment and carry out preparation of material for positional welding techniques	i) MIG/MAG ii) TIG iii) MMA Use: Clamping Tacking Bevelling Positioning	
	1.3 Join or repair a range of materials producing joints	Of the required quality and dimensions	
	1.4 Identify faults using appropriate inspection techniques		

## Unit 305

2. Understand high temperature thermal joining techniques	2.1 Explain the different techniques used to carry out positional thermal joining procedures	<ul style="list-style-type: none"> <li>i) visual inspection,</li> <li>ii) non destructive and destructive procedures covering</li> <li>iii) undercutting,</li> <li>iv) slag traps,</li> <li>v) penetration,</li> <li>vi) cracking</li> <li>leak testing</li> </ul>	
	2.2 Explain how to prepare and set up MIG/MAG, TIG, MMA welding equipment for positional welding tasks		
	2.3 Explain how to use thermal joining techniques to join and repair	<ul style="list-style-type: none"> <li>i) Cast iron</li> <li>ii) Alloys</li> <li>iii) Dissimilar metals</li> </ul>	
	2.4 Explain the safety preparations and precautions required to minimise risk prior to and during thermal joining and repair processes	<p>Taking into account 4 of each of the following:</p> <ul style="list-style-type: none"> <li>i) Seals</li> <li>ii) Filters</li> <li>iii) Contamination</li> <li>iv) Distortion</li> <li>v) Stress relief</li> <li>vi) Fire and fume hazards</li> <li>vii) Electrical/electronic components and/or systems</li> <li>viii) Ancillary equipment</li> </ul> <p>Precautions</p> <ul style="list-style-type: none"> <li>i) fumes,</li> <li>ii) explosions,</li> <li>iii) heat/fire,</li> <li>iv) sharp edges,</li> <li>v) airborne debris</li> </ul> <p>Personal injury</p>	

## Unit 305

### Learner's signature

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## Unit 306

TITLE	Land-based Engineering Operations – Service and Repair Engines and Components	Learner's name
LEVEL	3	
CREDIT LEVEL	10	
UAN	H/600/3437	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required to perform service and repair procedures on engines within land based engineering.		
Relationship to National Occupational Standards: This unit directly relates to 029NLEO11		

Learner Outcomes	Assessment Criteria	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
The learner will:	The learner can:		
1. Be able to perform service and repair procedures on engines and their components	1.1 Prepare, inspect and record the condition of engines and their components		
	1.2 Use correct measuring equipment to verify compliance of engine components	Covering six of the following: i) Piston and connecting rod ii) Piston ring gapping iii) Cylinder/liner taper, ovality and protrusion iv) Crankshaft journal ovality and end float v) Piston / head clearances vi) Valve, guide, seat, train, operating system vii) Cylinder head / block distortion viii) Engine oil pump Record results and compare with specifications and make recommendations	
	1.3 Investigate failed or worn parts and record and report findings		

## Unit 306

2. Be able to identify engine faults	2.1 Carry out tests to determine the cause of different engine problems	Two of the following: i) Compression ii) Engine power iii) Fuel consumption iv) Fuel pressure	
	2.2 Set and adjust engine performance within specified limits.		
	2.3 Identify and rectify engine system faults		
3. Understand how to analyse and interpret findings from engine inspections and rectify	3.1 Describe how to identify and rectify the cause of engine problems	i) engine performance ii) misfire iii) backfire iv) engine oil pressure v) overheating vi) seizure vii) abnormal noise viii) non starting ix) excessive crank case breathing x) oil consumption fuel delivery and system pressures xi) air intake charge pressures xii) abnormal fuel usage injection, cam shaft and ignition timing xiii) emissions including blue, white or black smoke engine performance not in accordance with manufacturers' specification xiv) weak and rich fuel mixtures xv) restricted intake and exhaust air flow xvi) verifying governor operation xvii) operation of cold starts	
	3.2 Explain the methods of sealing combustion chambers, fuel and ignition systems.		

