NZS 4614:1986

Installation of Domestic Solar Water Heating Systems

Superseding MP 4613: Part 2:1979

NZS 4614:1986

Single User PDF Terms & Conditions

You have material which is subject to strict conditions of use. Copyright in this material is owned by the New Zealand Standards Executive. Please read these terms and conditions carefully, as in addition to the usual range of civil remedies available to Standards New Zealand on behalf of the New Zealand Standards Executive for infringement of copyright, under New Zealand law every person who infringes copyright may be liable to a fine of up to $10,000 for every infringing copy or imprisonment of up to 5 years, or a fine of up to $150,000 or imprisonment not exceeding 5 years.

You have access to a single-user licence to read this non-revisable Adobe Acrobat PDF file and print out and retain ONE printed copy only.

We retain title and ownership of the copyright in this PDF file and the corresponding permitted printed copy at all times.

Under this license use of both the PDF file and the single permitted printed copy of this PDF file you may make are restricted to you. Under no circumstances are you permitted to save, sell, transfer, or copy this PDF file, the one permitted printed copy of this PDF file, or any part of either of them.

You undertake that you will not modify, adapt, translate, reverse engineer, decompile, disassemble or create derivative works based on any of the downloaded PDF file, nor will you merge it with any other software or document, even for internal use within your organization.

Under no circumstances may this PDF file be placed on a network of any sort without our express permission.

You are solely responsible for the selection of this PDF file and any advice or recommendation given by us about any aspect of this PDF file is intended for guidance only and is followed or acted upon entirely at your own risk.

We are not aware of any inherent risk of viruses in this PDF file at the time that it is accessed. We have exercised due diligence to ensure, so far as practicable, that this file does not contain such viruses.

No warranty of any form is given by us or by any party associated with us with regard to this PDF file, and you accept and acknowledge that we will not be liable in any way to you or any to other person in respect of any loss or damage however caused which may be suffered or incurred or which may arise directly or indirectly through any use of this PDF file.

Regardless of where you were when you received this PDF file you accept and acknowledge that to the fullest extent possible you submit to New Zealand law with regard to this licence and to your use of this PDF file.

NZS 4614:1986

INSTALLATION OF
DOMESTIC SOLAR WATER
HEATING SYSTEMS

ERRATUM

July 1986

In fig. B1 the arrow indicating true north is incorrect. It should point in the opposite direction to that shown.

In fig. B2 the central note should read:

'sight is aligned so .... at 9.30 a.m., 12.30 p.m.
and 3.30 p.m. ....

CONTENTS

continued overleaf

REQUEST FOR NEXT AMENDMENT

If this address label has not been returned SANZ has no record that you wish to receive future amendments to this standard.

To confirm that the next amendment has been requested, enter details of despatch below:

....

REQUEST FOR NEXT AMENDMENT

NZS4614:1986

Amendment No 1

If more than one copy is required state quantity here .... COPIES

Name and full postal address ....

Please type or print clearly

This is your request and mailing label for the next amendment to this New Zealand Standard. Please mail to Standards Association of New Zealand, Private Bag, Wellington.

RELATED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND STANDARDS

NZS 3501:1976	Copper tubes for water, gas, and sanitation
NZS 3604:1984	Code of practice for light timber frame buildings not requiring specific design
NZS 4608:0000*	Control valves for use in hot water systems
NZS 4613:1986	Domestic solar water heaters
NZS 7601:1978	Polyethylene pipe (type 3) for cold water services
NZS 7602:1977	Polyethylene pipe (type 5) for cold water services
NZS 7648:1974	Unplasticized PVC pipe for cold water services

AUSTRALIAN STANDARD

AS 1357:1972	Water fittings for protection and control of unvented storage water heaters

BRITISH STANDARD

BS 1387:1967	Steel tubes and tubulars suitable for screwing to BS 21 pipe threads

CANADIAN STANDARD

CSA B137.8:1977	Polybutylene (PB) piping for hot and cold water distribution systems

* In preparation

FOREWORD

This Standard supersedes Standards Association of New Zealand Miscellaneous Publication MP 4613:1979 *Solar water heating equipment* Part 2 *Code of practice for the installation of solar water heating equipment.*

The primary objective of the Standard is to optimize the solar contribution achieved by domestic solar water heating installations thereby reducing to a mimimum the consumption of other forms of energy thus permitting the recovery of the installation cost within the shortest possible time.

Commercially available solar water heaters for domestic installation are designed to operate up to about 55 °C with an acceptable solar contribution and operation of these units with higher temperatures will result in a reduced solar contribution.

Part 1 of MP 4613:1979 *Specification for solar water heating equipment* is also being revised and is being issued concurrently as NZS 4613.

NEW ZEALAND STANDARD
INSTALLATION OF DOMESTIC SOLAR WATER HEATING SYSTEMS

Part 1
Scope and general

101
SCOPE

101.1

This Standard sets out the requirements for the installation of domestic solar water heating systems incorporating auxiliary heating and intended to deliver water of potable quality. Systems covered are of fixed orientation and inclination having a collector area of not more than 6 m² and a storage capacity of not more than 450 L. They may be either:

(a) Systems with collector located remotely from container or

(b) Systems with collector and container close-coupled or integral.

The primary water circuit flow between collector and container may be by thermosiphon or forced circulation, and the auxiliary heating may be integral with, or remote from, the solar water heater.

Where the collector is located remotely from the container either component may be supplied separately or both components may be supplied as a complementary system.

101.2

The Standard does not apply to space heating, swimming pool heating or to hot water installations supplied from central hot water systems in large buildings.

101.3

The design, rating and performance of systems or components is dealt with in NZS 4613.

102
DEFINITIONS

102.1

In this Standard, unless inconsistent with the context, the following definitions apply:

ABSORBER. A device within a collector for absorbing radiant energy and transferring this energy as heat into a fluid.

AUXILIARY HEATING SOURCE. The heating appliances or devices added to a solar water heater to supply additional thermal energy input for days of insufficient insolation, inclement weather and either peak usage or excessive demand for hot water.

AUXILIARY HEATER PRIMARY CIRCUIT. Pipes which respectively convey water from the auxiliary heating source to the container and from the container to the auxiliary heating source.

CISTERN-FED WATER HEATER. A water heater which is supplied with cold water from a feed tank in which the level of the water is automatically maintained. The cold water feed tank may form an integral part of the water heater or it may be detached and mounted separately in such a manner that the maximum working head is not exceeded.

NOTE — Water heaters in which the level of water is automatically maintained by means of float or similar valve located inside the container are regarded as cistern-fed water heaters for the purpose of this Standard.

COLLECTOR. A device containing an absorber. Collectors may be provided singly or as multiple units supplying to a common container.

COLLECTOR APERTURE. The net area available for transmission of solar radiation through the outer air/cover interface.

CONTAINER. The vessel, including fittings, in which the heated water is stored; sometimes referred to as a storage container, cylinder or tank.

DISPLACEMENT WATER HEATER. A water heater in which cold water is fed into the container at or near the bottom, displacing but not mixing with the hot water as it is drawn off, at or near the top.

INCLINATION ANGLE. The angle between the absorbing surface of the collectors and the horizontal.

INDIRECT SYSTEM. A solar water heating system in which the fluid passing through the collector is not the fluid ultimately drawn from the hot taps.

OPEN-VENTED WATER HEATER. A water heater in which provision is made for a vent permanently open to the atmosphere. The heater may be connected to receive cold water either from the mains through a pressure reducing valve or from a feed tank, so that hot water is delivered either at the reduced mains pressure or at the feed tank head pressure.

POTABLE WATER. Water fit for human consumption.

PRIMARY CIRCUIT (SOLAR WATER HEATERS). Pipes which respectively convey water from the collector to the container and from the container to the collector.

RATED MAXIMUM WORKING PRESSURE. The maximum water pressure to which a water heater may be subjected as measured at the lowest point of the water heater. The preferred unit of measurement is kilopascals (kPa) but may be accompanied by the non-preferred unit of metres head of water (mH_20).

REGULATORY AUTHORITY. The authority such as water, gas, electricity, or local authority which is authorized by statute to exercise jurisdiction over the design, material, or installation or any part of a hot water system, or its supporting structure.

SECONDARY CIRCUIT FLOW AND RETURN PIPES. Pipes which respectively convey hot water from and return it to the container, and from which hot water may be drawn off.

SIDE-FED WATER HEATER. A displacement water heater with a free water surface in which the cold water is supplied from an integral feed tank attached to the side of the heater, and the hot water is drawn off at an outlet located below the free water surface.

SOLAR ORIENTATION. The angle between the horizontal projection of the normal to the surface of the collector and the north meridian, expressed as either east or west of north.

SOLAR PREHEATER. A solar water heater not containing a means of auxiliary heating and installed to preheat the cold water supply prior to its entry into any other type of domestic water heater.

SOLAR WATER HEATER. A system normally consisting of a collector and a container which may be integral, close-coupled or remote, and which heats water by means of radiant energy from the sun. Where it is not a preheater it will normally be fitted with, or connected to, an auxiliary heating source.

THERMOSIPHON HEAD. The head due to the difference in density between warmer and cooler portions of the liquid.

UNVENTED WATER HEATER. A water heater in which no provision is made for a vent permanently open to the atmosphere.

VENT PIPE. An open-ended pipe connected at any high point in a hot water system, or from any vessel containing hot water, and so arranged that the open end discharges into the air space of the cold water feed tank or to the outer atmosphere.

102.2

For the purposes of this Standard the word 'shall' refers to practices which are mandatory for compliance with this Standard. The word 'should' refers to practices which are recommended or advised.

102.3

The majority of the terms defined above are illustrated in figures 1 to 8 inclusive.

