

Introduction to Basic Solar Hot Water

Presented By
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History of Solar Hot Water

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The earliest recorded use of solar energy was in 6 A.D. by the Romans and Greeks. Because the source for wood during winter was often inadequate, they had designed their houses to face south so that they could catch the sun's heat during the winter months.

A law was passed mandating that every building built shouldn't block the sun from a structure that utilizes solar energy for their heat requirements.

History of Solar Hot Water Continued

- The first commercial solar water heater was patented in 1891; within five years, about 30 percent of the homes in Pasadena, California, had solar domestic hot water systems installed.
- In 1909 inventor William Bailey patented a solar hot water storage system that would keep the water warm overnight. He called it the “***Day and Night Solar Hot Water Heater***”.
- By 1918 Bailey’s invention sold over 4,000 units.

History of Solar Hot Water Continued

- Although the solar hot water heating industry had spread to Florida by the 1930s, copper shortages during World War II (coupled with economic incentives offered by electric companies to switch to their hot water heaters) crippled the burgeoning solar hot water industry.
- Japan took a different direction than America after WWII. Due to their high cost of energy, Japan embraced SHW. By 1960 more than 4 million SHW systems sat on the rooftops of Japanese homes and businesses. Today that number exceeds 10 million.

History of Solar Hot Water Continued

- It was almost more than a half century later when solar hit the mainstream market again, revitalized by the OPEC oil embargo and skyrocketing fossil fuel prices. Federal and state tax credits of the early 1980s for renewable energy systems gave the solar industry a major, if short-lived, boost.
- Almost overnight, a huge number of companies sprang up all across the nation to serve a seemingly insatiable demand for a wide array of solar installations.
- Then, in 1986, the Reagan Administration pulled the plug on solar incentives nearly laying the solar industry to rest.

History of Solar Hot Water Continued

- Unlike the United States and much of Europe, Israel, like Japan, found itself without sufficient fuel supplies in the early 1950s. The power situation became so bleak in the early days of the Jewish State that the government had to forbid heating water between 10 p.m. and 6 p.m.
- Despite mandatory domestic rationing of electricity, power shortages worsened, causing pumping stations to fail and threatening factory closures.

History of Solar Hot Water Continued

- A special committee impaneled by the government could only suggest the purchase of more centralized generators to overcome the problem.
- This conclusion raised the ire of Israeli engineer, Levi Yissar, who complained, "How about an already existing energy source which our country has plenty of - the sun. Surely we need to change from electrical energy to solar energy, at least to heat our water."

History of Solar Hot Water Continued

- Yissar put his money where his mouth was, becoming Israel's first manufacturer of solar water heaters. By 1967 about one in twenty households heated their water with the sun. But cheap oil coming from Iran in the late 1960s as well from oil fields captured during the Six Day War drastically reduced the price of electricity and the number of people purchasing solar water heaters.

History of Solar Hot Water Continued

- Israeli success in the Yom Kippur War brought on the infamous oil boycott of 1973. The Israelis responded by mass purchasing of solar water heaters.
- By 1983, 60% of the Israeli population heated their water with the sun.
- When the price of oil dropped in the mid 1980s, the Israeli government did not want people backsliding in their energy habits as has happened in the rest of the world. It therefore required its inhabitants to heat their water with the sun.
- Today, more than 90% of Israeli households own solar water heaters.

Benefits of a Solar Water Heating System

- Conserves Resources

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 - Easy To Afford
 - Saves Money

Applications for Solar Hot Water

Solar Hot Water Systems
Can Be Used In
Conjunction With
Radiant Heating
Systems For Homes,
Shops, & Garages and
snow melting.