## Unit 306

	3.3	Describe the effects of moisture and contaminants in fuel and ignition systems		
	3.4	Explain the procedure to verify correct engine timing covering both static and dynamic timing	Explain how to carry out the following tests to determine the cause of different engine problems i) Compression ii) Engine power iii) Fuel consumption iv) Fuel pressure	
4.	Understand how to take engine measurements	4.1 Describe the methods and techniques of taking engine specific measurements	i) piston ring gapping ii) cylinder, liner, taper, ovality and protrusion iii) crank shaft journal ovality and end float iv) piston/head clearance v) valve, guide, seat, train, operating system vi) cylinder head and ancillary components	



## Unit 306

### Learner's signature

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## Unit 307

TITLE	Service and Repair Suspension Systems on Land-based Equipment	Learner's name
LEVEL	3	
CREDIT LEVEL	5	
UAN	K/600/3438	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required service and repair suspension systems and components on land based equipment		
Relationship to National Occupational Standards: This unit directly relates to 029NLE021		

Learner Outcomes The learner will:	Assessment Criteria The learner can:	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
1. Be able to perform service and repair operations on suspension systems and their components	1.1 Remove, dismantle repair and reinstate suspension systems and components to manufacturer's specifications	<ul style="list-style-type: none"> <li>i) Cab suspension</li> <li>ii) Seat suspension</li> <li>iii) Axle suspension</li> </ul>	
	1.2 Diagnose faults in suspension assemblies and their components and recommend actions	Appropriate	
2. Understand the construction, function and operation of suspension systems	2.1 Describe the types, construction and operating principles of suspension assemblies and their components	<ul style="list-style-type: none"> <li>i) cab mounts</li> <li>ii) dampers</li> <li>iii) springs</li> <li>iv) accumulators</li> <li>v) levelling devices</li> <li>vi) cab and seat</li> </ul>	

## Unit 307

	2.2	Describe how to remove, dismantle, repair and reinstate suspension assemblies and components	To operator's/manufacturers' specifications i) cab suspension ii) seat suspension iii) axle suspension	
	2.3	Describe how to diagnose faults in suspension assemblies and components and recommend actions		

## Unit 307

### Learner's signature

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### Assessor's name

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## Unit 308

TITLE	Maintain Electronic Control and Monitoring Systems on Land-based Equipment	Learner's name
LEVEL	3	
CREDIT LEVEL	10	
UAN	M/600/3439	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required to maintain electronic control and monitoring systems on land based equipment		
Relationship to National Occupational Standards: This unit directly relates to 029NLEO23		

Learner Outcomes The learner will:	Assessment Criteria The learner can:	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
1. Be able to maintain electronic control and monitoring systems	1.1 Identify and locate, electronic control and monitoring systems and their components to retrieve and interpret stored information	To meet manufacturer's specifications	
	1.2 Establish parameters, calibrate and verify performance of the electronic control and monitoring systems		
	1.3 Maintain electronic control and monitoring systems and their components to confirm integrity		
	1.4 Prepare the system to be tested and carry out a diagnostic test using diagnostic tools and equipment to evaluate or rectify system performance		

## Unit 308

2. Understand how to maintain electronic control and monitoring systems	2.1 Summarise electronic control and monitoring systems and their application	<ul style="list-style-type: none"> <li>i) engine management</li> <li>ii) transmission management</li> <li>iii) headland management</li> <li>iv) performance monitoring</li> <li>v) closed circuit television monitoring</li> <li>vi) equipment instrumentation</li> <li>vii) driver information</li> <li>viii) suspension control</li> <li>ix) hydraulic control</li> <li>x) pilot steering</li> <li>xi) global positioning service</li> <li>xii) multiplexing</li> <li>xiii) telemetry</li> <li>xiv) automatic guidance systems</li> </ul>	
	2.2 Summarise how control and monitoring signals are generated and communicated and the causes and effects of interference	<ul style="list-style-type: none"> <li>i) CAN bus</li> <li>ii) ISO bus</li> <li>iii) GPS/satellite</li> </ul> <p>State the causes and effects of interference and summarise the methods of inhibiting external influences</p> <ul style="list-style-type: none"> <li>i) wireless</li> <li>ii) Pulse Width</li> <li>iii) Modulation PWM</li> </ul>	
	2.3 Summarise the function of electronic components	<p>The following components:</p> <ul style="list-style-type: none"> <li>i) transistors</li> <li>ii) capacitors</li> <li>iii) regulators</li> <li>iv) resistors</li> <li>v) transformers</li> <li>vi) thermisters</li> <li>vii) transducers</li> <li>viii) transmitters</li> <li>ix) actuators</li> <li>x) electronic control units (ECU)</li> </ul>	

