Title	**Demonstrate knowledge of basic thermodynamics relevant to the energy and chemical industry**		
Level	**3**	**Credits**	**5**

Purpose	This unit standard is intended for people working as boiler operators and process operators in an energy and chemical plant. People credited with this unit standard are able to demonstrate knowledge of: basic thermodynamics; the basics of energy; and the basics of heat, relevant to the energy and chemical industry.

Classification	Energy and Chemical Plant > Operation of Energy and Chemical Plant

Available grade	Achieved

Guidance Information

1 Legislation and regulations relevant to this unit standard include but are not limited to:
- Health and Safety at Work Act 2015;
- Health and Safety at Work (Hazardous Substances) regulations 2017 (HSWA);
- Resource Management Act 1991;
and any subsequent amendments.

2 Definitions
Energy and chemical plant may be in – petrochemical, agri-nutrient, power generation, dairy processing, meat processing, and wood fibre manufacturing, or other plants that operate with a combination of high temperatures, pressures, steam and/or chemicals in gas, liquid or solid form.
Plant – the operational unit, equipment and/or workplace at which the person is working.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of basic thermodynamics relevant to the energy and chemical industry.

Performance criteria

1.1 Describe thermodynamics in terms of the basic principles.

Range principles include but are not limited to – energy, heat, specific heat capacity, temperature, work, pressure, flow, power, force.

1.2 Describe the relationship between pressure, temperature, and volume in terms of the equation for each gas law.

Range gas laws include but are not limited to – Boyle's Law, Charles' Law, Gay-Lussac's Law, Combined Gas Law.

1.3 Describe the relationship between temperature and pressure in terms of saturation temperature and changes of state.

1.4 Describe absolute and gauge pressure in terms of their relationship to the energy and chemical industry.

1.5 Describe a thermodynamic cycle in terms of its relationship to the energy and chemical industry.

Outcome 2

Demonstrate knowledge of the basics of energy relevant to the energy and chemical industry.

Performance criteria

2.1 Describe laws that govern the behaviour of energy in terms of the laws of thermodynamics.

Range laws of thermodynamics include but are not limited to – zeroth, first, second, third.

2.2 Describe common forms of energy in terms of their uses.

Range common forms of energy include but are not limited to – potential, kinetic, internal, chemical, nuclear.

2.3 Describe the effect of energy on a substance using thermodynamic terms.

Range thermodynamic terms include but are not limited to – temperature, coefficient of linear expansion, change of state, specific heat capacity.

Outcome 3

Demonstrate knowledge of the basics of heat relevant to the energy and chemical industry.

Performance criteria

3.1 Describe heat in terms of types.

Range types include but are not limited to – sensible, latent, super.

3.2 Describe the transfer of energy from one body to another in terms of the process.

Range transfer includes but is not limited to – temperature, differential, coefficient of heat transfer, conduction, convection, radiation.

3.3 Interpret steam tables in terms of determining energy contents of steam and the boiling point of steam at different pressures.

Replacement information	This unit standard was replaced by skill standard 40381.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	27 June 2005	31 December 2014
Rollover and Revision	2	25 July 2006	31 December 2014
Review	3	22 May 2009	31 December 2016
Review	4	24 October 2014	31 December 2022
Review	5	27 February 2020	31 December 2026
Review	6	27 March 2025	31 December 2026

Consent and Moderation Requirements (CMR) reference	0079

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