Types of Systems

- Passive System
- Active System
- Direct System
- Indirect System

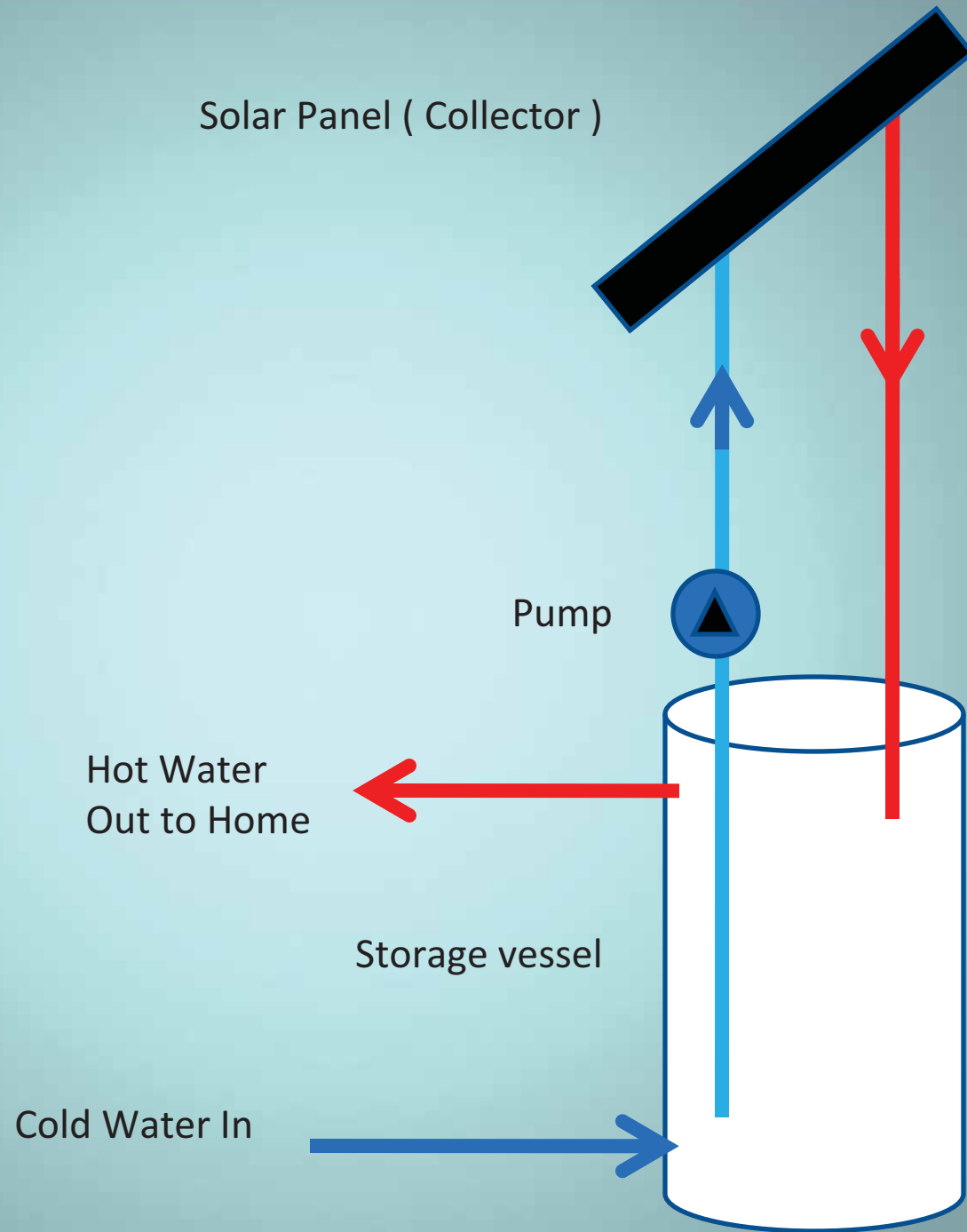
Passive Systems

- Passive solar water heaters circulate water or a heat-transfer fluid without electric pumps and other devices.
- There are two different types of passive systems: Thermosiphon and Batch Collection systems

Direct System

A direct system, alternately referred to as an “*open loop*” system, heats the same potable water used within the residence. Water circulation can be either AC or DC controlled or by using natural convection employing the thermosiphon process.

