EPA
United States
Environmental Protection
Agency

Solar Water Heating

SPECIFICATION, CHECKLIST AND GUIDE

Renewable Energy Ready Home

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About the Renewable Energy Ready Home Specifications

The Renewable Energy Ready Home (RERH) specifications were developed by the U.S. Environmental Protection Agency (EPA) to assist builders in designing and constructing homes equipped with a set of features that make the installation of solar energy systems after the completion of the home's construction easier and less expensive. The specifications were developed with significant input from stakeholders including policymakers, code officials, solar installers, and successful RERH builders. The specifications are based on best management practices and balanced with practical issues of cost, benefits to homeowners, builder production process compatibility, and marketability. Homebuilders that outfit houses that comply with the RERH specifications can assure homebuyers that, when they are ready, solar renewable energy systems can quickly and easily be integrated into their house with minimal retrofit installation costs.

The RERH specification and checklist take a builder and a project design team through the steps of assessing a home's solar resource potential and defining the minimum structural and system components needed to support a solar energy system. The following document also provides recommendations on aspects of homeowner education as it applies to the renewable energy ready concept. Satisfying the elements of the RERH specification may not be possible in all homebuilding situations due to factors such as excessive shading on the proposed array location.

To assist in evaluating each home, EPA has developed an online Renewable Energy Ready Home Solar Site Assessment Tool (RERH SSAT), which compares the solar resource potential of a proposed array site to an optimal solar resource potential for the same location. Under this specification, proposed array locations that demonstrate a minimum solar resource potential are considered good candidates to be outfitted with the necessary structural and system components to make the home RERH. Builders should use this tool to assess each property prior to making the home renewable energy ready.

It should be noted that this guide was developed to assist builders from across the country and that regional or local building practices and codes may differ from what is presented. It is advisable to consult code and solar energy professionals when planning a project to avoid issues that may impact the future installation of a renewable energy system. By following the specification, a builder should feel confident that the proposed array location on a home, built to the RERH specification, will provide a suitable installation environment for a fully operational solar energy system in the future.

Assumptions of the RERH Solar Water Heating Specification

These specifications were created with certain assumptions about the house and the proposed solar energy system. They are designed for builders constructing single family homes with pitched roofs, which offer adequate access to the attic after construction. It is assumed that flat plate collector type systems, the most common in the industry today, will be installed by the homeowner. While metering the system is encouraged, the specification does not address system wiring elements for associated system sensors or monitoring equipment.

For builders that desire to meet the elements of these specifications but are constructing multifamily buildings, flat roof residential structures, or buildings without attic access, or using alternatives to the roof mounted flat plate system (i.e., other solar water heating (SWH) technologies or ground mount systems), EPA recommends that an installer certified by the North American Board of Certified Energy Practitioners (NABCEP) determine the ideal system for the project's unique building environment. The NABCEP installer should also ensure that the system design is in compliance with all applicable codes: plumbing, electrical, and structural.

Builder and Specification Limitations

EPA has developed the following RERH specification as an educational resource for interested builders. EPA does not conduct third-party verification of the site data or the online site assessment results, or verify whether the home has been properly outfitted with a set of features that comply with this specification. The RERH specifications are not currently part of or recognized under any EPA program. Builders should avoid making implied or explicit claims that homes meeting this specification are EPA verified, recognized, labeled, or endorsed. Conformance to this specification is not predictive of future energy system performance. Homeowners are encouraged to seek assistance from a certified solar energy professional when installing an on-site solar energy system.

Renewable Energy Ready Home Solar Water Heating Checklist

Home Location:	City:	State:

RERH Checklist (See Renewable Energy Ready Home (RERH) specifications for details)		Builder Verified	NA
1 Building/Array Site Assessment			
1.1	Designate a proposed array location and square footage on architectural diagram: _____sq. ft.	❑	
1.2	Identify orientation (azimuth) of proposed array location: _____degrees.	❑	
1.3	Identify inclination of proposed array location: _____degrees.	❑	
1.4	Conduct a shading study documenting impacts on proposed array location: _____% adjusted annual shading impact. If using monthly values as verified through the solar path assessments, check here: _____.	❑	
1.5	Assess if proposed array location supports a solar resource potential of more than 75 percent of the optimal solar resource potential for the same location using the online RERH Solar Site Assessment Tool (SSAT). Yes ❑ This home meets the minimum recommended solar resource potential per the RERH SSAT Results; continue with Section 2 below. No ❑ This array location does not meet the recommended solar resource potential per the RERH SSAT Results; this location is not a good host for a future solar energy system and should not be made renewable energy ready.	❑	
2 Structural and Safety Considerations: Solar Water Heating			
2.1	Provide code-compliant documentation of the maximum allowable dead load and live load ratings of the existing roof; dead load rating should support an additional 6 lbs/sq. ft. for future solar system.	❑	
2.2	Provide code-compliant documentation of the maximum allowable floor load rating for storage tanks installed on non-concrete floors.	❑	
2.3	Install permanent roof anchor fall safety system (NA for roof pitch ≤ 3:12).	❑	❑
3 Renewable Energy Ready Home Infrastructure: Solar Water Heating			
3.1	Dedicate and label a 3' x 3' x 7'area in the utility room adjacent to the existing water heater for a solar hot water tank.	❑	
3.2	Dedicate and label a 3' x 2' plywood panel area adjacent to the solar hot water tank for the balance of system components/pumping package.	❑	
3.3	Install an electrical outlet within 6' of the designated wall area (3.2).	❑	
3.4	Install a solar bypass valve on the cold water feed of the water heater (cap and label both ends).	❑	
3.5	Install a single 4" chase or 2–2"chases from utility room to the attic space below designated array location (cap and label both ends).	❑	
3.6	Provide architectural drawing and plumbing riser diagram of RERH SWH system components.	❑	
4 Homeowner Education			
4.1	Provide to the homeowner a copy of this checklist and all the support documents listed below (to be provided to future solar designer).		
	- Copy of the Renewable Energy Ready Home Specification guide	❑	
	- Fully completed RERH checklist (all sections)	❑	
	- Architectural drawings detailing proposed array location and square footage	❑	
	- Plumbing riser diagram of RERH solar water heating system components and their locations	❑	
	- Shading study with percent monthly or adjusted annual shading impact(s)	❑	
	- Site assessment record generated by the online RERH SSAT indicating that the proposed site meets a minimum solar resource potential of 75 percent of optimal	❑	
	- Code-compliant documentation of the maximum allowable dead load and live load ratings of the roof	❑	
	- Code-compliant documentation of the maximum allowable floor load rating for storage tanks installed on non-concrete floors	❑	
5 Builder Best Practices (Optional Elements)			
5.1	Develop a detailed landscape plan with a clear emphasis on low-growth vegetation	❑	❑
5.2	Place roof penetrations above or north of the proposed array to prevent casting shadows on the array	❑	❑

Builder Completion Date:	Builder Company Name:
Builder Employee Name:	Builder Employee Signature:

1 Building/Array Site Assessment

1.1 Designate future/proposed array location

Builders should detail the location and the square footage of the proposed solar array area relative to the home on a project specific site plan (see Figure 1). (Horizontal or flat roof = 0º, Vertical roof = 180º. See Table 2.)

There are several options for locating a solar array in a residential setting, including mounting the array on the roof or on the ground. If the proposed solar array location is on a surface that does not fall under the specification's basic assumption of a single family home with a pitched roof that offers adequate attic access, EPA recommends that the builder consult with a certified solar energy professional when evaluating the home.

Builders that intend to meet both the solar photovoltaic (PV) and SWH RERH specifications should detail the location and the square footage of the roof area to accommodate both technologies. Although the RERH specification does not set a minimum array area requirement, most SWH systems require a minimum of 60 to 120 square feet (one/two 6' x 10' collectors) to meet the water heating needs for a three-person family, not including a buffer area for fire access. However, homes with a higher than average level of energy efficiency, such as those meeting ENERGY STAR® Homes Standards, may not necessitate an average-sized system.

1.2 Identify orientation (azimuth) of proposed array location

Builders should detail the orientation of the roof plane(s) for the proposed array location on an architectural diagram (see Figure 1). (South facing orientation = 180º, East = 90º, West = 270º. See Table 1.)

The energy output of a solar energy system is optimized by siting the array where the roof is oriented due south at an 180º azimuth (on a compass dial that is corrected for magnetic declination). For the purposes of this specification and checklist, proposed orientations that deviate from an 180º azimuth are acceptable. Depending on the home's location, azimuths that deviate more than +- 45º off of due

Table 1. Orientation of the system and corresponding azimuth angle which should be recorded in the RERH Checklist.

