

National Electrotechnology Training Package – UTE 99

**Electrotechnology
Trainer / Assessor Guide**





Department of Education, Training and Youth Affairs

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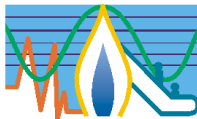
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This project was managed by the Australian National Training Authority on behalf of the Department of Education, Training and Youth Affairs.

First published:
STOCKCODE:
ISBN:
AEShareNet:
Version:
Release date:



ACN 070 582 017
ABN 22 070 582 017

Printed for:
**ElectroComms & EnergyUtilities Qualifications Standards
Body of Australia Limited (EEQSBA)**

Library classification information

Name of publisher:
Place of publication:
Name and address of Printer:

Writer: West Coast College of TAFE
Editor: West Coast College Editorial Staff

Table of contents

| | |
|---|-----------|
| Part 1 National Training Structures | 4 |
| 1.1 Training Reform in Australia | 4 |
| 1.2 National Training Framework (NTF) | 4 |
| 1.3 Australian Quality Training Framework (AQTF)..... | 5 |
| 1.4 Training Packages | 5 |
| 1.5 Australian Qualification Framework (AQF) | 5 |
| Part 2 Training in the Electrotechnology Industry | 6 |
| Overview | 6 |
| Assessment of Training Outcomes | 7 |
| National Advisory Groups | 8 |
| Part 3 Electrotechnology Industry Training and Assessment Model..... | 9 |
| 3.1 Overview | 9 |
| 3.2 Units of Competence | 10 |
| 3.3 On-the-Job Development..... | 11 |
| 3.4 Off-the-Job Development..... | 13 |
| 3.5 Final Decision | 14 |
| 3.6 Qualification (Modules) to Units of Competence | 14 |
| 3.7 Learning Strategies to Units Relationship..... | 14 |
| 3.8 Training and Assessment Module | 15 |
| Appendix A | 15 |
| A1 - Qualification structure | 16 |
| A2 - Example of a unit of competence | 17 |
| A3 - Example of module map | 21 |
| Appendix B | 22 |
| B1 – Workplace report module | 23 |
| B2 – Knowledge & skills module..... | 25 |
| Appendix C | 30 |
| C1 – Workplace experiences | 31 |
| C2 – Educational delivery | 31 |
| Appendix D | 32 |
| D1 – Assessment, workplace experience..... | 32 |
| D2 – Assessment, knowledge and skills..... | 34 |

Part 1 – National Training Structures

1.1 Training Reform in Australia

The 1970s and 1980s saw the beginning of a gradual shift from Australia's traditional reliance on primary industries such as mining and agriculture, to a growing emphasis on the development of a strong manufacturing, service and technology base. This shift necessitated a change from traditional practices in training, to a focus on producing a highly skilled and well-trained work force, which could ensure national competitiveness in an increasingly globalised, world market.

A number of key reports (Deveson, Mayer, Finn, Carmichael) provided the basis for the overhauling of the Australian training system. An expanded, more inclusive and nationally unified system was envisaged. It was to respond to individual needs and specific industry training requirements. It would provide nationally recognised qualifications.

In 1992 the Australian National Training Authority (ANTA) was established to administer a cooperative, strategic federal system of vocational training with strategic input by industry.

The late 1990s saw the introduction of New Apprenticeships and Vocational Education and Training (VET) in schools, the establishment of the National Training Framework (NTF) and the development of Training Packages.

1.2 National Training Framework

The NTF is intended to provide a nationally consistent system, which enables registered training organisations (RTOs) to:

- provide flexible and responsive training and assessment services for Australian enterprises to compete in a global environment;
- provide individuals with opportunities to optimise their potential
- issue qualifications that are nationally recognised.

The NTF is made up of the Australian Quality Training Framework (AQTF) and Training Packages.

1.3 Australian Quality Training Framework

The AQTF frames standards that are used to evaluate the quality of an RTOs' delivery and assessment systems, client services and administrative systems. The AQTF ensures that all RTOs and the qualifications they issue are recognised throughout Australia.

1.4 Training Packages

A Training Package describes the skills and knowledge needed to perform effectively in the workplace. Training Packages are developed by industry through the National Industry Training Advisory Bodies (ITABs), recognised bodies or by enterprises to meet the identified training needs of specific industries or industry sectors.

Training Packages firstly undergo a quality assurance process. They are then endorsed by the National Training Quality Council (NTQC) and placed on the National Training Information Service (NTIS).

Reviews ensure Training Packages remain current to meet industry needs and allow issues that arise during their implementation to be addressed.

1.5 Australian Qualification Framework

The AQF is a single, coherent framework for nationally recognised qualifications from Senior Secondary Certificates through to Doctoral Degrees. Within the framework there are six VET qualifications available, namely: Certificates I, II, III and IV; Diploma and Advanced Diploma.

Part 2 – Training in the Electrotechnology Industry

2.1 Overview

The standard of performance of a competent worker is described in Competency Standards. This is the standard required by industry for certifying relevant technical, productive and safe work practices.

Units of Competency, Assessment Guidelines and Qualifications for vocational training in the electrical, electronic and associated industry areas are found in various National Training Packages. Training Packages show how individual Units of Competency can be logically grouped together to form National Qualifications. The Assessment Guidelines provide general information mostly related to broad processes, which informs and guides Registered Training Organisations (RTOs) about their own policy arrangements for managing assessment activities.

National Training Packages provide no specific advice regarding the delivery of training to aid the achievement of competence. Therefore, to assist RTOs with the management of Vocational Education and Training a guideline Training and Assessment Model has been developed.

The model that best accommodates a learner who has had no prior experiences (new entrant) in the industry is one that recognises that learning occurs:

- from directed workplace learning activities followed by recurring experiences of these activities, together with
- a structured educational program.

