



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **UEENEEJ105A Position, assemble and start up single head split air conditioning and water heating heat pump systems**

Release: 2

## **UEENEEJ105A Position, assemble and start up single head split air conditioning and water heating heat pump systems**

### **Modification History**

Not Applicable

### **Unit Descriptor**

#### **Unit Descriptor**

**1)**

##### **1.1) Descriptor**

This unit covers the assembly, installation and starting up and de-commissioning of single head split air conditioning systems and split water heating heat pump systems up to a maximum of 18kW refrigeration capacity. It encompasses working safely and to standards, following routine procedures to install equipment, connecting pipe work, pressure testing, evacuating, perform functional checks and complete installation / regulatory documentation.

Note: The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 may apply to this unit. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.

### **Application of the Unit**

#### **Application of the Unit 4)**

This unit is intended for competency development entry-level employment-based programs incorporated in approved contracts of training. It may also be used to augment previously acquired competencies.

## Licensing/Regulatory Information

### 1.2) License to practice

The skills and knowledge described in this unit may, in some jurisdictions, require a license to practice in the workplace subject to regulations for undertaking refrigeration and air conditioning 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:

1. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill 2003 may apply to this unit. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.
2. 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, lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
3. 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)**      **2)**

### 2.1) Competencies

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

UEENEEJ172A Recover, pressure test, evacuate, charge and leak test refrigerants split systems

UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace

UEENEEJ102A Prepare and connect refrigerant tubing and fittings

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

## Employability Skills Information

### Employability Skills

3)

This unit contains Employability Skills. The required outcomes described in this unit of 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 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 assemble, install and start up split air conditioning and water heating heat pump systems	1.1	OHS procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures in preparation for the work are followed
	1.3	Safety hazards which have not previously been identified are noted and established risk control measures are implemented
	1.4	The work is appropriately sequenced in accordance with job schedule
	1.5	Appropriate personnel are consulted to ensure the work is coordinated effectively with others involved on the work site
	1.6	The layout of the pipe work to be installed is determined from job/manufacture specifications

ELEMENT	PERFORMANCE CRITERIA
	and diagrams
	1.7 Materials needed to carry out the work are obtained in accordance with established procedures and checked against job requirements
	1.8 Tools, equipment and testing devices needed to conduct the work are obtained in accordance with established procedures and checked for correct operation and safety
	1.9 Appropriately licensed electrician is engaged to carry out all electrical work for the air conditioning and water heating heat pump system
	1.10 Appropriately licensed plumber is engaged to carry out all mains water piping work for the heat pump hot water system
	1.11 Preparatory work is checked to ensure no damage has occurred and complies with requirements.
2 Assemble, install and start up split air conditioning and water heating heat pump systems	2.1 OHS risk control measures and procedures for carrying out the work are followed.
	2.2 System components are positioned in the specified location and assembled in strict accordance with manufacturer instructions and industry standards
	2.3 Interconnecting refrigerant piping/tubing is prepared and assembled in strict accordance with manufacturer instructions and industry standards.
	2.4 Components are pressure tested and evacuated in strict accordance with manufacturer instructions and industry standards
	2.5 Established methods for dealing with unexpected situations are discussed with appropriate person or persons, documented are dealt with safely and with the approval of an authorised person
	2.6 Ongoing checks of the quality of installation and start up are undertaken in accordance with

ELEMENT	PERFORMANCE CRITERIA
	established procedures
	2.7 Notification is given to appropriate person(s) that the system is ready for electrical and mains water connection in accordance with established procedures. (see note 1)
	2.8 The work is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles
3 Decommission split air conditioning and water heating heat pump systems	3.1 OHS risk control measures and procedures for carrying out the work are followed.
	3.2 Refrigerant is pump down and/or recovered from the indoor unit. Interconnecting refrigerant piping/tubing is removed and the indoor and outdoor refrigerant circuits are sealed in accordance with manufacturer instructions and industry standards/codes of practice
	3.3 Appropriately licensed electrician is engaged to isolate and disconnect electrical supply and cabling from the air conditioning and water heating heat pump system
	3.4 Indoor and outdoor unit, refrigerant pipework, water pipework condensate drains and electrical conduits/cables are un-mounted.
	3.5 Established methods for dealing with unexpected situations are discussed with appropriate person or persons, documented are dealt with safely and with the approval of an authorised person
	3.6 The work is carried out efficiently without waste of materials or damage to apparatus, circuits, the surrounding environment or services and using sustainable energy principles
4 Test single head split air conditioning and water heating heat pump systems and document	4.1 OHS risk control work completion measures and procedures are followed
	4.2 The system performance is tested to ensure compliance with technical standards, manufacturer/ job specifications and