## Unit 308

		2.4 Summarise the types and methods of inhibiting external electronic influences i) screening ii) twisted pairs i) grounding/earthing	
	2.4 Describe the tools and equipment used to test, repair and reinstate electronic control and monitoring systems and their components		
	2.5 Describe the methods used to check and maintain system integrity	i) connections ii) wiring routes/fixings iii) grounding/earthing	
	2.6 Summarise how to retrieve, interpret, reinstate and verify information stored in electronic control units (ECU)	Summarise how to calibrate and verify the correct operation of electronic control and monitoring equipment	

## Unit 308

### Learner's signature

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### Assessor's name

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## Unit 309

TITLE	Service and Repair Hydraulic Systems and Components on Land-based Equipment	Learner's name
LEVEL	3	
CREDIT LEVEL	5	
UAN	H/600/3440	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required to repair and service hydraulic systems in land based equipment		
Relationship to National Occupational Standards: This unit directly relates to 029NLEO24		

Learner Outcomes The learner will:	Assessment Criteria The learner can:	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
1. Be able to perform service and maintenance operations on hydraulic systems and their components	1.1 Inspect performance of hydraulic systems and components	and evaluate	
	1.2 Prepare the system to be tested and carry out tests using diagnostic tools to assess system performance		
	1.3 Interpret diagnostic results and recommend actions	Appropriate	
	1.4 Remove, dismantle, repair and reinstate system and components to manufacturer's specifications		

## Unit 309

2. Understand the construction, function and operation of hydraulic circuit systems and their components used in land based engineering applications	2.1	Interpret circuit diagrams and symbols and their functions within the system	
	2.2	Explain how to dismantle, repair and reinstate hydraulic components and systems	To manufacturer's specifications
	2.3	Explain the application of valves and the function of hydraulic systems and components	Valves i) orbitrol valves ii) Proportional valves iii) load sensed circuits iv) hydrostatic circuits v) trailer brake valves
			Hydraulic systems and components i) Hydraulic pumps and motors fixed and variable displacement ii) Hydraulic pressure maintaining valves, relief valves, shock valves iii) Hydraulic control valves, distributors, solenoid valves, proportional valves, pressure differential valves, pilot operated valves, trailer brake valve iv) Hydraulic rams, single, acting, double acting and cushioned v) Hydraulic direction flow valves, flow dividers, orbital valves, priority valves, restrictors vi) Reservoirs i) Accumulators
	2.4	Identify diagnostic test/s that will evaluate hydraulic system performance	and justify
	2.5	Interpret and compare test results	To manufacturers specifications and summarise options and recommendations

## Unit 309

### Learner's signature

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### Assessor's name

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## Unit 310

TITLE	Service and Repair Pneumatic Systems and Components for Land-based Equipment	Learner's name
LEVEL	3	
CREDIT LEVEL	5	
UAN	K/600/3441	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required to carry out service and repair on pneumatic systems and components for land based equipment		
Relationship to National Occupational Standards: This unit directly relates to 029NLE025		

Learner Outcomes	Assessment Criteria	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
The learner will:	The learner can:		
1. Be able to perform service and repair operations on pneumatic systems and components	1.1 Inspect performance of pneumatic systems and components	and evaluate	
	1.2 Prepare system to be tested and carry out tests using diagnostic tools		
	1.3 Interpret and record the results and recommend action	Appropriate	
	1.4 Remove, dismantle, repair and reinstate system and components to manufacturers' specification		

## Unit 310

2. Understand the construction, function and operation of pneumatic systems and components used in land-based engineering	2.1 Interpret circuit diagrams and symbols and their functions within a pneumatic system		
	2.2 Explain the application and function of pneumatic systems and components	<ul style="list-style-type: none"> <li>i) air compressors, air pressure regulating valves</li> <li>ii) relief valves</li> <li>iii) dump valves</li> <li>iv) air pressure control valves</li> <li>v) hand brake valves</li> <li>vi) foot brake valves</li> <li>vii) diaphragm operated valves</li> <li>viii) air activated cylinders,</li> <li>ix) air cushions</li> <li>x) fail-safe/ emergency system components,</li> <li>xi) air receivers and dryers</li> </ul>	
	2.3 Explain diagnostic tests and how to interpret the results	Summarise the options and recommendations that are formulated from the test results	
	2.4 Describe how to dismantle, repair and reinstate pneumatic systems and components		

## Unit 310

### Learner's signature

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### Assessor's name

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## Unit 311

TITLE	Service and Repair Powershift, Hydrostatic and CVT Transmissions on Land-based Equipment	Learner's name
LEVEL	3	
CREDIT LEVEL	10	
UAN	M/600/3442	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required carry out service and repair on powershift, hydrostatic, CVT transmission on land based equipment		
Relationship to National Occupational Standards: This unit directly relates to 029NLE027		