This model is based on a combination of on, and off-the-job learning experiences. It recognises that learning occurs in an active way and involves appropriate learning strategies. The model provides coherence between respective components. It also represents:

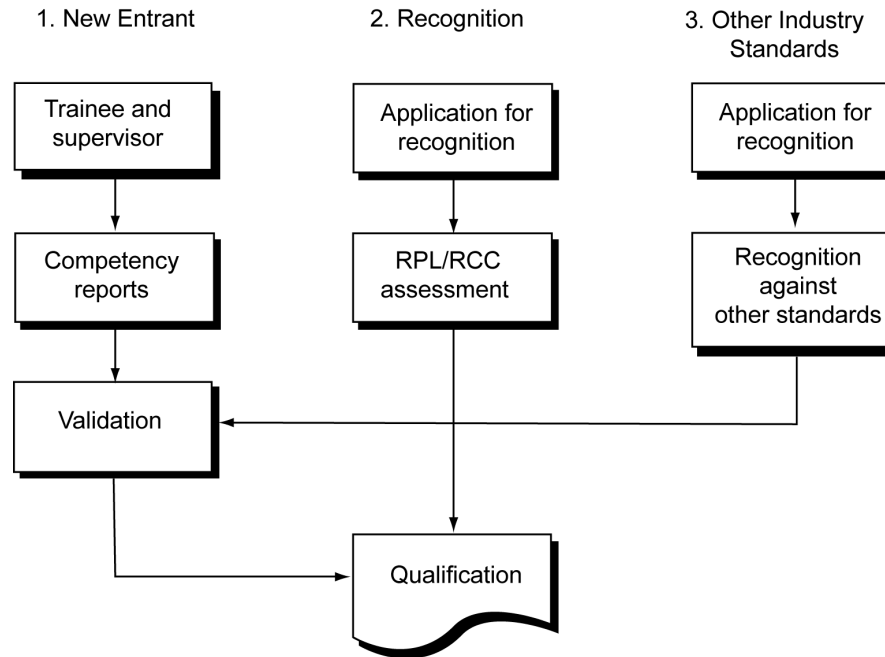
- a most effective and efficient means of delivering quality education and training, and
- a means of assessing if learning has occurred and competence has been attained.

The model is shown in a diagram at the end of this document. Specific information associated with each component part of the model is outlined below.

2.2 Assessment of Training Outcomes

Individuals are assessed to determine if they have the requisite knowledge and skills and how to apply them for effective work performance. The national Training Package provides for three assessment pathways as shown in the following diagram.

Assessment Model - Pathways



These pathways are further expanded in the Assessment Guidelines section of the National Training Package.

Irrespective of the pathway taken to achieve or prove competence, the assessment is against the performance benchmarks described in individual Units of Competence.

Units of Competence are not in themselves a training specification nor do they provide all of the necessary resources needed by recognised training and/or assessment organisations.

The way in which training and/or assessment is conducted and the way in which these processes are resourced depends on the requirements outlined in Units of Competence, the characteristics and background of the individuals involved in training or who are seeking recognition.

The processes of vocational education, training and assessment and the supporting resources for a new entrant are, typically, more extensive than those required for assessing someone seeking recognition of their prior learning or current competence. These processes and resource requirements are outlined in the remainder of this Guide. It should be noted that many of the same resources could be used to support the processes associated with the recognition of prior learning or current competence.

2.3 National Advisory Groups

The National Electrotechnology Training Advisory Group (NETAG) - is a body that advises the National Electrotechnology Competency Advisory Council, about the maintenance of the National Electrotechnology Training Package (NETP). NETAG provides advice on matters of learning and assessment strategies with relation to the Training Package. It comprises one State/Territory ITAB Electrotechnology Training Advisory Group (ETAG) member (established in each State/Territory by the State/Territory ITAB) representing public/private RTOs in their State or Territory. Each representative is a technical expert in learning and assessment strategies. All State/Territory ITAB Network Executive Officers are automatically members of NETAG and actively participate. It formally meets no less than twice per year and is coordinated by the EEQSBA. It discusses all matters pertaining to the NETP and aims to review, resolve and recommend matters related to the endorsed, and in particular, the non-endorsed (Support Materials) components.

The membership of NETAG and each representative's contact details are available at www.eeqsba.com.au

Part 3 – Electrotechnology Industry Training and Assessment Model

3.1 Overview

The performance benchmark of a competent worker is described in Competency Standards (see Appendix 1). This benchmark is the standard required by industry for certifying relevant technical, productive and safe work practices. Individual workers are assessed against these standards.

Competency Standards along with guidelines for managing assessments and qualification requirements are found in National Training Packages. From this, individual Units of Competence are logically grouped together to form National Qualifications that are issued to individuals who meet all the specified requirements.

Assessment Guidelines provide information about a number of different pathways and processes that can be followed to affirm competence, along with other general information.

National Training Packages provide no specific advice regarding the delivery of training. In relation to assessment arrangements, advice is confined to broad processes. Therefore, to assist Registered Training Organisations with the management of Vocational Education and Training, a guideline Training and Assessment Model has been developed.

The model that best accommodates a learner who has had no prior experiences (new entrant) in the industry, for which National Training Packages have been written, is one that recognises that learning occurs from:

- directed workplace learning activities followed by recurring experiences of these activities, together with
- a structured educational program.

The model is based on a combination of on and off-the-job learning experiences. It recognises that learning occurs in an active way and involves appropriate learning strategies. The model provides coherence between respective components. It also represents:

- the most effective and efficient means of delivering quality education and training, and
- a means of assessing if learning has occurred and competence has been attained.

The learning and assessment model is shown in a diagram at the end of this document. Specific information associated with each component part of the model is outlined below.

3.2 Units of Competence

Units of Competency are specifications of work performance and do not provide information about the provision of training or detailed ways about how assessment activities are carried out. Hence, given the nature of the information (content and its interrelationship) contained within the Units of Competence there is the potential for a variety of interpretations to occur when RTOs are designing training programs.

Consequently there is the likelihood for considerable variation and inconsistency in delivery and assessment outcomes among RTOs; that is, the outcomes are different, even if the *process*¹ for assessing competence against individual Units is similarly applied.

Using agreed learning strategies (see below) that are commonly adopted by all RTOs could significantly reduce the likelihood of variation and increase the consistency of assessment outcomes among RTOs, as they provide:

- clarification of the relationship of the underpinning knowledge and skills in different sections of the Unit of Competence, for the purpose of learning efficacy and delivery efficiency, of which a modular approach for training delivery is derived
- clear and specific details of the breadth and depth of the information required for delivery and achievement of competency
- more information regarding what constitutes sufficient and appropriate evidence for attributing competence
- a means of delivering education and training in manageable lots that can be assessed, reported and administered in ways that suit learners and RTOs

Note: The modular approach encompasses the term module² or module descriptors. Modules are based on subject matter and are used to describe a detailed learning strategy. A module or module descriptor is generally a document of approximately five pages that has been derived from the Units of Competency within the Competency Standards part of a National Training Package. The quantum, breadth and depth of individual modules associated with each Unit of Competency, depends largely on the technical nature of the Unit and the educational efficacy needed to ensure learning is effected.

