UEERE0012Y Develop effective engineering strategies for energy reduction in buildings

Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

This unit replaces and is not equivalent to UEERE0012 Develop effective engineering strategies for energy reduction in buildings. Modifications include:

- Prerequisite removed
- Significant amendments made to Elements and Performance Criteria
- Updates to performance and knowledge evidence requirements and CVIG content developed.

Application

This unit involves the skills and knowledge required to develop effective engineering strategies for energy reduction in buildings.

It includes developing and documenting engineering strategies/methods to effectively reduce energy use in buildings. It also includes documenting and reporting engineering strategies for energy reduction in buildings.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Not applicable

Competency Field

Renewable Energy

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS	PERFORMANCE CRITERIA

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1 Identify engineering energy strategies for a building	**1.1** Work health and safety (WHS)/occupational health and safety (OHS) requirements and workplace procedures are identified and applied
	1.2 Scope of engineering evaluation is determined from specifications of building, services, plant and machinery and in consultation with relevant person/s
	1.3 Advice is sought from work supervisor to ensure work is coordinated effectively with relevant person/s
	1.4 Tools, testing devices and materials needed to carry out work are obtained and checked for correct operation and safety
	1.5 Industry regulations, legal obligations and job requirements are identified and applied to work in accordance with workplace procedures
2 Develop engineering strategies for energy reduction in a building	**2.1** Inspection, tests and measurements are carried out in accordance with WHS/OHS requirements and workplace procedures
	2.2 Energy use of building, services, plant and machinery is obtained and applied to the engineering evaluation process
	2.3 Energy evaluation tests are set up in accordance with inspection and test methods and workplace procedures
	2.4 Engineering strategies to reduce energy use without compromising occupancy standards are developed in accordance with energy management techniques and evaluation test results
	2.5 Engineering evaluation is carried out without damage to systems, circuits, the surrounding environment or services using sustainable energy practices
	2.6 Worksite is cleaned and made safe in accordance with workplace procedures

2.7 Results of energy use evaluation and recommended engineering strategies and their criterion for energy reduction are documented in accordance with workplace procedures

2.8 Engineering energy reduction report is completed and forwarded to relevant person/s

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Developing engineering strategies for effective energy reduction must include at least the following:	• two buildings

Unit Mapping Information

This unit replaces and is not equivalent to UEERE0012 Develop effective engineering strategies for energy reduction in buildings.

Links

UEE - Electrotechnology Training Package Companion Volume Implementation Guide at: [sector webpage link here]

Assessment Requirements for UEERE0012Y Develop effective engineering strategies for energy reduction in buildings

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- Significant amendments to Performance and Knowledge Evidence
- Updates to performance and knowledge evidence requirements and CVIG content developed.

Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least two occasion and include:

- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements
- determining the extent of the evaluation
- setting up and conducting appropriate examinations and tests
- reporting evaluation including recommendation for improving energy efficiency
- developing sustainable engineering strategies for energy reduction in buildings
- documenting and reporting engineering strategies for effective energy reduction in buildings.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of the following. Additional advice and definitions for some items is provided in the UEE Training Package Companion Volume Implementation Guide (CVIG).

- climate and thermal comfort
- emerging technologies
- solar geometry and radiation
- heat transfer
- glazing systems
- insulation
- thermal mass

- comfort control strategies
- thermal performance of a building
- methods to predict dynamic performance
- use of simulation to predict performance
- energy rating schemes
- sustainable and safe building materials
- engineering principles
- relevant job safety assessments or risk mitigation processes
- relevant manufacturer specifications
- relevant WHS/OHS legislated requirements
- relevant workplace documentation
- relevant workplace policies and procedures
- sustainable energy principles and practices.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must occur in suitable workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated suitable workplace operational situations that replicate workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or other simulations
- relevant and appropriate materials, tools, facilities and equipment currently used in industry
- resources that reflect current industry practices in relation to developing strategies for effective energy reduction in buildings
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

Links

UEE - Electrotechnology Training Package Companion Volume Implementation Guide at: [sector webpage link here]

CVIG content

climate and thermal comfort may include:	• characteristics of the different Australian climatic types • use of climatic data in published and electronic forms to extract the quantities relevant to energy efficient design • relationship between climate and comfort using bioclimatic or psychrometric charts • calculation of heating or cooling degree days or degree hours for various locations • calculation of thermal neutrality for a given location
solar geometry and radiation may include:	• definition of the terms: declination, hour angle, zenith angle, azimuth and altitude angles, and the equation of time • conversion of solar time to local time and vice versa • position of the sun and the length of shadows with the aid of algorithms, tables, sun charts or computer software • daily irradiation incident on a wall, window or roof of a given tilt and orientation • relative summer and winter irradiation of windows facing the cardinal orientations • building facades and surrounding thermal mass • orientation and proximity to other buildings
heat transfer may include:	• thermal processes of conduction, convection and radiation apply to the transfer of heat in buildings • calculation of the summer and winter U-values of building elements using tables and software • calculation of the infiltration heat transfer in a building
glazing systems may include:	• different types of glazing systems and their characteristics • different types of shading devices and the window orientations for which they are most appropriate • solar heat gain for different glazing types and angles of incidence • calculation of the average daily irradiation of a window partly shaded by eaves, using computer software • calculation of the average daily heat gain through a window partly shaded by eaves
insulation may include:	• different types of insulation and where they are used • how different types of insulation are installed in roofs, walls and floors • determination of the minimum R-values of roof insulation for different locations using Australian Standard AS 2627 Thermal insulation of dwellings or similar standards

thermal mass may include:	• advantages and disadvantages of using substantial thermal mass in different climate types and for different heating and cooling regimes • where thermal mass can be located in a building • definition of the following terms: time lag, decrement factor, admittance and response factor
comfort control strategies may include:	• interpretation of the usefulness of a design strategy with the aid of a psychrometric chart showing control potential zones for a particular location • selection of the most useful comfort control strategies for Australian climatic regions
energy efficiency in buildings may include:	• determination of the direction of the following: both true and magnetic, north winter and summer sunrise, winter and summer sunset • solar access in summer and winter to various possible house locations on a site and room locations within the house • how vegetation can be used to both funnel and deflect wind • using cross ventilation as a cooling strategy
thermal performance of a building may include:	• heating requirements of a building using the heating degree day or hour method
dynamic performance predicted by a computer simulation programs may include:	• active solar system types available which can provide hot water, space heating and cooling • the best location on the roof, and the optimum tilt and orientation of the collector panels • function of the main components of an air or water-based solar space heating system • schematic of the fluid circuit of an air or water-based space heating system • main solar cooling system types
energy rating schemes may include:	• differences in approach used by house energy rating schemes in Australia • energy performance of a number of houses using a computer simulation program such as NatHERS or BERS • other methods to reduce energy consumption within and outside a building, including appliance efficiency, human behaviour changes, building management strategies and transportation minimisation

	• additional cost of energy efficiency measures and cost savings using life cycle cost or simple pay back methods according to AS 3595 and AS/NZS 4536 Life cycle costing
sustainable and safe building materials may include:	• common building materials and their embodied energy content • environmental impact of the production of various building materials • problems associated with the use or disposal of building materials