

# Solar Hot Water Heaters

## Making Your Home Solar Ready



During construction or renovation, preparing your home for solar energy can be easy. When the time comes to install your solar water heater, a few preparations now can save you hundreds of dollars and will ensure that your system will provide maximum energy savings.

The information contained in this flyer is general in nature, and should not be considered a substitute for professional advice. Also, the installation of a Solar Hot Water System into your home will require a Building Permit and must comply with all applicable law(s). Please visit your local Toronto Building office for more details.

### Basic Solar Design Issues

Unfortunately not all existing homes are suitable for a solar water heater. It is estimated that shading and improper roof orientation limit one out of every four current homes from using this renewable energy source. However, if you are building a new house or an addition then you have an opportunity to ensure that your home can have the maximum solar potential.

Making your home Solar Ready involves preparation in three areas of your home:

- The roof - where the solar hot water collectors will be installed;
- The utility room – where the controls and solar hot water tank will be installed;
- The pipe run or “chase” – where the pipes will be run between the roof and the utility room.

### On the Roof

#### Roof Orientation

Direction: South east to south west solar hot water heaters can typically be installed within 45° of south and experience only marginal performance losses.

The slope of the solar collector(s) when it is installed should roughly match your latitude (44° in Toronto). Variations up to 15° should not impact the overall performance of the solar collectors; also roof racking systems are available to adjust the angle of the solar collectors.

#### Space on the Roof

A 3.6m wide x 3m high (12' wide x 10' high) clear area allows for the installation of most solar collectors. This space must be clear of chimneys, roof vents, dormer windows, and other protrusions.

There should be a minimum of 0.6m (2') of space left between all sides of the collectors and the roof edge to allow for maintenance and safe access from ladders to the roof for roof contractors.

The solar collector space on the roof should be as close to the peak as possible to allow for a simpler installation. Pipe connections to the solar collectors are normally done at the bottom and the top of the collectors.

#### Roof Loading

Most solar collectors have a “filled weight” of approximately 20 kg per m<sup>2</sup> and generally do not require any increased structural support on modern roofs.

However, solar systems that have their water storage on the roof can add substantial weight to a roof surface; extra preparation may be required to ensure that the roof can support the collectors and storage tanks.

Solar collectors installed on a roof rack above the roof are likely to experience greater wind loading and are likely to require increased structural support.

#### Shading

Solar energy systems need to maximize exposure to the sun to operate at peak performance. Your solar collectors must be clear from shading all year long. A visual inspection of the roof's solar potential must take into account: that the sun is much lower in the winter than in the summer; and, that surrounding trees may grow and create more shade.

### In the Utility Room

#### Space Requirements

The solar hot water storage tank and the pumping package are the two major components that are installed in the utility room. Your conventional water heater becomes the backup heater once the solar water heater is installed. There should be an area adjacent to the conventional water heater for the solar hot water tank. Since the pipe run to the rooftop collectors will terminate directly above this area, it should be free of any electrical panels or windows.

This area should be adjacent to a wall space of approximately 1m x 0.6m where the installer can place the controls and pump package. There should be an electrical outlet within 1.8m (6') of this area for connecting the solar controls and pump. This area should also have a floor drain close by.

#### Pre Plumbing the Solar Bypass

Installing the solar hot water heater plumbing connections at the time of construction or when replacing a water tank will save time and extra costs at the time of the solar installation.

A solar bypass valve should be installed on the cold-water feed of the water heater. These pipes should be capped to prevent the valves from being accidentally opened. You may be required to add a backflow preventer and have a pressure tank installed in the cold water feed. A professional plumber should do this work.

#### Floor Loading

Solar hot water storage tanks typically hold 200 – 300 L of water and can weigh approximately 270 kg to 400 kg when filled. Generally basement and concrete floors will not have a problem with this additional loading. However, new homes with instantaneous water heaters may not have the water heater installed in a conventional utility room and you should ensure that the floor in the location of your solar hot water tank can withstand the increased loading.

### Pipe Run

#### Layout of the Pipe Run

##### Option A: Installation of a Chase

Where the solar collectors are directly above the utility room or horizontal pipe runs can be done in the attic or utility room then installing a straight “pipe chase” is the preferred method in making the home solar ready.

A single straight 4” pipe chase or two 2” pipe chases from the utility room to the roof space should allow for the installation of the solar pipes and pipe insulation during solar system installation.

Simply leaving a boxed-in open space in the wall rather than installing an actual chase pipe is not recommended as others, unaware of the function of the space, may inadvertently install wires and plumbing through it.

The chase should have test caps installed on both ends and the chase sealed at the ceiling-attic penetration to maintain home air tightness and fire rating.