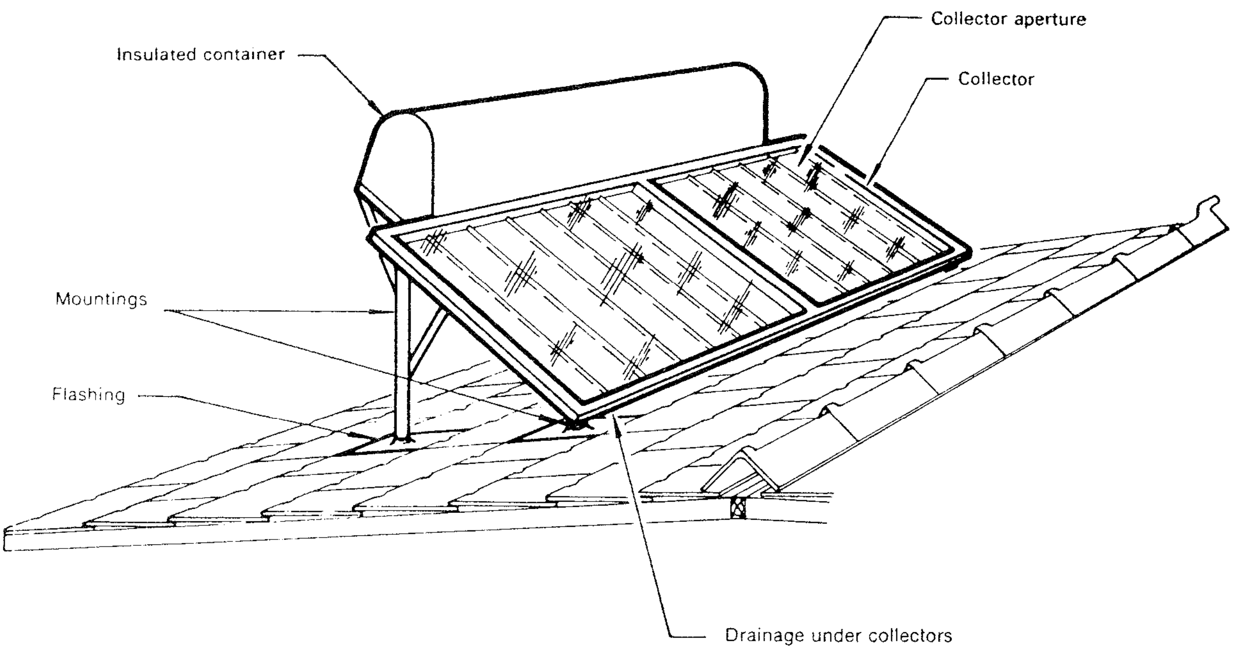


Fig. 1
CLOSE-COUPLED SOLAR WATER HEATER

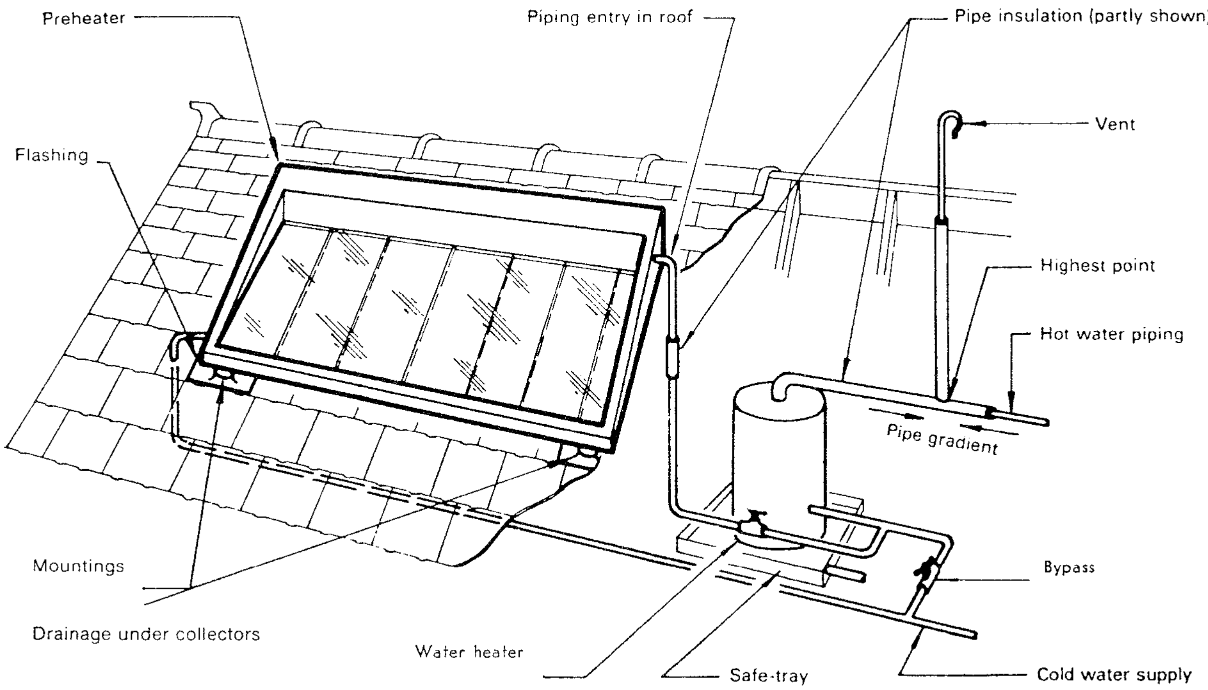


Fig. 2
PREHEATER TO EXISTING WATER HEATER (REDUCED PRESSURE SYSTEM SHOWN)

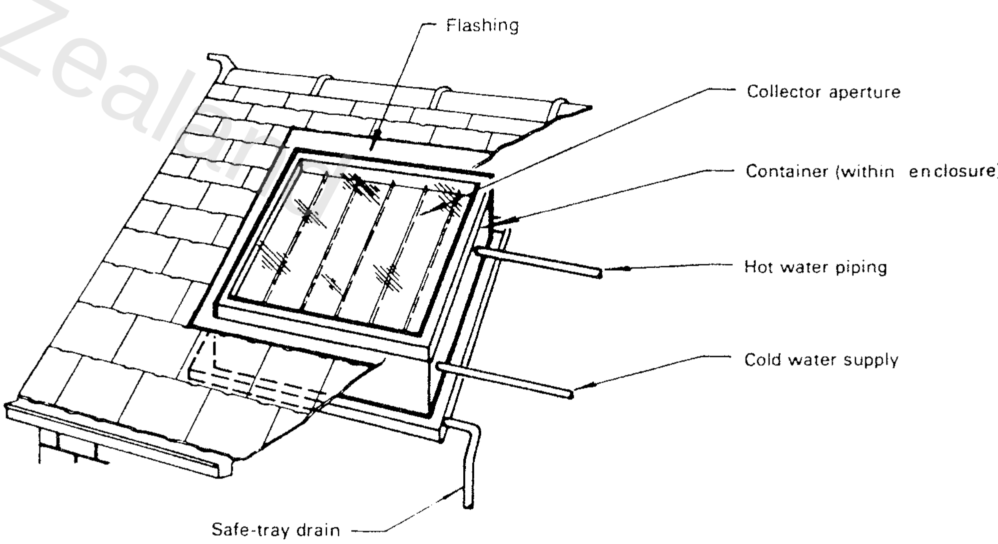


Fig. 3
INTEGRAL UNIT

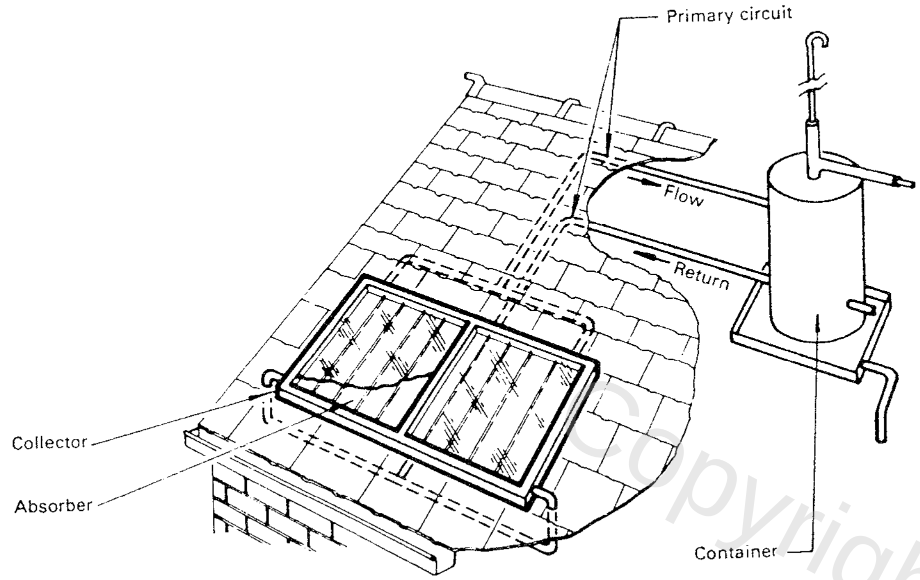


Fig 4
THERMOSIPHON SYSTEM WITH REMOTE CONTAINER

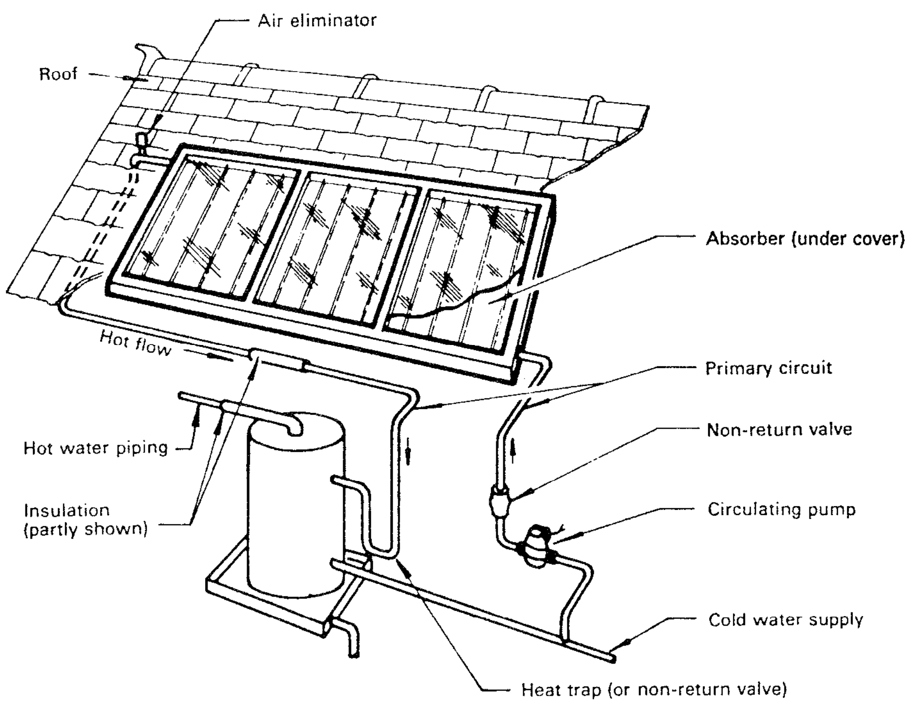
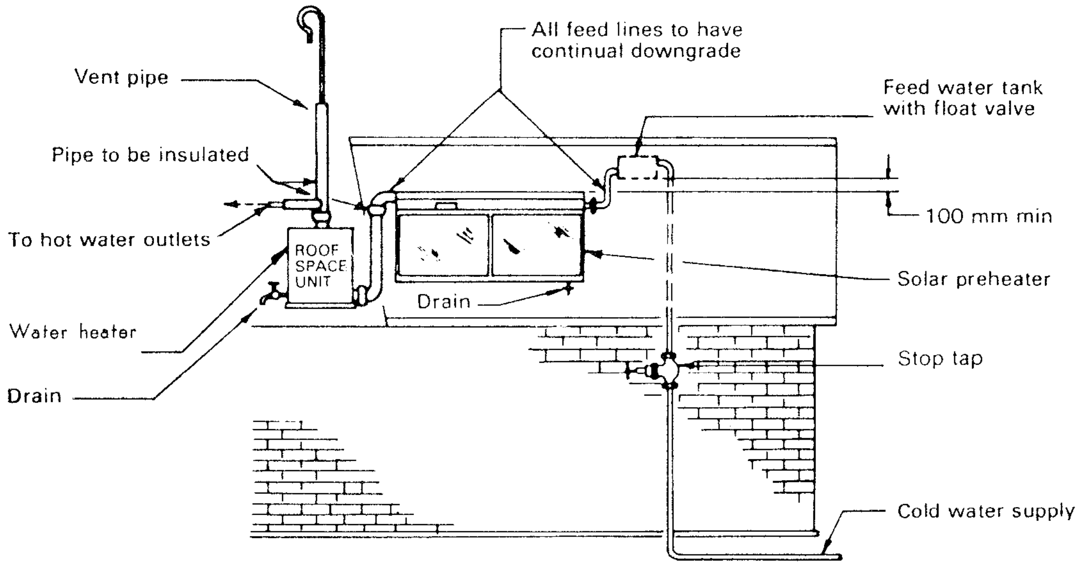
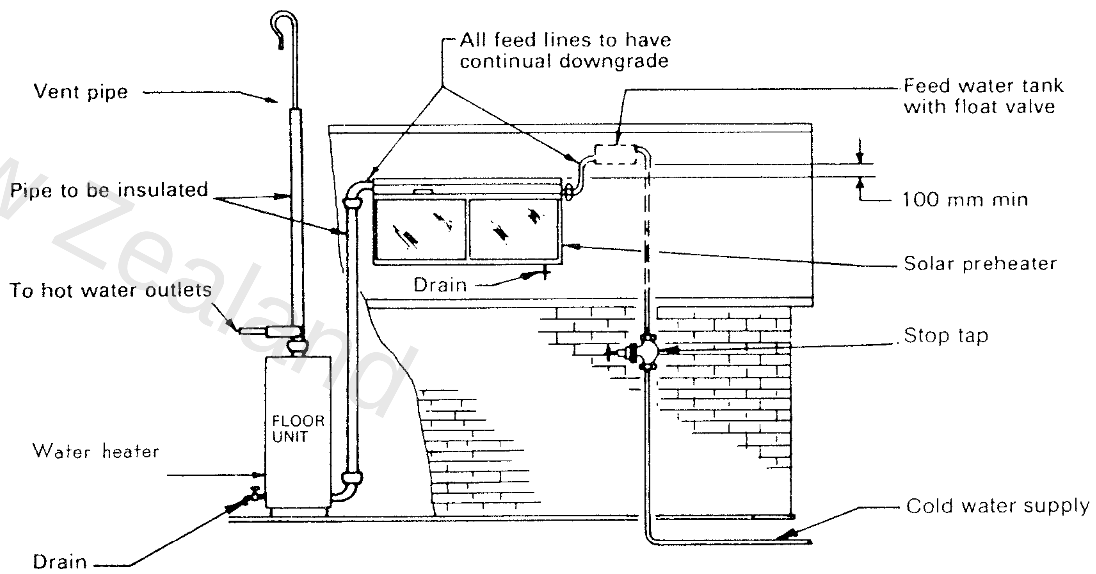


