Title	**Demonstrate knowledge of gas analytical measurement and flame, gas, smoke, and heat detection**		
Level	**4**	**Credits**	**5**

Purpose	This unit standard covers principles of industrial gas analytical measurements and detection and the operation of systems used to perform the measurements. People credited with this unit standard are able to demonstrate knowledge of: – stack and/or particulate monitoring and measurement; – chromatography measurement; – humidity measurement; – analytical sampling systems; – flame detectors; – gas detectors; – smoke detectors; and – heat detectors.

Classification	Industrial Measurement and Control > Industrial Measurement and Control - Theory

Available grade	Achieved

Guidance Information

Reference
Approved code of practice for the design, safe operation, maintenance and servicing of boilers, https://worksafe.govt.nz/;
and all subsequent amendments and replacements.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of stack and/or particulate monitoring and measurement.

Performance criteria

1.1 Describe principles of stack and/or particulate monitoring.

Range dichotomous sampler particulate, infra red, zirconia probe, light attenuation/transmissiometer, carbon monoxide (CO), carbon dioxide (CO_2), nitrous oxide (NO), particulate.

1.2 Define factors taken into account when making stack monitoring measurements.

Range air dilution, water vapour, plant operating conditions, wet sample, dry sample.

1.3 Describe calibration techniques.

Range dedicated test equipment, sample.

Outcome 2

Demonstrate knowledge of chromatography measurement.

Performance criteria

2.1 Describe principles of chromatography and detectors.

Range thermal conductivity, flame ionisation, carrier gas, packed column, measuring circuit.

2.2 Identify typical measurement applications using chromatography, and describe graphical read outs.

Range liquid, gas, vapour samples.

Outcome 3

Demonstrate knowledge of humidity measurement.

Performance criteria

3.1 Define areas of application for humidity measurements.

Range pulp and paper, powder plant.

3.2 State the principles and terms involved in humidity measurements.

Range dew point, relative humidity, saturated solution, saturation pressure, specific humidity, hygrometer.

3.3 Determine relative humidity using psychometric chart and hygrometer.

Range sling psychometer, wet-dry bulb hygrometer.

3.4 Describe hygrometer types.

Range chilled mirror type, surface conductivity type.

Outcome 4

Demonstrate knowledge of analytical sampling systems.

Performance criteria

4.1 State the steps to obtain and process an analytical sample and show in a block diagram.

4.2 State the components of a sampling system.

Range may include but is not limited to – pumps, filters, scrubbers, dryers, phase separating devices, vaporisers, heat exchangers.

Outcome 5

Demonstrate knowledge of flame detectors.

Performance criteria

5.1 List types of flame detectors and describe their operating principles.

Range electric conduction type, visible radiation, photocell, infrared radiation, ultraviolet radiation.

5.2 Identify flame detector applications.

5.3 Explain reasons for self-checking function of flame detectors.

Range shutter, operational check.

Outcome 6

Demonstrate knowledge of gas detectors.

Performance criteria

6.1 List types of gas detectors and describe their operating principles.

Range semiconductor, polarographic, electrochemical, catalytic.

6.2 Identify gas detector applications.

Outcome 7

Demonstrate knowledge of smoke detectors.

Performance criteria

7.1 List types of smoke detectors and describe their operating principles.

Range ionisation, photoelectric.

7.2 Identify smoke detector applications.

Outcome 8

Demonstrate knowledge of heat detectors.

Performance criteria

8.1 List types of heat detectors and describe their operating principles.

Range bimetallic, thermistor, fusible link (low melting point solder), filled system.

8.2 Identify heat detector applications.

Replacement information	This unit standard and unit standard 28080 replaced unit standard 2641. This unit standard replaced unit standard 2668.

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	28 November 2013	31 December 2027
Rollover and Revision	2	28 June 2018	31 December 2027
Review	3	30 January 2025	31 December 2027

Consent and Moderation Requirements (CMR) reference	0003

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