40379 Explain the principles of steam generation and combustion relating to boiler operation

Kaupae Level	3
Whiwhinga Credit	5
Whāinga Purpose	This skill standard is intended for people working as boiler operators.
	People credited with this skill standard are able to explain: the principles of steam generation relating to boiler operation; and the principles of combustion, heat transfer, and air supply in relation to efficient and safe boiler operation.
	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.	Explain the principles of steam generation relating to boiler operation.	a.	Describe the effects of the properties of steam on a boiler operation and downstream usage		
		b.	Explain the processes and factors that influence water circulation in a boiler		
		c.	Interpret steam tables at specified temperature and pressure readings to identify saturation temperature, sensible and latent heat content, and specific volume.		
2.	Explain the principles of combustion, heat transfer, and air supply in relation to efficient and safe boiler operation.	a.	Explain the principles of combustion and heat transfer in terms of boiler operations.		
		b.	Describe the monitoring of flue gas parameters in terms of combustion process efficiency.		
		C.	Describe the monitoring of flue gas parameters in terms of safety and atmospheric emissions.		
			Describe methods used to provide combustion air to boilers in terms of operating principles.		

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: properties include but are not limited to dryness factor, superheat, enthalpy.

- 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.
- 2a: principles of combustion and heat transfer include but are not limited to combustion theory, chemical reaction, radiation, convection, conduction, flue gas quality, economy of operation.
- 2b: parameters include but are not limited to oxygen, carbon monoxide, carbon dioxide, opacity.
- 2c safety and atmospheric emissions may include consent requirements, risks and hazards of incomplete combustion.
- 2d: methods include but are not limited to forced draught, induced draught, balanced draught, natural draught.

Definition

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

Pārongo Whakaū Kounga | 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 21461.				
Rā arotake Planned review date	31 December 2029				

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