Fig. 5
PUMPED CIRCULATION



(a) Unit in roof space



(b) Unit on floor

Fig. 6
CISTERN-FED WATER HEATERS WITH SOLAR PREHEATER

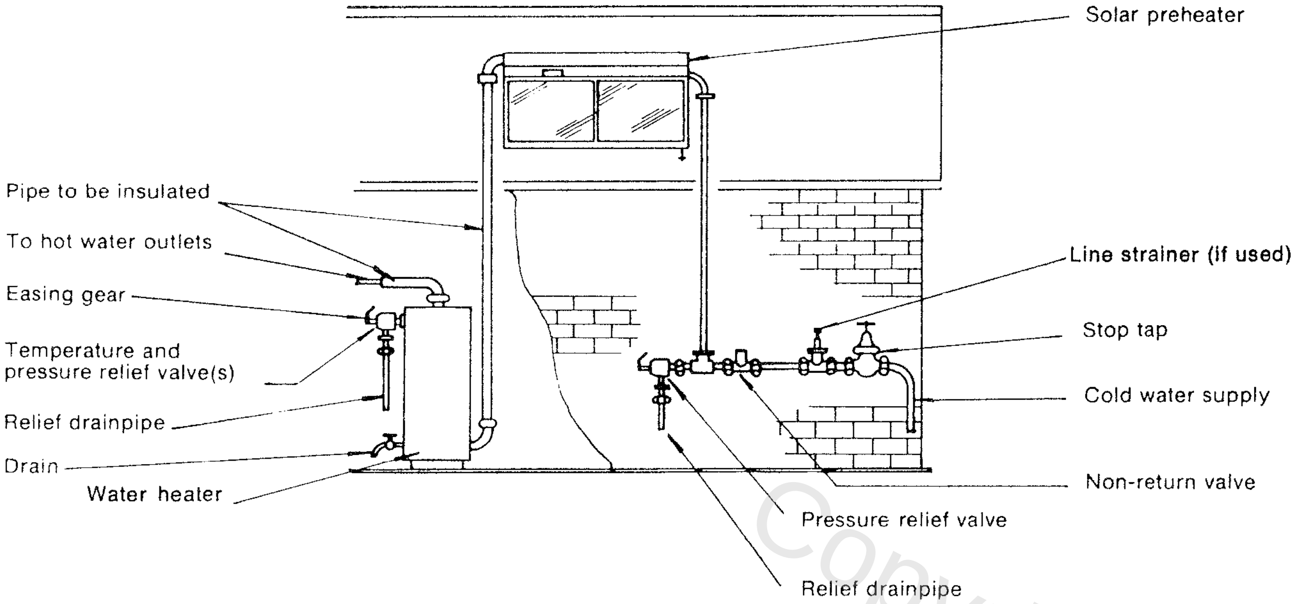


Fig. 7
WATER HEATER OPERATING AT MAINS PRESSURE, WITH SOLAR PREHEATER

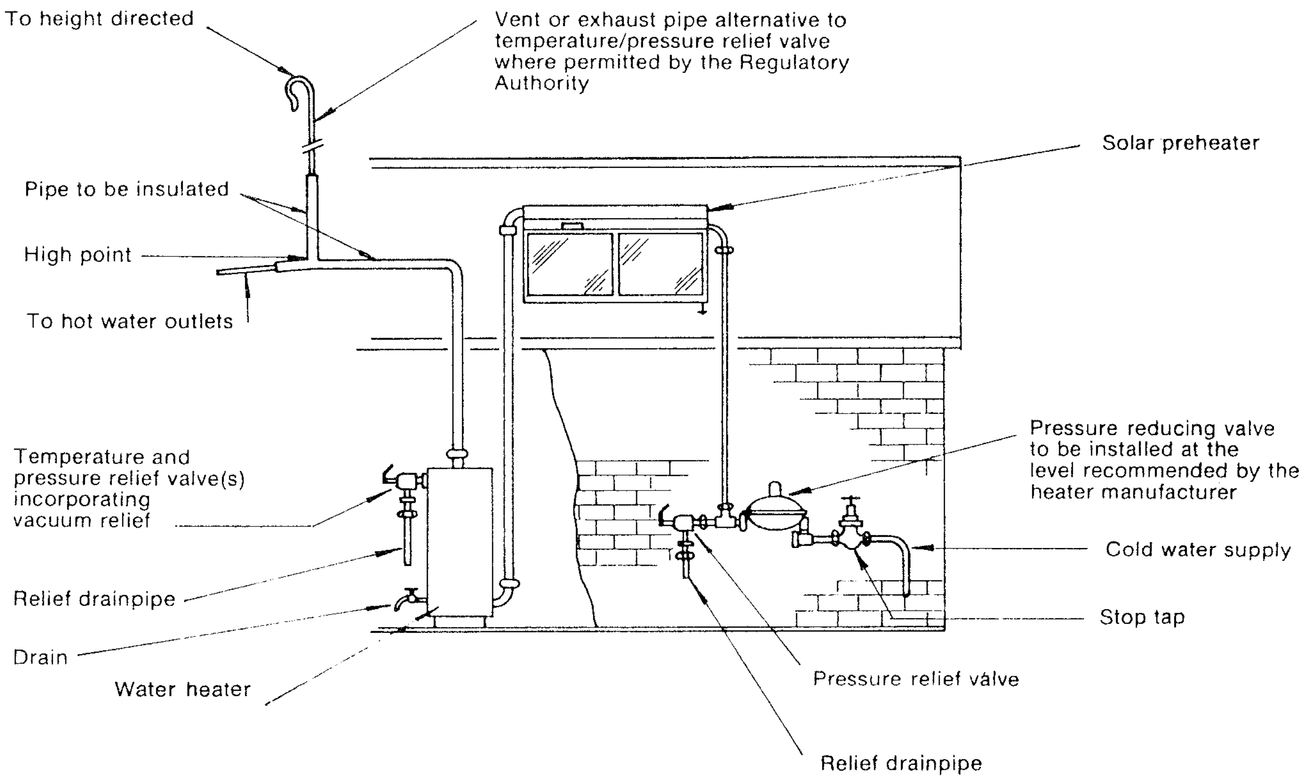


Fig. 8
WATER HEATER CONTROLLED BY PRESSURE-REDUCING VALVE, WITH SOLAR PREHEATER

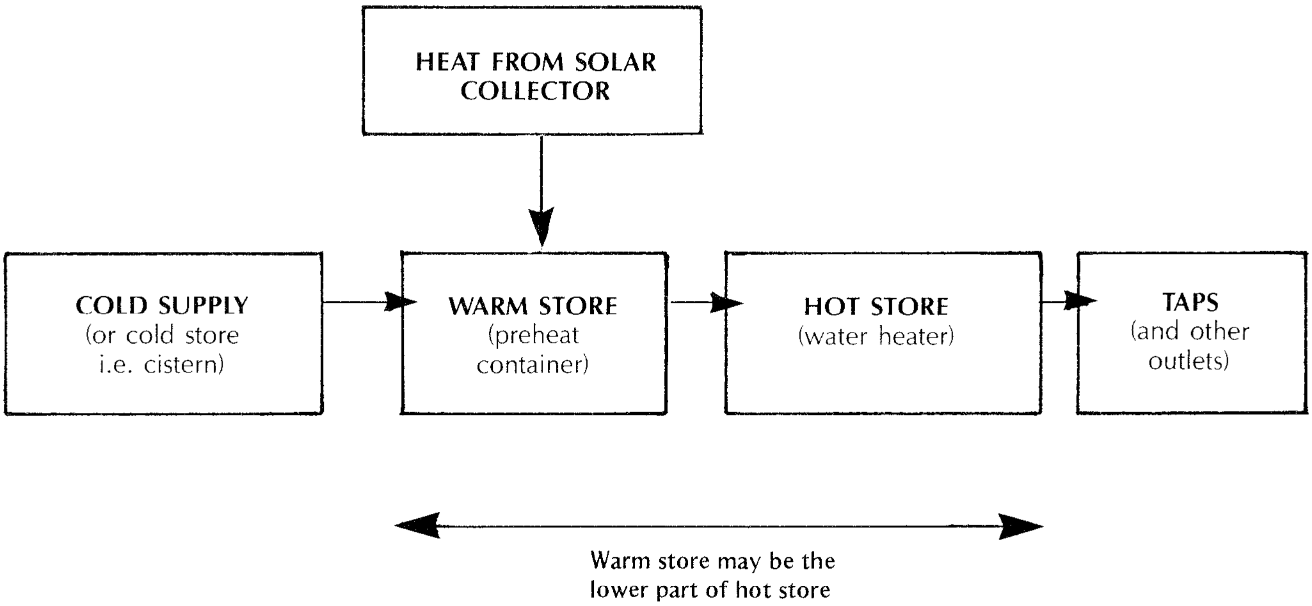


Fig. 9
PRINCIPLE OF SOLAR WATER HEATER SYSTEMS(SCHEMATIC)

103
TYPES OF SYSTEMS

103.1

Many different designs of solar water heaters are possible and they may be classified in several ways. Each type has its own advantages and disadvantages. (See also Appendix A).

103.2

A hot water system for domestic purposes incorporating solar heating usually contains arrangements for providing heat by other means. This auxiliary heating is necessary because in New Zealand the water cannot be heated to the required draw-off temperature at all times of the year by solar energy alone.

103.3

The working principle of solar hot water systems is shown schematically in fig. 9. Water from the cold supply is led to the 'cold store' (the feed cistern) whence it passes into the preheat vessel, forming the 'warm store', where it is heated by solar energy. The water then passes to the 'hot store' (the hot water cylinder) which is heated by auxiliary energy when required. Where cistern-fed water heaters are not used the cold supply is direct to the preheater.

103.4

Another arrangement which is intended to ensure that the hottest water is always available for use, is to employ a vessel in which the bottom portion functions as the preheat vessel and the top part as the 'hot store'.

104
WATER QUALITY

104.1

Only potable water should be used in the solar water heater system.

105
COMPLIANCE

105.1

General

This Standard is intended to provide details of the work and materials necessary to give an efficient hot water supply at the points of usage and to conform to good standards of workmanship. The installation shall be deemed to comply with this Standard only if it complies with all relevant clauses herein, and the manufacturer's instructions.

NOTE — Attention is drawn to the need to comply with the applicable statutory regulations and bylaws of the relevant regulatory authorities concerned. If there is conflict between the manufacturer's instructions and the requirements of the regulatory authority, the contractor shall advise the regulatory authority and the manufacturer of the variation, and shall also advise the customer of the appropriate action taken.

105.2

Materials and components

All materials and components used in the installation shall comply with the appropriate standard and with the manufacturer's instructions.

106 CONTRACTOR'S RESPONSIBILITIES

106.1 General

The contractor shall obtain all relevant permits to carry out the work prior to commencing installation and shall be responsible for ensuring compliance with the following requirements in addition to those specifically listed as contractor's responsibilities within this Standard.

106.2 Prior to commencing installation

The contractor shall inspect the premises and roof structure to determine whether the building is structurally capable of accepting the solar water heater, and if this is so confirm this to the customer.

106.3 During installation

The contractor shall ensure that every care is taken to warn and protect occupants of the building and members of the public from personal injury which may occur from falling tools, roof components, internal light and other fittings and any other hazards of a general nature. Any loose materials or fittings which may become a hazard shall be removed or secured before commencing installation.

106.4 Water quality

The contractor shall check with the local water supply authority and/or take all reasonable precautions to ensure the quality of water available to the solar water heater is suitable.

106.5 Dissimilar metals

The contractor shall ensure that direct contact is not made between dissimilar metals.

106.6 Hot water outlet

The contractor shall ensure that a hot water outlet will be open to atmosphere during installation until the hot water system is charged with water.

