



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEK153A Assess energy loads and uses for energy efficiency in residential, office and retail premises

Release: 1

UEENEEK153A Assess energy loads and uses for energy efficiency in residential, office and retail premises

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the undertaking of energy audits of residential, small offices and retail premises to evaluate the energy efficiency of the premises and to make recommendation on design implementations. It encompasses working safely, apply extensive knowledge of electrical installations and components and their operating parameters, gathering and analysing data, applying problem solving techniques, developing and documenting engineering solutions.

Application of the Unit

Application of the Unit 2)

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

Licensing/Regulatory Information

License to practice 3)

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.
Note:

License to practice

3)

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

Pre-Requisites

Prerequisite Unit(s)

4)

Competencies

4.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK1 52A Develop strategies to address sustainability issues for electrical installations.

Literacy and numeracy skills

4.2)

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading 4 Writing 4 Numeracy 4

Employability Skills Information

Employability Skills

5)

The required outcomes described in this unit of

Employability Skills

5)

competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element.
Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT

PERFORMANCE CRITERIA

1 Prepare to assess residential, office and retail premises for energy efficiency evaluation.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	The extent of the energy assessment are determined from premises orientation, premises floor plans, building structure plans, energy accounts, and situation reports and in consultation with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
	1.5	Effective strategies are determined to ensure solution development and implementation is carried out efficiently
2 Assess residential, office and retail premises for energy efficiency evaluation.	2.1	OHS risk control measures and procedures for carrying out the work are followed
	2.2	Knowledge of energy loads is applied to developing energy efficient strategies to address

ELEMENT	PERFORMANCE CRITERIA
	energy use.
	2.3 Parameters, specifications and performance requirements in relation to energy use are set in accordance with established procedures
	2.4 Approaches to resolving sustainability issues are analysed to provide most effective solutions
	2.5 Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy
	2.6 Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3 Document assessment of residential, office and retail premises for energy efficiency.	3.1 Solutions to energy use are tested to determine their effectiveness and modified where necessary
	3.2 Adopted solutions are documented, including instructions for implementation that incorporates risk control measures to be followed
	3.3 Appropriately competent and qualified persons required to implement solutions to energy use are coordinated in accordance with regulatory requirements and enterprise policy (See Note)
	3.4 Justification for strategies used to solve energy use is documented for inclusion in work/project development records in accordance with professional standards

Note:

A licence or permit to practise in the workplace is required for specified work on building and premises

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and assessment of energy loads in residential, office and retail premises.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01- Residential, office and retail premises energy efficiency assessment EK153A

Evidence shall show an understanding of residential, office and retail premises energy efficiency assessment to an extent indicated by the following aspects:

T1 Energy management, legislation and regulation relevant to residential, office and retail premises encompassing:

- National Building Code of Australia
- State Building Codes
- Standards Australia for Energy Auditing
- Mandatory Disclosure
- State based legislation for energy management in business
- NABERS Tenancy
- NABERS Basix
- Minimum Renewable Energy T
- NatHERS ratings
- Renewable Energy Credits
- Small Technology Credits

T2 Water Supply and Use encompassing:

- collect and analyse information on household water use and on ways to improve water efficiency in the home
- ability to analyse the water consumption index for different sectors.
- ability to analyse domestic water use and ways to minimize the use of water.
- understanding on the methodology applied to water savings
- Perform water star rating calculations

T3 Greenhouse Gas Emissions encompassing:

- concept of Greenhouse Gas Emissions and Global Warming
- Fossil Fuel Resource Depletion and Mining impacts the

REQUIRED SKILLS AND KNOWLEDGE

environment

- breakdown of Energy Consumption in the Australian Domestic Sector

T4 Environmental Context – Ecological Impacts and Resource Use encompassing:

- concept of Greenhouse Gas Emissions and Global Warming
- Fossil Fuel Resource Depletion and Mining impacts the environment
- breakdown of Energy Consumption in the Australian Domestic Sector
- breakdown of Water Consumption in the Australian Domestic Sector