##### Option B: Installing the Solar Pipe Run

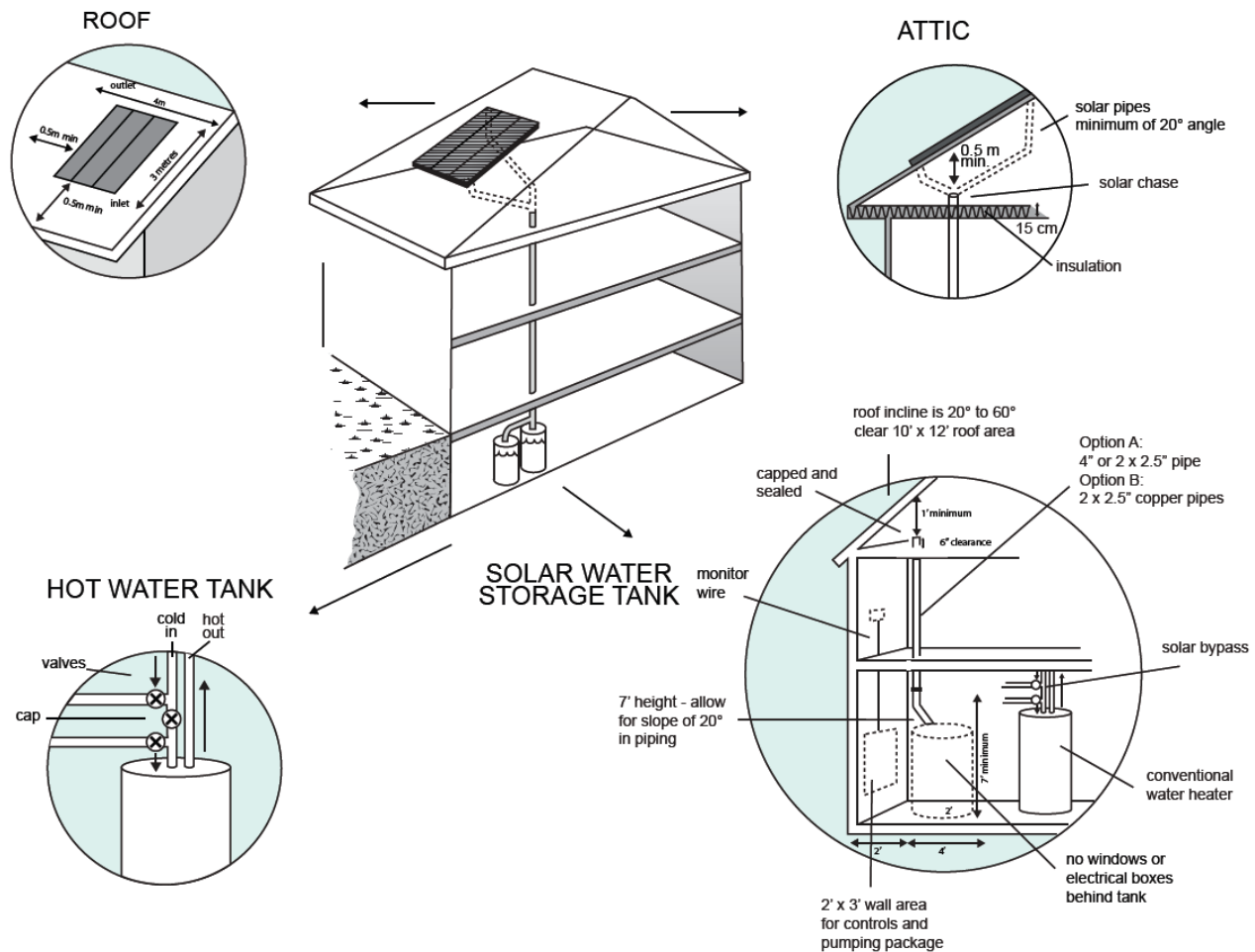
Where the pipe run between the roof space and the utility room travels at a slope, the pipe run bends, or there is no attic space, the actual pipe run between the utility room and the roof space should be installed.

If you choose this option then you should contact a solar professional who can prescribe pipe and insulation size.

Generally most solar water heating systems will use two ½” diameter copper pipes. Both pipes must be independently insulated with 25mm of insulation (minimum) with a temperature rating of at least 180 °C (356 °F). The pipes will need to be secured throughout the run.

As with Option A, the pipes should be capped and the ceiling-attic penetration sealed to maintain air tightness and fire rating.

The pipes should also be pressure tested to ensure there are no leaks. If they are leaking at the time of the solar installation they will likely have to be replaced – often at great expense.