106.7 Collector mounting and orientation

The contractor shall ensure that the collector is mounted with the correct solar orientation and inclination angle (either as specified by the manufacturer or in accordance with this Standard), in a position where optimum solar exposure without excessive shading by other buildings or vegetation will be experienced. The contractor shall ensure that the correct mounting frame for the area wind conditions is supplied and used and that collector and container are located and fixed to adequate building structural members.

106.8 Precautions with empty collector

The contractor shall ensure that the collector is not left exposed to the sun for prolonged periods while either empty of water or when charged with water but disconnected from the container. The collector water connections shall be left open when the collector is exposed to the sun during the installation period. Suitable precautions should be taken to prevent ingress of dust and dirt during this period.

106.9 Removal of waste materials

On completion of the installation, all metals, scrap, waste, drillings and dust shall be removed from the roof.

106.10 Water charging of solar system

The contractor shall arrange for the solar hot water system to be charged with water before the auxiliary heating is connected to the heater. Alternatively such arrangements shall be made as are necessary to ensure that the auxiliary fuel supply is left isolated until the solar hot water system is charged with water (see 502).

106.11 Provision of shade cover

On completion of the installation and prior to the building or system handover the contractor shall ensure that when required a shade cover is provided over the collector aperture.

106.12 Frost protection

Wherever ground or air frost conditions can occur the contractor shall ensure that, according to the manufacturer's instructions, adequate precautions are taken to guard against damage to the equipment through frost or freezing, or both.

106.13 Commissioning

The commissioning of the installation and its handing over to the customer shall be the responsibility of the contractor. The contractor shall instruct the customer in the method of operating the heater and hand the customer a copy of the manufacturer's operating and maintenance instructions. If no responsible person is present at the time of commissioning, the operating and maintenance instructions shall be left in a prominent place.

106.14 Making good

Where solar water heaters are installed in existing premises, the contractor shall additionally be responsible for making good as specified in 503.

106.15
Precautions

Where corrosive conditions of water supply or atmosphere are known to the contractor the purchaser shall be advised of any necessary maintenance requirements created by such corrosive conditions.

107 SELECTION OF MATERIALS

107.1

Materials used in the installation of domestic solar water heaters shall be selected for their suitability to in-service conditions such as direct sunlight, rain, wind, hail, snow and frost, high temperatures and condensation.

107.2

All materials used in the installation of solar equipment shall have an expected in-service life of at least 15 years unless specifically excluded by the manufacturer.

107.3

All materials that are jointed directly to, or contact other materials shall have sufficient chemical compatibility with those materials to prevent corrosion or other deterioration that would impair their function during their intended service life.

107.4

The installation of solar equipment shall not introduce, or cause the introduction of, toxic substances or impurities into potable water.

Part 2
Installation of solar water heaters

201
GENERAL

201.1
Pressure rating

Every solar water heater collector and container shall be installed in such a manner that the rated maximum working pressure is not exceeded.

201.2
Roof mountings and supports

201.2.1

The solar water heater and components shall be suitable for the location and type of installation. Due regard shall be paid to mounting height above ground level, direction and speed of prevailing winds, seismic areas and requirements of the regulatory authority.

201.2.2

All fixings used for support or fastening shall be hot-dip galvanized after fabrication, or shall be of type 316 stainless steel or other suitable corrosion resistant material.

201.2.3

Only mountings supplied by the manufacturer shall be used. Any required alteration to these mountings shall be approved by the manufacturer.

201.2.4

Structural members which penetrate the roof shall be flashed or rendered watertight in such a manner as will allow for expansion, be appropriate to the situation and meet the requirements of the regulatory authority.

202
RESISTANCE TO GRAVITY, WIND AND EARTHQUAKE LOADS

202.1

Every solar water heater collector, container and other equipment shall be capable of meeting the following requirements for gravity, wind and earthquake loads.

202.2
Gravity loads

202.2.1

The dead load of equipment when full of fluids shall be supported either directly by load-bearing walls or by framing members. Individual members providing such support shall be checked for strength and creep deflection when:

(a) A single concentrated mass greater than 25 kg, or two or more such concentrated masses each greater than 10 kg, act on that member

(b) For roofs with lightweight claddings having a cladding mass not greater than 20 kg/m², the distributed mass of the equipment exceeds 10kg/m²

(c) For roofs with heavy claddings having a cladding mass greater than 20 kg/m² the distributed mass of the equipment exceeds 20 kg/m².

202.2.2

When it is necessary to carry out calculation checks, the deflection of roof framing members under the action of the total dead load (initial plus imposed) plus creep should not exceed span/300.

202.2.3

Where additional support is required this can be provided by underpurlins, struts, strutting beams and the like to transfer loads to load-bearing walls.

202.3
Wind loads

202.3.1

Equipment external to the structure shall be fixed to withstand design loads resulting from a pressure of:

(a) 1.1 kPa due to wind blowing parallel to a building surface in any direction and acting on the elevated projected area AND

(b) 0.9 kPa acting normal to the building surface on the projected surface area.

202.3.2

Fixings securing equipment against such wind pressures shall have a minimum strength of 1.3 times the calculated design load.

202.4
Earthquake loads

202.4.1

Any item of equipment fixed above ground floor level shall be secured against a force of 0.3 times the weight of that item acting in a horizontal direction for buildings up to two storeys high, and 0.6 times the weight for equipment fixed above the second floor level in buildings greater than two storeys high (NZS 4203 table 9). Fixings securing equipment against such earthquake loads shall have a minimum strength of 1.25 times the calculated design load.

Methods of securing to comply with this requirement are shown in figures 10 and 11. Other means approved by the Engineer may be substituted. The minimum size of fastening for containers is shown in table 1.

Table 1 MINIMUM SIZE OF FASTENINGS REQUIRED TO SECURE WATER HEATERS

Equipment weight kg	*Minimum fastener size*			
	Screw in 25 mm thick wood	*Screw in 50 mm thick wood*	*Bolt with washer through wood*	*Bolt through steel*
Below 50	10 g	10 g	M6	M6
50 to 100	24 g	24 g	M6	M6
100 to 150	Not recommended	24 g	M6	M6
150 to 200	Not recommended	24 g	M10	M6
200 to 250	Not recommended	12 mm dia.	M12	M6
250 to 350	Not recommended	12 mm dia.	M12	M10

202.4.2

For buildings complying with NZS 3604, where the total mass of the equipment attached to any particular roof plane (framing or cladding) exceeds 10 kg/m² of total roof plane area and the roof cladding has a mass not exceeding 20 kg/m², then the framing of that plane shall be braced against horizontal earthquake loads as if it were a heavy roof (cladding mass exceeds 20 kg/m²) as required by NZS 3604.

202.4.3

Where the total mass of the equipment exceeds 20 kg/m² of total roof plane area and the cladding mass exceeds 20 kg/m², then the bracing of the framing of that roof plane against horizontal earthquake loads shall be specifically designed.

202.4.4

In all cases not covered by 202.4.2 or 202.4.3 the bracing of the roof framing against earthquake loads shall be subject to specific calculation, or as required by NZS 3604 for the particular roof concerned.

203
ACCESS FOR MAINTENANCE
203.1
Service maintenance

The following provisions shall be made for periodic inspection and maintenance access:

(a) Containers. Containers shall have unobstructed access to components such as electric heating units, relief valves, burners, flues, controls, replaceable anodes or similar items where these items are incorporated in the unit

(b) Collectors. Each collector shall be readily accessible by means of a ladder, or from the surrounding roof area

(c) Accessibility of markings. The collector(s) and/or the container, shall be so placed that markings and instructions are readily visible

(d) Pumps. In systems with forced primary circulation, the primary circulating pump shall have unobstructed access and unions shall be fitted on either side to allow for its removal without disturbing the adjacent pipelines.

203.2
User maintenance

The valve easing gear of any temperature, pressure or combination pressure/temperature relief valves shall be accessible for maintenance and operation, and any user operating instructions shall be located for convenient access. See Appendix C.

204
INSTALLATION OF CONTAINERS
204.1
General

204.1.1

The capacity of a solar store or the solar storage section of a combined store shall be as recommended by the manufacturer. A general guide is 40 litres per square metre of absorber surface.

204.1.2

The design shall ensure that in the continued absence of solar energy the stored volume of heated water will be not less than any requirement of the regulatory authority.

204.1.3

Thermal convection caused by a source of heat other than solar energy shall not result in water heated by that other source being circulated through the collectors.

204.1.4

The container shall be suitable for the water condition and for the supply pressure to which it is to be connected. It shall be of a design suitable for the mounting position and general area of installation.