Orientation	Azimuth Angle (°)
N	0 or 360
NE	45
E	90
SE	135
S	180
SW	225
W	270
NW	315

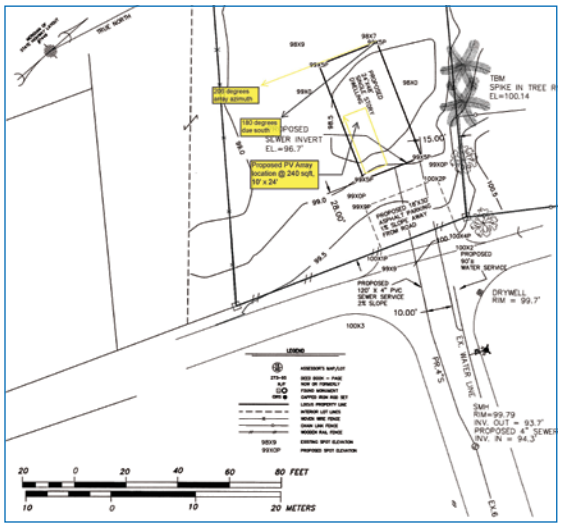

Figure 1: Site Plan. The site plan should detail the location, orientation, and the square footage of the proposed solar array area.

south can result in unacceptable performance losses. For the purpose of this specification, building mounted arrays will be assumed to be mounted flush with the roof surface found at the proposed array location.

1.3 Identify inclination (tilt or roof pitch) of proposed array location

Builders should detail the inclination (tilt or roof pitch) for the proposed array location on an architectural diagram (see Figure 2) and record the inclination in degrees on the Checklist in 1.3. (Horizontal or flat roof = 0º, Vertical roof = 180º. See Table 2.)

The energy output of a solar energy system is optimized by designing the array to be tilted on an incline that approximately matches the degrees of the geographic latitude at the array's location; significant deviations from this tilt can result in system performance losses. Although system arrays (panels or collectors) can be racked up to meet the inclination/tilt needed for optimal system output, this specification is based on and limited to the known building attributes (roof pitch) at the time of construction. For the purpose of this specification and checklist:

- Building mounted arrays will be assumed to be mounted flush with the roof surface found at the proposed array location.
- Builders should only assume an inclination/tilt other than that of the existing roof pitch if alternative design drawings have been completed by a NABCEP solar professional.

Table 2. Existing roof pitch and corresponding tilt angle should be recorded in the RERH Checklist.

Roof Pitch	Tilt Angle (°)
Flat	0
4:12	18.4
5:12	22.6
6:12	26.6
7:12	30.3
8:12	33.7
9:12	36.9
10:12	39.8
11:12	42.5
12:12	45.0

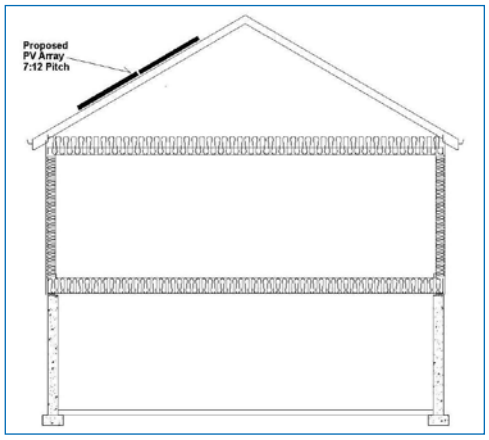

Figure 2: Roof Pitch Detail. The inclination (roof pitch or tilt) for the proposed array location should be detailed in an architectural diagram.

1.4 Conduct a solar shading study on proposed array location

Builders should conduct a comprehensive shading study that documents the impacts of permanent and seasonal shading on the proposed array location. The builder should record the site's monthly and/or annual percent shading impacts from each solar shading study (see Figure 3) in the RERH Checklist and for use in the online RERH SSAT. (No shading = 0%, Site is fully shaded = 100%)

The energy output of a solar energy system is optimized by siting a solar array where there is little to no current or anticipated shading. (See section 5.1 for landscaping shading considerations.) Shading potentially represents the largest impact on a site's suitability to support a solar energy system. A solar site assessment study helps to ensure that permanent and seasonal shading impacts are accounted for under actual site conditions. With minimal equipment and training, builders can easily conduct a shading study or choose to have a solar professional provide this service. For the purpose of this specification and checklist:

- Builders or designers must conduct a solar shading study using an industry accepted sunpath tool such as a Solar Pathfinder, Solmetric SunEye, or a solar industry-accepted equivalent approach to determine the seasonal shading impacts on the proposed array location.
- The solar shading study should identify the percent of available solar radiation (or conversely the percent shading impact for the proposed array location) on a monthly and/or adjusted annual basis. Refer to the directions of the solar sunpath tool on how to make this determination. The RERH SSAT will accept either annual or monthly percent shading values. The estimated shading impact will contribute to a system output derate factor, which will affect the site's suitability to support a system.
- If the proposed array location is particularly large in square footage, or is divided between two different roof planes, then the builder should conduct multiple shading studies at various points across the proposed array area(s).