Some solar hot water systems require that the pipes between the solar collectors and the utility room have a minimum slope of 20°, so run these pipes at a minimum of 20° slope. Improperly sloped pipe runs could void warranties offered by your solar professional.

A 14 gauge, 2-wire cable or a wire specified by a solar professional must be run with the piping if Option B is pursued. This will be used as the temperature sensor wire for the pump controller or as a photovoltaic power cable to directly power the pump. This cable runs from the utility room to the attic and should have enough extra length in the attic to reach the roof penetration and stretch 3m (10') onto the roof. Also, be sure to leave enough in the utility room to reach the solar storage tank.

**Termination in the Attic or on the Roof**

There are two options for terminating the chase or the pipe run: if you are installing a chase, it should be terminated in the attic; if you are installing the actual solar pipes then they can be installed to the attic or onto the roof.

*Option A: Installing to the Attic*

The chase or pipes should protrude above the attic insulation by 15cm and there should be at least 0.3m of headspace between the pipes and the rafters to make future connections easier.

*Option B: Installing onto the Roof*

If the pipes are run to the roof, they must terminate at the proper location relative to the solar collector configuration. Installing a single chase up to the roof is not recommended as the inlet and outlet pipes may be at different locations for different systems. If you are considering this option, consult with a solar professional on the layout of the plumbing run.

**Finishing Touches: Solar Monitor**

Installing a solar monitor in the living space of your home allows you to monitor the performance of the solar water heating system.

For the solar monitor, run six 16-18-gauge wires (such as thermostat wire) from the solar space in the utility room to the monitor location. Most monitors are installed near the thermostat or in the kitchen. The wires should terminate in the living space in a covered electrical box with 15 cm of extra wire.

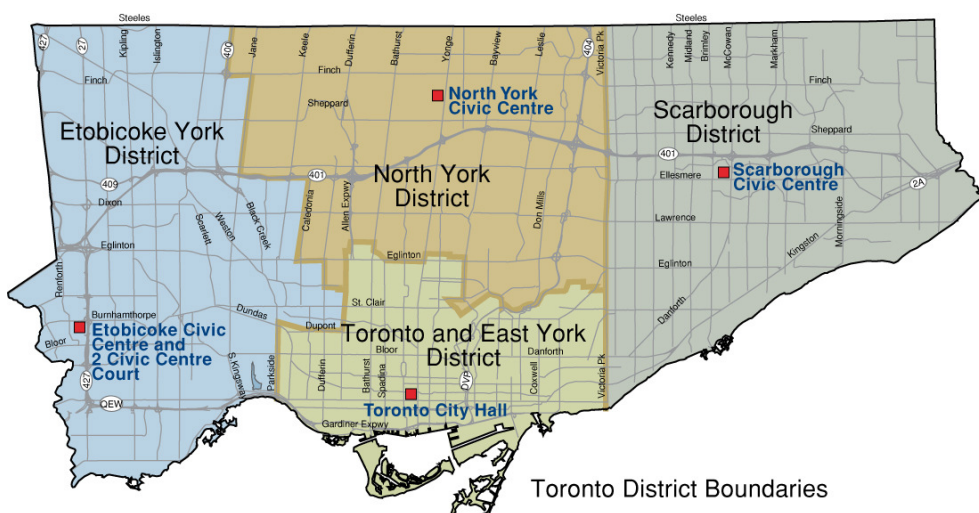
**Selecting Your Solar Professional**

There are several factors to consider when selecting a solar professional. The company you select should be experienced; so ask how long they have been in business and ask for a list of past clients to use as references. Look for a company that sells CSA certified solar products.

Remember that Solar DHW Systems can provide 20-30 years of free energy so don't focus on cost alone: a higher priced solar hot water system may actually be the better deal if it buys you a superior system and provides years of trouble free operation.

To find Solar Professionals in the Toronto area, or for more information on solar energy and technologies, please visit the Canadian Solar Industries Association (CanSIA) online directory at: [www.cansia.ca](http://www.cansia.ca)

*Toronto Building would like to thank the Canadian Solar Industries Association (CanSIA) for providing the information and illustration for this flyer.*



Toronto District Boundaries

**Etobicoke York District**  
2 Civic Centre Court, 1st Floor  
Toronto, ON M9C 5A3  
416-394-8002

**North York District**  
North York Civic Centre  
5100 Yonge Street, 1st Floor  
Toronto, ON M2N 5V7  
416-395-7000

**Toronto and East York District**  
Toronto City Hall  
100 Queen Street W, Ground Floor  
Toronto, ON M5H 2N2  
416-392-7539

**Scarborough District**  
Scarborough Civic Centre  
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