T5 Energy Efficiency Methodologies encompassing:

- Energy Services Approach and how it relates to energy auditing
- End User Focus and how it relates to energy auditing
- Opportunistic Approach and how it relates to energy auditing
- Understand and explain an Energy Management Strategy in relation to energy efficiency, energy management, demand management, fuel switching and renewable energy
- Explain what is meant by Financially Viable Best Practice Solutions
- Understand and explain a Water Management Strategy in relation to water efficiency, water management, source switching and water reuse/recycling
- understanding of the Opportunistic Best Practice Solutions in relation to water and explain how this differs from Financially Viable Best Practice Solutions
- Benchmarking with reference to Statistical Benchmarks, Technology Benchmarks and Best Practice Financially Viable Benchmark Methodologies
- Explain and calculate Best Practice Energy and Water Star Ratings
- Explain the Property Cost and Environmental Impact Tables in relation to reporting energy audit outcomes
- Explain the Sustainable Initiative Investment Tables in relation to reporting energy audit outcomes

T6 Energy and Society encompassing:

- understanding of Electricity Charges
- drivers of the predicted Electricity Price Increases in Australia
- Network Charge and Retail Charge Increases and how they

REQUIRED SKILLS AND KNOWLEDGE

- relate to electricity price
 - The Carbon Pollution Reduction Scheme impact on electricity prices
 - Renewable Energy Target impact on electricity prices
- T7 Energy Auditing Theory and Practice encompassing:
- scope of Australian Standards for energy auditing
 - understanding of the Energy Audit Process in relation to Data collection, Analysis and the Communication of results
 - understanding of Accounts, Bills and Data, Tariff Structures and the identification of Domestic Tariff Types
 - understating of and proficiency in Energy and Energy Balance Calculations including power calculations, usage time calculations, power factor calculations and energy conversions from kWh to MJ
 - understanding for the process involved in Onsite Assessment in a domestic and small business energy audit.
 - knowledge on ways of gathering information on household energy use and costs
 - Identify and mitigate the Risks and Hazards associated in a domestic and small business energy audit.
 - Performing energy and power calculation
 - Determine the Power Rating of Equipment and Metering and Measurement in a domestic and small business energy audit.
 - Perform energy balance calculations
 - Provide advice on ways to improve energy efficiency
 - ability to perform Greenhouse Emission calculations, Emissions Factors, Carbon Intensity of Electricity vs. Natural Gas and LPG and Global Warming Potential and CO₂ Equivalents
 - ability to perform Financial Analysis in terms of Simple Payback and Simple Payback Period and Return on Investment or Rate of Return
 - understanding for Reporting and Communication of energy audit results
- T8 Water Auditing Services Theory and Design encompassing:
- understanding of water flow rates of taps, showers and irrigation, toilets, washing machines, dishwashers and filtration and top up water use for pool systems
 - Performing a residential water meter reading
 - understanding on the trends of water use and charges
 - understanding of the Water Efficiency Labeling (WELS)