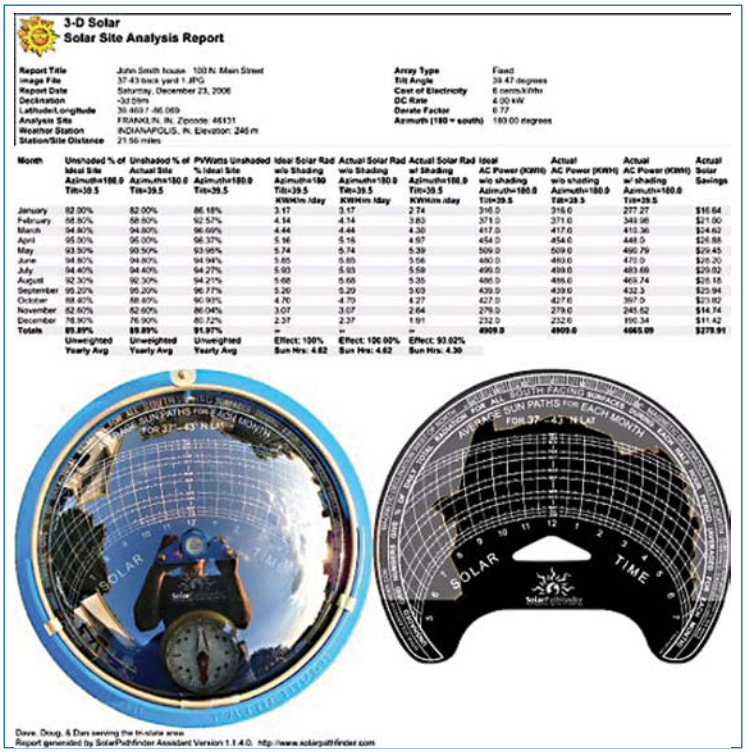
3-D Solar
Solar Site Analysis Report

Figure 3: Solar Pathfinder Report. The sunpath tool report identifies the percent shading impact for the proposed array location on a monthly and/or adjusted annual basis.

1.5 Document the solar resource potential at the designated array location

Builders should use EPA's online RERH SSAT to demonstrate that each proposed system site location meets a minimum solar resource potential.

EPA has developed an online site assessment tool, which assists builders in assessing whether a new home offers an appropriate installation environment for the future installation of a solar energy system. The RERH SSAT takes into account known factors of the proposed array location (azimuth, tilt/inclination, and shading) and compares the solar resource potential of the proposed array location to an optimally sited solar system in the same location. The results of the tool should not be interpreted as an estimation of the future energy generation. The builder will need the following site information for each proposed home assessment (see Figure 4):

- Location of home (ZIP code or latitude and longitude coordinates)
- Orientation of proposed array surface (azimuth in degrees)
- Roof inclination/pitch at proposed array surface (degrees off of horizontal)
- Percent shading at proposed array location (monthly or annual input options)

The builder can access the RERH SSAT at *http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.pt_bldr.* Proposed array sites that demonstrate a minimum of 75 percent of the optimal solar resource potential are considered good candidates for making a home renewable energy ready. The RERH SSAT results page can be printed to provide to homeowners (see Figure 5).

For sites that fail to provide a suitable solar resource potential, builders and project design teams are encouraged to propose alternate or improved site locations. The data inputs (orientation, inclination, and shading) used in the RERH SSAT to estimate the solar resource opportunity have a cumulative impact on the site assessment results. Shading tends to have the largest impact, whereas orientation and inclination tend to have less of an impact on the solar site assessment results. Builders are encouraged to design the home with these factors in mind.

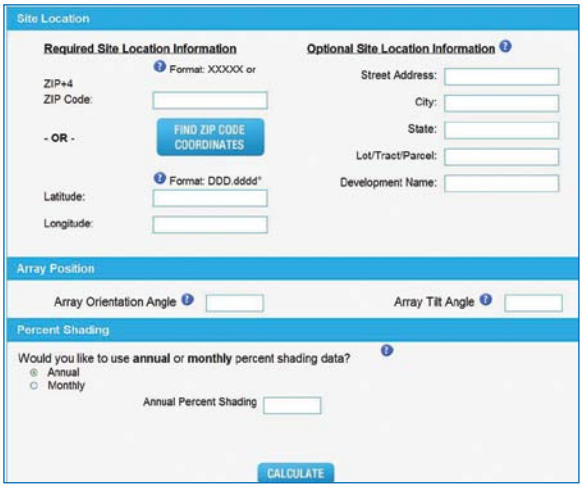

Figure 4: RERH Solar Site Assessment Tool Inputs. The RERH SSAT requires the following inputs for the proposed array: location, orientation, inclination and percentage shading.

