



Low Pressure Solar Geyser Installation Guide

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This unit must be installed, maintained, and repaired strictly in accordance with the appropriate and relevant requirements of SANS 10254 and SANS 10106.



NOTE: SANS-10106 requires that an Engineer be consulted before installing a geyser on a roof if it has a capacity greater than 250L.

1. Installation

To ensure public safety and the warranty of the system, the system must be assembled and installed by a trained and competent installer.

As of 2014, all plumbers doing solar hot water installations, under the new Section 9 of SANS 10106: 2014, must issue a certificate of compliance (COC).

Under the new legislation, the practice of performing solar installations without being properly qualified, not using compliant materials and not issuing PIRB COCs is now illegal in terms of the National Building Regulations, Water Services Act, Occupational Health and Safety Act, the Water and Sanitation By-laws, and the Consumer Protection Act. A solar water heating system is not SANS 10106 compliant if a certificate has not been issued. COCs will also be required for insurance cover of the installation.

2. Occupational Health and Safety

Solar geyser installation should be conducted in accordance with the OHS Act. Installer must be knowledgeable about the OHS Act and its application.

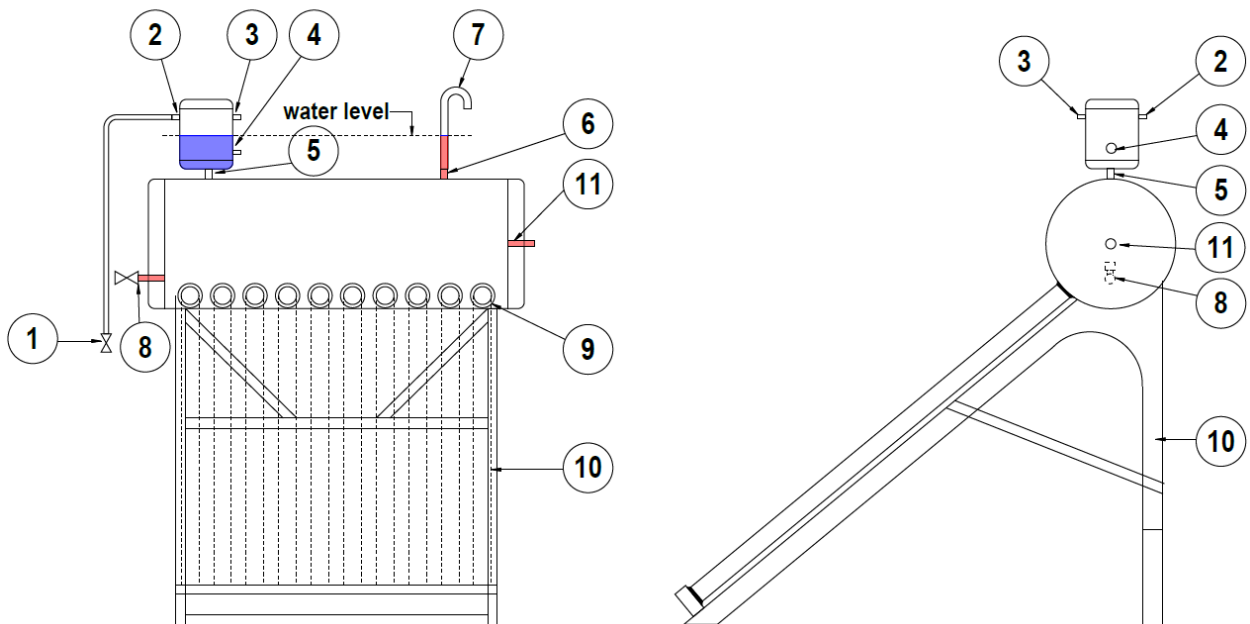
It is the installer's responsibility to provide and maintain, to the extent feasible, a working environment that is safe and does not pose any risk to the assistant's health and safety.

Wearing personal protection equipment such as overalls, non-slip shoes, and eye, head, and hand protection is always mandatory.

To ensure a safe working environment, pay attention to the roof structure. A fall arrest harness should be worn and anchored to the roof to prevent an accidental fall.