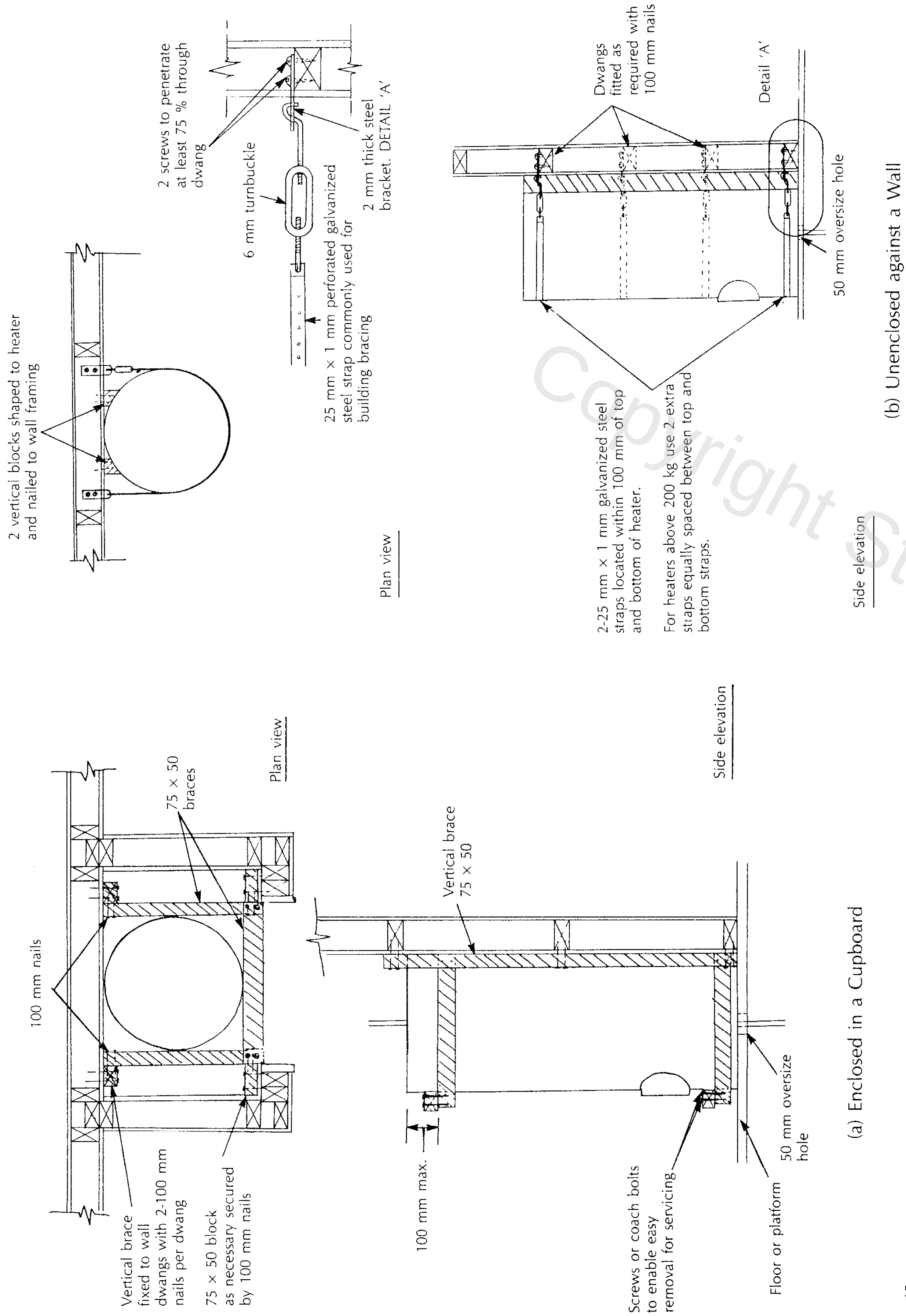


Fig. 10
METHOD OF SECURING CONTAINERS AGAINST SEISMIC FORCES

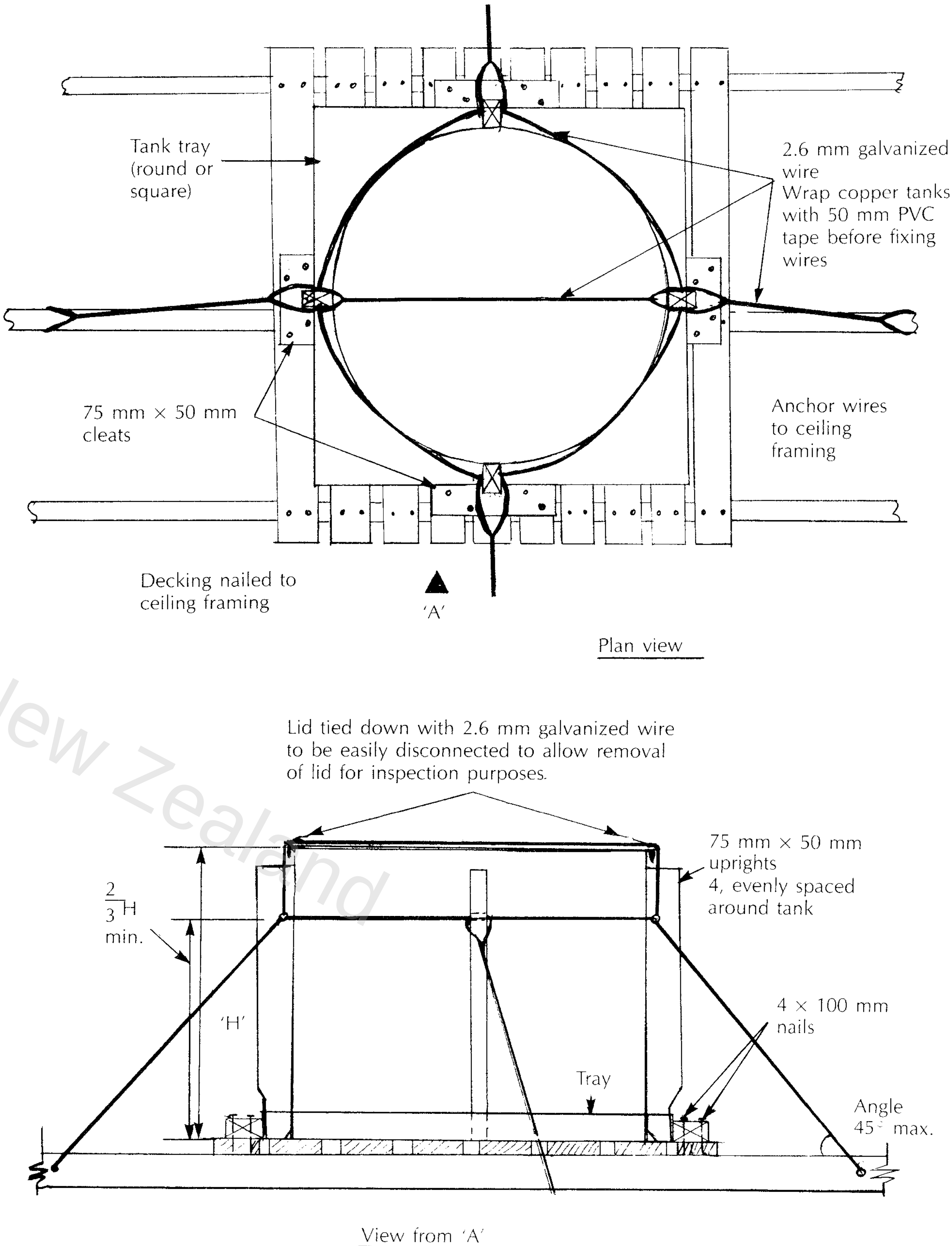


Fig. 11
METHOD OF SECURING COLD WATER FEED TANKS AGAINST SEISMIC FORCES

204.1.5

The container shall be installed in a substantially level position with adequate support.

204.1.6
Minimum head

204.1.6.1

Cistern-fed containers should be so installed that the vertical distance from the marked water level of the feed tank to the highest hot water delivery point is not less than 1 m.

204.1.6.2

Interconnecting piping between the cistern and the container shall comply with the requirements of Part 3.

204.2
Container location and access

204.2.1
Location of container

204.2.1.1

The container should be located as close as practicable to the most frequently used outlet point or points (see also 205.2). Containers labelled as suitable for water supply pressures of 120 kPa or less may be installed in the roof space, provided that they are vented in accordance with 204.4.2 or unless otherwise approved by the regulatory authority.

204.2.1.2

Containers labelled as having a maximum external design pressure differential of 120 kPa between the atmospheric pressure and the (lower) pressure within the container shall be located and installed in such a manner that the external pressure rating differential is not exceeded unless the container is fitted with a vacuum-relief valve complying with 204.4.5 or is fitted with an open vent to atmosphere as a means of preventing excess external pressure.

204.2.2
Access for removal

The container shall be positioned so as to allow its removal with the minimum of structural alteration.

204.3
Safe trays

204.3.1

A safe tray shall be installed where required by the regulatory authority or where damage could arise from leakage from the container or cold water feed tank, for example in high rise flats or in a roof space. It shall be fitted with an overflow pipe of not less than 40 mm diameter discharging clear of the building.

204.3.2

A radial clearance of not less than 50 mm shall be provided between the container or feed tank and the tray.

204.3.3

Where a metal tray is used it shall be not less than 0.45 mm thick, and to avoid corrosion shall not be in direct contact with the container, feed tank or piping but shall be separated by a bituminous roofing fabric or other equivalent waterproof material which is not an electrical conductor.

204.4
Pressure relief and venting of containers

204.4.1

Vent or relief valve to be provided
Every container shall:

(a) Have a vent, complying with 204.4.2 or be fitted with a pressure-relief valve or combination temperature/pressure-relief valve complying with 204.4.3;

(b) For unvented pressure water containers not designed to withstand a full vacuum, be fitted with a vacuum-relief valve complying with 204.4.5;

(c) Be fitted with any additional pressure protective devices required by the regulatory authority or specified by the manufacturer for the particular type of container.

All required venting, pressure-relief valves, vacuum-relief valves or other pressure protective devices shall be correctly installed and operative. If they are not built into the container or supplied by the manufacturer, the contractor shall ensure devices of a make and type specified by the manufacturer or regulatory authority are installed.

204.4.2
Vent pipe

The installation of the pipe shall be in accordance with the following requirements:

(a) The pipe shall rise continuously from the highest point of the container without restriction or sharp change in direction other than permitted in (d) below. No tap or valve shall be fitted in the vent line between the heater and the vent outlet

(b) The pipe shall be as short as practicable

(c) The pipe shall rise to a height not less than 80 mm above the water level in the cold water feed tank for every 1 m between the overflow water level in the cold water feed tank and the base of the heater, or 300 mm, whichever is the greater

(d) The pipe shall either be taken to the outer air, suitably bent and properly supported where it projects more than 1 m above the roof; or alternatively turned downward and discharged into the cold water feed tank by passing through the lid for a distance not exceeding 25 mm and not below the cold water inlet or on to the ball float

(e) Where a pressure-reducing valve with vent pipe relief is used, the pipe shall rise to a height above the valve equal to the pressure rating of the valve in metres of water plus a minimum of 1 m and a maximum of 2 m. The pipe shall rise to a height above the bottom of the water heater not exceeding the maximum head of the water heater

(f) The pipe shall be of sufficient size to relieve the energy input from collectors and auxiliary energy sources, but in no case shall it be less than the size recommended by the container manufacturer, subject to a minimum of 20 mm NB

(g) The pipe shall be insulated in accordance with the requirements of 306.5.

On secondary circuits the vent pipe required at the highest point of the hot water piping shall also be accepted as providing the pressure relief for the container, provided that it meets the conditions set out above.

204.4.3
Pressure and temperature-relief valves

204.4.3.1
Every unvented container shall be fitted with a combination temperature/pressure-relief valve in accordance with NZS 4608 or AS 1357 and unless otherwise required by the regulatory authority, shall be provided with a pressure-relief valve having provision for manual operation, fitted on the cold water supply to the container (see 203.2). This is additional to any temperature, pressure or combination pressure/temperature-relief valves required to be fitted to the container by the regulatory authority.

204.4.3.2

The cold water pressure-relief valve shall be located at the lowest level feasible for the container installation and shall be separated from the container by at least 1 m of uninsulated pipe, (generally as shown in figures 7 and 8) and as required by the regulatory authority. The pressure setting differential between the cold water and hot water pressure-relief valves shall be as required by the regulatory authority but the setting of the cold water valve should normally be lower.

204.4.4
Drainpipe (pressure or temperature relief)

The relief drainpipe shall be installed in accordance with the manufacturer's instructions.

204.4.5
Vacuum relief

Wherever a vacuum-break function is incorporated and the vacuum-break is separate or contained in another fitting, the body of the relief valve shall be above the level of the water in the container and the valve installed strictly in accordance with the container manufacturer's instructions.

205 INSTALLATION OF COLLECTORS

205.1
Avoidance of shade

Collectors shall be located so as to be clear of shade for 3 h either side of solar noon at all times of the year (i.e. nominally 9.30 am to 3.30 pm standard time). Partial shading during these hours, due to small objects such as chimneys, flues and TV antennas is, however, permissible.

NOTE — A means of determining whether a collector will be shaded is given in Appendix B.

205.2
Position relative to container

205.2.1

Placement of collectors relative to the container shall be in accordance with the manufacturer's instructions.

205.2.2

Where no such instructions are given the collectors shall be placed as close as is practical to the container, and for thermosiphon systems where the collector is remote from the container, the top of the collectors shall be not less than 150 mm (measured vertically) below the bottom of the container.

205.3
Solar orientation

Collectors should face geographic north whenever practicable. Deviations from north will reduce the performance of the solar water heater, depending upon the amount of deviation and the latitude.

205.4
Inclination

205.4.1

Collectors should be inclined at a similar angle to the latitude angle. The deviation from this angle should be not more than ±20 degrees.

205.4.2

For thermosiphon systems, the minimum allowable inclination angle shall be 10 degrees, unless specifically recommended by the manufacturer for a lesser angle.

205.4.3

Generally, improved winter performance and lower mean water temperature through the collector are obtained by an inclination angle greater than the latitude angle while improved summer performance is obtained from an inclination angle less than the latitude angle.

205.4.4

Performance factors for various combinations of inclination and direction are given in fig. 12.

205.5
Removal of collector

Collectors shall be installed in such a way as to enable a collector to be readily removed without disturbing adjacent pipework or other collectors.

inclination angle

Direction	*(degrees)*	*0°*	*20°*	*40°*	*60°*	*80°*	*90°*
West	270	0.85	0.85	0.80	0.72	0.60	0.53
	300	0.85	0.92	0.92	0.86	0.73	0.65
	330	0.85	0.98	0.99	0.93	0.80	0.71
North	0	0.85	0.97	$\boxed{1.00}$	0.94	0.80	0.70
	30	0.85	0.94	0.95	0.88	0.74	0.65
	60	0.85	0.88	0.86	0.77	0.65	0.57
East	90	0.85	0.80	0.73	0.64	0.52	0.46

Good orientation   Moderate orientation   Poor orientation

Fig. 12
FACTORS FOR INCLINATION AND SOLAR ORIENTATION

The relative performance of flat plate collectors in different orientations is illustrated. It is clear that collectors should face within about 45° of north, and be fitted at an inclination angle between 20° and 50°.

If for some reason it were necessary to place collectors facing due west at 60° inclination, then to avoid loss in performance, the collectors would have to be 1/0.72 (or 1.4) as large, i.e. increased by 40 % in the collector area.

Where collectors other than flat-plate type (cylindrical shape for instance) are used similar optimum requirements for orientation will apply, i.e. the axis of the cylinder should be inclinded at 20° to 50°. The performance loss by using poorer orientations has not been as fully explored as for the flat-plate case.