Additional support materials including delivery materials and assessment instruments based on agreed learning strategies, further improve quality and consistency in outcomes.

¹ Process relates to gathering data, analysing the data, making a decision about what is analysed and reporting the outcome

² Module refers to and includes underpinning Knowledge and Skills Module (K&SM) related to off-the-job training and Work Performance Module (WPM) related to the on-the-job training

3.3 On-the-Job Development

A learner's on-the-job development relates to the application of the knowledge and skills (generally learned/acquired as part of the off-the-job development). This knowledge and these skills are then more fully developed by repetitive reinforcement on-the-job. This is a process that involves directed workplace activities that are closely supervised as well as routine events that are more generally supervised. Furthermore, it will involve gradual exposure of the learner to more complex activities with increasing autonomy in on-the-job activities.

3.3.1 Learning Strategies – Work Performance Modules

The purpose of a Work Performance Module (WPM) is to bring together information from relevant parts of a Unit of Competence that relates to routine day-to-day work activities as well as providing clarification regarding the type and quantity of evidence needed for training and assessment purposes.

In the workplace setting activities are planned for, then undertaken on a range of items of apparatus and equipment, using a variety of tools, procedures, tests and so forth, normally found and/or used in the workplace. Once the work is completed appropriate strategies and processes such as housekeeping, documentation, return to service permits, are followed. Consequently the most effective way of confirming that both the knowledge and skills are being applied is one that captures information relating to routine day-to-day work.

3.3.2 Experiences – On-the-Job

Both the equipment within the normal work environment and the learner's immediate supervisor³ are readily available resources for the development and reporting of workplace experiences.

Learners need to keep a record of their work experiences and have them regularly checked for accuracy and clarity by their supervisor. These records can be used to verify that the learner has undertaken the full range of experiences outlined in a Unit of Competency, which in turn provide management information to the learner's supervisor regarding how work is allocated.

3.3.3 Assessment - On-the-Job

The record of on-the-job experiences (3.2 above) can also be used for submitting evidence for making judgments about the learner's on-the-job performance. For assessment purposes, evidence provided by a learner needs to be compared to the requirements outlined in the WPMs. The evidence needs to be accurate and gathered in a logical way so it can be easily analysed. Additionally, the evidence must be sufficient, current and authentic and should be gathered regularly and submitted for analysis in a timely manner.

³ Supervisor – refers to a person who is competent in the same field of work as the learner and is responsible for the learner's workplace skill and competency development

3.4 Off-the-Job Development

To be effective, workers require knowledge and skills that are developed through vocational education experiences, relevant to each Unit of Competency. Knowledge and skills are reinforced and further developed through their on-the-job application learnt through integration with the off-the-job environment.

3.4.1 Learning Strategies - Knowledge and Skills Modules

The purpose of a Knowledge and Skills Module (K&SM) is to expand on the brief content statement in the 'Evidence Guide' of each Unit of Competence. K&SMs are specifically designed to:

- provide a clear purpose statement about their relationship to the overall educational program,
- ensure they support the needs of the workplace,
- support a variety of delivery modes (eg; face to face, distance, computer assisted learning or other),
- provide content and structure that facilitate learning retention,
- provide clarification regarding the type and quantity of evidence needed for assessment purposes.

3.4.2 Delivery – Off-the-Job

Off-the-job learning is based on the K&SMs and occurs in a location that is not directly related to the enterprise's core business activities. The location might be in a specialist-learning environment or at the learner's place of work.

The off-the-job learning environment must provide best educational practice, be staffed with appropriately qualified personnel and equipped with the necessary physical resources and learning materials to ensure that this component of the learner's vocational experience is effective and efficient.

3.4.3 Assessment - Off-the-job

The off-the-job assessment occurs against the stated educational criteria of the K&SMs. The process assesses the knowledge and skills that underpin workplace performance, ensuring that the learner knows why something is done as well as knowing how to do it, ensuring competent work performance in new contexts. Typically, these modules will allow for the assessment of the integration of knowledge and skills and promote better problem solving and diagnostic skills and provide a foundation for further knowledge and skill development, when required.

3.5 Final Decision

The final decision about attributing competence is based on an evaluation of all acquired evidence relevant to each Unit of Competence. This is always a complex process made simpler when records of previous assessment events are accumulated on a per Unit of Competence basis and cover a WPM and K&SMs.

Typically, no further assessment activities are required unless doubt exists about the sufficiency; currency or authenticity of all previously assessed evidence. In some cases, additional evidence may be required to satisfy the needs of authorities⁴ that align their processes to the decisions of RTOs. In some cases there may be a need for a final test with the result being included with previously assessed evidence as part of the overall assessment decision.

A final test is an holistic event that:

- encompasses the critical components within the competency standards
- is relative to what is required by the group of units that make up the qualification
- assesses the currency and integration of the on and off-the-job learning

The composition of the final test, if required, depends on the quality and extent of the data initially gathered and the ongoing judgment processes adopted during the program.

3.6 Qualification

A qualification is awarded once the Units of Competency for that Qualification are successfully completed. A transcript of a learner's success in individual modules is also issued as part of the academic record.