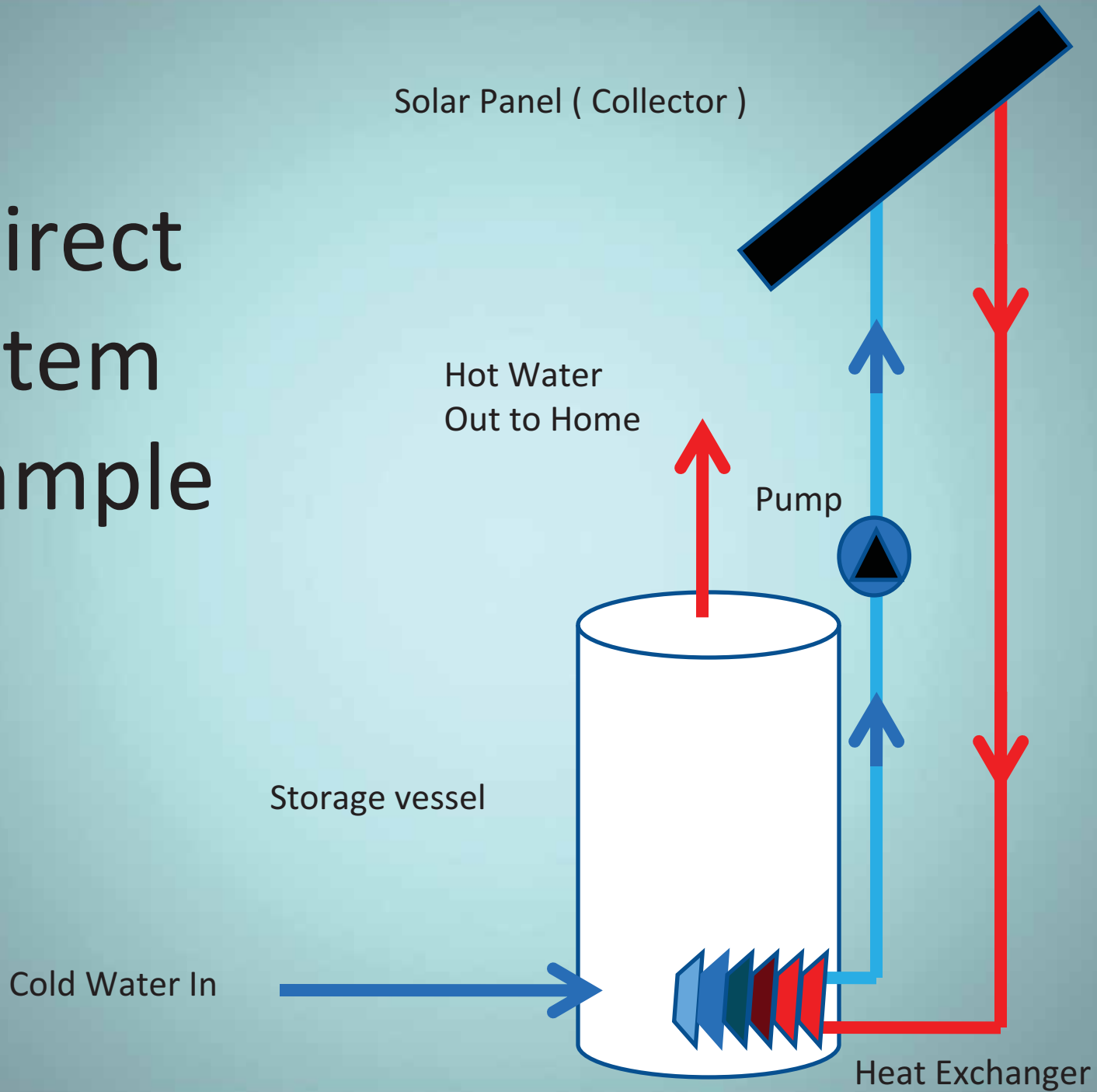
Direct System Example



Indirect System

An Indirect system, also known as “*closed loop*” system, will employ a heat exchanger to transfer heat to potable water storage. This type of system could be installed in locations where the collectors are subject to freezing temperatures for extended periods of time. Indirect system circulation can be either AC or DC.