205.6 Mounting

205.6.1

Collectors shall be erected and mounted strictly according to the manufacturer's instructions. When mountings are supplied by the manufacturer, they shall be used without alteration except with the specific approval of the manufacturer.

205.6.2

Individual collectors shall be mounted either directly to the roof structure or to a suitably designed frame fixed to the roof structure and shall not rely on pipe connections for structural strength.

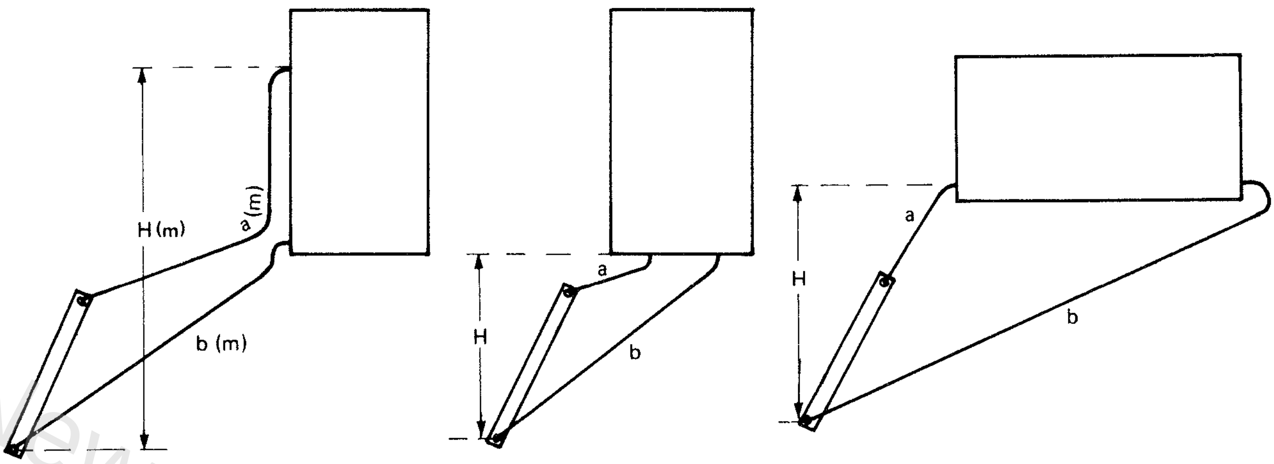
205.6.3

Provision shall be made to ensure adequate drainage either under or over the collector and the collector shall be arranged so as not to trap rainwater, leaves, dirt etc.

206 THERMOSIPHON CIRCULATION

206.1

Adequate thermosiphon flow shall be obtained by ensuring that pipe diameter is correctly related to pipe length as shown in fig. 13.



Absorber area	*Pipe diameter (nominal)*	*Maximum circulator pipe length (a + b)*				
		H = 1	*H = 1.5*	*H = 2*	*H = 2.5*	*H = 3*
m²	mm	m	m	m	m	m
1 to 2	20	3	10	25	30	
	25	10	23			
2 to 4	20				5	8
	25	3	15	25		
	32	10	20			
4 to 6	25			3	5	8
	32	3	6	12	18	24
	40	20	50			

NOTE — Absorber areas over 6 m² should be specifically designed.

Fig. 13
RECOMMENDED PIPE SIZES AND MAXIMUM LENGTHS FOR THERMOSIPHON SYSTEMS

206.2

The circulation pipe from the top of collectors to the effective entry point in the container shall have a minimum upward slope of 1 in 20 at any point unless it is vented at that point. It shall have an overall average slope of not less than 1 in 7. The shortest practical route should be used between the collector and the container with the minimum number of bends. All bends shall be swept with easy radii.

207 PUMPED CIRCULATION

207.1

The pump used shall be as specified by the manufacturer.

207.2

The installation shall comply with the manufacturer's stated conditions of pressure, temperature and flow for which the system is designed.

207.3

Adequate flow shall be ensured by following the manufacturer's instructions regarding pipe sizing and layout.

207.4

If fluid is circulated between collectors at a higher level and a container at a lower level, special provision shall be made to comply with 207.9. The prevention of unwanted circulation may be inherent in the design of the system itself, but if not, a non-return valve suitable for the pump pressure shall be incorporated in the circuit.

Specific instructions as to how this special provision is to be made shall be obtained from the manufacturer and carefully followed by the contractor.

207.5

Where the pump is of an exposed gland type, it shall be situated so that any leakage from the gland cannot cause damage to the structure. If inside a building it shall be installed in a safe tray which effectively drains to the outside of the building.

207.6

It is recommended that an indicator should be installed to show when the pump is energized.

207.7

Aerating pumps shall have filters to prevent the entry of airborne dust and bacteria, and be installed so that they are protected from water entry when not energized.

207.8

The normal pumped flow velocity is about 1 m/s in the circulation pipes, but at the point of entry into the container a much lower water velocity is required to avoid undue mixing. If not already incorporated in the container, a baffle, diffuser or other effective means shall be provided to prevent such mixing.

207.9

All pumped installations shall be designed to avoid significant loss of stored heat.

207.10
Pump installation

The pump installation shall comply with the following requirements:

(a) The primary circulating pump shall be installed to draw the colder water from the lower section of the container and to circulate this water through the collectors before returning it to the container

(b) Only connection points provided by the manufacturer in the container, or in fittings or components supplied by the manufacturer, shall be used for the cold water supply from the container and hot water return to the container. The connections shall be made strictly in accordance with the manufacturer's instructions

(c) Where the primary circulating pump is mounted separately from the container, the pump shall be rigidly supported on a properly designed base or frame and the piping system so arranged that no perceptible vibration is transmitted to either the collector or to the dwelling

(d) Circulating pump controls shall be fitted and connected strictly in accordance with the manufacturer's instructions in an accessible position and, if mounted outdoors, shall be protected by an adequately ventilated weatherproof cover

(e) Where electronic temperature probes are used, the contractor shall ensure that the probe pocket is free of moisture and is protected against moisture entry

(f) A warning notice on voltage used and a control wiring diagram shall be affixed to the inside of the control box cover and the fusebox, together with identification of control components fitted and the name of the supplying agents.

(g) The control system shall be such that transfer fluid is only circulated when there is sufficient energy to be collected or when the system is specifically designed to provide controlled circulation for frost protection.

Part 3
Plumbing

301
WORKMANSHIP

301.1

The installation shall be carried out in such a manner that the system performs satisfactorily within the requirements of this Standard and withstands all reasonable service conditions.

All plumbing shall conform to relevant standards and the requirements of any relevant regulatory authority.

302
PROTECTION AGAINST WEATHER

302.1

All components including pipe sheathing, roof penetrations and flashings shall be designed and secured to resist without excessive damage or impairment the impact of all hail, freezing and wind forces applicable to the installation.

Care should be taken to ensure that hot and cold water piping to externally mounted systems is adequately protected against freezing, in particular, the strainers, valves and the like. Additional insulation may be required to these items, or alternative locations found away from freezing temperatures.

All piping, including safe-waste piping, passing through any wall, roof, or other surface shall, where ingress of rainwater is possible, be flashed or rendered watertight in such a manner as will allow for expansion, and be appropriate to the situation.

303
PRIMARY CIRCUITS

303.1

Where the solar collectors and container are separate, the primary circuit shall comply with the following requirements:

(a) Minimum inclination angle of collectors complies with 205.4

(b) Flow and return lines comply with fig. 13

(c) Insulation of piping complies with 306.5

(d) Be of a size specified by the manufacturer or the designer of the installation, but not less than the minimum size detailed in fig. 13. For pumped systems the manufacturer shall specify sizes and maximum lengths

(e) Be installed in accordance with the manufacturer's instructions

(f) Be as short and as direct as is practical

(g) Contain no more than six 90-degree bends, each of 3d minimum centreline radius, (where d is the pipe diameter), in the total length of supply and return piping. The full cross-section of the pipe shall be maintained throughout the bend without wrinkling or flattening of the inside surface radius of the bend

(h) Be free from kinks and restrictions on all piping lengths, bends and at fittings and connections

(j) Not incorporate pipe elbows

(k) Provide for piping to rise or fall on a continuous gradient to prevent airlocks or water hammer. Adequate automatic air elimination shall be provided

(m) Not incorporate dissimilar metals.

304
SECURING OF PIPES AND FITTINGS

304.1

Any pipe or fitting which may be subjected to strain when a stop tap or other fitting is used normally or is screwed on or off, shall be adequately supported.

305
COLD WATER SUPPLY

305.1
General

The water heater or container shall be connected to the cold water supply so that the container is not subjected to a pressure in excess of its rated maximum working pressure.

305.2

Where the cold water supply pressure may exceed the maximum stated by the manufacturer, heaters shall be connected either:

(a) From a cold water feed tank, used solely for this purpose, unless it is of sufficient capacity to supply such other water requirements which may be permitted by the regulatory authority; or

(b) Through a pressure-reducing, pressure-ratio or pressure-limiting valve to the manufacturer's specification.

305.3
Cold water controls

305.3.1
Control devices

Except where otherwise specified by the regulatory authority, the cold water supply shall be controlled by the following devices in the sequence listed and generally as shown in figures 6, 7, and 8:

(a) Stop tap, except that where the container is fed from other than a mains supply, a gate valve shall be used in lieu of a stop tap. The stop tap or gate valve shall be accessible from floor or ground level

(b) Line strainer, if specified

(c) Non-return device complying with AS 1357

(d) Pressure-reducing, pressure-limiting or pressure-ratio valves (where required) complying with NZS 4608 or AS 1357

(e) Pressure-relief valve (where specified) complying with NZS 4608 or AS 1357

(f) Provision for draining where specified (see 305.6).

305.3.2
Position

Any device approved for use in a particular position e.g. horizontal only, shall be installed only in the approved position.

305.3.3
Cistern-fed heaters

Cistern-fed water heaters shall be controlled by a stop tap in accordance with this Standard.

305.4
Control of supply to cold water feed tanks

Cold feed tanks which supply water to a water heater shall be controlled by a stop tap and float valve.

305.5

Pressure-reducing, pressure-limiting, and pressure-ratio valves

Where a system is designed with a pressure-reducing, pressure-limiting or pressure-ratio valve and a vent pipe and the valve is not inbuilt, the contractor shall fit the valve to the water heater to the manufacturer's instructions and in accordance with 204.4.2 (e) and (f).

The pipe between the valve and the container shall have a nominal diameter not less than that of the container inlet.

A pressure-relief valve shall not be used to replace an existing vent pipe.

305.6
Drainage of collectors and storage water heaters

Where the manufacturer has not provided facilities for drainage of the collectors and container, the contractor shall provide a drain outlet at the lowest point of the piping circuit which shall be:

(a) Closed by a valve, plug tap or drain tap, as appropriate, where the container is required to be periodically bled or drained for maintenance purposes; or

(b) Sealed by a plug or cap in all other cases, unless otherwise required by the regulatory authority.

306
WATER PIPES AND FITTINGS

306.1
Pipes

306.1.1

All pipes shall comply with one of the following Standards:

(a) Hot water or cold water:
Copper pipes — NZS 3501
Galvanized steel pipes — BS 1387
Polybutylene pipes — CSA B137.8

(b) Cold water only:
Polyethylene pipes — NZS 7601 or NZS 7602
Unplasticized PVC pipes — NZS 7648

306.1.2

The completed water piping installation including fittings, but not including container, shall be capable of withstanding pressures of 2000 kPa or twice the maximum working pressure, whichever is the lesser.

306.2
Piping inside the building

Piping inside the building should be concealed wherever practicable and permitted by the regulatory authority.

306.3
Provision for expansion

Provision for expansion shall be made in pipe runs by providing clear space at bends and branches to permit movement; and sufficient free length around the bend or along the branch to prevent overstressing the pipe.

306.4
Hot water reticulation

The layout and size of hot water pipes in a non-circulatory system (including branches from circulatory systems) shall minimize the amount of dead (cold) water drawn off before hot water commences to flow at any tap and give an adequate flow at all outlets with a minimum of interference with the flow at one outlet when another is opened.

Where plastics pipes are used care should be taken to ensure that the pressure/temperature rating of the pipes is not exceeded.