**ELEMENT**

**PERFORMANCE CRITERIA**

requirements (Note 2)

- 4.3 Work site and equipment is cleaned and made safe in accordance with established procedures. (Note 3)
- 4.4 Work completion is documented and appropriate person(s) notified in accordance with established procedures

Note.

1. a. Electrical connection shall be carried out by an appropriately licensed electrician.  
b. Mains water connection shall be carried out by an appropriately licensed plumber.
2. Unit performance is completed after associated electrical work is carried out by an appropriate electrically licensed person.
3. Making safe includes leak testing and fitting of caps to all refrigerant access ports, which could allow refrigerant to escape into the environment. It includes de-commissioning.

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

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

Evidence shall show that knowledge has been acquired of safe working practices and positioning, assembling and starting up split air conditioning and water heating heat pump systems.

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

#### **KS01-EJ105A Split air conditioning and water heating heat pump system installation**

Evidence shall show an understanding of split air conditioning and water heating heat pump system installation, start-up and decommissioning, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

##### **T1 Sustainable energy**

- The earth's atmosphere
- The greenhouse effect
- Energy usage in Australia (gases, coal, fuel oil etc)
- Projected population increase and its effects
- International and national greenhouse imperatives: the role of regulators and similar bodies (Kyoto Protocol)

##### **T2 Sustainable energy work practices**

- Definitions
- Renewable energy technologies (solar, wind, biomass, geothermal, tidal, hydro, nuclear)
- The concept of co-generation
- Economic benefits of sustainable energy initiatives

##### **T3 Heritage awareness**

- Heritage listings (concept and types (world, national, commonwealth etc))
- Purpose of regulations related to maintenance of listed sites
- Responsibilities while working in and around listed sites
  - Environmental protection



## REQUIRED SKILLS AND KNOWLEDGE

- Government agencies (AGO, EPHC, DEC etc)
- Environmental protection (land, water, atmosphere, human settlement, biodiversity etc)
- Purpose of regulations related to environmental protection
- Responsibilities while working in and around environmentally protected sites
- Protocols for working in and around protected sites (legislated acts - ozone protection etc)

### T4 Relevant installation codes

- Applicable standards and codes (building, electrical, health, environmental – OH&S act, ozone protection act, Refrigerant Handling Code of Good Practice
- Introduction to MEPS (minimum energy performance standards) and the star rating

### T5 Split air conditioning systems

#### T6 Types and applications

- categories (high wall, floor mounted, ceiling mounted, cassette, ducted)
- sub categories (single head, multi head)
- types (cooling only, reverse cycle, inverter, dc)
- typical applications for each category / type
- system ratings (hp vs kw, standard ambient conditions for capacity ratings ,actual star rating examples)
- Components, construction and operation
- evaporators (finned induced and forced draught)
- metering devices (capillary, restrictor)
- service ports (ball valves, post valves, schrader valves)
- reverse cycle (reversing valves)
- air distribution – non-ducted (fans, filters, swing louvers etc)
- air distribution - ducted (ducting types, bto's, dampers, outlets, grilles, plenums, filters etc)
- typical ducting layouts (maps)
- typical mechanical system layouts (cooling only, reverse cycle)
- evaporating and condensing temperatures / pressures - design and typical operating values
- controls - operating and safety (encapsulated lp & hp sensors, compressor overload, de-ice stat etc)

### T7 Split water heating heat pump systems

- Types and typical applications. including hot water heating and swimming pool heating
- Components, construction and operation
- Cooling coil
- Heating coil
- Metering devices (capillary, restrictor)
- Service ports (ball valves, post valves, Schrader valves)
- Typical mechanical system layouts

## **REQUIRED SKILLS AND KNOWLEDGE**

- Evaporating and condensing temperatures / pressures - design and typical operating values
- Controls - operating and safety (encapsulated LP & HP sensors, compressor overload, etc)