The rules and specifications for working at heights must always be adhered to, especially when using ladders and scaffolding.

3. Overview



- | | |
|----------------------------------------------------------------------------------------------|------------------------------------|
| 1 Cold water supply isolation valve (not included) | 7 Vent pipe (not included) |
| 2 Cold water supply connection port | 8 Drain valve (SANS 1808-53) |
| 3 Overflow port | 9 58mm port for vacuum glass tubes |
| 4 Cold water (low pressure) outlet port for supply to house (used to balance water pressure) | 10 Frame |
| 5 Auxiliary tank connection port | 11 Hot water outlet port |
| 6 Vent port | |

4. Critical Information!!!!

- The vent pipe must be **OPEN**. By closing or restricting the vent pipe, a vacuum is created when the geyser is emptied, which can cause the tank to collapse.
- Ensure that the vent pipe is upright at the top of the tank.
- Before inserting the glass tubes, fill them with water. Adding cold water to heated glass tubes @ ~ 300°C will instantaneously shatter all the tubes.
- Lubricate glass tubes with soapy water before inserting. Do not use grease, Vaseline, oil, or any other lubricants. This will damage the seals and cause leaks.

5. Location selection

The following can be considered when choosing a location for the Low-Pressure solar geyser kit:

- Assess the roof structure that will support the anticipated load. The unit needs to be fixed to the roof and supported to maintain the correct orientation and tilt angle, without causing deterioration of roofing material.
- Ensure that the installation location is free of shade during the day throughout the year. Take note of trees, chimneys, tall buildings, etc that may cast a shadow on the geyser.
- The highest solar input can be obtained from 9am to 3pm.
- The solar geyser must be installed with the glass tubes facing North.
- Geyser should be installed as close as possible to the consumer. Long lengths of pipe will cause a loss in efficiency.
- It is essential to inspect the roof truss system carefully after it has been filled with water to ensure it will sustain the system's weight. Ensure that the front foot of the storage tank is inspected carefully. It is usually best to locate the front foot of the tank over a tile batten, purlin, or similar structure for maximum strength. Solar water heaters must be installed with additional bracing if the roof is not able to bear the load.

6. Main Assembly

6.1. Unpacking and Inspection



Unpack and check contents of box, ensure all parts has been received.

Solar geysers should be assembled according to the roof mounting requirements.
Note that the exact model you receive may differ slightly from the photos below.

6.2. For flat roofs:

Front View:



Side View:



Rear View:



6.3. For 26° pitch roofs:

Front View:



Side View:



Rear View:



Place the geyser tank on top of the frame. Take note that the geyser will be able to slightly rotate clock- and counter-clockwise. Do not fasten the geyser yet to the frame. The slight rotation will assist to make it easier to insert the glass tubes.

Once all the tubes are connected, the geyser can be fastened to the frame.

Take note: If all the tubes leak from the silicone seals at the holes, this indicates that the tank is rotated too much either clockwise or counter clockwise. Rotate accordingly to rectify the problem.



In a bucket, prepare a solution of soapy water and dip the open ends of the glass tubes into the soapy water.



The glass tubes should be filled with water (up to about 80% full) prior to installation. This will prevent the tubes from heating up during installation and causing them to crack when the cold water is later connected.

Place the dust cover over the outside of the tube.

Insert the soapy open end of the glass tube carefully into the hole where the silicone seal is located. Lubricate the silicone seal with soapy water if necessary. Twist and press the tube into the silicone seal until it is properly inserted.

Twist and pull the tube down/out towards the end-support until it firmly sits in the plastic tube cup / tube support hole.

Push the dust cover back until it is in contact with the geyser tank.

Repeat the same process for the remaining tubes.

If all the tubes are in place, tighten the geyser tank to the frame.



Additional notes:

- This is a low-pressure solar geyser; installing it as high as possible will result in a higher static water pressure.
- Be careful not to break the small glass nipple at the mirror end of the glass tube. Keep the nipple of the glass tube on your foot while holding it.

