Title	**Demonstrate knowledge of distillation equipment in an energy and chemical plant**		
Level	**3**	**Credits**	**12**

Purpose	People credited with this unit standard are able to: demonstrate knowledge of energy and chemical distillation processes and associated equipment; demonstrate knowledge of energy and chemical distillation equipment control and protection systems; and describe design and construction of energy and chemical distillation equipment; in an energy and chemical plant.

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 energy and chemical distillation processes and associated equipment.

Performance criteria

1.1 Describe distillation in terms of the principles.

Range evidence of at least two principles is required.

1.2 Identify site distillation components in terms of their purpose and function.

Range towers, columns, strippers, accumulators and/or vessels, reboilers, condensers, heaters, coolers, ejectors, driers, separators.

1.3 Identify external auxiliary components for each type of distillation equipment in terms of their purpose and function.

Range feed systems, analysers, reflux lines, pumps, heaters, coolers, chemical injection systems, compressors, refrigeration system, condensers.

1.4 Identify internal components for each type of distillation equipment in terms of their purpose and function.

Range pall rings, bubble cap trays, structured packings, sieve trays, downcomers, weirs, nozzles, diversion chute.

1.5 Describe the principles of the long, medium, and short-term storage of distillation equipment.

Range nitrogen capping, dry storage, chemical storage.

Outcome 2

Demonstrate knowledge of energy and chemical distillation equipment control and protection systems.

Performance criteria

2.1 Identify and describe control systems for distillation equipment and auxiliary systems in terms of their operating principles.

Range flow, pressure, temperature, level.

2.2 Describe equipment protection systems, in terms of their purpose, and inputs.

Range control system, alarm/trip systems, purge systems, mechanical relief, emergency depressurisation systems, deluge.

2.3 Describe the principles of heat and mass balance on the unit in relation to equipment and process requirements.

Outcome 3

Describe design and construction of distillation equipment in an energy and chemical plant.

Performance criteria

3.1 Describe the materials used in the construction of distillation equipment in terms of their properties and reasons for selection.

Range 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.

3.2 Describe corrosion, erosion, expansion, and thermal stress in terms of the causes and effects.

3.3 Describe basic distillation vessel design in terms of the principles.

Range distillation, fractionation, vacuum distillation, different feeds, McCabe-Thiele diagrams, rectifying/stripping sections, reflux ratios, pressures, throughput, volatility.

Replacement information	This unit standard was replaced by skill standard 40377. This unit standard and unit standard 18733 replaced unit standard 9615.

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	24 January 2002	31 December 2018
Review	2	20 February 2009	31 December 2018
Rollover and Revision	3	20 April 2017	31 December 2022
Review	4	27 February 2020	31 December 2026
Review	5	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.