SOLAR COLLECTOR PANEL INSTALLATION

Correct positioning and good installation of solar collector panels are essential for an effective and efficient solar water heating system.

By Alide Elkink, Freelance Technical Writer, Wellington

nstallation of roof-mounted collector panels for a solar water heating system must consider the extra loading on the roof structure and the wind loading on the panels themselves. Also, damage to the roof and roof cladding must be avoided, the weathertightness of the roof maintained and panels orientated correctly for maximum solar gain.

Compliance requirements

New Zealand Building Code Clause G12 *Water supplies* specifies the performance requirements for solar water heating systems. Compliance document G12/AS2 *Solar water heaters* provides a means of compliance within criteria set out in paragraph 1.1.1, which include that panels must not exceed 22 kg/m² and the hot water storage tank must not be roof-mounted. There are also limits on cylinder weight when installed within the roof space.

AS/NZS 3500.4:2003 *Plumbing and drainage – Heated water services* provides a broader means of compliance that includes the situations excluded by G12/AS2.

A building consent is required for installation as the system is generally connected to a potable water supply. It may also be required under Building Code Clause B1 *Structure* due to the additional loading on the roof. Durability of materials is set out in Clause B2 *Durability*. If there are any concerns about roof loading or strengthening of the roof is required, consult an engineer.

All plumbing work must be certified by a registered plumber and electrical work certified by a registered electrician.

- Other relevant standards include:
- NZS 3604 *Timber framed buildings*
- NZS 4613 Domestic solar water heaters
- **NZS** 4614 Installation of domestic solar water heating systems
- AS/NZS 2712 Solar and heat pump water heaters Design and construction
- AS/NZS 4692.2 Electric water heaters Minimum Energy Performance Standard (MEPS) requirements and energy labelling.

Check roof is suitable

Before installing a solar water heating system, confirm that:

- the roof area is adequate for the required installation
- the loading will not exceed the roof structure capacity
- I the direction and inclination of panels will maximise solar gain
- there is no or minimal shading
- I there is a route for the pipework between the collector and the cylinder
- access is available for roof and panel maintenance
- I installation of the panel will not affect the durability/performance of the roof cladding.

Options for fixing panels

Solar collector panels can be fixed:

- parallel and directly onto the roof (there must be an air gap between the panel and the roof cladding)
- lelevated on a frame and parallel to the roof
- on frames fixed onto the roof at an angle to maximise solar gain, for example, on a low slope roof
- as insets into the roof if the weathertightness of the roof can be maintained (not discussed in this article).

Face collector panels true north

The correct direction and inclination of solar panels is essential to maximise solar collection. Panels should face geographic north if possible, although between NNE and NNW is acceptable (see Figure 1).

Panels should be installed at the same angle as the latitude of the location. Wellington is at latitude 41° S, for example, so ideally the collector angle should be mounted at 41° to the horizontal but may have a deviation of $\pm 20^{\circ}$ (see Figure 2). \rightarrow



Figure 1: True north orientation.



Figure 2: Collector panel installation angle.



Figure 3: Gable high pressure wind zone area.

The panels should be located where they are:

- away from gable edges (see Figure 3)
- not shaded by overhanging trees or taller adjacent buildings, particularly during winter months
- not obstructing drainage paths
- I not likely to collect roof debris.

Materials and fixings

Collector panel materials must be compatible with adjacent roofing materials (see Table 2 of G12/AS2). Select materials subject to rainwater run-off in accordance with Table 3 of G12/AS2.

Do not use connecting pipes for collector support.

Panels must be strapped, bolted and secured against the seismic and wind loadings of the region and installed according to the manufacturer's instructions to maintain the weathertightness and integrity of the roof.

All fixings must be hot-dip galvanised mild steel, or if the roof is not coil coated or galvanised steel, they can be type 316 stainless steel. Seal all fixings that penetrate metal roof claddings with purpose-made neoprene washers or EPDM flexible boots. Do not use washers and other sealing materials that have carbon black filler levels over 15% by volume or 25% by weight with unpainted galvanised steel or zinc/aluminium roofing.

Collectors fixed directly to metal roof

Fix collectors directly to metal roofing with:

a minimum of four support points per panel within 200 mm of panel edges with fixings into 50 mm minimum wide purlins



Figure 4: Collector panel fixed directly to roof.

a minimum of 12 self-tapping screws so that the average load at any point is not greater than 15 kg.

Panel mounting clips and fixings may be screw-fixed directly onto the top of the corrugations with butyl rubber spacer blocks under each fixing (see Figures 4 and 5).

Collectors elevated and parallel to roof

Where solar collectors are elevated and parallel to the roof, they must be a maximum of 50 mm above the roof cladding. Fix collectors:

- with screws or bolts in accordance with G12/AS2 paragraph 6.4.1 (see Figure 6)
- into purlins, rafters or trusses in accordance with G12/AS2 paragraph 6.4.2
 on collector support rails in accordance with G12/AS2 paragraph 6.5
- (see Figure 7).

Collectors fixed on frames onto roof

Where collector panels must be fixed at a different pitch to the roof, they must be fixed to frames (see Figure 8). Frames may be run horizontally across the roof slope or vertically up the roof slope.

- The frame support rails must:
- have a minimum of eight fixing points
- be 50 x 50 x 6 mm minimum hot-dip galvanised mild steel angle sections or equivalent
- be connected to rafters or truss top chords in accordance with G12/ AS2 paragraph 6.6.2(c) and Figure 20
- have connections mid-way between the struts and the outer support rail fixings (see Figure 9).

Where support rails run horizontally, each rail must be supported by at least four rafters or truss top chords. Proprietary collector panel support frames may be used but they must meet requirements given in G12/AS2 paragraphs 6.6.3–6.6.6 including strut angle size, material, diagonal fixing location and connections.

More information

A series of comprehensive installation details for metal roofing can be found in the compliance document G12/AS2. This can be downloaded free from www.dbh.govt.nz/compliance-docs-get-copies.

The Solar Industries Association and EECA have developed the *Code of* practice for manufacture and installation of solar water heating systems in New Zealand, which is available online at www.solarindustries.org.nz.



Figure 5: Collector fixing - fixed directly to roof.



Figure 6: Collector fixing - elevated and fixed directly to roof.



Figure 7: Collector support rail across slope - collector elevated and parallel to the roof.



Figure 8: Collectors mounted at different angle to roof.



Figure 9: Part collector support frame for mounting at different pitch to roof cladding.

+