Learner Outcomes	Assessment Criteria	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
The learner will:	The learner can:		
1. Be able to perform service and repair operations on powershift, hydrostatic and CVT transmissions and their components	1.1 Identify transmissions and their components	<ul style="list-style-type: none"> <li>i) powershift,</li> <li>ii) hydrostatic and</li> <li>iii) CVT transmissions</li> </ul>	
	1.2 Remove, dismantle, repair and reinstate transmission to manufacturer's specification and standards	Prepare transmission to be tested	
	1.3 Perform operational and diagnostic tests identifying and categorising faults in transmission	<ul style="list-style-type: none"> <li>i) Mechanical</li> <li>ii) Hydraulic</li> <li>iii) Electrical / electronic</li> <li>iv) Operator use</li> </ul> Record faults and recommend appropriate action	

## Unit 311

2. Understand the construction function and operation of powershift, hydrostatic, CVT transmissions and their components	2.1 Interpret technical documentation relating to transmissions to perform diagnostic tests	<ul style="list-style-type: none"> <li>i) drive paths</li> <li>ii) shift and engagement patterns</li> <li>iii) stationary and rotating components</li> <li>iv) fault codes</li> </ul> <ul style="list-style-type: none"> <li>i) monitoring intermittent faults</li> <li>ii) simulation</li> <li>iii) substitution</li> </ul> Operational tests	
	2.2 Explain the different types of transmissions including layout, construction, operating principles and function	<ul style="list-style-type: none"> <li>i) speed sequencing and / or matching components</li> <li>ii) directional change and / or shuttle components</li> <li>iii) range change and variable speed components</li> <li>iv) speed monitoring devices</li> <li>v) transmission clutching and braking components</li> <li>vi) single and multiple epicyclic units</li> <li>vii) variable displacement pumps</li> <li>viii) hydrostatic motors</li> <li>ix) safety and protection devices</li> <li>x) operational limitations (stationary work) (towing) (bump starting) (engine braking)</li> </ul> Explain why it is necessary to time certain transmission components	
	2.3 Describe how to remove, dismantle, repair and reinstate powershift, hydrostatic, CVT transmissions and their components	to manufacturer's specification and standards	



## Unit 311

	2.4	Evaluate faults in powershift, hydrostatic and CVT transmissions using operational and diagnostic test data	i) (Mechanical ii) Hydraulic iii) Electric / electronic iv) Operator use	
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## Unit 311

### Learner's signature

I confirm that the evidence above is all my own work

..... Date .....

### Assessor's name

I confirm that the evidence for this unit is complete and meets the requirements for validity, authenticity and sufficiency.

Signed.....Date .....

### Internal verifier's signature (if sampled)

.....Date.....

## Unit 312

TITLE	Refrigerant Handling	Learner's name
LEVEL	3	
CREDIT LEVEL	2	
UAN	L/601/5310	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required to handle refrigerants		
Relationship to National Occupational Standards: This unit directly relates to 029nLEO28		

Learner Outcomes	Assessment Criteria	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
The learner will:	The learner can:		
1. Be able to handle refrigerants in accordance with legislation	1.1 Identify and locate air conditioning systems and their components		
	1.2 Identify the correct refrigerant types and system capacities according to application		
	1.3 Use the appropriate tools and equipment to carry out refrigerant handling activities recovery		
	1.4 Follow safety procedures to collect and transfer any waste material in accordance with relevant legislation and policies		
	1.5 Maintain and process appropriate records		
2. Know how to handle refrigerants in accordance with legislation	2.1 Describe the operating principles and function of Mobile Air Conditioning (MAC) and fixed plant refrigeration systems and components		

## Unit 312

	2.2	Describe types of refrigerants and their properties, characteristics and environmental impact		
	2.3	Describe how to handle refrigerants including recovery, testing (pressure or vacuum), flushing and recharging in Mobile Air Conditioning and fixed plant refrigeration systems		
	2.4	Describe how to work in a way which minimises the risk of any refrigerant emissions		

## Unit 312

### Learner's signature

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## Unit 313

TITLE	Service and Repair of Land-based Air Conditioning, Climate Control and Refrigeration Plant and Equipment	Learner's name
LEVEL	3	
CREDIT LEVEL	3	
UAN	F/601/5305	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required service and repair land based air conditioning, climate control and refrigeration plant and equipment		
Relationship to National Occupational Standards: This unit directly relates to 029NLEO28		

