40450 Operate fired pressure equipment in an energy and chemical plant

Kaupae | Level	4
Whiwhinga | Credit	10
Whāinga | Purpose	This skill standard is intended for people working as boiler operators and energy and chemical process operators in an energy and chemical plant. People credited with this skill standard are able to: describe fired pressure equipment used in the energy and chemical industry, and fired pressure equipment plant protection systems used in an energy and chemical plant; and operate, monitor and control fired pressure equipment in an energy and chemical plant. This skill standard can be used in the New Zealand Energy and Chemical qualifications at Level 4 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. Describe fired pressure equipment used in the energy and chemical industry.	a. Describe the differences in fired pressure equipment in terms of the use of each type.
	b. Describe materials used for the construction of fired pressure equipment in terms of process conditions.
	c. Describe corrosion, erosion, expansion, and thermal stress in terms of causes and effects on fired pressure equipment.
	d. Describe auxiliary equipment and systems in terms of purpose and use for each type of fired pressure equipment.
	e. Describe air systems for fired pressure equipment in terms of purpose and use.
	f. Describe specific fuels used in fired pressure equipment in terms of the chemical composition and chemical reaction for complete combustion.
	g. Describe the design of basic fired pressure equipment in terms of safety and the requirements of the Code.

Hua o te ako | Learning outcomes	**Paearu aromatawai** | Assessment criteria
	h. Describe the theory of heat transfer in terms of the operation of pressure fired equipment.
	i. Describe burner design set-ups in terms of the advantages and disadvantages of different types of fuels used in fired pressure equipment.
	j. Describe fuel systems in terms of design and operation.
	k. Describe long, medium, and short-term storage methods for fired pressure equipment in terms of use.
2. Describe fired pressure equipment plant protection systems used in an energy and chemical plant.	a. Describe fired pressure equipment plant protection systems in terms of purpose, operating concepts and the protection provided.
	b. Describe fired pressure equipment emergencies in terms of procedures to respond to them.
3. Operate fired pressure equipment using safe work practices in an energy and chemical plant.	a. Locate fired pressure equipment in accordance with the site-specific asset tagging system and organisational requirements.
	b. Describe a heat balance for specified fired pressure equipment in terms of the percentage efficiency and any key factors that would cause variance.
	c. Describe operations and tuning used to optimise fired pressure equipment efficiency in terms of operational factors.
	d. Describe causes and effects of potential operational problems in terms of steps and techniques required to correct them.
	e. Identify control systems for fired pressure equipment and auxiliary systems.
	f. Operate fired pressure equipment efficiently by applying proper tuning and adjustments.
	g. Carry out checks on fired pressure equipment.
	h. Complete all plant documentation related to the process and equipment operation.

Hua o te ako | Learning outcomes	**Paearu aromatawai** | Assessment criteria
4. Monitor and control fired pressure equipment in an energy and chemical plant.	a. Identify any deviations from normal operating parameters that can occur in fired pressure equipment in terms of the impact on plant operations and techniques used to respond to each deviation.
	b. Take and record corrective actions to return to normal operating parameters.
	c. Interpret and adjust flue gas analysers to maintain optimum safe performance.
	d. Carry out routine procedures and functional testing of equipment systems.

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.
- 1a: types include but are not limited to – water and fire tube boilers, fired heaters, incinerators.
- 1b: materials include but are not limited to – alloy steels, ceramics, fire bricks, other refractory materials.
- 1d: equipment includes but is not limited to – burner, igniter, sampler, analyser, soot blower, air pre-heater, explosion door; systems include but are not limited to – fuel system, furnace purge system, safety system, blow-down system, control system.
- 1e: air systems include but are not limited to – natural draught, forced draught, balanced draught, induced draught; evidence of an example of each air system that demonstrates the impact of the air system type on fire box pressure is required.
- 1f: fuels include but are not limited to – gas, liquid, solid.
- 1g: equipment includes but is not limited to – fire tube, water tube, reformer, fired heater, incinerator, flare.
- 1h: heat transfer includes but is not limited to – convection, radiation, conduction.
- 1i: fuels include but are not limited to – hydrocarbon gas, hydrocarbon liquids, coal, biomass.
- 1j: fuel systems include but are not limited to – chain grate, sprinkler stoker, ram stoker, conveying, storage systems; operations include but are not limited to – start-up, shut-down, control of fuel.
- 1k: methods include but are not limited to – nitrogen capping, water wedging, dry storage, chemical storage.
- 2a: systems include but are not limited to – trip, purge, flame sensor, overpressure relief, under pressure relief, burner management.
- 2b: evidence of furnace explosion and one other emergency is required.

- 3c: operational factors include but are not limited to – excess air, furnace heat release, stack temperatures, stack gas composition, tube fouling, flue fouling, carbon monoxide monitoring, turn down.
- 3d: problems include but are not limited to – incorrect purging, positive pressure, air starvation, unburnt fuel build-up, insufficient process flow level, flame out, unstable flame, overheating, flame impingement, liquid in gas fuels, incorrect lighting.
- 3e: control systems may include but are not limited to – flow, pressure, temperature, level, air, oxygen; evidence of at least four (4) control systems is required.
- 4a: evidence of at least three (3) deviations from normal operating parameters is required.

Definitions:

Code – the current Approved Code of Practice for the Design, Safe Operation, Maintenance and Servicing of Boilers, Occupational Safety and Health Service, and other relevant associated codes, https://worksafe.govt.nz/dmsdocument/1571-acop-the-design-safe-operation-maintenance-and-service-of-boilers.

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.

Fired pressure equipment – equipment that is operated under pressure and is directly fired.

Organisational requirements – documented policies and procedures. These may include: equipment manufacturers' procedures; plant procedures; suppliers' instructions; site signage; codes of practice; company health and safety plans; on site briefings; and supervisor's instructions. This includes all regulatory and legislative obligations that apply to the plant.

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 relevant to this skill standard includes but is not limited to:

- Health and Safety at Work Act 2015;
- Hazardous Substances and New Organisms Act 1996;
- Resource Management Act 1991;

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	24 April 2025	N/A
Kōrero whakakapinga | Replacement information	This skill standard replaced unit standard 3035.		
Rā arotake | Planned review date	31 December 2029		

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