306.5
Insulation of piping

306.5.1
Insulation requirements

All piping specified as insulated shall be insulated with an approved heat-insulating material, the properties of which shall not be inferior to closed cell flexible elastomeric insulating sleeve of 10 mm thickness for pipes of 20 mm NB or less and of 13 mm thickness for pipes of larger diameters. Aluminium foil may be used in still air spaces.

306.5.2
Insulation exposed to the weather

306.5.2.1

Insulation exposed to the weather, shall be protected by metal sheathing, weatherproof tape, or other weatherproof coating.

306.5.2.2

Sheathing shall be so lapped that water will not enter the joint or alternatively, the joints shall be additionally covered to provide the same degree of weatherproofing.

Part 4
Installation of auxiliary heating

401
GENERAL

401.1
Thermal capacity

Auxiliary heating equipment installed shall have sufficient thermal capacity to supply normal hot water requirements in its own right.

401.2
Design

Auxiliary heating equipment shall be of a design suitable for the maximum pressure, maximum and minimum temperatures and the typical analysis of the inlet water and shall comply with the requirements of the local water supply authority.

401.3
Performance

Auxiliary heating equipment shall meet the standard of performance and approval requirements of the relevant energy supply authority.

401.4
Thermostat setting

To obtain an acceptable solar contribution, the auxiliary heating should be suitable for operation at 55 °C nominal temperature. Where this cannot be effected by adjustment of the thermostat setting, the thermostat should be replaced by one of a type and design approved by the regulatory authority. The thermostat shall be marked at the operating temperature.

402
INSTALLATION OF SOLAR/ELECTRIC WATER HEATERS

402.1
Consultation with supply authority

The electricity supply authority should be consulted prior to commencing work on the installation of a solar/electric water heater so as to determine:

(a) Whether electricity supply is available

(b) The wattage of the heating unit and the suitability of the container to meet the tariff conditions

(c) The suitability of an existing electricity supply to provide the required load.

403
INSTALLATION OF SOLAR/GAS WATER HEATERS

403.1
Consultation with supply authority

The gas supply authority should be consulted prior to commencing work on the installation of a solar/gas water heater so as to determine if gas supply is available, or the suitability of an existing gas supply to meet the required demand.

Part 5
Completion of installation

501
FLUSHING OF SYSTEM
501.1

On completion of the installation the contractor shall thoroughly flush the collectors and the hot water system with cold water and subsequently reseal prior to testing.

502
WATERTIGHTNESS TESTS AND CHARGING OF SYSTEM
502.1

The hot water system shall be tested hydrostatically by the contractor with not less than its normal hydrostatic head, to ensure that it is watertight. The contractor shall check that no leakage occurs while the system is under test pressure. All safe trays and safe-wastes shall be tested with water to ensure that they do not leak under full overflow conditions.

502.2

All vent pipes, and drain pipes from pressure-relief and/or temperature-relief valves, shall be tested with water to ensure they are unobstructed and open to the atmosphere.

502.3

Unless required otherwise by the manufacturer's instructions, the contractor shall leave the installation charged with water, with the water supply turned on, and shall ensure that the system is free from airlocks.

503
MAKING GOOD
503.1

In existing premises the contractor shall make good any surface, structure or fitment disturbed during the installation of the solar water heating system, to the extent prescribed in 503.2 and 503.3.

503.2
Roof

The roof shall be so restored that:

(a) The strength of the roof structure is not less than before it was disturbed;

(b) The roof is weatherproof within the area (or areas) disturbed;

(c) The restored roofing is properly secured and left in a condition not inferior to, and to match with, the undisturbed portion of the roof except that the contractor shall not be required to paint any galvanized or similar sheeting;

(d) Upon completion of installation, the contractor shall remove all metallic scrap, waste, drillings and dust from metallic roof cladding.

503.3
Parts other than the roof

503.3.1

Where the contractor is carrying out building alterations on the site, the parts shall be restored to a condition and finish not inferior to the surrounding surface or fitment.

503.3.2

Where the contractor is not carrying out building alterations, any holes in walls, ceilings and floors shall be filled with material appropriate to the surface material and all fitments, structures and surfaces shall be properly restored.

APPENDIX A RECOMMENDATIONS FOR THE DESIGN OF DOMESTIC SOLAR WATER HEATING SYSTEMS

A1 General

With installations which comprise components that are not specifically designed for use with each other, it may not be possible to readily predict the performance of the system. Such systems commonly result from the addition of a new component to an existing component, e.g., solar collectors added to an existing hot water system. However, it is possible to avoid fundamental design mistakes in such systems and the recommendations set out below embody what is felt to be good practice in order to obtain a reasonable solar contribution.

A2 Water storage capacity

A2.1

The storage capacity of the container should be not less than the anticipated average daily consumption of the household.

A2.2

For increased solar performance, a storage capacity of from 1.5 to 2.0 times the anticipated average daily consumption is recommended.

A2.3

For systems using off-peak auxiliary heating, the storage capacity of the container should be not less than 1.5 times the anticipated average daily consumption.

NOTE — The auxiliary heated part of the storage may be subject to minimum storage capacity requirements of the regulatory authority.

A3 Recommended operating temperature

For the purpose of obtaining an acceptable solar contribution, auxiliary heating (whether integral or remote) should be suitable for operation at 55 °C nominal temperature.

A4 Combined pressure/temperature-relief valve

The rating of the valve should allow for the energy input of the collectors at 99 °C.

A5 Collector/container size ratio

The collector aperture should be related to the volume of the container, and to the location of the installation as indicated below. Where the storage capacity of the container differs significantly from the value given below, the collector aperture should be adjusted to maintain approximately the same ratio. Slightly less collector aperture will be required for collectors with selective surfaces.

Location	*Collector*		*Container*	*Solar*
	Inclination angle	*Aperture*	*volume*	*fraction (approx)*
	degrees	m²	L	%
Auckland	20-40	4	360	65
Wellington	20-40	4	360	60
Christchurch	20-40	4	360	60
Invercargill	20-40	4	360	56

NOTE — The solar fraction is that percentage of the total energy delivered by the hot water system which is supplied by solar radiation.

APPENDIX B
ESTIMATION OF SHADING OF COLLECTORS

B1
General

In order to assess whether collectors will be subject to shading during the year, it is necessary to know the solar altitude for the installation location when the sun is at its lowest, i.e. in mid-winter. As most of the useful solar radiation is received within 3 h either side of solar noon, any significant shading of collectors between 9.30 am and 3.30 pm standard time, will affect the performance of the system, and should be avoided. Table B1 lists the solar altitude at mid-winter for various locations. By checking the solar altitude, as observed at the lower edge of the collectors, the installer can determine whether or not nearby buildings, trees etc will cast a shadow on the collector, i.e. if a building, observed from the base of the collectors, is above the mid-winter solar altitude, then that building will cast a shadow on the collectors.

Table B1
SOLAR ALTITUDE AT MID-WINTER

City	*Latitude*	*9.30 am*	*12.30 pm*	*3.30 pm*
	deg.	deg.	deg.	deg.
Auckland	37	16	30	16
Wellington	41	13	25	13
Christchurch	44	11	23	11
Invercargill	46	9	20	9

B2
Sun locator

B2.1

The mid-winter solar altitude may be checked using a commercial 'sun locator', however, a simple solar altitude sight may be constructed from the diagram in fig. B1. Fig. B1 may be glued on cardboard, or preferably reproduced to a larger scale on cardboard, and then cut out and assembled. An assembled sight is shown.

B2.2

The solar altitude sight is used by aligning the arrow due north, using a compass or map, and with the base of the sight horizontal, sighting the 9.30 am., 12.30 pm and 3.30 pm positions of the winter sun, from a view-point near the base of the solar collectors. Any objects which can be seen above the sight will cast a shadow on the collector in winter. The use of the solar altitude sight is shown in fig. B2.

B3
Approximate method of determining solar altitude

In the absence of a solar altitude sight, the mid-winter solar altitude can be estimated by eye, using the fact that a closed fist extended at arm's length from the head subtends approximately 10 degrees at the eye (see fig. B3), as follows:

(a) Select a viewpoint close to the lower edge of the collectors, and face due north

(b) Extend one arm with the index finger in line between your eye and the true horizon

(c) Make a closed fist with your other hand, place it upright on top of the other; this gives a solar altitude of 10 degrees

(d) Placing the second fist on top of the first will give 20 degrees and so on. Using this approximation the altitude at which the sun will be found at 12.30 pm in mid-winter may be estimated using table B1 and any likely shading noted

(e) By repeating this procedure facing NE and NW the mid-winter solar altitude at 9.30 am and 3.30 pm repectively, may be estimated using the figures in table B1.