Learner Outcomes	Assessment Criteria	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
The learner will:	The learner can:		
1. Be able to perform air conditioning, climate control and refrigeration service and maintenance operations	1.2 Remove, dismantle, inspect, repair and reinstate systems and/or components	To legislative and manufacturer's specifications and standards Identify and locate system types and their components as appropriate	
	1.2 Select and use the appropriate tools and equipment to carry out testing and maintenance activities	To manufacturer's specifications and standards i) leak testing ii) pressure testing iii) vacuum testing iv) gas recovery v) system flushing vi) recharging vii) performance testing viii) Maintenance  Carry out operational checks and/or tests to establish system functionality	

## Unit 313

	1.3 Diagnose and rectify different faults	Five faults i) compressor and / or drive failure ii) refrigerant loss iii) restricted refrigerant flow iv) restricted air flow v) faulty switch and / or sensors vi) faulty temperature controls vii) under / over charge of refrigerant or lubricant viii) system contamination and/or corrosion	
	1.4 Collect, transfer and dispose of any waste material following current legal and environmental requirements		
	1.5 Maintain appropriate records		

## Unit 313

2. Understand the construction function and operation of air conditioning, climate control and refrigeration systems and their components	2.1	Describe the types, construction, function and operating principles of air conditioning, climate control and refrigeration systems and their components	<ul style="list-style-type: none"> <li>i) compressors and their drives,</li> <li>ii) couplings,</li> <li>iii) pipes and hoses</li> <li>iv) condenser</li> <li>v) evaporator</li> <li>vi) receiver drier</li> <li>vii) thermostats</li> <li>viii) control and thermal expansion valves (TXV), fixed orifice tube (FOT)</li> </ul>	
	2.2	Explain how to carry out operational checks and diagnostic tests to establish system functionality	<ul style="list-style-type: none"> <li>i) compressor drive</li> <li>ii) switches and controls</li> <li>iii) cooling rate/effectiveness</li> <li>iv) condensation and or icing</li> <li>v) insulation, air flow</li> <li>vi) filter inspection</li> </ul> <p>Explain how to evaluate tests results Justify appropriate diagnostic conclusion/s based on test results</p>	
	2.3	Describe how to recognise and rectify faults	<ul style="list-style-type: none"> <li>i) compressor and or/drive failure, refrigerant loss</li> <li>ii) restricted refrigerant /air flow,</li> <li>iii) faulty switch and/or sensors</li> <li>iv) temperature controls</li> <li>v) under/over charge of refrigerant or lubricant</li> <li>vi) system contamination and /or corrosion</li> </ul>	
	2.4	Describe how to collect, transfer, dispose of any waste material following current legal and environmental requirements		



## Unit 313

	2.5	Summarise the procedures, tools and equipment to remove dismantle, inspect and reinstate air conditioning and refrigeration components	To legislative and manufacturer's specifications and standards  Explain how to select and use the appropriate tools and equipment to include all of the following <ul style="list-style-type: none"> <li>i) maintenance</li> <li>ii) leak testing</li> <li>iii) recovery</li> <li>iv) flushing</li> <li>v) recharging</li> <li>vi) performance testing</li> <li>vii) pressure testing</li> <li>viii) vacuum testing</li> </ul>	
	2.6	Explain what relevant documentation should be used when handling refrigerants	and how to maintain the appropriate records	

## Unit 313

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## Unit 314

TITLE	Monitor the Handover and Installation of Land-based Equipment	Learner's name
LEVEL	3	
CREDIT LEVEL	5	
UAN	T/600/3443	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required to prepare for and handover the installation of land-based equipment		
Relationship to National Occupational Standards: This unit directly relates to 029NLEO29		

Learner Outcomes The learner will:	Assessment Criteria The learner can:	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
1. Be able to perform the handover and installation of land-based equipment	1.1 Identify a suitable location, agree and prepare for hand over and installation with customer		
	1.2 Use the correct procedure to handover and install the equipment as specified	<ul style="list-style-type: none"> <li>i) legal</li> <li>ii) machine economic</li> <li>iii) performance</li> <li>iv) efficiency</li> <li>v) professionalism</li>   <li>i) handbooks</li> <li>ii) stop procedures</li> <li>iii) safety issues</li> <li>iv) control and operation techniques</li> <li>v) maintenance</li> <li>vi) service schedules</li> <li>vii) warranty and terms and conditions</li> </ul>	
	1.3 Use an appropriate format to record the results of the installation	vii) Recipient to sign	