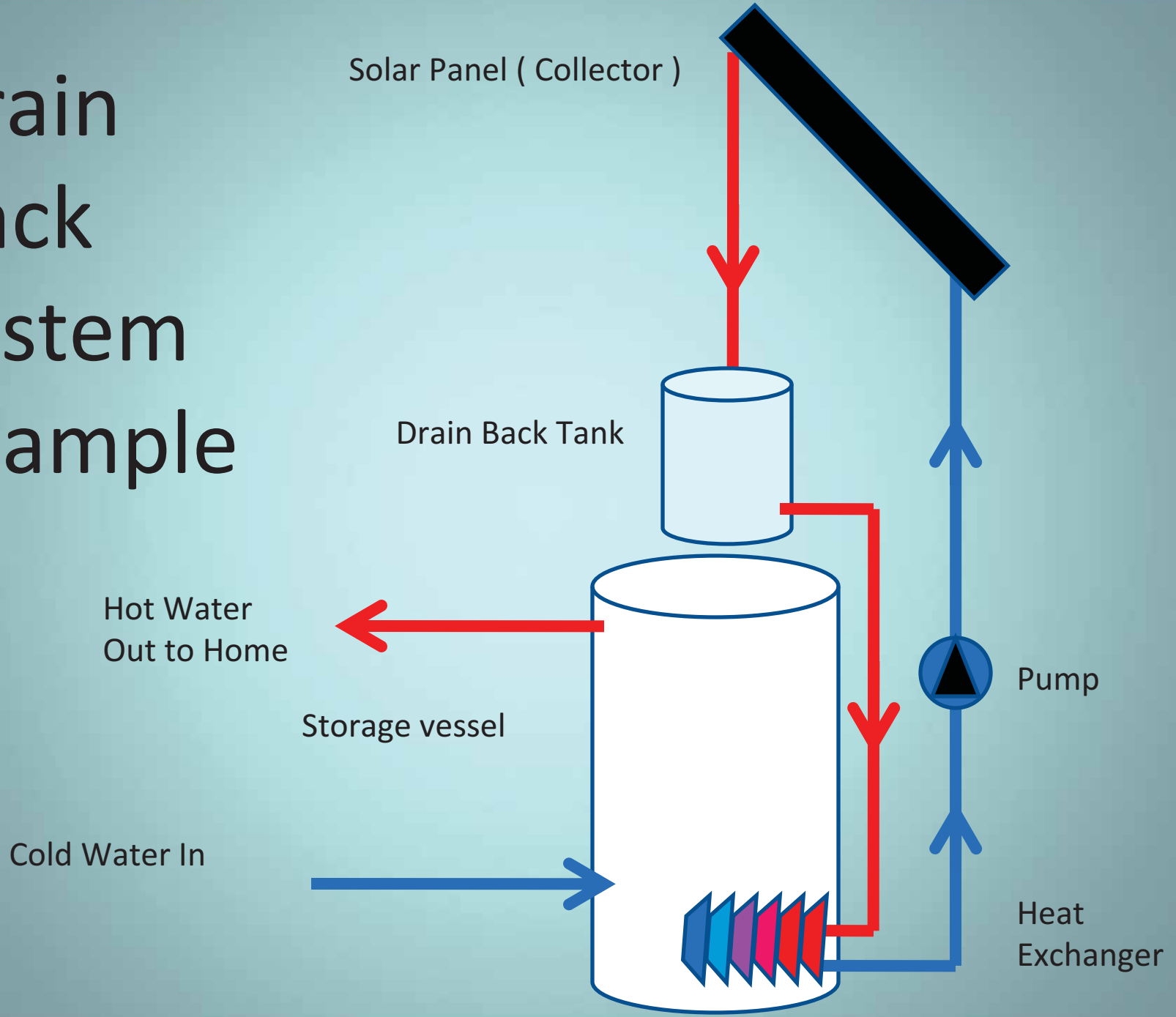
Indirect System Example

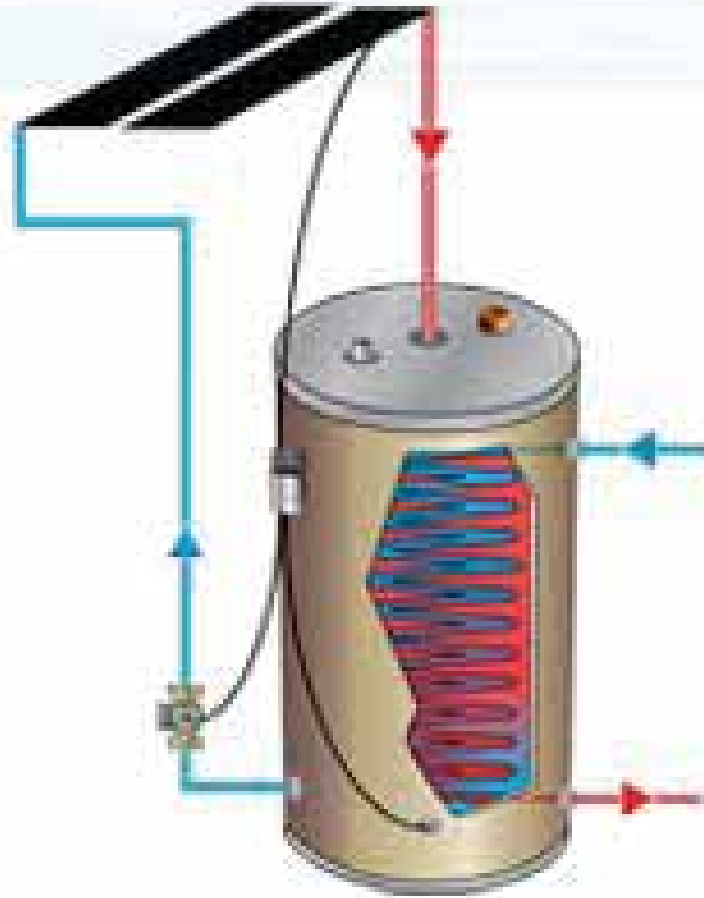


Drain Back System

Drain Back Systems are indirect, closed-loop systems offering a near maintenance-free operation. Suitable for most residential applications, the drain back system is designed to eliminate the need for costly over-heating and/or freeze-protection devices.

Drain Back System Example





**THE SIMPLE DRAINBACK SYSTEM
ONE TANK, ONE PUMP, ONE CONTROLLER**

Sizing Your System



Fundamental Questions For Sizing Your System

- What is the intended use of the system?
- Should I use this for heating the structure as well?
- How many people will the system be supporting?
- How much storage capacity is needed?
- How many collectors will be needed for your application?
- What type of system is best for you?

Rule of Thumb

- If the system is to be used for DHW only, then the basic rule of thumb when sizing a SHW system is 20 gallons of hot water per person per day.
- Simply multiply the number of members in a household by 20 gallons and that will give you the households average daily hot water requirement.
- There are, however, a number of factors that can alter this estimate.

Panel Location

- Locate a roof area facing as close to due south as possible for the placement of the solar collectors.
- Inspect the roof. If it is in poor condition, it is advisable to replace all or part of the roof where the system will be attached.
- If the collectors are placed at a steeper pitch than the roof itself, the additional exposed flat surfaces could present extreme wind loading forces during sustained high winds. Check local codes for roof load requirements.