### **T8 Installation of unit and pipework**

- Respect for customers premises (on-time, respectful language, private commodities, toilets, clean-up etc)
- Noise and vibration (problems for neighbours, typical council requirements)
- Location & mounting - outdoor unit (suitable locations, slabs, brackets (wall/roof), machine pads (e.g. waffle) etc)
- Location & mounting - indoor unit/water heater (suitable locations, penetrations, hanging, mounting methods)
- Refrigerant piping (layout, installation, insulation, pair coil, protection (steel trunking, plastic pipe duct))
- Condensate drains and pumps (correct drainage, safety drain on FCU, condensate pumps)
- Personal safety (safe lifting, correct use of ladder and platforms)
- Manufacturers installation instructions (examples of typical manufacturers installation guides)
- Electrical connections by electrician
- Mains water connections by plumber

### **T9 System start up**

- Manufacturers start-up instructions (examples of typical manufacturers guides)
- Pressure testing refrigerant pipework and system (nitrogen)
- Evacuation
- Opening outdoor unit valves
- Checking refrigerant charge (pressures, temperatures, sweat line, evaporator superheat etc)
- Adding refrigerant (manufacturers recommended top-up values for longer pipework runs)
- Leak detection
- Customer familiarisation (completing warranty card, operating instructions, general maintenance instructions)

### **T10 De-commission split air conditioning systems**

- Closing isolation valves on outdoor unit.
- Indoor unit pump down and recovery
- Sealing refrigerant components
- Electrical isolation and disconnection by electrician
- Mains water isolation and disconnection by plumber
- Unit, piping, drain and electrical cable removal

## Evidence Guide

### EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

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 nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much 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

##### 9.2)

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

## EVIDENCE GUIDE

### unit

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines - UEE07'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall 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:
  - Position, assemble and start up split air conditioning and water heating heat pump systems as described in 8) and including:
    - A Determining job requirements correctly
    - B Positioning and assembling system components to specifications
    - C Assembling piping and tubing to specifications
    - D Pressure testing and evacuating the system in accordance with manufacturer's instructions and industry standards, codes and regulations.  
Note:  
Refrigerant purging is not permitted in Australia
    - E Giving notification to appropriate person for electrical connections to be completed

## EVIDENCE GUIDE

- F De-commissioning single head split air conditioning and water heating heat pump units
- G Testing system performance correctly to manufacturer design specifications
- H Documenting work activities
- I Demonstrating a basic understanding of system performance outside manufacturers design specifications
- J Demonstrating a basic understanding of the compressor, condenser, evaporator and flow control types and their function relevant to single head split system installation
- K Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the 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 shall 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.

Evidence should show demonstrated competency in positioning, assembling and starting up split air conditioning and water heating

## EVIDENCE GUIDE

heat pump systems.

### 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.

## Range Statement

### RANGE STATEMENT

8) 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 the assembly, installation and starting up and de-commissioning of single head split air conditioning and water heating heat pump systems (hot water or swimming pool) up to a maximum of 18kW<sub>r</sub> 'refrigeration' capacity with the following attributes:

- safe working
- Australian/New Zealand standards applied
- routine procedures followed
- equipment installation
- pipe work connection
- pressure test
- evacuation
- functional performance checks
- installation/regulatory documentation completion

Note:

1. The Ozone Protection and Synthetic Greenhouse Gas Legislation Amendment Bill and the Ozone Protection and Synthetic Gas Management Regulations apply to this qualification. Prior to planning the delivery of any training and/or assessment activities all legislative and regulatory requirements shall be identified and included.
2. This includes the installation, commissioning and de-commissioning of single head wall hung split air conditioning and water heating heat pump systems. The maximum plant capacity for each system is 18 kW<sub>r</sub>.
3. This unit DOES NOT COVER COMPETENCIES FOR service, repair, maintenance, diagnostic/fault finding and electrical work and the safe and proper installation of commercial refrigeration and air conditioning and water heating heat pump plant and equipment.

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

### 2.2) Literacy and numeracy skills

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	3	Writing	3	Numeracy	3
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### 2.2) Literacy and numeracy skills

Competency Field 5)

Refrigeration and Air Conditioning