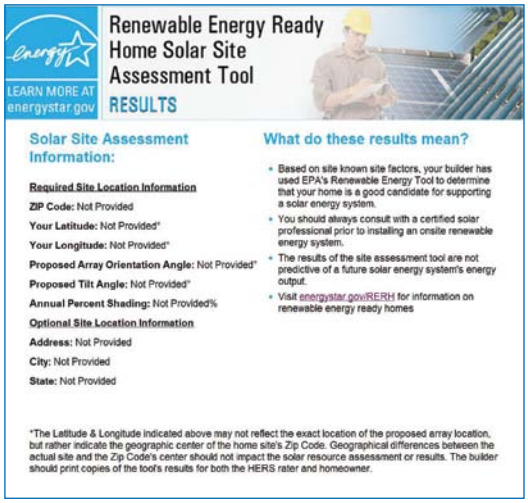

Figure 5: Results page generated by the RERH Solar Site Assessment Tool.

2 RERH Structural and Safety Considerations

2.1 Document the maximum allowable dead and live load ratings of the existing roof

The builder should submit code-compliant documentation of the structural capacity of the roof and of the current dead loads on the roof. This documentation should demonstrate that the roof has the capacity to support a minimum of 6 pounds per square foot additional dead load above code for the installation of a future SWH system.

Conventional SWH flat plate collector systems can add approximately 6 pounds per square foot of dead load to the roof or structure. Wind will add live loads; the magnitude of live loads will depend on the geographic region and the SWH system type and integration approach used for the final system. It is recommended that the roof has the capacity to support a minimum of 6 pounds additional dead load for a future SWH system. The builder should ensure that these future loads are accounted for in the design of the roof and should provide design drawings and/or calculations, prepared in conformance and in a format that is acceptable to the permitting agency. At a minimum, these documents must include specific documentation of dead loads, live loads, wind loads, and, where applicable, snow loads for the existing roof design. These plans will provide important information for the solar designer when the homeowner decides to install a system. Please note that a low sloped roof, a 4:12 pitch or lower, may require additional reinforcement beyond what is typically found in a conventional framing or truss design.

2.2 Document the maximum allowable floor load rating of non-concrete floors for proposed solar storage tank areas

The builder should provide the homeowner with code-compliant documentation of the maximum dead weight load rating for all non-concrete floor assemblies in the designated location of the solar hot water storage tank. The designated location of the future hot water storage tank should be able to support 1,200 pounds additional dead load.

Solar hot water storage tanks typically hold 80 to 120 gallons of water and weigh approximately 800 lbs to 1,200 lbs when filled. Generally, basement and concrete floors will not be damaged by this additional loading; however, homes without basements and homes that use on-demand water heaters may not have the water heater installed in a utility room with a concrete floor. The builder should ensure that the designated location of the solar water tank can withstand the increased floor loading and should provide to the homeowner design drawings and/or calculations, prepared in conformance and in a format that is acceptable to the local permitting agency.

2.3 Install permanent roof anchor fall safety system on sloped roofs

It is recommended that the builder install a fall safety system on roofs with a pitch greater than 3:12.

The process of installing a solar energy system on a sloped roof carries inherent risk. To provide adequate protection to installers, it is recommended that a permanent roof anchor fall safety system be installed on roof pitches steeper than 3:12 (see Figure 6).[1] The system should include a permanent roof anchor designed to provide fall protection for a single user when securely installed on a roof subsurface or vertical wall (see Figure 7).[2]

The permanent roof anchor should meet the federal requirements of the Occupational Safety and Health Administration. The fall safety system should also be compliant with ANSI standard *A10.14: Construction and Demolition Operations—Requirements for Safety Belts, Harnesses, Lanyards, and Lifelines for Construction and Demolition Use*.

Figure 6: Miller Single-D roof anchor before installation.

Figure 7: Roof anchor should be installed on a roof subsurface or vertical wall.

[1] Image courtesy of Miller Fall Protection.
[2] Image courtesy of Miller Fall Protection.

3 RERH Infrastructure: Solar Water Heating

3.1 Dedicate a space in the utility room adjacent to the existing water heater for a solar storage tank

The builder should designate a dedicated space for the future solar hot water storage tank. A 3′ x 3′ x 7′ area, located adjacent to the home's hot water heater, should be designated and clearly labeled as an RERH component (see labeling suggestions in Appendix A) and recorded on the utility room floor plan (see Figure 8) to be provided to the homeowner. This dedicated space should match the area referenced in section 2.2 for the floor load calculation.

The solar hot water storage tank is one of two major components of an SWH system that are installed in the utility room. Typically, a domestic hot water solar system with an 80 to 120 gallon storage tank will require approximately 9 square feet of floor space with 7 feet of total vertical clearance. The builder should designate a space no less than 3′ x 3′ x 7′ and locate it near the home's hot water heater so that pipe that runs between the two components can be kept to a minimum. Since the pipe run or pipe chase of the solar energy system will terminate directly above this space, it should be free of all electrical wiring and service panels as well as windows. Labeling this area as an RERH component is recommended, as is recording its location on a plumbing riser diagram. Once installed, the solar hot water storage tank should become the primary source of hot water, whereas the home's existing water heater should serve as a backup heating source.