7. Auxiliary systems assembly

7.1. Cold water supply

The water level in the geyser is controlled by the small auxiliary tank on top of the geyser. Connect the auxiliary tank to the main geyser tank. Use thread sealant (plumbers' tape, hemp, etc) between the auxiliary tank and the main geyser tank to prevent leaks.



The auxiliary tank is equipped with a ball-float valve that allows high pressure water to enter the geyser. Once the desired water level is reached, the valve will close (~ 50% of the auxiliary tank height). Ensure the overflow is directed to where it shall not cause damage to the building.

Take note:

- The auxiliary tank has 4 connection points:
 - Bottom: Connection to main geyser tank
 - Top-side #1: Cold water supply (high pressure water)
 - Top-side #2: Overflow. (Leave open. An extra pipe upward will put water in the foam, foam swells, valve gets stuck)
 - Bottom-side: Connection for cold water going to the house. This is useful since the cold-water pressure will be the same as the hot water pressure. Note that the cold-water flow is limited. Unbalanced water pressure (hot vs cold) can cause problems in the operation of the geyser and mixing valves, such as at the shower.

- It is also possible to use a Latco valve in place of the auxiliary tank, however, in our experience, it will eventually leak and cause corrosion or other operational issues if it is not regularly inspected and serviced. The vent must be equipped with an open, 1.5 metre pipe to make adjustment easier. The installation method can result in metal fatigue issues where the vent pipe enters the tank. This is not the preferred method.
- When the cold water is sourced from a water tank, the solar geyser must be installed at such an elevation to allow the geyser to be filled with water even when the water tank is at low water level.
- If the geyser was not used for an extended time and need to be used again, cold water re-connection should preferably be done at night-time (or best, just before sunrise). This will ensure that the glass tubes are cold when cold water is added.

Be careful not to overtighten the pipe when connecting the cold-water supply to the auxiliary tank. The stainless-steel wall is very thin and can easily be damaged when over-tightening. The brass ball valve on the inside can also rotate if excessive force is applied on this connection, causing the ball valve not to re-seat properly.

7.2. Vent pipe

Since the auxiliary tank will control the water level at approximately 50% of the auxiliary tank's height, a breather pipe will be required on the vent hole of the geyser. The height of the vent pipe should correspond to the same height of the auxiliary tank. This will allow air to exit/enter the main geyser tank and prevent water from leaking from the vent hole when the water level in the tank is reached.

WARNING

- **DO NOT** restrict or block the vent pipe.
- **DO NOT** install a vacuum breaker, a pressure relief valve, a check valve, or any other device on the vent pipe that will restrict or prevent air flow in or out of the geyser tank.

7.3. Hot water outlet

Connect the hot water outlet to the hot water outlet port on the main geyser tank. Depending on the model, the location will be on the side of the main geyser tank (above the drain port).

