

## Demonstrate knowledge of solar water heating safety, regulatory compliance and design

**Level** 5

**Credits** 15

**Purpose** People credited with this unit standard are able to: explain the safety considerations for the installation and operation of solar hot water systems; explain regulatory considerations for the installation of solar hot water systems; describe reference standards and codes available for the installation of solar hot water systems; demonstrate knowledge of solar hot water system types and applications; explain solar hot water system supplementary heating options; explain solar water heating components and operation; explain solar water heating valves and piping; explain solar water heating system design considerations and demonstrate knowledge of system troubleshooting.

**Subfield** Plumbing, Gasfitting and Drainlaying

**Domain** Plumbing

**Status** Proposed

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**Entry information** Open.

**Accreditation** Evaluation of documentation and visit by NZQA and industry.

**Standard setting body (SSB)** Plumbing, Gasfitting and Drainlaying ITO

**Accreditation and Moderation Action Plan (AMAP) reference** 0008

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

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### Special notes

#### 1 References

- Relevant New Zealand Building Code (NZBC) compliance documents available from <http://www.dbh.govt.nz>:
- B1 Structure and supersessions.
  - E1 Surface water and supersessions.

- Acceptable solution G12/AS2, Solar hot water heaters, Dec, 2007 and supersessions.
  - H1 Energy efficiency and supersessions.
  - AS/NZS 2712: 2007 Solar and heat pump water heaters - Design and construction, and supersessions.
  - AS/NZS 3500.4: 2003 Plumbing and drainage - Heated water services.
  - EECA Solar water heating guidebook: A technical guide for building industry professionals, Oct 2006, and supersessions.
  - Code of Practice for Manufacture and Installation of Solar Water Heating Systems in New Zealand, Solar Industries Association, October, 2004, and supersessions.
- 2 All aspects of installation must meet the Plumbers, Gasfitters and Drainlayers (PGD) Act 2006. The PGD Act specifies the minimum registration/licensing requirements for those undertaking installation of solar hot water systems and provisions for disciplinary action where breaches of the PGD Act are proven.

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## Elements and performance criteria

### Element 1

Explain the safety considerations for the installation and operation of solar hot water systems.

#### Performance criteria

- 1.1 Safety considerations are explained in terms of the dangers presented by pressure and temperature in solar hot water systems, compared to other hot water heating options.

Range commissioning and operation.

### Element 2

Explain regulatory considerations for the installation of solar hot water systems.

#### Performance criteria

- 2.1 Building consent requirements for solar hot water system installation are explained.

Range New Zealand Building Code (NZBC) B1, E1, G12, H1 and alternative solutions.

- 2.2 Process for applying for building consent is explained in accordance with the relevant territorial authority's requirements.

### Element 3

Describe reference standards and codes available for the installation of solar hot water systems.

#### Performance criteria

3.1 Standards and codes are described is described in terms of their scope and application to solar hot water installations.

Range NZBC acceptable solution G12/AS2, AS/NZS 2712, ASNZS 3005.4, EECA Solar water heating guidebook, Code of practice for manufacture and installation of solar water heating systems in New Zealand.

#### **Element 4**

Demonstrate knowledge of solar hot water system types and applications.

#### **Performance criteria**

4.1 Solar hot water systems are compared with other systems in terms of cost, energy savings and advantages and disadvantages.

Range includes but not limited to heat pump, electric, gas.

4.2 Solar hot water system types are compared in terms of strengths and weaknesses.

Range systems include: open loop, closed loop, thermosiphon, drain down and variations.

Comparison criterion includes but is not limited to - performance efficiency, operation limitations, installation, complexity, reliability, durability, user requirements.

4.3 System pressure options are compared in terms of strengths and weaknesses.

Range low, medium, mains.

4.4 Solar hot water system applications are explained in terms of strengths and weaknesses compared to other systems.

Range applications include: preheater, pool heating, underfloor heating, space heating and in conjunction with other heating sources.

4.5 Solar hot water system applications are explained when used in conjunction with other supplementary systems.

Range may include but not limited to gas and wetback supplementary systems.

#### **Element 5**

Explain solar hot water system supplementary heating options.

