

Solar Ready Construction – Georgia/South Carolina

“Solar Ready Construction” has two components

- (1) a South facing **roof** that is un-shaded from 9AM to 3PM with a large rectangular area free from vent pipes, skylights, and other protuberances and
- (2) **wiring and piping** that must be included in the construction of a new house so that at a later date the homeowner may easily buy and install solar PV (electric) and solar hot water systems.

The complete solar systems with wiring and piping should be included in the original building permit for the house design. Building permits may also need to be executed to demonstrate the structural integrity of the roof when the optional solar system is installed at some point in the future.

The **roof** need not face exactly South but must be within a South-East to South-West orientation. The roof should be deep enough to accommodate two rows of panels, that is, greater than 11 feet deep. Typically, using standard silicon cell-based panels, 90-100 square feet is required for each kW installed. A combination of triangular and rectangular solar panels can be fitted onto a triangular hip roof. Thin film panels typically require nearly twice the area.

The components of a solar PV (photovoltaic) electric system are

- (1) solar panels on the roof to generate DC electricity from the sun, or solar panels with roof-mounted inverters generating AC electricity.
- (2) wiring through the roof to the attic where fuses or circuit breakers are located in combiner boxes,
- (3) wiring from the attic to a cut-off box and then to the inverter located either (a) close to the main electrical service panel or (b) outside next to the electrical meter, In the case of roof-mounted inverters wiring would go to a cut-off box and then directly into the service panel.
- (4) an inverter device to convert DC to AC current, (not required with roof mounted inverters). Inverters should contain circuitry to protect the solar panels.
- (5) wiring from inverter to a cut-of box and then to main service panel,
- (6) a dual pole circuit breaker in the main service panel rated between 20 and 60 amps, and
- (7) optionally, a wireless display of system operation located within the living space..

The solar panels are mounted to the roof of the house so that they sit 4 to 6 inches above the surface of the roof to allow for heat dissipation. Typically a racking system consisting of L feet and aluminum rails supports the rectangular panels. It can be attached using lag bolts directly through shingles into the roof joists and sealed with roofing compound. Additional supports are used for roofs where the panels need to be tilted. Triangular or trapezoidal panels can be used to follow roof configuration, and usually come with custom racking. In the case of standing seam metal roofing the panels are attached directly to the seams – or in cases of peel-and-paste solar strips applied directly to the metal.

If a customer purchases the solar option before the house is built it is advisable to mount a short standoff for the L feet before the roof is finished so that rafters may be easily located for lag bolts and flashing may more easily be installed around the standoff.

The only PV components that must be included in a new house to make it “**solar ready**” are: wiring from the attic to the inverter and wiring from the inverter to the main service panel. The DC wiring is typically three #10 AWG, 90 C rated, stranded copper wires encased in EMT or flexible metal conduit and should have at least six feet of extra wire coiled at each end for future connections. The AC wiring is typically 10-2 romex located in the wall.

Optionally, when no decision has been made whether to go with a DC or AC installation, the building can be made **solar ready** by installing 1-11/4” diameter EMT metal conduit with a pull string. This is sufficient to accommodate either wiring up to about 5kW. In this case the conduit should extend at least 5’ into the attic for ease of future installation.

In addition to traditional panels, photovoltaic materials can also be provided in special roof shingles, self-adhesive flexible laminates, and "thin film" panels. Interior wiring requirements are identical to those specified above.

The components of a solar domestic hot water (DHW) system are

- (1) evacuated collector tubes, or flat panel collectors, mounted in a racking system on the roof,
- (2) insulated copper pipes from the roof into the attic,
- (3) insulated copper pipes from the attic to the vicinity of the hot water heater,
- (4) 80 - 120 gallon solar storage tank with integrated heat exchanger,
- (5) pumps, valves, and controller which mount to the tank,
- (6) plumbing from the new hot water storage tank to the old hot water heater, and
- (7) a sensor wire (thermostat wire) from the attic to the storage tank area paralleling the pipes. (In new homes, it is recommended that an “on-demand” hot water heater be used instead of the usual hot water tank with electric elements or gas burner. The gas on-demand heater is recommended over the electric if possible.)

The only DHW components that must be included in a new house to make it **solar ready** are insulated pipes from the attic to the vicinity of the hot water heater and sensor wire from attic to basement paralleling the pipes. The pipes are two 3/4 inch copper pipes covered with foam insulation (O.D. 2 inches) with at least three feet of extra pipe and insulation at each end for future connections. The hot side must have high heat insulation before applying foam, or the heat will melt the foam. Ideally, the thermostat wire should have enough extra wire coiled up in the attic to reach any point on the roof and a coil in the basement to reach the solar storage tank, but practically 6 feet of extra wire at each end is sufficient.

Conduit and piping should be secured within the chase-way every 10 feet. The wires and pipes should be conveniently accessible for service personnel and adjacent/beneath the south facing roof area since this is where the panels will be located.

[Adapted by Jack Star (jack@solarcitiesusa.com tel: 912-233-4288) from a guide provided by design/build firm Hopkins-Porter for Georgia/South Carolina conditions. **Disclaimer:** This is only a guide. Always check with local inspectors or architects for current requirements. -- April 2011.]

See some additional **solar ready** tips in “A Homebuilder’s Guide to Going Solar” which can be downloaded from: <http://www1.eere.energy.gov/solar/pdfs/44792.pdf>
Residential and commercial tax incentives can be found at <http://www.dsireusa.org>