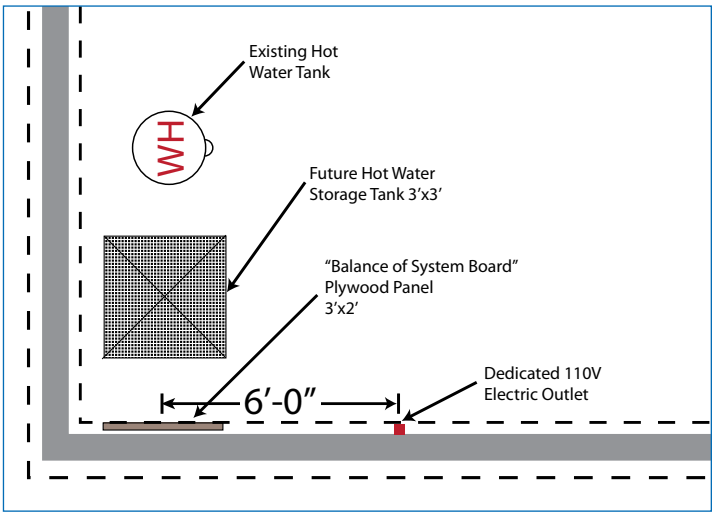

Figure 8: Utility Room Floor Plan. This plan should include the location of existing hot water heater, designated space for future hot water storage tank, electrical outlet, and pump package mounting panel.

3.2 Dedicate a wall space adjacent to the solar storage tank for the mounting of the controls and pump package

The builder should dedicate a wall space for mounting the balance of system components, known as the pumping package. The area should include at a minimum a 3′ x 2′ plywood panel backing that is clearly labeled as the "Balance of System Board" and on the plumbing riser diagram as an RERH component (see Figure 10).

The pumping package is the second of the two major components of an SWH system that are installed in the utility room. The builder must designate an area to facilitate the future installation of the pumping package. This area should include a 3′ x 2′ piece of finished plywood that is fastened to the wall studs. The purpose of the plywood backing is to:

- Ensure a dedicated space for these components.
- Provide a secure foundation for mounting future equipment.
- Facilitate the future installation of these components by the installer.

The plywood backed area should be clearly labeled to indicate its purpose to the homeowner. (See labeling guidance in Appendix A.)

3.3 Install an electrical outlet within 6′ of the wall space designated in 3.2

The builder should install a code-compliant 110V electrical outlet within 6′ of the dedicated wall space referenced in section 3.2 (see Figure 8) to service the electric needs of the balance of system components.

There must be an 110V electrical outlet within 6′ of the plywood backed pump package mounting area to provide power to the solar controls and pump.

3.4 Install a solar bypass valve on the cold water feed of the existing water heater

The builder should install a code-compliant valve assembly (solar bypass valve) on the cold water feed of the existing water heater to be used to connect the solar storage tank (see Figure 9)[3]. The solar bypass valve should be capped and labeled as an RERH component. (See Appendix A for labeling guidance.)

Most SWH systems will require the installation of a separate hot water storage tank. The solar bypass valve requirement is to make future connections to this storage tank simple and affordable without having to drain the home's existing plumbing system. The solar bypass valve should be installed on the cold-water feed of the existing water heater and should be configured in the following manner (see Figure 9):

- Install two "T" fittings in the "Cold Water Inlet" pipe that supplies cold water to the existing water heater.
- Install shut-off valves on each of the "T" fittings and one in the main pipe between the two "T" fittings.
- Stub-off and cap the two open-ended shut-off valves to prevent leakage should the valves be accidentally opened.

Builders should be aware that many municipal building codes now require that a backflow valve and pressure tank be installed on the cold water feed. A professional plumber should do this work.

Also worth considering, but not defined by this specification, is the installation of a floor drain.