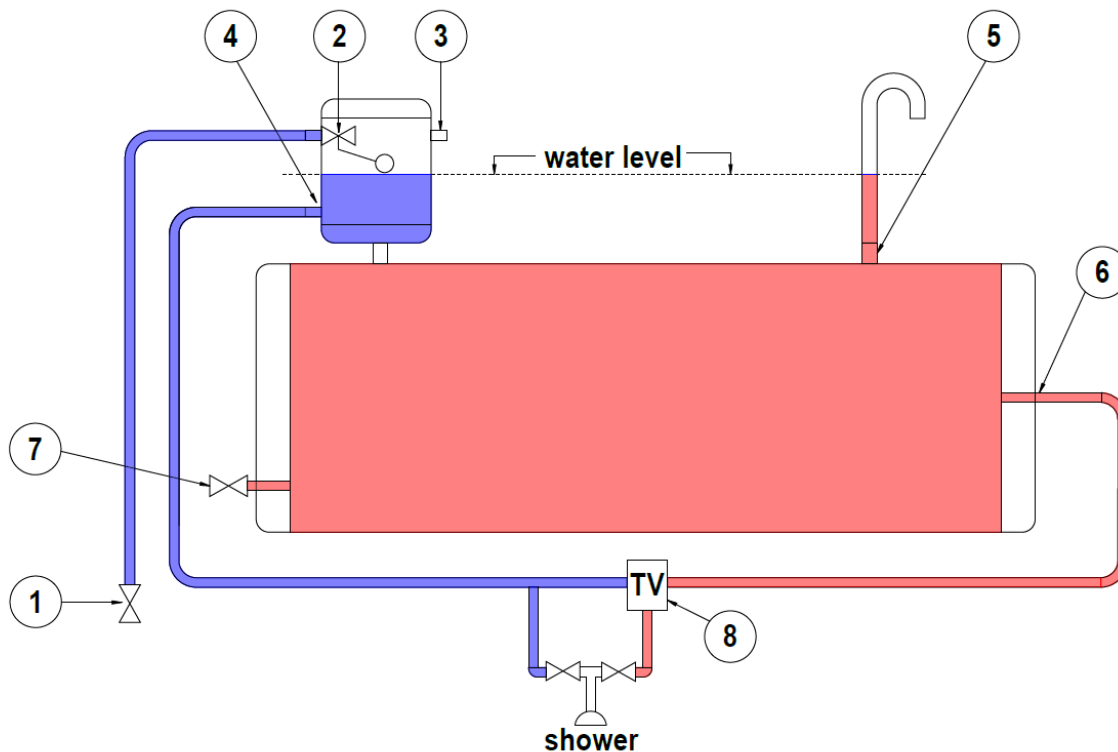
When connecting the hot water outlet pipe, take care of the following:

- Be careful not to overtighten the connection. Excessive force may damage the inner tank.
- Use thread sealer (plumbers' tape, hemp, etc) to ensure the connection does not leak.

The geyser will supply hot water at low pressure (i.e., the static height of the geyser above the house, typically 20 kPa to 50 kPa). Municipal water will be at a higher pressure (typically between 200 kPa and 500 kPa). When hot water is used on mixer taps, the cold water tends to push back into the hot water pipes and back into the solar geyser. This causes water to overflow on the auxiliary tank overflow connection.

To prevent the above, it is recommended to do one of the following:

- Install a pressure reducing valve for the cold-water supply to the house
- Use the cold-water supply port on the side of the auxiliary tank to provide cold water to the entire house. Note that this pipe has a limited flow.



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|----------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| 1 Cold water supply isolation valve | 7 Drain valve (SANS 1808-53) |
| 2 Float valve (SANS 752) | 8 Anti-scalding / tempering valve (SANS 1299) (Not included) |
| 3 Overflow port | |
| 4 Cold water (low pressure) outlet port for supply to house (used to balance water pressure) | |
| 5 Vent port | |
| 6 Hot water outlet port | |

From the above installation diagram, the following is required:

- A drain cock according to SANS 1808-53
- An anti-scalding valve connected with hot water and cold water supplying the hot water feed to the house according to SANS 1299
- A float valve according to SANS 752