REQUIRED SKILLS AND KNOWLEDGE

- Scheme as it relates to water auditing
 - Identifying water efficiency opportunities in home sustainability assessments.
 - operation of a Greywater System
 - understanding of the factors that impact on Garden Water Demand
- T9 Lighting Services Theory and Efficient Design encompassing:
- understanding for fundamental Illumination design for domestic and small business
 - understanding for Illumination in terms of Light Output, Light Level and Brightness
 - determine target light levels for differing tasks
 - understanding of the characteristics of light sources including Efficacy, Colour Temperature and Colour Rendering Index
 - understanding for the different Ballast types, their efficiency and benefits
 - understanding of Incandescent Lamps, Halogen Lighting, Domestic Fluorescent Lighting and comparisons between these and applications for the domestic and small business sector
 - understanding of the application of Lighting Methodology for Best Practice Energy Efficiency design
 - understanding of Energy Saving Lighting Opportunities in the domestic and small business sector
- T10 Thermal Performance and Climate Control encompassing:
- understanding of the Thermal Performance of a building impacts on Heating, Ventilation and Air Conditioning energy use including Orientation, Thermal Mass, Insulation, Glazing, Shading and Ventilation
 - understanding of the Air Conditioning Designs including Ducted systems, Split-system air conditioners, Multi-headed split systems, Individual Room Air Conditioners (RAC), Through Wall / Window and Portable units
 - Identifying ways for improving the thermal performance of a residential building envelop elements
 - ability to apply the knowledge of Australian climate zones
 - understanding of Air Conditioning Technologies including Refrigerated type air conditioning, Inverter type air conditioning, Reverse cycle air conditioning, Evaporative air conditioners, Breeze power systems and Digital Scroll Compressors
 - understanding and the application of Energy Efficiency Ratio

REQUIRED SKILLS AND KNOWLEDGE

(EER) and Coefficient of Performance (COP) and show proficiency in EER and COP calculations

- understanding and the application of the Air Conditioning Star Ratings
- understanding of Gas and Electric Heating Options and air (ducted) heating
- understanding of the operation of an Air Conditioning System and describe each components including the compressor, evaporator, condenser, expansion valve and fan coil
- understanding of ceiling and pedestal fans and ventilation climate control
- understanding of the factors that impact on Climate Control Energy Consumption
- understanding of best practice Climate Control Methodology as applied to the domestic and small business sector
- understanding of the domestic and small business Climate Control Saving Opportunities
- ability to conduct a thermal performance assessment of a domestic residence

T11 Food Storage Services Theory and Efficient Design encompassing:

- understanding of refrigeration system basics operation
- understanding of different refrigeration models
- understanding of refrigeration characteristics including operation, automatic defrost, cooling temperature control, ice maker, ice and water dispenser, door seals and hinges
- understanding for the factors that impact on refrigerator energy use including size, configuration temperature setting, clearance around cabinet and ambient conditions, making ice, ice and water antisweat heaters, seals, insulation, compressor efficiency and age
- understanding of refrigerator & freezer star ratings
- understanding of food storage saving opportunities

T12 Food Preparation Services Theory and Efficient Design encompassing:

- understanding of different food preparation appliances
- understanding of the different operation of Gas and Electric hot plates and ovens and the advantages and disadvantages of each
- understanding for EMI food preparation methodology
- understanding for Food Preparation Saving Opportunities

REQUIRED SKILLS AND KNOWLEDGE

- Food Preparation Services Theory and Efficient Design

T13 Water Heating Services Theory and Efficient Design encompassing:

- understanding for different water heaters including Electric and Gas Storage, Gas Instantaneous (Continuous Flow), Electric Heat Pump and Solar Hot Water Heaters
- understanding for solar water heater configurations and characteristics including Passive (or thermo siphon) systems and Active (or pumped) systems Solar Collector types, One Shot Booster
- knowledge of how RECs relate to Solar Water Heater RECs
- understanding of factors that influence water heater Energy Use including Pipework and Fitting Insulation, Atmospheric Conditions, Water Efficiency, Temperature Setting and Maintenance & Operation
- understanding of and proficiency in Water Heating / Cooling Calculations
- understanding of EMI Water Heating Methodology
- understanding of domestic Water Heating Saving Opportunities
- understanding of types of entertainment and administration appliances found in domestic residences

T14 Entertainment and Administration Services Theory and Efficient Design encompassing:

- understanding of appliance Standby Power including the different mode; Passive and Active Standby
- understanding of appliance Energy Star ratings
- understanding of MEPS and Labelling Requirements for Televisions
- an understanding of Computers energy consumption including computer power management
- understanding of Entertainment & Administration Saving Opportunities

T15 Cleaning Services Theory and Efficient Design encompassing:

- understanding of Clothes Washers types including Vertical axis and Horizontal axis
- understanding of factors that impact on clothes washing energy use
- understanding of energy and water MEPS Star Ratings and how they apply to clothes washers
- understanding of Clothes Dryer types including Spin Dryer,

REQUIRED SKILLS AND KNOWLEDGE

Condenser dryers, gas dryers and Heat pump dryers

- understanding of Clothes Dryer Controls
- understanding of Dishwasher types
- understanding of vacuum cleaner types
- understanding of EMI Cleaning Methodology
- understanding of domestic Cleaning Saving Opportunities

T16 Pumping Systems (and Pools) Theory and Efficient Design encompassing:

- understanding of Pumping Services in relation to domestic and the small business sector
- understanding of Pumping Types including centrifugal and positive displacement and pump selection and design
- understanding of Pumping Theory including Pressure Head, Pressure pumping vs. Transfer pumping, Pump Curves, Pump Best Efficiency (Operating) Point BEP, Variable Speed Drive, Energy Balance for a Typical Pumping System and Electric Motors
- understanding of the operations of domestic pools in terms of Pool Pumps, Pool Backwashing, Cartridge Filters, Pools Turnovers, Pool Water Use and Pool Heating
- understanding of energy efficiency pool systems design methodology
- understanding of domestic pool systems saving opportunities

T17 Smart Metering Solutions encompassing:

- understanding and benefits of the different metering available to the domestic and the small business sector
- understanding of metering opportunities relation to domestic and the small business sector

T18 Renewable Energy (Solar PV) encompassing:

- understanding of design of Solar PV Systems and different panel types including Mono-crystalline, Poly-crystalline and Amorphous
- understanding of solar panel characteristics and choice of selection
- understanding of the Balance of Systems, Rules of Thumb, Shading, Orientation and Shading of strings in an on grid solar power system
- performing Solar PV energy calculations and calculate REC Entitlement for a Small Solar PV System
- understanding of the different Feed-in Tariff Schemes and how

REQUIRED SKILLS AND KNOWLEDGE

they apply to solar PV

- T19 Energy Audit System encompassing:
- understanding of Domestic and Small Business Energy Audit Forms and Legend
 - ability to conduct an Energy and Water Audit for the domestic and the small business sector
 - understanding of Domestic and Small Business Sector Energy Audit Report

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity,

electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

**Critical aspects
of evidence
required to
demonstrate
competency in
this unit** 9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
 - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
 - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
 - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
 - Demonstrate an appropriate level of skills enabling employment

- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
- Carryout energy assessments to address energy efficiency issues as described in 8) and including:
 - A Identifying and quantifying the extent of the energy use, loads and patterns of usage for electrical and energy installation energy problem/s.
 - B Identifying and quantifying the extent of the energy use, loads and patterns of usage for electrical and energy installation energy problem/s.
 - C Identifying the operational patterns in control of the user that impact on energy use and the energy services supplied by the energy technology that allow the quantifying energy use.
 - D Perform an energy balance to model the current energy use to the existing energy bills.
 - E Identifying effective energy saving opportunities to reduce energy use from
 - F Understand the extent of the scope of the electrical and energy installation design problems, constraints and likely cost of installation.
 - G Obtain energy system/component parameters, specifications and performance requirements appropriate to each problem.
 - H Test and commission energy saving opportunity solutions to energy problems.
 - I Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.
 - J Document and report financial and technical justification of solutions implemented in accordance with professional standards
 - K Deal with unplanned events by drawing on essential knowledge and skills to provide

appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified.

Context of and specific resources for assessment **9.3)**

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

Method of assessment **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

**Concurrent
assessment and
relationship with
other units**

9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational health and safety unit(s) must be incorporated in relation to this unit.

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to carrying out energy assessments and documenting energy efficiency strategies on at least two types of residential, office or small retail premises.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Renewable and Sustainable Energy