#### **Performance criteria**

5.1 Solar supplementary heating options are explained by comparison; in terms of strengths and weaknesses.

Range supplementary heating options include instantaneous/on-demand, storage, gas energy, electric energy, ripple control.

Comparison criterion includes but is not limited to - performance efficiency, operation limitations, installation, complexity, reliability, durability, user requirements.

5.2 Supplementary heating requirements are explained in terms of legionella prevention.

5.3 Function of electricity ripple control is explained for electric supplementary heating systems.

Range for relevant electricity retailer and local distribution network.

## Element 6

Explain solar water heating components and operation.

### Performance criteria

6.1 Component requirements are explained from a safety perspective.

6.2 Storage tank options are explained.

Range water stratification, energy efficiency, connection with collector and controller, non-solar tank, solar specific tank, tank location, tank fastening and support.

6.3 Collector options are explained in terms of advantages and disadvantages and suitability.

Range unglazed, evacuated tubes, glazed, flat plate, frame fastening and support.

6.4 The function and typical setup of a heat dissipater within a solar water heating system is explained.

6.5 The function and typical setup of an expansion vessel within a solar water heating system is explained.

6.6 Pump options, requirements and controller setting are explained in accordance with system application, energy performance requirements and the NZBC.

6.7 Function and operation of system controller is explained.

Range includes but not limited to: 240 volt and 12 volt controllers, choice of controller, setting options, supplementary heating control, maximising solar gain.

6.8 Flow rate meter requirements and typical flow parameters are identified.

Range single and multiple meters.

- 6.9 Temperature sensors in a solar system are explained in terms of set up, meeting operational requirements and maximising efficiency.

### **Element 7**

Explain solar water heating valves and piping.

#### **Performance criteria**

- 7.1 Valve type options and use are explained in accordance with system application, safety requirements and the NZBC.

Range pressure temperature relief valves, non return valves, thermosiphon arrestor valves, solar transfer valves.

- 7.2 Closed loop heat transfer fluid selection is explained in terms of options and operational requirements.

Range glycol, water.

- 7.3 Piping considerations and requirements are explained in accordance with solar requirements.

Range type of piping, anti-thermosiphon loop design, jointing, fitting, sealants, external deterioration, external weather seal, penetrations to dwelling, vermin resistance.

- 7.4 Insulation requirements for solar pipework and components are explained in terms of energy efficiency.

### **Element 8**

Explain solar water heating system design considerations.

Range For complete system including use of supplementary heating.

#### **Performance criteria**

- 8.1 System design arrangements are explained from the perspective of ensuring safe installation and operation.

- 8.2 Solar hot water system design considerations are explained.

Range durability, deterioration, weathertightness, user profile, installation time, servicing, ease of operation, life cycle cost, capital cost, energy efficiency, complexity, convenience, reliability, structural attachment and practicality, aesthetics.

- 8.3 Overall system setup considerations are explained in terms of how the components relate to each other.

Range tank design and location, stratification of stored water, location of supplementary heating, system control, avoidance of thermosiphon to collector, placement and relationship of the components explained in elements 6 and 7.

8.4 Options for system overheating protection are explained.

8.5 Options for system freeze protection are explained.

Range active, passive, drain back, freeze plug, closed loop, climate zone.

## Element 9

Demonstrate knowledge of system troubleshooting.

### Performance criteria

9.1 Typical sources of poor system performance are explained in terms of cause and rectification.

Range includes but not limited to: loss of heat through controller, excessive use of pump, poor energy performance, excessive discharge of over temperature water, water hammer, excessive use of supplementary heating.

### Please note

Providers must be accredited by the Qualifications Authority, or an inter-institutional body with delegated authority for quality assurance, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be accredited by the Qualifications Authority before they can register credits from assessment against unit standards.

Accredited providers and Industry Training Organisations assessing against unit standards must engage with the moderation system that applies to those standards.

Accreditation requirements and an outline of the moderation system that applies to this standard are outlined in the Accreditation and Moderation Action Plan (AMAP). The AMAP also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

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### Comments on this unit standard

Please contact the Plumbing, Gasfitting and Drainlaying ITO [info@ito.co.nz](mailto:info@ito.co.nz) if you wish to suggest changes to the content of this unit standard.