Title	**Demonstrate introductory knowledge of mechanical building services**		
Level	**3**	**Credits**	**8**

Purpose	This unit standard is intended primarily for use in the training of personnel in the mechanical building services industry and covers introductory knowledge of mechanical building services. People credited with this unit standard are able to demonstrate knowledge of: the physical principles underpinning the operation of mechanical building services equipment; the role of air conditioning in relation to human comfort; electricity relevant to the mechanical building services trade and the scope of different electrical practising licenses; the refrigeration cycle as used in mechanical building services; heat transfer in mechanical building services systems with reference to major components; the scope and structure of the mechanical building services industry in New Zealand; the Building Act requirements in relation to mechanical building services installation; and mounting mechanical building services components.

Classification	Mechanical Engineering > Heating, Ventilating, and Air Conditioning

Available grade	Achieved

Guidance Information

1 References and legislations
New Zealand Building Code.
Ministry of Business, Innovation and Employment (MBIE). *Compliance Document for the New Zealand Building Code*. Wellington, 2005. Available at: https://www.building.govt.nz/building-code-compliance/building-code-and-handbooks/compliance-schedule-handbook/.
The International System of Units (SI). 8th edition. France: Bureau International des Poids et Mesures. 2006. Available at http://www.bipm.org/utils/common/pdf/si_brochure_8_en.pdf.

2 Definitions
Accepted industry practice refers to approved codes of practice and standardised procedures accepted by the mechanical building services industry sector as examples of best practice.
Compliance Document refers to Ministry for Business, Innovation and Employment Compliance Document for the New Zealand Building Code.

Introductory knowledge refers to the knowledge that is commonly expected of a second year trainee or apprentice and requires the candidate to employ a broad knowledge of the subject matter, incorporating fundamental theoretical concepts to make informed judgements in the mechanical building services industry.
SI refers to the Système International d'Unités, or International System of Units.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of the physical principles underpinning the operation of mechanical building services equipment.

Performance criteria

1.1 The terms *saturation, latent heat of fusion*, *latent heat of evaporation*, *specific heat*, *relative humidity*, and *dry and wet bulb temperature* are explained in relation to mechanical building services.

1.2 The first and second laws of thermodynamics are described in terms of energy, heat, work, and enthalpy.

1.3 The SI units for temperature and pressure are stated together with symbols.

1.4 The terms *specific volume*, *specific density*, and *specific gravity* are explained, and their SI units are stated together with symbols.

Outcome 2

Demonstrate knowledge of the role of air conditioning in relation to human comfort.

Performance criteria

2.1 Relationship between air temperature and net radiant energy exchange is described and supported by examples.

2.2 Effects of air stratification and equipment location on human comfort are described and supported by examples.

2.3 Effects of low and high humidity on human comfort are described and supported by examples.

2.4 Given sample conditions taken by a sling psychrometer, results are plotted using a psychrometric chart to illustrate zones of human comfort.

2.5 The effects of air movement and micro-climates on human comfort are described with reference to different internal environmental conditions.

Outcome 3

Demonstrate knowledge of electricity relevant to the mechanical building services trade and the scope of different electrical practising licenses.

Performance criteria

3.1 The characteristics of insulators, conductors, series and parallel circuits are identified from the point of view of current flow.

3.2 Ohms law is stated and used to calculate current, given voltage, and resistance.

3.3 Examples of the application of the heating and magnetic effects of electrical current are identified with reference to practical applications.

3.4 The difference between direct current and alternating current is explained with reference to current waveform, direction, and frequency.

3.5 Single-phase and three-phase motors are compared from the point of view of suitability for different applications.

3.6 Electrical hazards and their management are described with reference to the effect of electrical shock on the human body.

3.7 Range of electrical work permissible for holders of different electrical licences and qualifications are identified.

Range unlicensed electrical workers, Electrical Installers, Electricians, Electrical Service Technicians, Electrical Appliance Serviceperson.

Outcome 4

Explain the refrigeration cycle as used in mechanical building services.

Performance criteria

4.1 The refrigeration cycle as used in mechanical building services is explained with the aid of a given diagram and with reference to changes in volume, temperature, pressure, and state of the refrigerant.

Outcome 5

Demonstrate knowledge of heat transfer in mechanical building services systems with reference to major components.

Performance criteria

5.1 The method of heat transfer for a heating system is identified from a given block diagram, and the functions of major components are outlined.

Range method of heat transfer – source of heat, transfer medium, emitter.

5.2 The method of heat transfer for a ventilating system is identified from a given block diagram, and the functions of major components are outlined.

Range method of heat transfer – outside air, transfer medium, outlets.

5.3 The method of heat transfer for an air conditioning system is identified from a given block diagram, and the functions of major components are outlined.

Range method of heat transfer – remove heat, transfer medium, reject heat.

Outcome 6

Demonstrate knowledge of the scope and structure of the mechanical building services industry in New Zealand.

Performance criteria

6.1 The services provided by the mechanical building services industry to other industry clients are outlined.

Range evidence of five services is required.

6.2 Industry associations that impact on the mechanical building services industry are identified and their roles outlined in reference to their functions in the mechanical building services industry.

6.3 The accountabilities and responsibilities of key personnel in the installation and servicing of mechanical building services equipment are outlined.

Range key personnel may include but is not limited to – installation and maintenance supervisors, construction site mangers, design engineers, site maintenance engineers, building owners, other trades.

Outcome 7

Demonstrate knowledge of Building Act requirements in relation to mechanical building services installation.

Performance criteria

7.1 Fire stopping requirements for pipe and duct penetrations are identified in accordance with the Compliance Document.

7.2 Maintenance of the integrity of the building envelope is identified in accordance with the Compliance Document.

Range requirements for fire, requirements for water tightness.

7.3 Requirements for mounting of mechanical building services equipment and suspension of pipe work are identified in accordance with the Compliance Document.

Range structural support, vibration, seismic requirements.

Outcome 8

Demonstrate knowledge of mounting mechanical building services components.

Performance criteria

8.1 The structural components of a building are identified, and materials they can be made from are described.

8.2 The procedures and precautions to observe when mounting mechanical building services components are described.

Range manufacturer's instructions, building drawings and specifications, maintaining building structural integrity, accessibility of components and labelling, accepted industry practice.

Planned review date	31 December 2023

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	16 July 2010	31 December 2023
Review	2	29 March 2018	31 December 2023
Review	3	1 November 2018	N/A

Consent and Moderation Requirements (CMR) reference	0013

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.