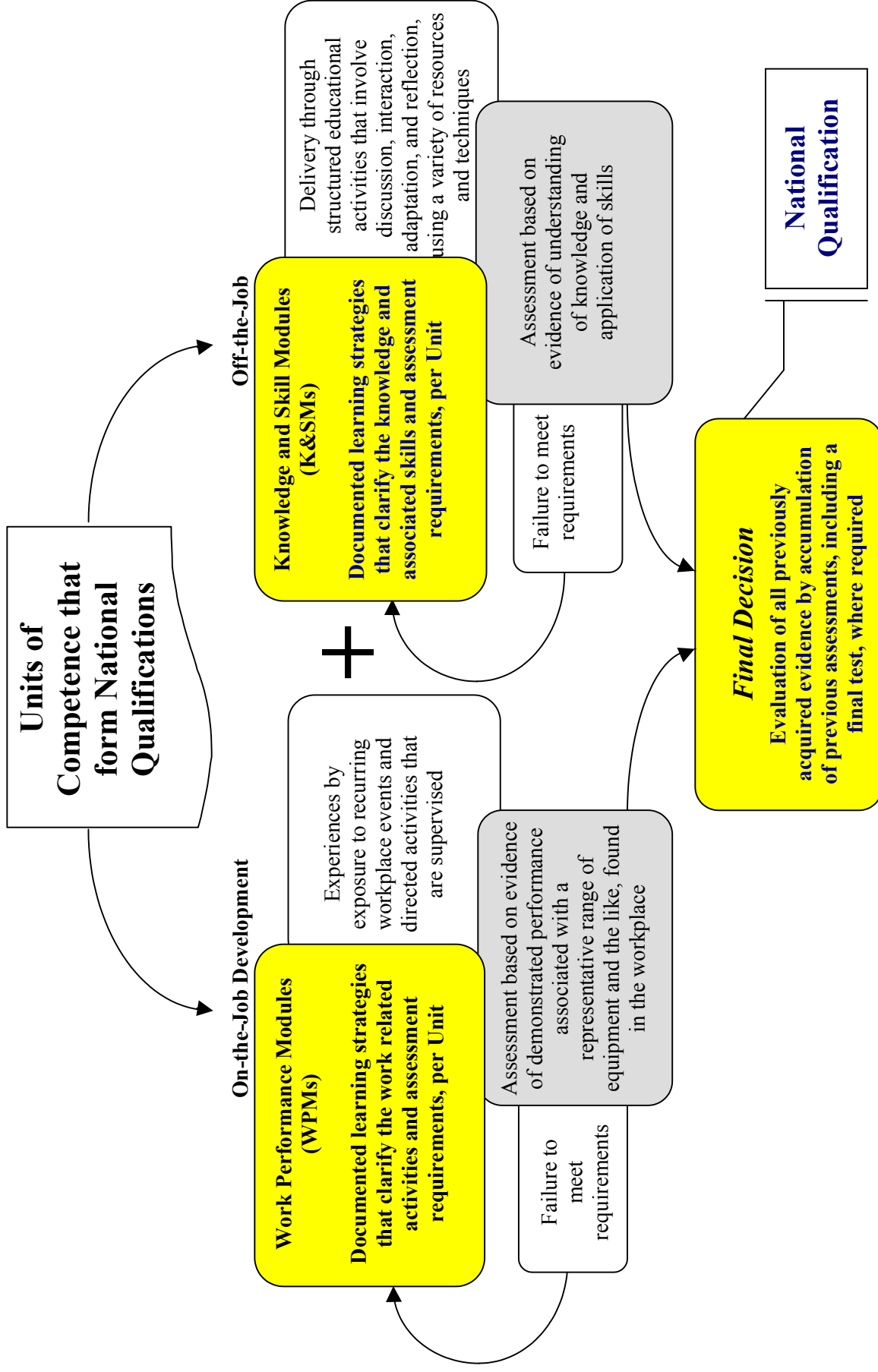
3.7 Learning Strategies (Modules) to Units of Competence Relationship.

For training administration and information dissemination purposes, developing a matrix showing the relationship between Modules and Units of Competency is a useful tool for administering delivery arrangements. In some cases some National Training Packages already have matrices (module maps) developed to assist RTOs.

Training system administrators require the matrix to be fully developed identifying all modules (K&SM and WPM) associated with each individual Unit of Competency. For the purpose of information dissemination, the matrix only needs to show the unique modules as they relate to the group of Units of Competency within a qualification; that is, common modules relating to more than one Unit of Competence in a qualification need only to be shown once.

⁴ Electrical Licensing Authorities and like bodies

8.0 Training and Assessment Model



APPENDIX A

Qualification Structure (A1)

Example of a Unit of Competence (A2)

Example of a Module Map (A3)

Electrotechnology Data Communications – Certificate II

| | |
|-------------------------------------|---|
| National Qualification No | UTE 2 02 99 |
| Qualification Specialisation | ‘As determined by the specialisation selected below with relevant information included in records and on reports and/or transcripts attached to the testamur’ |

Core Units - All to be completed

| | |
|---------------|--|
| UTE NES105G A | Install and terminate wiring systems – <i>cabling/wiring support and protection</i> |
| UTE NES105H A | Install and terminate wiring systems – <i>network communications</i> |
| UTE NES201F B | Perform basic repair to electrical/electronic apparatus – <i>data communications</i> |
| UTE NES202F B | Assemble/disassemble electrical/electronic components – <i>data communications</i> |
| UTE NES401F B | Perform functional apparatus checks – <i>data communications</i> |

Elective Units - One to be completed

| | |
|--------------|-----------------------------------|
| UTE NES002 A | Attend to breakdown |
| UTE NES003 A | Transport apparatus and materials |
| UTE NES005 A | Co-ordinate materials |

End of this qualification

UTE NES201 (A to Z qualifier) B

Perform basic repair to electrical/electronic apparatus

Descriptor: Undertake basic repairs to electrical/electronic apparatus by following routines described in work instructions or apparatus manuals.

| Elements | | Performance criteria | |
|----------|---------------------------------------|----------------------|--|
| 201.1 | Prepare carry out basic repair work | 201.1.1 | Repair work is prepared to ensure <i>OH&S policies and procedures</i> are followed |
| | | 201.1.2 | <i>Appropriate personnel</i> are consulted to ensure the work is co-ordinated effectively with others involved |
| | | 201.1.3 | <i>Apparatus</i> maintenance schedules and specifications are checked against <i>requirements</i> |
| | | 201.1.4 | Materials needed to complete the work are obtained in accordance with <i>established procedures</i> |
| | | 201.1.5 | <i>Tools and testing devices</i> needed to carry out the work are checked for correct operation and safety |
| 201.2 | Carry out basic repair work | 201.2.1 | <i>OH&S policies and procedures</i> are followed |
| | | 201.2.2 | <i>Circuits</i> are checked as being isolated where necessary using specified testing procedures |
| | | 201.2.3 | <i>Apparatus</i> is repaired in accordance with <i>established procedures</i> and repair routines |
| | | 201.2.4 | On-going checks of the quality of the work are undertaken in accordance with <i>established procedures</i> |
| 201.3 | Inspect and notify completion of work | 201.3.1 | Final inspections are undertaken to ensure the repair of <i>apparatus</i> conforms to <i>requirements</i> |
| | | 201.3.2 | Work completion is <i>notified</i> in accordance with <i>established procedures</i> |

Range statement

General

Generic items in this unit are shown in italics, *e.g. established procedures*. The definition and intended scope covered by generic items is described in the Glossary that forms an integral part of this range statement.

