

40381 Outline foundational thermodynamic concepts relevant to the energy and chemical industry

Kaupae Level	3
Whiwhinga Credit	5
Whāinga Purpose	<p>This skill standard is intended for people working as boiler operators and process operators in an energy and chemical plant.</p> <p>People credited with this skill standard are able to: outline foundational thermodynamic concepts; and describe the principles and forms of energy; and heat, relevant to the energy and chemical industry.</p> <p>This skill standard can be used in the New Zealand Energy and Chemical qualifications at Level 3 and above.</p>

Hua o te ako me Paearu aromatawai | Learning outcomes and assessment criteria

Hua o te ako Learning outcomes	Paearu aromatawai Assessment criteria
1. Outline foundational thermodynamic concepts relevant to the energy and chemical industry.	a. Outline thermodynamics in terms of the foundational principles.
	b. Describe the relationship between pressure, temperature, and volume in terms of the equation for each gas law.
	c. Describe the relationship between temperature and pressure in terms of saturation temperature and changes of state.
	d. Describe absolute and gauge pressure.
	e. Describe a thermodynamic cycle in terms of its relationship to the energy and chemical industry.
2. Describe the principles and forms of energy relevant to the energy and chemical industry.	a. Describe laws that govern the behaviour of energy in terms of the laws of thermodynamics.
	b. Describe common forms of energy in terms of their uses.
	c. Describe the effect of energy on a substance.
3. Describe heat relevant to the energy and chemical industry.	a. Describe heat in terms of types.
	b. Describe the transfer of energy from one body to another in terms of the process.
	c. Interpret steam tables to determine energy contents of steam and the boiling point of steam at different pressures.

Pārongo aromatawai me te taumata paearu | Assessment information and grade criteria

Assessment Specifications:

- 1a: principles include but are not limited to – energy, heat, specific heat capacity, temperature, work, pressure, flow, power, force.
- 1b: gas laws include but are not limited to – Boyle's Law, Charles' Law, Gay-Lussac's Law, Combined Gas Law.
- 2a: laws of thermodynamics include but are not limited to – zeroth, first, second, third.
- 2b: common forms of energy include but are not limited to – potential, kinetic, internal, chemical, nuclear.
- 2c: thermodynamic terms include but are not limited to – temperature, coefficient of linear expansion, change of state, specific heat capacity.
- 3a: types include but are not limited to – sensible, latent, super.
- 3b: transfer includes but is not limited to – temperature, differential, coefficient of heat transfer, conduction, convection, radiation.

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.

Ngā momo whiwhinga | Grades available

Achieved

Ihirangi waitohu | Indicative content

None

Rauemi | Resources

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.

Pārongo Whakaū Kouna | Quality assurance information

Ngā rōpū whakatau-paerewa Standard Setting Body	Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council
Whakaritenga Rārangi Paetae Aromatawai DASS classification	Manufacturing > Energy and Chemical Plant > Operation of Energy and Chemical Plant
Ko te tohutoro ki ngā Whakaritenga i te Whakamanatanga me te Whakaōritenga CMR	0079

Hātepe Process	Putanga Version	Rā whakaputa Review Date	Rā whakamutunga mō te aromatawai Last date for assessment
Rēhitatanga Registration	1	27 March 2025	N/A
Kōrero whakakapinga Replacement information	This skill standard replaced unit standard 21464.		
Rā arotake Planned review date	31 December 2029		

Please contact Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council at qualifications@hangaarorau.nz to suggest changes to the content of this skill standard.