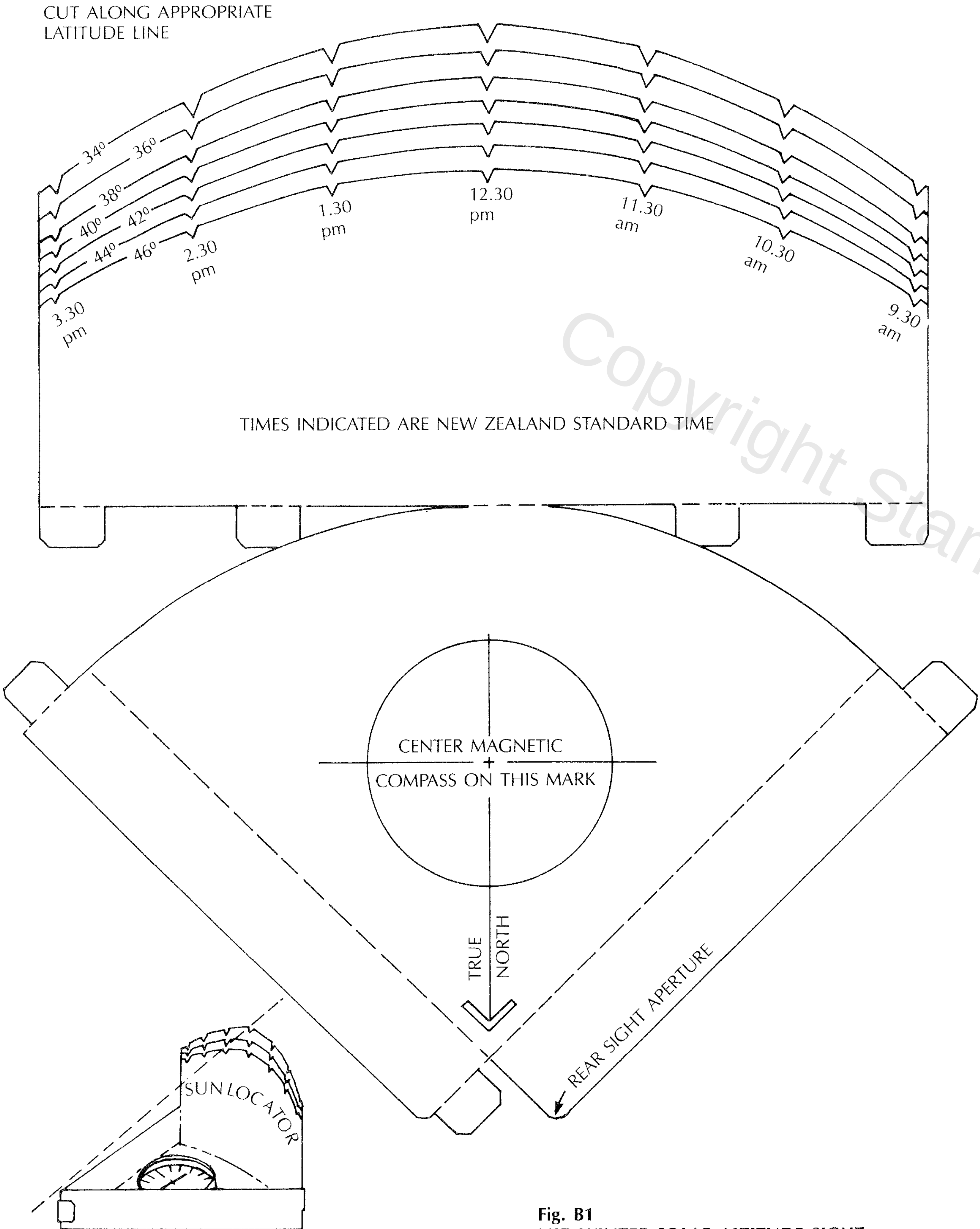


Fig. B1
MID-WINTER SOLAR ALTITUDE SIGHT

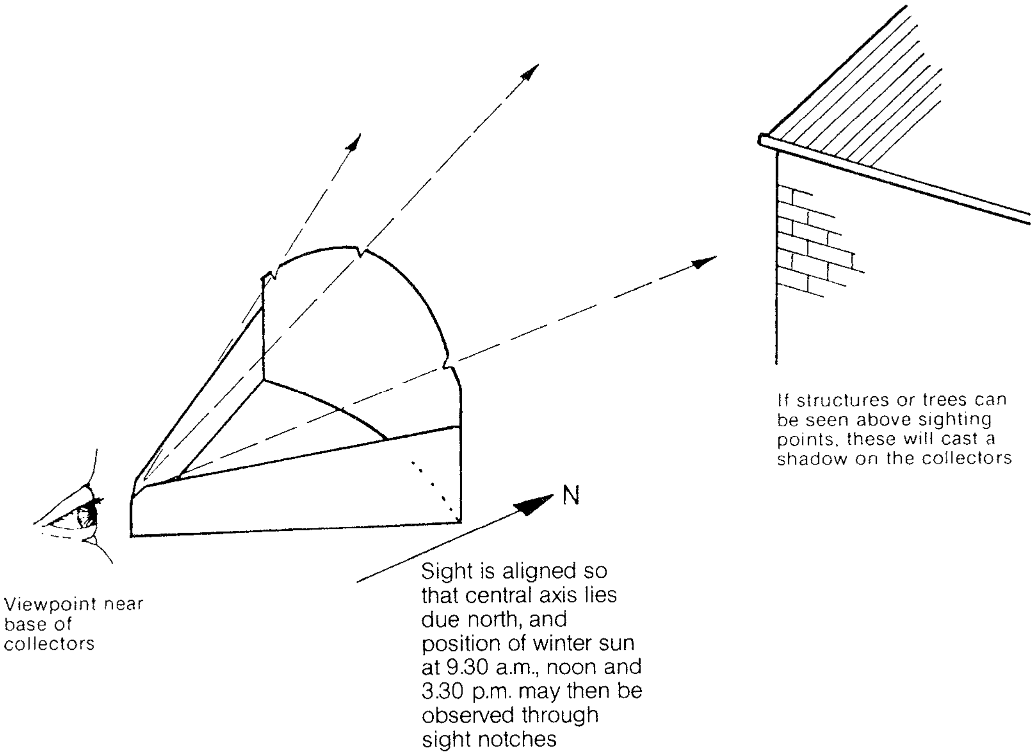


Fig. B2
USE OF SOLAR ALTITUDE SIGHT

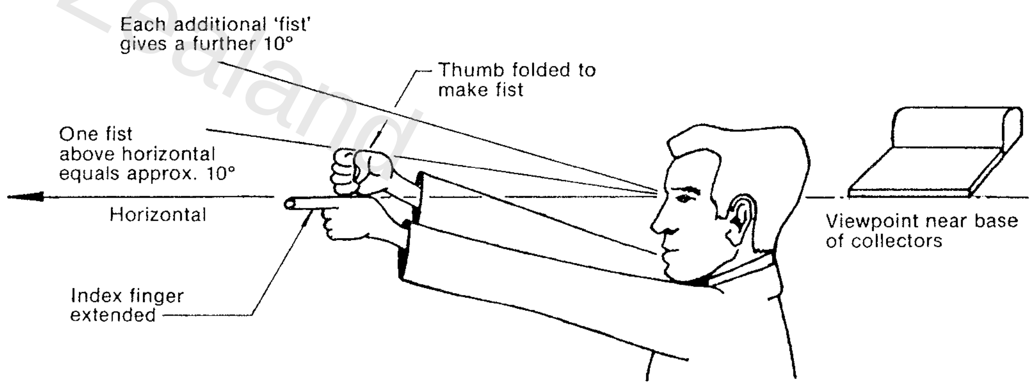


Fig. B3
'FIST' METHOD OF ESTIMATING SOLAR ALTITUDE

APPENDIX C RECOMMENDATIONS FOR MAINTENANCE

C1

The nature of a solar water heating installation will expose its component parts to the effects of weather extremes prevailing in the area of installation. An amount of inspection and maintenance is necessary to ensure that under these conditions the unit will continue to give optimum performance during its lifetime.

Additional factors which will affect its efficiency include natural shade, water quality and normal water usage patterns.

The following guide is provided on points which will require attention from time to time:

(a) Following completion of the installation, the owner or occupier of the premises in which the solar water heater is installed should ensure that the collector and container are correctly charged with water at all times

(b) During any period when the solar hot water system is not in regular daily use and where no alternative means of limiting water temperature rise is incorporated, a shade cover should be fitted over the collector aperture as a means of minimizing corrosion and scale formation within the absorber water passages. Shading of the collector aperture is also recommended during any extended period when hot water draw-off is minimal, but is not applicable to indirect fluid heat-exchange systems

(c) Any areas of galvanized steel on collectors or containers which are exposed to the weather but are not regularly rain washed should be painted and any exposed aluminium surfaces in locations within 3 km of the sea should also be painted. All exposed metal-work should be hosed down regularly with fresh water to reduce corrosion.

(d) In extremely dusty areas or locations adjacent to dust-forming plant, the transparent covering of the solar collector should be washed with clean water at least every 3 months, should adequate rain not have fallen in that period to clean the cover naturally. Broken or deteriorated covering should be replaced immediately by a competent serviceman

(e) Shading from adjacent shrubs and trees should be checked annually under both summer and winter conditions and if shading from these sources is experienced between 9.30 am and 3.30 pm., then corrective action should be taken, e.g. pruning, cutting or trimming. Partial shading of the collector by chimneys, flues, TV antennas etc during these hours is acceptable, provided that it does not exceed approximately 10 percent of the area. Shade from newly erected buildings should be checked and if unit performance is affected, relocation of the unit may be necessary

(f) The seal on the collector glass cover should be inspected and any necessary maintenance carried out to maintain the watertightness of the unit

(g) The surface coating of the absorber should be inspected and in the event of significant deterioration of this surface the owner or user of the solar water heater should arrange with the contractor or manufacturer or their agents to have the necesary maintenance or rectification work carried out

(h) Check that all vent, relief and drain lines are clear of obstructions and free to operate at all times

(j) Where pressure-relief valves are fitted to the cold water supply line to the container and to the hot water outlet from the container, the following routine maintenance procedures should be adopted:

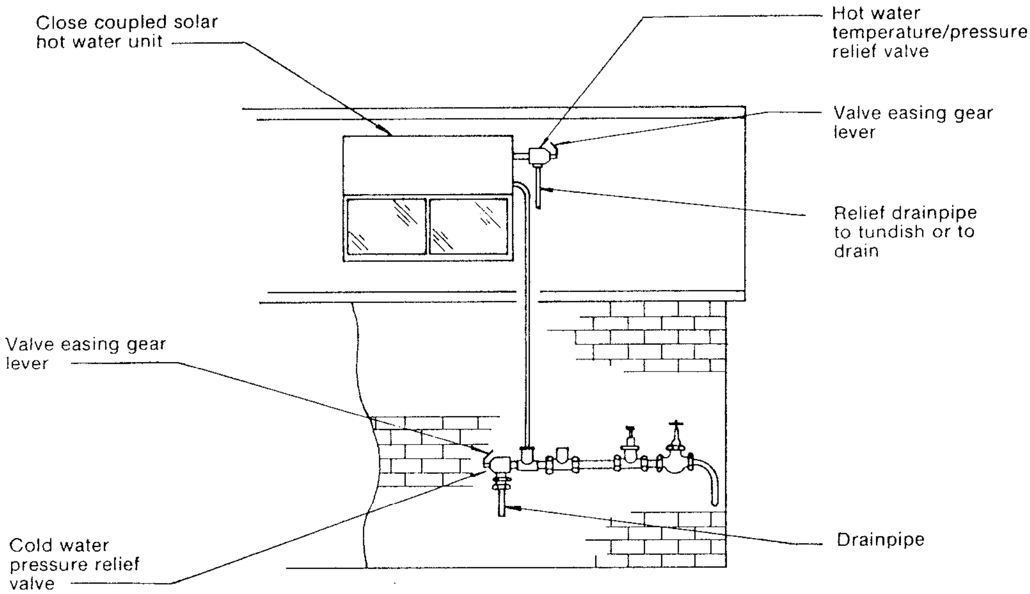
  (i) Easing gear on the cold water pressure-relief valve should be operated for a number of short periods, each of approximately 10 to 15 seconds duration, at intervals not exceeding 3 months. After reseating the valve, check that there is no leakage from the valve.

  (ii) Hot water pressure-relief valve (or combination pressure/temperature-relief valve) should be operated in a similar manner to the cold water pressure-relief valve where possible. The hot water pressure-relief valve (or combination pressure/ temperature-relief valve) should be replaced at intervals not exceeding five years in all installations.

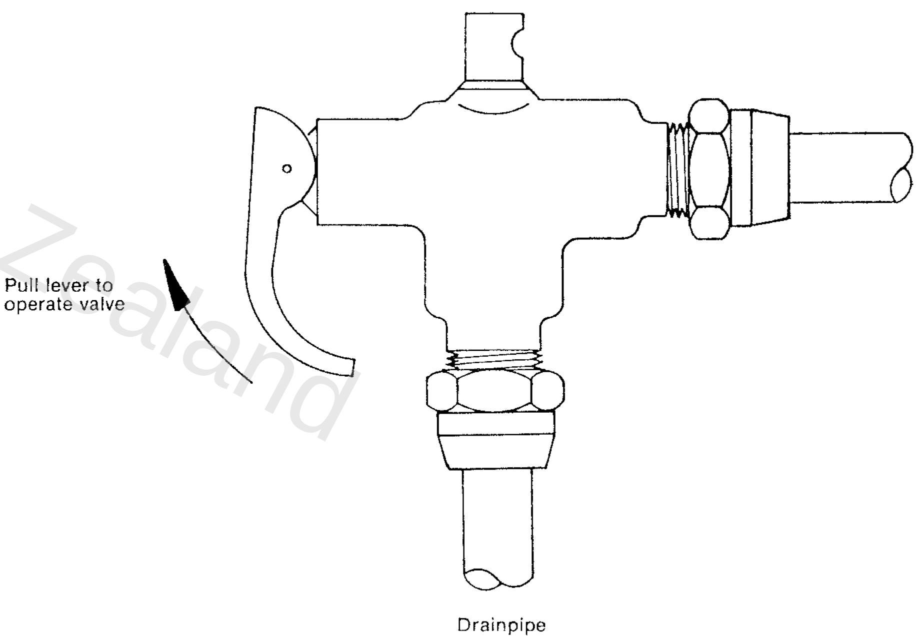
  Location and operation of valve easing gear is illustrated in fig. C1.

(k) Check that water temperature controls on auxiliary heating systems are effectively maintained with temperature settings held within the limits specified

(m) Insurance cover against damage to either the solar water heater or its components should be arranged by the owner on completion of the installation.



(a) Location of valve easing gear



(b) Detail of operation of valve easing gear

Fig. C1
LOCATION AND OPERATION OF VALVE EASING GEAR

Other New Zealand Standards for water supply, use and disposal

NZS 4601	1971	Performance of water fittings and appliances
NZS 4602	1976	Low pressure thermal storage electric water heaters with copper cylinders. Amend: 1, 1976
NZS 4603	1985	Installation of low pressure thermal storage electric water heaters with copper cylinders (open-vented systems)
NZS 4604	1978	Dairy-type thermal storage electric water heaters with copper cylinders
NZS 4605	1978	Code of practice for the installation of dairy-type thermal storage electric water heaters
NZS 4610	1982	Household septic tank systems
NZS 4611		Non-thermostatic shower mixing valves
NZS 4611 Part 1	1982	Specification for materials, design and construction. Bound with NZS 4611: Part 2
NZS 4611 Part 2	1982	Code of practice for installation. Bound with NZS 4611: Part 1
NZS 4613	1986	Domestic solar water heaters
NZS 4616	1984	Washbasins (± AS 1730: 1975) Amend: 1; 2; 3; A

NOTES