Currency in unit of competence

In order to maintain currency in this unit on-going competency development is to occur. This would include keeping abreast of any changes in legislation, regulations, procedures, technology and the like related to the scope and application of this unit.

Evidence guide

This Evidence guide is intended to include components defined within the Range statement, of which the Glossary is an integral part. Terms in italics, *e.g. consistent performance*, with respect to the Evidence guide are also contained in the Glossary.

Critical aspects of evidence

Achieving competence

Achievement of this unit of competence is based on each of the following conditions being met:

- demonstrating consistent performance for each element of the unit in the related category and specialisation, which is to be, exhibited across a representative range of applications, autonomously and to requirements.
- meeting the performance criteria associated with each element of competence by employing the techniques, procedures, information and resources available in the workplace for each of the categories and areas of specialisation undertaken from those listed in the Range statement or Evidence guide.
- demonstrating an understanding of the underpinning knowledge and skills identified for the categories and related specialisation undertaken in the section, of this unit titled 'Underpinning knowledge'.

Reporting requirements

The reporting of the judgements about competence must be in the context of the individual unit being assessed and the qualification to be issued. Regulatory requirements in individual jurisdictions may require recording of additional information. Recognition of knowledge and skills transfer may be maximised by recording and issuing transcripts covering additional information. This could be detailed statements about the achievement of knowledge and skills. Any additional reporting is a matter for negotiation between the RTO and its clients.

Maintaining competence

Consideration should be given to periodic evaluations of skills and knowledge within this unit that are critical to safety, operation of plant and equipment and the like, particularly where relevant skills and knowledge are not frequently practiced.

Context of assessment

Competency will be determined on evidence of having *consistently performed* across a *representative range* of applications which includes such things as *apparatus, circuits, wiring systems, plant, equipment, tools, accessories, components* and the like relative to that required for the *category* undertaken within and relevant to this unit of competence; autonomously and to requirements. Equivalent evidence from other sources is also acceptable.

Interdependent assessment of units

Nil.

Underpinning knowledge

This section specifies the knowledge and skills required to underpin the elements and performance criteria relevant to the unit. This, with other aspects of evidence, will ensure that an individual is able to transfer and apply such knowledge and skills to new situations and environments.

This section includes that set of knowledge and skills additional to that specified in the above mentioned section titled 'Interdependent assessment of units'.

The underpinning knowledge for this unit is too extensive to be included in this guide. Please refer to the Training Package for further information.

APPENDIX A3

Electrotechnology Qualifications

Certificate II – Electrotechnology Data Communications (UTE 2 02 99)

| Modules | | Core Units | | | | | | |
|-----------|---|------------|-----|---------|---------|---------|---------|---------|
| Nat. Code | Title | | Dur | NES105G | NES105H | NES201F | NES202F | NES401F |
| NBB002 | Occupational Health & Safety | C | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| NE172.1 | Electrical Wiring & Equipment 1 | C | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| NE175 | Workshop Practices | C | 1 | 1 | 1 | 1 | 1 | 1 |
| NUE003 | Building & Building Services | C | 1 | | 1 | | | |
| NUE052 | Applied Electricity 1 | C | 1 | | 1 | 1 | 1 | 1 |
| NUE058 | Electrical Concepts & Applications | N | 1 | | 1 | 1 | 1 | 1 |
| NUE095 | Parts & Components Selection | C | 0.5 | | | 0.5 | 0.5 | 0.5 |
| NUE190 | Standards & Regulations - Telecommunications | C | 0.5 | | 0.5 | 0.5 | 0.5 | 0.5 |
| NUE191 | Telecommunications Cables & Installation Methods | C | 2 | | 2 | | | |
| NUE192 | Telecommunications Systems Overview | C | 0.5 | | 0.5 | 0.5 | 0.5 | 0.5 |
| NUE193 | Telecommunications Earthing & Protection | C | 0.5 | | 0.5 | 0.5 | 0.5 | 0.5 |
| NUE210 | Drawing Interpretation & Sketching | C | 0.5 | | 0.5 | 0.5 | 0.5 | 0.5 |
| NEWO105G | Install & Terminate Wiring Systems (<i>Cabling/Wiring Support & Protection</i>) WP | N | ~ | WP | | | | |
| NEWP105H | Install & Terminate Wiring Systems (<i>Network Communications</i>) WP | N | ~ | | WP | | | |
| NEWP201F | Perform Basic Repair to Electrical/Electronic Apparatus (<i>Data Communications</i>) WP | N | ~ | | | WP | | |
| NEWP202F | Assemble/Disassemble Electrical/Electronic Components (<i>Data Communication</i>) WP | N | ~ | | | | WP | |
| NEWP401F | Perform Functional Apparatus Checks (<i>Data Communications</i>) WP | N | ~ | | | | | WP |

APPENDIX B

An example of a

Workplace Report Module (B1)

Knowledge and Skills Module

Descriptor (B2)

Appendix B1

1. Module details

Module name

Diagnose and rectify faults in apparatus and associated circuits – (Data Communications) - Work performance

Suggested Trainer /Assessor structured assessment time

The time taken to complete this module will vary depending on the opportunities the learner is given to develop their skills and the method used to obtain evidence of work performance used to attribute competence. It is expected that a trainer/assessor would require approximately 4 hours to evaluate evidence of competency.

Module code

NEWP201f

Discipline code

2. Module purpose

This module provides methods and criteria for gathering evidence that shows a person has achieved the levels of performance specified in Unit NES501f diagnose and rectify faults in apparatus and associated circuits – *Data communications*.

3. Prerequisite modules

This module shall be undertaken in conjunction with modules that provide the knowledge and skills underpinning performance.

4. Relationship to competency standards

This module supports Unit NES501f Diagnose and rectify faults in apparatus and associated circuits – *Data Communications* of the Electrotechnology competency standard.