PANEL LOCATION

Proper location and orientation of the solar collectors is important for maximum system efficiency. The collectors should be unshaded for the middle six hours of the day in each month of the year and should be located as close to the storage tank as possible to minimize heat loss in the piping runs. The best orientation is achieved when the collectors are facing due south and tilted at an angle from the horizontal of latitude + 10°. Figure 1 below shows many alternatives for collector mounting. When roof mounting, placing the collectors as close as possible to the peak of the roof will make installation easier due to increased attic access

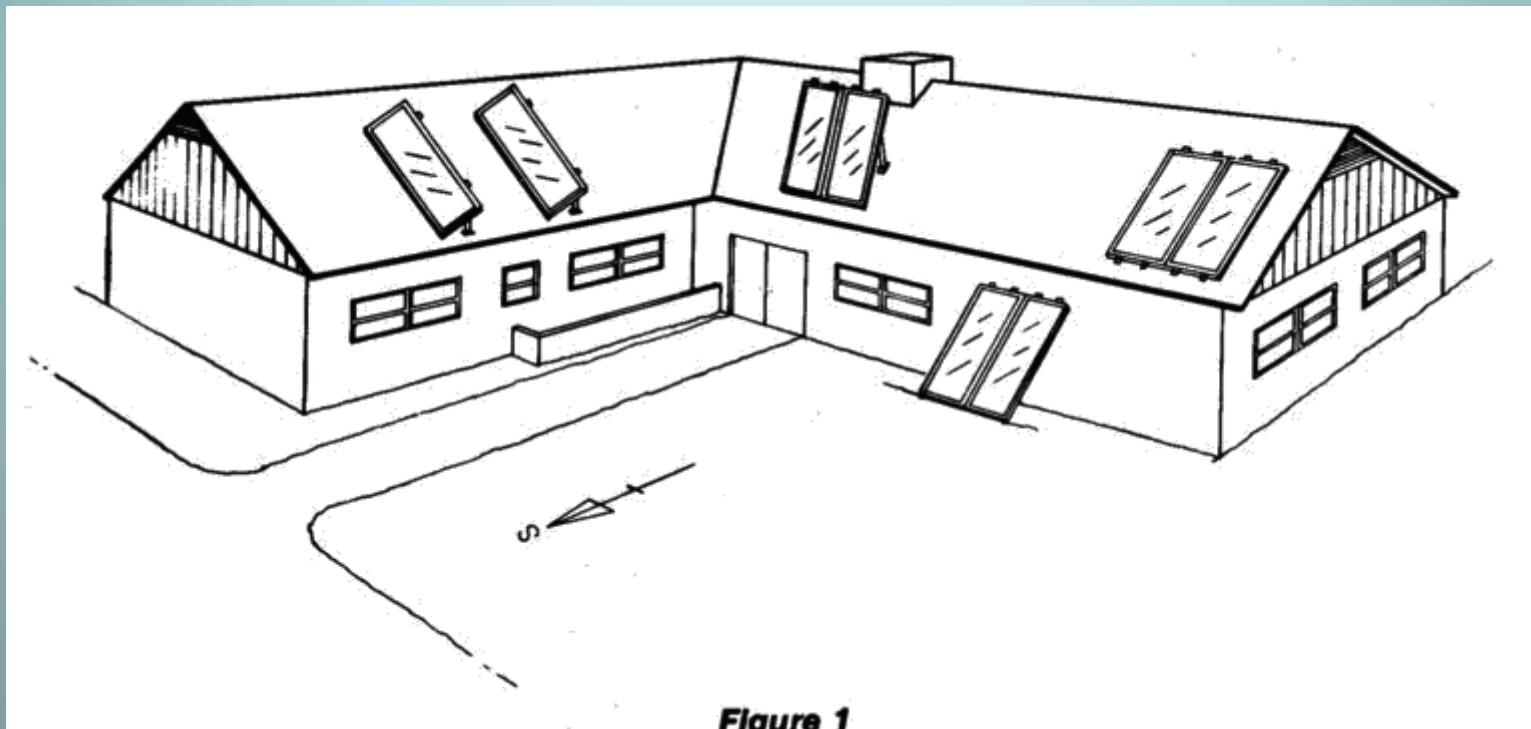


Figure 1

Questions & Answers

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