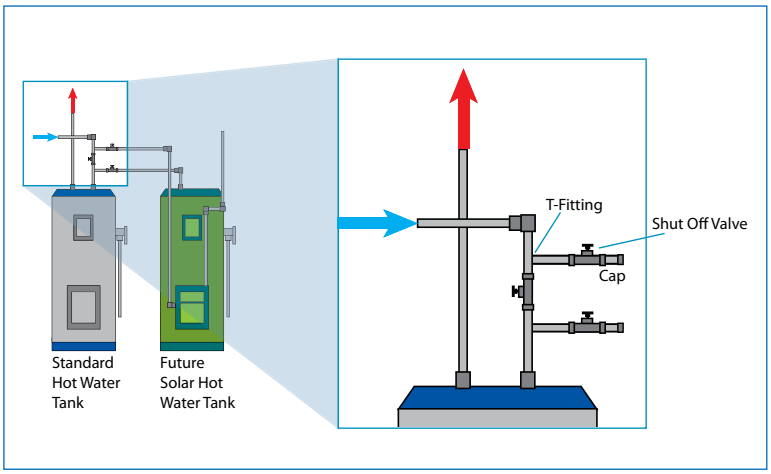

Figure 9: Solar Bypass Plumbing Detail. The cold water feed of the existing water heater should have a code-compliant valve assembly installed to connect to the future solar storage tank. Solar bypass valve assembly includes shut-off valves on each of the stubbed and capped "T" fittings, and one shut off valve in the main pipe between the two "T" fittings.

[3] Image courtesy of Natural Resources Canada.

3.5 Install pipe chase from utility room to the attic space below designated array location

The builder should install either a single 4" or two 2" PVC chases from the utility room to the roof space. (See Figure 10.) The pipe chase should be installed as a straight run and be clearly labeled as an RERH component.

A single straight 4" pipe chase or two 2" pipe chases installed in a straight run from the utility room to the underside, or attic side, of the designated solar array roof area will allow for the installation of the solar pipes and pipe insulation during the solar system installation. The pipe chase can be made of lightweight PVC or any other code-compliant material that is favored in the local housing market. It is not recommended to use a boxed-in open chase in the wall as other contractors may inadvertently install wires, plumbing, and ductwork through it. The use of a boxed-in open chase may also compromise the integrity of the home's thermal shell. With this in mind, the chase should be capped on both ends and sealed at all floor and ceiling penetrations to maintain air tightness and mandatory fire ratings.

A straight pipe chase between the utility room and the attic is the recommended method. Minor horizontal pipe runs at either end of the pipe chase are allowable. However, in situations where the pipe chase between the attic space and the utility room travels at a slope, bends, or terminates in an area lacking sufficient access or in a way that would prevent the continuation of the pipe run to the collector area or solar storage tank, it is recommended that the actual system water pipes be installed between the utility room and the roof area. A certified NABCEP solar professional should be consulted when installing the actual pipe run as opposed to a pipe chase.

The termination of the pipe chase or pipes should extend beyond the attic insulation by 6 inches and be located in an area that provides sufficient accessibility and clearance: 18 inches from the top of the chase to the underside of the roof deck. This is so a solar installer can continue the pipe run above the roof deck to the solar array at a future point in time. If the actual pipes are run to the roof, they must terminate at a universally convenient location relative to the proposed solar array location. The end of the pipe chase or pipes should be labeled to indicate its purpose and intended use. (See Appendix A for labeling guidance.)

3.6 Provide architectural drawing and plumbing riser diagrams of the RERH SWH system components

The builder should develop architectural drawings and plumbing riser diagrams that summarize the installed system equipment (pipe chase, etc.). The drawings should accurately represent the installed elements of the system during the final inspection of the house and be included in the homeowner education packet.

The builder should provide a basic architectural drawing to the homeowner summarizing where the equipment is located within the house (see Figure 10). The builder should also provide the homeowner with a plumbing riser detail of the SWH system components. This diagram should have sufficient detail to clearly identify:

- Pipe chase size and type
- Length of chase from the designated roof/attic termination point to the utility room
- Designated location and allotted space size of future hot water tank
- Designated location and allotted space size of pump package mounting panel (see Figures 8 and 10)

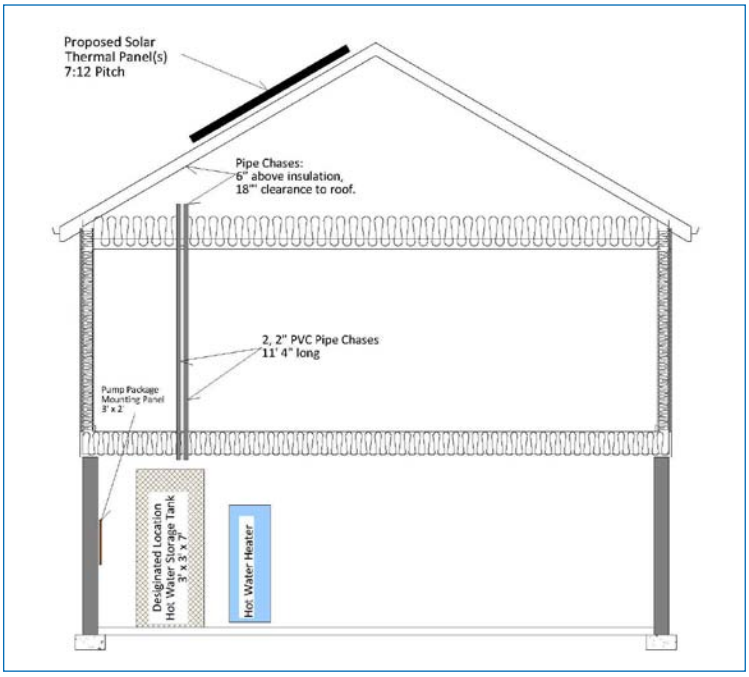

Figure 10: Plumbing Riser Detail. The plumbing riser detail should include the pipe chase location and size and balance of system component locations.