5. Assessment strategy

Gathering evidence of performance directly in the workplace

Evidence of competent performance shall be gathered by one or more methods described below.

In this method a qualified assessor shall gather the evidence through direct observation of relevant work activities on multiple occasions and situations.

Note: Direct assessment of work activities may not be acceptable in some work places as it may be disruptive to productivity and requires further safety measures.

Gathering evidence of performance in a simulated work environment

In this method the simulated work environment shall include equipment relevant to the competencies to be assessed and arranged in a manner similar to a real work place. Assessment activities shall be as close as practicable to real work situations and include real work decisions by the learner.

Gathering evidence of performance, from indicators in relevant work experience

In this method evidence shall be gathered from a log of work experience indicators, relevant to the unit(s) of competency being assessed. The log shall be maintained by the learner and entries verified by a qualified responsible person. Such evidence shall be used to form a profile of competency development. An assessor, to ensure that the learner is being given sufficient exposure to the range of work activities and to determine when a final decision about competency can be made, shall periodically review the profile.

Assessment criteria

In judging work performance it is essential that evidence regarding the following aspects of competency be considered.

- Performance is autonomous and to requirements and **occurs on at least 2 occasions for each of the following elements:**
 - Plan and prepare for installation
 - Install wiring systems
 - Inspect and notify completion of work
- **and at least 4 of the following apparatus and associated circuits:**

Unenclosed support (eg clips, saddles, hangers and ties); Non-metallic conduit; Metallic conduit; Trunking; Cable tray/ladder; Underground systems; Aerial; Catenary support.

At least three of the four-cable protection and support systems must be appropriately demonstrated on-the-job in real work activities. One or more cable protection and support systems may then be achieved by the combined effect of relevant off-the-job training and the skill transfer from prior satisfactory completion of the other three systems.

- Applying **techniques, procedures, information and resources** relevant to performance.

In making a final judgement about a learner's competence the Registered Training Organisation (RTO) must make sure that such judgement is made on **sufficient evidence** being presented. This evidence should be from a number of quantitative and qualitative events and over a period showing the development of competent work performance by the learner.

Resource requirements

Resources should be sufficient for participants to carry out activities, from which evidence may be gathered, on an individual basis. This will include access to tools, equipment, standards and other documents that are necessary to perform the activities required.

Assessment should take into account variations between particular industry sectors and different enterprises. For example equipment used in underground coal mining will be different in some respects from that used in a manufacturing facility.

Where this module is used in an approved Traineeship or Apprenticeship program learners should be advised to obtain, where available, respective EEQSBA⁵ *User Guides* (these outline in detail what training and work performance the learner is required to undertake for the program).

Occupational health and safety requirements

A safe and healthy environment will be provided for participants and assessors as well as safety procedure with regard to assessment activity.

⁵ EEQSBA - ElectroComms and EnergyUtilities Qualifications Standards Body of Australia Ltd

Appendix B2

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| 1. Module details | |
| Module name | Advanced Security Systems |
| Suggested structured learning time | 40 hours |
| Module code | NUE 485 |
| Discipline code | 0703225 Electrotechnology |
| 2. Module purpose | To provide a comprehensive introduction to transmission systems used in electronic security systems, including terminology, transmission mediums, computer modems, hardware devices and software packages and standards. |
| 3. Prerequisite modules | Nil |
| 4. Relationship to competency standards | This module provides some of the knowledge and skills underpinning competency in the following standards: National Electrotechnology Industry Standards, particularly NEW 209. |
| 5. Content | <p>Transmission Systems</p> <ul style="list-style-type: none"> • Fibre Optics <ul style="list-style-type: none"> – Introduction – Principles – Advantages – Disadvantages – CCTV Applications – Components – Dangers to eyesight from bare fibres – Lasers • Coaxial <ul style="list-style-type: none"> – Construction – Types – Features – BNC connectors – Installation – Trouble shooting • Twisted Pair <ul style="list-style-type: none"> – Features – Advantages – Disadvantages • Microwave <ul style="list-style-type: none"> – Principles – Features |

- Advantages
- Disadvantages
- Infrared
 - LED
 - LD
 - Advantages
 - Disadvantages
- Telephone Networks
 - Introduction
 - Fast Scan Video Transmission
 - PSTN (Public Switched Telephone Network)
 - ISDN (Integrated Services Digital Network)
 - Video Monitoring stations
 - Securitel systems
- Choosing a medium
 - Distance
 - Harsh environment/high security
 - Cost
 - Advantages
 - Construction of cables
 - Physical properties
 - Applications
 - Terminations
- Intrinsically safe wiring
 - Where it is needed
 - Alternatives
- Modems
 - Commands
 - Uses

Assessment methods**6. Assessment strategy**

Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness, assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.

Conditions of assessment

Learning and assessment will take place in a classroom/laboratory environment and in a real or simulated security installation.

7. Learning outcome details**Learning outcome 1**

Describe the physical properties of common types of fibre optic cables.

Assessment criteria

1.1 State relevant Occupational Health and Safety standards for

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| | <p>Optical Systems.</p> <p>1.2 State the danger to eyesight from Laser light sources and from penetration by optical fibre.</p> <p>1.3 Describe the construction of slotted core, loose tube and cord fibre cables.</p> <p>1.4 List the advantages of each type of cable.</p> <p>1.5 Describe the following specifications as they pertain to fibre optic cables:</p> <ul style="list-style-type: none">• Simplex• Duplex• Diameter• Bandwidth• Attenuation• Operating temperature• Minimum bending radius |
| Learning outcome 2 | Describe common applications of fibre optic cables in electronic security systems. |
| Assessment criteria | <p>2.1 Describe how fibre optic cable may be used to carry video signals in electronic security systems.</p> <p>2.2 Describe how fibre optic cable may be used to carry voice data and control data signals in electronic security systems.</p> <p>2.3 Describe the transmission of multiplex data using fibre optic cable.</p> |
| Learning outcome 3 | Describe common methods of terminating fibre optic cable. |
| Assessment criteria | <p>3.1 Explain the safe practices required when handling and repairing fibre optic cables.</p> <p>3.2 Describe the processes involved when terminating optical fibre cable using optical connectors.</p> <p>3.3 Describe the processes involved when terminating optical fibre cable using mechanical splicing.</p> <p>3.4 Describe the processes involved when terminating optical fibre cable using fusion splicing.</p> |

