



Australian Government

UEERA0003 Analyse the thermodynamic performance of HVAC/R systems

Release: 1

UEERA0003 Analyse the thermodynamic performance of HVAC/R systems

Modification History

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

Application

This unit involves the skills and knowledge required to analyse the thermodynamic performance of heating, ventilation and air conditioning/refrigeration (HVAC/R) systems.

It includes analysing HVAC/R systems and providing solutions to thermodynamic performance issues. It also includes working safely, gathering and analysing thermodynamic performance data, applying problem-solving techniques, and developing and documenting results and solution/s.

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

Pre-requisite Unit

Not applicable

Competency Field

Refrigeration and air-conditioning

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

- 1 Prepare to analyse thermodynamic performance of HVAC/R system**

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

- 1.1** Work health and safety (WHS)/occupational health and safety (OHS) processes and workplace procedures for a given work area are identified and applied

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| | 1.2 | WHS/OHS risk control measures and workplace procedures are followed in preparation for HVAC/R work |
| | 1.3 | Extent of the thermodynamic issues are determined from performance specifications and situation reports and in consultation with relevant person/s |
| | 1.4 | HVAC/R activities are planned to meet scheduled timelines in consultation with others involved in the work |
| | 1.5 | Strategies are formed to ensure HVAC/R analysis and solution implementation is carried out efficiently in accordance with workplace procedures |
| 2 | Analyse thermodynamic performance of HVAC/R system | |
| | 2.1 | WHS/OHS risk control measures and workplace procedures for carrying out HVAC/R work are followed |
| | 2.2 | Thermodynamic principles are applied to analytical solutions to HVAC/R system |
| | 2.3 | Parameters, specifications and performance requirements in relation to HVAC/R system are obtained in accordance with workplace procedures |
| | 2.4 | Analysis of HVAC/R thermodynamic parameters is carried out to provide effective solution/s |
| | 2.5 | Unplanned events are dealt with safely and effectively in accordance with regulatory requirements and workplace procedures in a manner that minimises risk to personnel and equipment |
| | 2.6 | Quality of work is monitored against performance agreement and/or workplace procedures or industry standards |
| 3 | Document and report results of the HVAC/R thermodynamic performance analysis and actions taken | |
| | 3.1 | Solutions to HVAC/R thermodynamic issues are evaluated to determine their effectiveness and modified, as required |
| | 3.2 | HVAC/R analysis is documented and includes details of findings, calculations and assumptions |
| | 3.3 | HVAC/R analysis is reported to appropriate person/s to |

determine appropriate action to be taken based on findings

- 3.4** Justification for findings and any actions to be undertaken in relation to the HVAC/R equipment is documented for inclusion in work/project or development records in accordance with industry standards and workplace procedures

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.

Analysing thermodynamic parameters of HVAC/R systems must include at least the following:

- two different refrigeration and air conditioning systems

Unit Mapping Information

This unit replaces and is equivalent to UEENEEJ193A Analyse the thermodynamic performance of HVAC/R systems.

Links

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEERA0003 Analyse the thermodynamic performance of HVAC/R systems

Modification History

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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 one occasion and include:

- understanding the thermodynamic performance issues
- forming effective strategies for analysing refrigeration and air conditioning systems performance
- obtaining thermodynamic performance parameters, specifications and performance requirements appropriate to each situation
- evaluating the results of the analysis
- documenting analysis details of all findings, calculations and assumptions
- documenting justification of actions to be implemented in accordance with professional standards
- dealing with unplanned events
- applying problem-solving techniques
- applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, workplace procedures and practices, including using risk control measures
- applying sustainable energy principles and practices.

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:

- refrigeration systems, safe working practices and relevant standards, codes and regulations, including:
 - major components, type and functions:
 - evaporators
 - compressors
 - expansion devices
 - ancillary components
 - refrigerants

- system operation and performance:
 - thermodynamic properties of refrigerants
 - pressure enthalpy charts
 - refrigerant cycle
 - refrigerant cycle represented on pH charts
 - introduction to refrigerating effect, heat of compression, heat rejected on high side, co-efficient of performance, liquid sub-cooling suction superheating
 - effects on performance of changing operating pressures, liquid sub-cooling, suction superheating
- application of refrigeration:
 - introduction to industrial refrigeration, specific system component types and refrigerants
 - scope of commercial refrigeration, specific system component types and refrigerants
- refrigerated enclosures and cabinets:
 - merchandising and display cabinets:
 - deep freeze meat
 - dairy
 - fruit and vegetable
 - multi-deck display
 - single deck
 - well type
 - island cases
 - glass door
 - reach door
 - reach in merchandisers
 - defrosting methods
 - cold rooms and freezer rooms
 - types and construction
 - insulation
 - vapour barrier
 - frost heave
 - interior fittings
 - location of equipment
 - defrosting methods
 - cold tracking
 - trace heating
 - storage conditions
 - temperature
 - relative humidity
 - air velocity

- air patterns
 - load limits
- air conditioning systems
- introduction to air conditioning systems, safe working practices and relevant standards, codes and regulations, including:
 - WHS/OHS requirements:
 - Building Code of Australia (BCA) requirements
 - AS 1668 The use of ventilation and air conditioning in buildings parts 1 and 2
 - AS/NZS 3666 Air-handling and water systems of buildings
 - noise and vibration
 - air quality
 - sick building syndrome
 - operating requirements:
 - ventilation
 - air distribution
 - terminal velocity
 - temperature
 - relative humidity
 - air quality
 - noise
 - basic psychrometrics
 - operating modes:
 - ventilation
 - evaporative cooling
 - ventilation and cooling
 - ventilation and heating
 - dehumidification
 - dehumidification and reheat
 - humidification
 - operating terminology/characteristics:
 - throw and drop
 - primary and secondary air
 - coanda effect
 - heating, ventilation and air conditioning (HVAC) system components and functions:
 - fans
 - ducting
 - registers
 - dampers
 - filters
 - cooling coils

- heating coils
- induction units
- fan coil units
- terminal units
- humidifiers, pumps and sprayers
- hydronic systems and components
- applications and construction of air conditioning systems:
 - applications
 - residential, commercial, low and high rise, industrial ventilation and air conditioning
 - packaged plant
 - split systems (wall and floor console, ceiling fan coil), wall facia, roof top and reverse cycle option central station plant
 - all air systems, constant volume variable temperature, constant temperature variable volume, and air/water systems
 - all water system, multi-zoning, thermal storage systems
 - basic air conditioning system diagrams
 - duct layout
 - hydronic layout
 - unit/conditioner drawings
- HVAC control systems:
 - basic principles
 - terminology
 - symbols and diagrams
 - basic applications
- problem-solving techniques
- relevant HVAC/R manufacturer specifications
- relevant job safety assessments or risk mitigation processes
- relevant workplace documentation
- relevant workplace policies and procedures
- typical thermodynamic performance issues.

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 workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated 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, equipment and personal protective equipment (PPE) currently used in industry
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

Links

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