40380 Monitor equipment and systems used for steam generation in boilers

Kaupae | Level	3
Whiwhinga | Credit	8
Whāinga | Purpose	This skill standard is intended for people working as boiler operators in an energy and chemical plant. People credited with this skill standard are able to: identify steam generation equipment and fittings; describe combustion air equipment, steam generation fuel systems and burner equipment, and feedwater equipment and lay-up, in boilers; and monitor boiler water condition. 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
1. Identify steam generation equipment and fittings in boilers.	a. Describe boilers in terms of design and operating principles.
	b. Identify the components of steam generating equipment in terms of function.
	c. Describe boiler mountings in terms of their purpose.
	d. Describe boiler instrumentation in terms of boiler operations.
	e. Identify boiler gauge glass problems and describe solutions to these problems.
2. Describe combustion air equipment in boilers.	a. Describe equipment used to provide combustion air to boilers in terms of its mechanical and operating principles.
	b. Describe equipment used to control combustion in terms of its operating principles.
3. Describe steam generation fuel systems and burner equipment in boilers.	a. Describe fuels used for steam generation in terms of their handling characteristics, use, and requirements for complete combustion.
	b. Describe fuel systems and fuel safety systems in terms of function.
	c. Describe burner equipment and configuration in terms of mechanical operating principles.

4. Describe feedwater equipment and lay-up in boilers.	a. Identify site-specific water treatment systems and describe their purpose in terms of their effect on the quality of the feedwater, safety and maintenance of supply.
	b. Identify chemicals used in boiler feedwater systems and describe their purpose in terms of their effect on the quality of the feedwater.
	c. Describe the potential hazards associated with boiler water treatment chemicals in terms of their effect on personnel, plant and the environment, consistent with Safety Data Sheet details.
	d. Describe feedwater pump type in terms of start-up procedures.
	e. Describe the consequences of incorrect water treatment in terms of the effect on safe operation of the boiler.
	f. Describe blowdown equipment in terms of type and function.
	g. Describe condensate return monitoring and diversion equipment in terms of purpose, economic and operating problems and function.
	h. Describe impurities in feedwater in terms of their source and effects on the boiler, feedwater system, condensate system, and steam quality.
	i. Describe boiler feedwater tests in terms of the impact of out of specification test results on the boiler.
	j. Describe wet and dry boiler lay-up in terms of purpose and use.
5. Monitor boiler water condition.	a. Collect boiler water samples in accordance with organisational requirements.
	b. Log and analyse obtained test result of boiler water samples against specification.
	c. Identify deviations and take corrective action.

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

Assessment specifications:

- evidence for the practical components of this skill standard must be supplied from the workplace.
- evidence for all outcomes must be presented in accordance with organisational requirements.
- 1a: boilers include but are not limited to – water tube, shell or fire tube, combination fire tube-water tube, once-through coil, electrode boiler, fluidised bed boiler.

- 1b: if using Water Tube boiler: Water circulation – convection/natural circulation, forced circulation, Steam Drum, Downcomer, Mud drum (Lower header), Riser (Steam Generation tubes), density, temperature,
- 1b: if using Fire Tube Boiler: Water circulation – convection/natural circulation, forced circulation, Fire tube, Gas pass, density, temperature,
- 1c: boiler mountings include but are not limited to – safety valves, feed check valve, blowdown valve, air vent, main stop valve, access doors, steam limiting valve, superheater steam vent
- 1d: instrumentation includes but is not limited to – pressure gauge, gauge glasses, operational controls, safety controls, level, pressure, flow, temperature transmitters, feedwater flow, boiler pressure, drum level (single and 3-element control).
- 1e: problems include but are not limited to – leakage, blockage, breakage, false readings.
- 2a: combustion control equipment includes but is not limited to – primary air, secondary air, forced draught, induced draught, tertiary air.
- 2b: equipment includes but is not limited to – fans, dampers, registers, air heaters.
- 3a: fuels include but are not limited to – gas, liquid, solid, biomass, biogas, bioliquids, hydrogen, site specific fuels.
- 3b: fuel systems include but are not limited to – gas, liquid, solid, biomass, biogas, bioliquids, hydrogen.
- 4a: equipment includes but is not limited to – primary treatment, secondary treatment, boiler feedwater, boiler feedwater storage, tank deaerator, pump, feed check valve, isolating valves, pipework, condensate system.
- 4e: includes – scale, corrosion, foaming, carry over.
- 4f: blowdown equipment includes but is not limited to – bottom blowdown, continuous, blowdown control.
- 4g: evidence of at least two (2) benefits and two (2) hazards is required.
- 4h: impurities include but are not limited to – dissolved solids, dissolved gases, suspended solids.4i: tests include but are not limited to – hardness, total dissolved solids, pH, alkalinity, scale inhibitor reserve, oxygen scavenger reserve.

Definitions:

Boiler means a device – (i) Most of which is an arrangement of pressure containment parts; and (ii) The purpose of which is to generate steam (A) By the use of a directly applied combustion process; or (B) By the application of heated gases; and (C) Includes any of the following: (i) Boiler piping: (ii) Combustion equipment: (iii) Combustion management systems: (iv) Controls: (v) Economisers: (vi) Fans: (vii) Feed and circulating pumps: (viii) Pressure fittings: (ix) Reheaters: (x) Superheaters: (xi) Supports: (xii) Water level management systems; but does not include a hot water boiler.

Organisational requirements – documented policies and procedures or other directions provided to staff for boiler start up, operation, and shut down. These may include: manufacturers' procedures; plant procedures; suppliers' instructions; site signage; legislative requirements; codes of practice; company health and safety plans; on site briefings; and supervisor's instructions.

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);
- Health and Safety in Employment (Pressure equipment, cranes and passenger ropeways) Regulations 1999;
- Resource Management Act 1991;

  and any subsequent amendments.

Pārongo Whakaū Kounga | Quality assurance information

Ngā rōpū whakatau-paerewa | Standard Setting Body	Hanga-Aro-Rau 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 21462.		
Rā arotake | Planned review date	31 December 2029		

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