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| Learning outcome 4 | Select the correct cable and wiring method. |
| Assessment criteria | <p>4.1 Recognise cable selection characteristics including:</p> <ul style="list-style-type: none">• Current capacity• Voltage rating (insulation)• Temperature rating• Shielding• Insertion loss• Bandwidth <p>4.2 Describe approved methods of wiring termination and joining.</p> <p>4.3 Given a list of different security applications, select an appropriate medium for data transmission and give reasons for this selection.</p> <p>4.4 Explain the requirements of the SAA Wiring Rules AS3000 and relative rules and instructions for extra low Voltage and data cabling.</p> |
| Learning outcome 5 | Identify hazards that may be encountered in wiring systems. |
| Assessment criteria | <p>5.1 Recognise hazardous situations and locations that may cause:</p> <ul style="list-style-type: none">• Electric shock• Fire• Explosions– Electromagnetic radiation <p>5.2 Describe the installation of equipment requiring earthing or is double insulated.</p> |
| Learning outcome 6 | Identify non hard wiring installation methods. |
| Assessment criteria | <p>6.1 Identify methods of transmitted alarm conditions.</p> <p>6.2 Identify methods of transmitted arming and disarming of security systems.</p> <p>6.3 Identify methods of transmitted video and data signals.</p> |
| Learning outcome 7 | Describe modem interface requirements |
| Assessment criteria | <p>7.1. Explain the requirements for DTE to DCE to DCE to DTE.</p> <p>7.2 Describe the necessary interface for:</p> <ul style="list-style-type: none">– PC to PC via modem– Alarm panel to monitoring system via modem. <p>7.3 Describe the features and specifications of a Hayes compatible smart modem.</p> |
| Learning outcome 8 | Describe modem protocols |

Assessment criteria

- 8.1 Explain the following modem standards
- V.22
 - V.32
 - V.42
 - X.25
- 8.2 Explain the following modem protocols
- Full-duplex
 - Half-duplex
 - X modem
- 8.3 Configure and install hardware and software for the correct operation of an alarm system that will indicate alarm conditions via a modem.

8. Delivery of the module**Delivery strategy**

Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective way to achieve this is by the integration of theory and practice where students learn by experimentation and through research and laboratory reports. It is recommended that learning and assessment be facilitated in a holistic manner, which may require a learning outcome sequence other than that indicated in the module.

Resource requirements

Minimum teacher qualifications:

Certificate IV Assessment & Workplace Training

Trade qualifications in the electrical/electronic discipline and a demonstrated high level of competency in security installations. This would normally be achieved by relevant workplace experience in this field.

Non human resources:

Resources should be sufficient for students to carry out practical exercises on an individual basis. This will require, as a minimum:

- Multimeters
- Typical circuit drawings
- A selection of alarm control panels and sensors
- A selection of cables and connectors
- Fibre optic terminating kit
- Suitable PC
- A range of modems

Manufacturers' Handbooks for systems used in a laboratory.
Manufacturers' installation guides for systems used in a laboratory.
Various security panels sourced locally.

Textbooks

CCTV Surveillance, Herman Kruegle. Butterworth-Heinemann.

Security 'A Guide', Neil Cumming. Butterworth-Heinemann.

Reference books and Standards

AS2201.1-1998, Australian Standard – Intruder alarm systems, Part 1: Systems installed in client's premises.

AS2201.2-2000, Australian Standard – Intruder alarm systems, Part 2: Monitoring centres.

AS2201.3-1992, Australian Standard – Intruder alarm systems, Part 3: Detection devices for internal use.

AS2201.4 -1990, Australian Standard – Intruder alarm systems, Part 4: Wire-free systems installed in client's premises.

AS2201.5-1992, Australian Standard – Intruder alarm systems, Part 5: Alarm transmission systems.

ACA's Communications Cabling Manual.

Magazines

Security Electronics Magazine, Bridge Publishing Aust. Pty. Ltd, 25 Renwick Street, Leichhardt, NSW, 2040, Internet:

<http://www.semweb.com>

Internet resources

Ademco - <http://www.ademcoint.com>

Australian Communications Guide – <http://www.austelguide.com.au>

Crow - <http://www.crowaust.com.au>

Dedicated Micros – <http://dedicatedmicros.com>

Detection Systems - <http://www.detectionsys.com>

Detection Systems Australia (EDM) - <http://www.edm.com.au>

Direct Alarm supplies (DAS) - <http://www.das.com.au>.

Digital Security Controls (DSC) - <http://dscsec.com>

Interlogix Inc. - <http://www.intellogixinc.com>

Interlogix Security and Life Safety Group -

<http://www.interlogixsecurity.com>

Inner Range Pty Ltd. - <http://www.innerrange.com.au>

Ness Security Products - <http://www.ness.com.au>

Paradox Security Systems - <http://www.paradox.ca>

Sentrol – <http://www.sentrol.com>

Southwest Microwave – <http://southwestmicrowave.com>

Tecom Systems – <http://www.tecom.com.au>

User Guides

Where this module is used in an approved Traineeship or Apprenticeship program students should be advised to obtain, where available, respective EEQSBA⁶ *User Guides* (these outline in detail what training and work performance the student is required to undertake for the program).

Equipment

It is strongly advised that students have access to a range of product literature available from manufacturers and suppliers of security alarm systems.

Specialised facilities and equipment made available by the training

⁶ EEQSBA - ElectroComms and EnergyUtilities Qualifications Standards Body of Australia Ltd

Occupational Health and Safety Requirements

provider include the following:

- Control and indicating equipment
- Visual warning devices and audible warning devices.

In addition students will require access to the following:

- Standard electronic laboratory equipment should be available for practical exercises.
- Standard electronic industry hand tools for assembly and installation of equipment.

A safe and healthy environment will be provided for students and teachers, as well as safety procedures followed with regard to teaching/learning activities.

APPENDIX C

Workplace Experiences (C1)

Educational Delivery (C2)

Appendix C1 – Workplace Experiences

Re-occurring workplace events need to involve exposure to a range of plant, tools, equipment, components, operating systems and the like, that are representative of normal activities that occur at work, relative to the Units of Competence within a Qualification. Activities such as these, under appropriate levels of supervision, are important to the learner's development.