7.4. Insulation

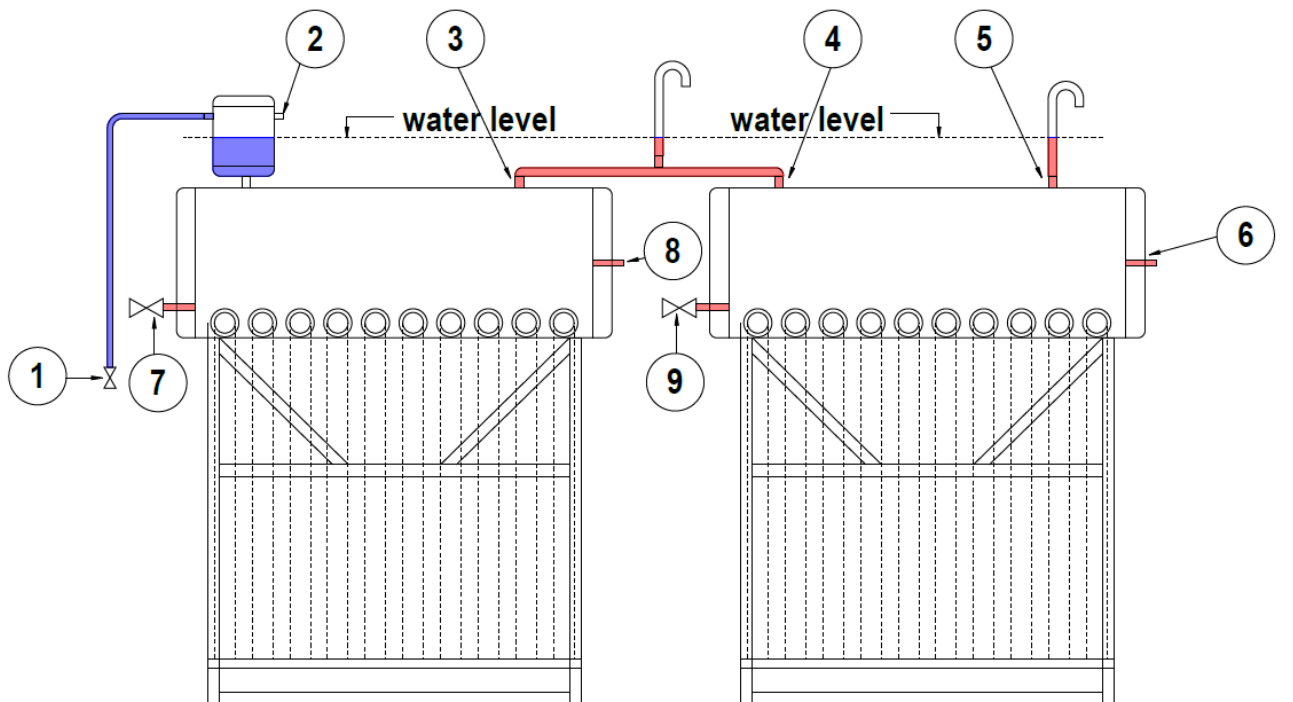
To ensure maximum efficiency from the solar geyser, ensure that all the pipes connected to the solar geyser are properly insulated. If a pipe feels warm to the touch, it will lose heat and will result in a decline in heating efficiency.

This includes the following pipes:

- vent pipe
- the pipe between the auxiliary tank and main geyser tank
- hot water pipe to the house

7.5. Series connection

Multiple solar geysers may be connected in series if the hot water consumption rate is high. One connection option exists:



- | | |
|--------------------------------------------------------------------------------------|-----------------------------------------|
| 1 Cold water supply isolation valve | 5 Vent port of second geyser – required |
| 2 Overflow port | 6 Hot water outlet port |
| 3 Vent port connected to auxiliary port of second geyser tank. Vent pipe required | 7 Drain valve (SANS 1808-53) |
| 4 4 – Auxiliary port connected to vent port of first geyser tank. Vent pipe required | 8 Hot water outlet port |
| | 9 Drain valve (SANS 1808-53) |

8. General notes

- The solar geyser requires approximately 6 hours of direct sunlight to heat up the rated volume of water from cold ($\sim 25^{\circ}\text{C}$) to hot ($>60^{\circ}\text{C}$).
- If the geyser is not used for more than 24 hours, the water will start to boil. This is not a problem if cold water remains connected.
- For every 1L of hot water that is taken out of the geyser, 1L of cold water will be added to the volume. Hence, as the geyser is used, the water temperature will drop. As mentioned above, it requires approximately 6 hours to reheat the full volume of water. A good rule of thumb for usage, is to consider between 50L to 70L of hot water volume per person in the household that makes use of the geyser.

9. Maintenance

- A qualified or trained individual should perform maintenance.
- Ensure that the entire system, including all pipes and auxiliary tank, is regularly inspected, and repaired if necessary.
- When pipe insulation material is damaged, repair or replace it as needed. Failure can lead to system inefficiency, as well as burst pipes, especially in freezing areas.
- Replace damaged vacuum tubes when found cracked or broken.
- It is recommended you flush and clean the inside of evacuated tubes and hot water storage tank every 2 years. Make sure that vacuum tubes' seals are intact and replace them if necessary.