4 Homeowner Education

4.1 For all RERH homes, develop and provide a homeowner education packet

For homes that satisfy the elements of the RERH specification, it is recommended that the builder develop a homeowner education packet to be left on-site that includes this guide and companion checklist, all necessary architectural drawings, shading study, code-compliant load documentation, as well as electrical drawings and riser diagrams.

A renewable energy ready home not only involves important design considerations and additions to the building itself but a transfer of this information to the future homeowner. Builders are encouraged to provide the homeowner the following documents:

- Copy of the Renewable Energy Ready Home Specification guide
- Fully completed RERH checklist
- Architectural drawings detailing the proposed array location and square footage (see Figures 1 and 2)
- Plumbing riser diagram of RERH SWH system components that details the dedicated location for the mounting of the balance of system components (see Figures 8 and 10)
- Shading study with percent monthly or adjusted annual shading impact(s) (see Figure 3)
- Site assessment record generated by EPA's online RERH SSAT indicating that the proposed site meets a minimum solar resource potential of 75 percent of optimal
- Code-compliant documentation of the maximum allowable dead load and live load ratings of the existing roof
- Code-compliant documentation of the maximum allowable floor load rating for storage tanks installed on non-concrete floors

If a builder sites a system that falls outside of the assumptions outlined in this specification (see the Assumptions section), an NABCEP installer should update the diagrams and/or provide homeowner education information that documents the RERH components of the proposed future system.

5 Builder Best Practices (Optional Elements)

5.1 Landscape Plan

The builder should avoid implementing landscaping that has the potential to shade the proposed array location at the time of home construction or in future years. As a rule of thumb, vegetation with a mature specie height should adhere to a distance-to-height ratio of 2.6 to the nearest point of the proposed array location. Builders and/or landscape architects should seek input from state or local agricultural agents if they are unsure about the expected height of the vegetation they are considering. The builder should submit a detailed landscape plan with a clear emphasis on low-growth vegetation.

5.2 Placement of non-array roof penetrations and structural building elements

Careful placement of roof penetrations will maximize the available roof space for and facilitate the eventual installation of the proposed array. If the proposed array is to be located on a roof, care must be taken to ensure that the proposed array location is not affected by typical plumbing or mechanical roof penetrations. The placement of such penetrations should be above or north of the proposed array so that shadows are not cast on the array location. Typical plumbing and mechanical roof penetrations can hinder the installation of a flush-mounted system on the proposed roof area.

Appendix A: RERH Labeling Guidance

EPA does not provide labels for labeling the RERH components described in the specification. However, guidance is provided below for the builder about the suggested application and size of labels for each applicable item in the specification.

General Guidance:

EPA suggests using a weatherproof label to ensure that the components stay labeled until the time of renewable energy system installation. Avery® White WeatherProof™ Labels for Laser Printers 5520 may be a good choice.

The size and placement of the labels listed below are merely suggestions. Builders are encouraged to use their best judgment to ensure that the elements are clearly labeled to avoid confusion, damage, or duplication for the solar installer or other contractors working in the home.

Table 3. Label suggestions for the RERH components to ensure appropriate use upon installation of the RE system.

Items	Approximate Label Size	Labeling Guidance	Label Placement	# of Labels	Section Reference
Future Hot Water Storage Tank	10" x 6"	RENEWABLE ENERGY READY HOME Future Hot Water Storage Tank	Label can be placed on the wall area by the space with an arrow indicating the location of the future hot water tank.	1	3.1
Solar Thermal Balance of System Board	10" x 6"	RENEWABLE ENERGY READY HOME Solar Thermal Balance of System Board	Label can be placed on the wall area in the center of the plywood panel.	1	3.2
Solar Thermal Bypass Valve	3" x 1"	RENEWABLE ENERGY READY HOME Solar Thermal Bypass Valve	Label can be wrapped around the bypass valve so the text is visible and upright (if possible).	2	3.4
Solar Thermal Pipe Chase or Pipes	3" x 1"	RENEWABLE ENERGY READY HOME Solar Thermal Pipe Chase	Label can be wrapped around the pipe/chase so the text is visible and upright.	2 to 4 labels depending on chase or pipe application	3.5

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