# 40377 Recognise distillation equipment and its purpose in an energy and chemical plant

Kaupae   Level	3
Whiwhinga   Credit	12
Whāinga   Purpose	People credited with this skill standard are able to describe: energy and chemical distillation processes and associated equipment; energy and chemical distillation equipment control and protection systems; and design and construction of energy and chemical distillation equipment; in an energy and chemical plant. This skill standard can be used in the New Zealand Energy and Chemical qualifications at Level 3 and above.

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

Hua o te ako   Learning outcomes	Paearu aromatawai   Assessment criteria		
. Describe energy and chemical distillation processes and associated equipment.	a. Describe distillation in terms of the key separation principles.		
	b. Describe the principle of mass balance in the complete distillation system.		
	c. Identify site distillation components in terms of their purpose and function.		
	<ul> <li>Identify external auxiliary components for each type of distillation equipment in terms of their purpose and function.</li> </ul>		
	e. Identify internal components for each type of distillation equipment in terms of their purpose and function.		
	f. Describe the procedures for the long, medium, and short-term storage of distillation equipment.		
2. Describe energy and chemical distillation equipment control and protection systems.	<ul> <li>a. Identify control systems for distillation equipment and auxiliary systems and describe their operating principles.</li> </ul>		
	b. Describe equipment protection systems, in terms of their purpose, inputs, and outputs.		
	c. Describe the impact to product quality of insufficient design capacity in process heating / cooling equipment relative to feed rate.		

Hua o te ako   Learning outcomes		Paearu aromatawai   Assessment criteria		
3.	Describe design and construction of distillation equipment in an energy and chemical plant.	a.	Explain the properties and reasons for selection of materials used in the construction of distillation equipment.	
		b.	Explain corrosion, erosion, expansion, and thermal stress on distillation equipment in terms of the causes and effects.	
		C.	Describe basic distillation vessel design in terms of throughput capacity.	

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

Assessment specifications:

- 1a: evidence of at least two principles is required.
- 1c: towers, columns, strippers, accumulators and/or vessels, reboilers, condensers, heaters, coolers, ejectors, driers, separators.
- 1d: feed systems, analysers, reflux lines, pumps, heaters, coolers, chemical injection systems, compressors, refrigeration system, condensers.
- 1e: pall rings, bubble cap trays, structured packings, sieve trays, downcomers, weirs, nozzles, diversion chute.
- 1f: nitrogen capping, dry storage, chemical storage.
- 2a: flow, pressure, temperature, level.
- 2b: control system, alarm/trip systems, purge systems, mechanical relief, emergency shut down systems, emergency depressurisation systems, deluge.
- 3a: temperature and/or pressure tolerance, corrosion resistance, cost factors, location, size, mild steel, cast steel, alloy steels, non- ferrous metals, copper and its alloys, ceramics, glass, polymers.
- 3c: distillation, fractionation, vacuum distillation, different feeds, McCabe-Thiele diagrams, rectifying/stripping sections, reflux ratios, pressures, throughput, volatility.

#### 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 Kounga | Quality assurance information

<b>Ngā rōpū whakatau-paerewa</b>   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	<b>Putanga</b>   Version	<b>Rā whakaputa</b>   Review Date	<b>Rā whakamutunga mō te aromatawai</b>   Last date for assessment		
Rēhitatanga   Registration	1	27 March 2025	N/A		
<b>Kōrero whakakapinga</b>   Replacement information	This skill standard replaced unit standard 18423.				
<b>Rā arotake  </b> Planned review date	31 December 2029				

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