10. Troubleshooting

THE WATER IS ONLY LUKEWARM AT THE END OF THE DAY

Given our 14+ years of solar geyser experience, you can run through the following checklist.

- Check if any shadows are cast on the glass tube.
- Check that the glass tubes are clean, dust and mud free.
- Check that the glass tubes bottom side still has a mirror finish. If it is dull white, replace the tube.
- Check that there are no leaks on the hot water piping.
- Check that the hot and cold-water piping is not incorrectly connected (flushing a toilet with hot water is not a great idea).
- If all the above does not solve the problem, confirm the consumption rate. 50L to 70L capacity per person in the household that use the geyser. The first person will get the hottest water.

WATER IS LEAKING FROM THE AUXILIARY TANK

Given our 14+ years of solar geyser experience, you can run through the following checklist.

- In the case of a new installation, check what caused this event. Water pressure balancing is likely to be involved if the mixer tap is opened and the auxiliary tank starts leaking. Check that cold-water pressure is not excessive.
- If the leaking water is cold, shut off the cold-water supply to check whether the leak has stopped. Check the float valve on the inside of the auxiliary tank if it stops. There are two possible reasons for this, either (1) the float valve can get stuck on the auxiliary tank, if it is installed at a skew angle, or (2) dirt can get onto the silicone sealing surface of the brass float valve (the valve seat is dirty).
- If water is leaking from the overflow port of the auxiliary tank, make sure the geyser is level. An excessive installation angle will result in a leak from the overflow port.

WATER IS LEAKING FROM THE MAIN GEYSER TANK

Given our 14+ years of solar geyser experience, you can run through the following checklist.

- When the leak is coming from the holes where the glass tubes enter the tank, make sure that the glass tube and silicone seal are in proper contact. Reposition the seal by moving the tube in and out. An excessive leak may indicate that the silicone seal has moved out of place and into the tank. Use a piece of wire to fish out the seal.
- A leak that originates from all the holes where glass tubes enter the tank indicates that the position of the main tank is slightly off. Rotate the main tank clockwise or counter clockwise until all the tubes make contact with the silicone seal.
- If water leaks from the top of the vent pipe, ensure the pipe is the right length (level with the auxiliary tank). Once the vent pipe is the correct length, verify the level at which the tank was installed. An excessive angle will result in leaks from the vent pipe.
- If water leaks from the bottom of the vent pipe, ensure that the threaded interface is sealed properly with thread sealant (plumbers' tape, hemp, etc).

THE GEYSER IS NOT FILLING UP WITH WATER

Given our 14+ years of solar geyser experience, you can run through the following checklist.

- Check that there is cold water supply.
- Ensure the cold-water supply is connected to the auxiliary tank at the correct connection port.
- If the water supply comes from a water tank, ensure that the top of the auxiliary tank is below the low liquid water level of the water tank.
- If water supply is present, check the brass float valve inside the auxiliary tank. It has a small strainer to filter out large sand particles. Sometimes, especially with new installations, plastic pieces and plumbers' tape that was present in the pipe network, will be captured by the strainer causing a flow restriction. Clean the strainer out by means of disconnecting the cold-water supply pipe and inspecting the strainer from the outside of the auxiliary tank. A small tweezer works great to pick out any particles or foreign matter.
- Ensure that the float piece on the brass float valve inside the auxiliary tank moves freely up and down.
- Ensure that the vent pipe is open and not restricted.

THE GEYSER IS NOT SUPPLYING WATER TO THE HOUSE

Given our 14+ years of solar geyser experience, you can run through the following checklist.

- Ensure that water is present in the geyser tank. If not, reconnect the cold-water supply. Be careful not to supply cold water while the glass tubes are empty and hot.
- Check that the vent pipe is open and not restricted.
- Uninsulated pipes may freeze during the winter, causing flow restrictions. Insulate all bare pipes.

ONE OF THE GLASS TUBES BROKE

- Use the bottom end of the glass tube as a temporary plug if it is still intact.
- Some glass soft drink bottles can also serve as a temporary plug.
- Replacement tubes can be ordered from The Sun Pays.