## Unit 314

2. Understand how to perform the handover and installation of land-based equipment	2.1	Identify the reasons and benefits of handover and installation of products	<ul style="list-style-type: none"> <li>i) legal</li> <li>ii) machine economic</li> <li>iii) performance</li> <li>iv) efficiency</li> <li>v) professionalism</li> </ul>	
	2.2	Describe how to carry out an installation using a systematic process and the relevant quality control systems including special machine characteristics	<ul style="list-style-type: none"> <li>i) handbooks</li> <li>ii) stop procedures</li> <li>iii) safety issues</li> <li>iv) control and operation techniques</li> <li>v) maintenance</li> <li>vi) service schedules</li> <li>vii) warranty and terms and conditions</li> </ul> Recipient to sign	
	2.3	Describe technical advice and assistance within limits of own authority and how to deal with queries and problems		

## Unit 314

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## Unit 315

TITLE	Inspect and Test Land-based Machinery and Equipment	Learner's name
LEVEL	3	
CREDIT LEVEL	10	
UAN	A/600/3444	
The aim of this unit is to provide the learner with the knowledge, understanding and skills required to inspect and test land-based machinery and equipment		
Relationship to National Occupational Standards: This unit directly relates to 029NLEO30		

Learner Outcomes The learner will:	Assessment Criteria The learner can:	Assessment Requirements (appropriate to the qualification route taken)	For inserting direct evidence or referencing to where the evidence can be found
1. Be able to inspect and test land-based machinery and equipment	1.1 Establish the objectives of the inspection or test	Covering three activities i) compliance (manufacturer's/ technical/ legislation) ii) verification of repair iii) accident or incident occurrence iv) diagnosis	
	1.2 Observe and record information to evaluate the condition, application and performance of equipment	Relevant service history Technical reference date	
	1.3 Identify and rectify faults in equipment which cause crop or product loss	Investigate failed and/or worn parts and record the findings	

## Unit 315

2. Be able to analyse and interpret findings	2.1	Check the data gathered is accurate and takes account of test conditions	Eliminate any influence of external factors affecting the performance	
	2.2	Recognise the cause and effect of failure(s)		
	2.3	Analyse the data using approved methods and procedures	e.g. dynamometer tests, oil sampling Compare the analysis against the product specification and identify any deviations  Determine the implications of the findings	
	2.4	Present findings and recommendations		
3. Understand how to Inspect and test land-based machinery and equipment	3.1	Describe methods used to investigate intermittent faults		
	3.2	Describe the causes and symptoms of malfunction		
	3.3	Describe the methods, diagnostic and specialist equipment used to establish conformity with manufacturer's, technical and legislation requirements	Appropriate Methods i) logical elimination ii) simulation iii) comparison iv) isolation of components v) comparing results against Manufacturers specification	

## Unit 315

	3.4	Describe the difference between a characteristic and a malfunction	Explain how to analyse, interpret and present findings	
4. Understand how to formulate and recommend actions	4.1	Describe actions that could be considered following inspection and testing and their implications	<p>The range of Action</p> <ul style="list-style-type: none"> <li>i) replace</li> <li>ii) repair</li> <li>iii) modify</li> <li>iv) update</li> <li>v) substitution</li> <li>vi) impound</li> <li>vii) beyond economic repair</li> <li>viii) service</li> <li>ix) pass / fail</li> <li>x) unsafe</li> </ul> <p>Implications</p> <ul style="list-style-type: none"> <li>i) warranty</li> <li>ii) cost effectiveness</li> <li>iii) integrity of repair</li> <li>iv) insurance considerations</li> <li>v) timescale</li> <li>vi) health and safety</li> <li>vii) impact on dealership operations</li> <li>viii) impact on the customers' operations</li> </ul>	
	4.2	Explain how to recognise the need for operator training requirements to avoid reoccurrence of failures		



## Unit 315

		<p>Explain how to classify a repair</p> <ul style="list-style-type: none"><li>i) warranty</li><li>ii) insurance claim</li><li>iii) forced breakage</li><li>iv) lack of maintenance</li><li>v) unauthorised intervention</li><li>vi) sabotage/ vandalism</li><li>vii) overload</li><li>viii) operator abuse</li><li>ix) inappropriate usage</li></ul>	
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## Unit 315

### Learner's signature

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