It is important that workplace experiences are documented so they can be analysed to determine if the learner is gaining exposure to the required range of experiences.

Documented data can be entered into a logbook or the memory of a computer for later analysis. Log books or scan cards (a means of entering data into a computer) need to be formatted in a way that informs the learner as to what is required of them as well as making date entries simple, relative to the Workplace Report Modules.

Appendix C2 – Educational Delivery

This component of the learner's development follows best educational practice where theorems and concepts are reinforced by practical examples and exercises, typically delivered in an educational environment that is conducive to learning. Theorems, concepts and analysis of circuit operations and equipment performance need to be placed in the correct context by relating them to work activities.

Typically, knowledge and skills are delivered in an educational environment that is conducive to learning.

The process of learning occurs in many ways. Typically, this will involve discussion, interaction, adaptation and reflection between the learner and the lecturer/trainer and involve the field of work.

Discussion and interaction connect adaptation and reflection. The learner uses the lecturer/trainer description to adapt their actions and reflects on the result in order to modify and develop their own description until it accords with the lecturer/trainer in the process of discussion.

An integral responsibility of the trainer/lecturer is to ensure that all students can access learning and assessment situations equally. It is therefore important that each student is supported individually with regard to any factors, which may impede their access to any interactions. Literacy and numeracy difficulties as well as individual cultural contexts will need to be taken into account and addressed as necessary to ensure equity of access.

The learning process can be supported in many ways, all involving text and diagrams irrespective of the platform on which these are described. The most commonly adopted platform uses print based documents, notwithstanding the emergence of new and improved ways that computer and information technologies can assist the process. Irrespective of the platform the nature of the text, diagrams and supporting instructions are generally located under the following content headings. See example of the contents of a typical print based documents (knowledge and skills module) below.

Note: Print based documents typically contain basic information which assists with discussion and interaction. They in themselves do not provide for a full and rich learning experience without the added value of a teacher or other means needed to fulfil all aspects of the learning process.

APPENDIX D

**Assessment – Workplace Experience
(D1)**

Assessment – Knowledge and Skills (D2)

Assessment

The skills and knowledge required by a competent worker are described in terms of Units of Competence (or Competency Standards). To be assessed as ‘competent’, against Electrotechnology Competency Standards, individuals need to demonstrate that they have undertaken workplace functions and have acquired specified knowledge and skills.

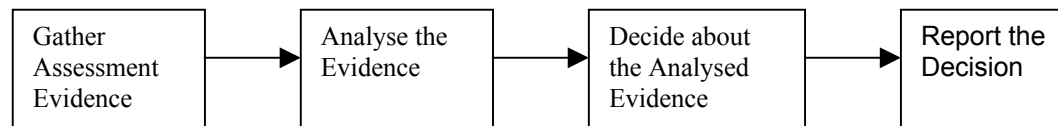
A qualified assessor must assess a candidate, wishing to be assessed against specific Electrotechnology Units of Competence. The assessor must use assessment processes, methods and tools, which are in accordance with the Electrotechnology Training Package.

Assessment involves gathering evidence to demonstrate that an individual has the knowledge and skills required by the specified competency standard. This may include assessment of knowledge and skills obtained through educational courses as well as through application of knowledge and skills in the workplace.

Good planning of workplace assessment is most important. The plan is to be based on a suitable process that is in line with the Competency Unit – BSZ401A: Plan Assessment from the Assessors and Workplace Trainers National Training Package. Assessors need to address the four elements of competence in BSZ401A, being:

- establish evidence requirements for a specific context
- establish suitable assessment methods
- develop assessment tools appropriate to a specific assessment context
- trial assessment procedure

The general process for assessing competence is shown in the following diagram.



Assessors need to adapt the process to take account of physical and operational conditions as well as the characteristics and background of the candidate being assessed. Once the process has been finalised, the candidate should be advised.

The assessment of performance against the technical competencies includes the assessment of generic competencies such as team work, written and verbal communications, use of computers, using mathematical techniques and the like. Generic competencies are embedded within the technical competencies and form part of the learning strategies. Unless an individual learner requires special assistance then there is no particular need for separate training and assessment of these generic competencies.

Appendix D1 – Assessment, workplace experience

Assessment of workplace experiences involves determining whether a candidate has provided sufficient evidence to demonstrate that they are applying specified levels of skill and knowledge in their work environment.

The evidence provided may include the following:

- Work activity records.
- A transcript of training outcomes.
- A portfolio of learning experiences.
- A self-assessment by the candidate against the relevant competency standard(s).
- Supervisor's report(s), addressing requirements of the identified competency standard(s).
- Practical demonstration.
- Details of training undertaken linked to requirements of the identified competency standard(s).
- Outcomes of a challenge test.

The assessor may use a variety of assessment methods to gather evidence. Appropriate methods for documenting workplace experiences related to this National Training Package are:

- on-the-job work observation
- practical exercises in the workplace or under simulated workplace conditions
- appraisal and report by a supervisor / trainer or colleague
- questioning and discussion with the candidate
- written / practical test

Appendix D2 – Assessment of Knowledge and Skills

Assessment of knowledge and skills involve determining whether a candidate has sufficient understanding and knowledge, and be able to demonstrate the associated skills.

The instruments used to provide evidence may include the following:

- True / false statements.
- Multiple-choice questions.
- Matching statements.
- Completion of statements.
- Calculations.
- Definitions, explanations.
- Essays.
- Observation checklist.
- Product assessment.
- Questioning to complement observations.
- Simulated work exercises.
- Structured practical exercises.
- Fault finding exercises.

Table of contents

Example: Content of a knowledge and skill module

| | |
|--|------------|
| Using this learning guide | vii |
| Follow the icon prompts..... | ix |
| Recommended resources | x |
| Topic 1. The types and purposes of mechanical and manual aids | 6 |
| Learning activities..... | 5 |
| Topic 2. The purpose, location and capacity of manholes and pits..... | 9 |
| Learning activities..... | 5 |
| Topic 3. Types and capacity of duct work | 12 |
| Learning activities..... | 5 |
| Topic 4. The different types of underground cable | 16 |
| Learning activities..... | 5 |
| Answers to all learning activities | 24 |
| Summative learning activities for module | 27 |
| Glossary..... | 29 |