

Passive Solar Space Heating

Oregon Department of Energy

ELIGIBILITY – To qualify for a tax credit, you must have an Oregon income tax liability. The tax credit can apply to either your primary or secondary residence. The passive solar space heating system must reduce the home's annual heating and cooling energy use by 20 percent. The tax credit is claimed when you file your state income tax.

CREDIT AMOUNT - The Oregon Residential Energy Tax Credit Program provides a tax credit for solar space heating systems based on the estimated energy savings produced by the system. The one-time credit amount is 60 cents per kWh saved up to \$1,500, or 50 percent of the net cost of the system, whichever is less. The net cost includes the cost to design, acquire, construct, install and permit the system. Net cost does not include service contracts, rebates, or refunds. The savings estimate can either be determined by you hiring a qualified engineer or designer to model the annual energy use energy analysis software or by meeting the prescriptive path for passive solar design requirements. These prescriptive requirements are briefly described in these instructions. For more detail, go to the Oregon Department of Energy's Web site. The other important step in estimating annual performance is to complete a site assessment using the attached "Sun Chart" worksheet is used to estimate the impact of external shading on system performance.

PASS-THROUGH OPTION – If you are an Oregon resident and do not have an Oregon income tax liability, you may choose to transfer your tax credit to an Oregon resident or business that does. The Pass-through Option will allow you transfer your tax credit to an individual or business with an Oregon tax liability who will make a lump-sum payment to you based on a percentage of the certified tax credit amount. To use this option, complete this application form first. Your application will be reviewed for eligibility. A Pass-through Option Application will be sent to you in return. You and your pass-through partner (the tax credit recipient) will complete and sign the Pass-through Option Application and mail it to the Oregon Department of Energy. You are responsible for finding your own pass-through partner. The Department of Energy will then issue the tax credit certification to the pass-through partner. There may be tax implications. We advise you to consult with your tax preparer.

PROCESS – Don't wait to apply for the tax credit. The Oregon Department of Energy should receive the application **no later than April 1** of the year following the purchase. The Department of Energy will send a tax credit Certificate to file with your tax return once your application has been processed.

Take the following steps to receive your tax credit:

- 1. Complete a sun chart for your location.** On the attached sun chart, draw the south-facing skyline (horizon, trees and other objects) your solar equipment will be exposed to. The percentage reduction in system yield is determined by adding the numbers in the blocks that contain obstructions.
- 2. Submit a completed Application and Verification Form for Tax Credit Certification Passive Solar Space Heating System.** The form may be filled out on your computer. Please print it, sign it and mail it with your receipt to the Oregon Department of Energy. The forms can NOT be filed on-line. Include the sun chart, proof of payments (receipts, contracts, or invoices dated and marked paid by your contractor). If the paperwork you submit demonstrates that your system qualifies for the tax credit, the Oregon Department of Energy will approve your application and send you a Certification specifying the qualifying tax credit amount.
- 3. Complete the pass-through option section on the form if you are using this option.** The pass-through option allows an applicant to transfer the tax credit to a pass-through partner in return for 95 percent of the value of the tax credit. If you choose the pass-through option, you transfer your tax credit and may not claim

it. The tax credit is issued in the name of the pass-through partner. There may be tax implications for the pass-through partner. We advise you to consult with your tax preparer.

4. **Claim the tax credit on your state income tax form.** The credit must be claimed for the tax year in which the alternative energy device was purchased (down payment) if the device is operational by April 1 of the next following tax year. Proof of purchase must be a contract or invoices dated in the year for which the applicant is claiming the credit.
5. **Keep your Certification, a copy of your application, and proof of payment with your tax records.** (Submit a copy of these documents with your tax return and retain the originals.) If your return is audited, the Oregon Department of Revenue will request copies of the information from you. Tax credits not taken in the first year may be carried forward up to five years.

Passive Solar Space Heating Prescriptive Path

Partially heating a home with solar energy is not difficult in Oregon. If done correctly the home will use 20 to 50 percent less energy during the heating season and remain cool during the summer months. Two approaches can be used to heat a home with solar energy: an active system or a passive system. Active systems use mechanical equipment such as a pump or fan to move energy from collectors into the house. Passive systems use south-facing windows to allow solar heat and light into the home, and overhangs and thermal storage to prevent overheating.

Accurately estimating annual solar savings is difficult and requires detailed computer modeling. The following prescriptive path was developed to ensure your home's eligibility. The term "solar windows" refers only to those windows that face within 30 degrees of *true* south, have a Solar Heat Gain Coefficient (SHGC) of not less than 0.60, and are located in a room with thermal storage. A SHGC value of 0.60 indicates that 60 percent of the sun's energy will pass through the window. Retain the window rating stickers for proof of their SHGC rating. Thermal storage is expressed in units of "diurnal heat capacity" (DHC) which is a function of the materials properties, thickness and location in the house. To be useful as thermal storage, it is important that it *not* be heated by other sources such as by a radiant floor heating system.

Prescriptive Path Requirements*

1. The building layout maximizes passive solar gain and good daylighting. At least half the windows are solar windows (for new construction).
2. There is sufficient solar window area. West of the Cascades this is equal to 9 percent of the total floor area. East of the Cascade this is equal to 8 percent of the total floor area. Single story homes should have 1 percent more window area because of their greater heat loss rate per square foot of floor area. Sunspace type systems may use 1 percent less window area because of their more efficient control of heat gain and loss.
3. South windows have a SHGC not less than 0.60.
4. The area-weighted average window heat loss rate (U-factor) is not greater than 0.35.
5. There is adequate thermal storage to prevent overheating. (storage = 30 times solar window area)
6. Window overhangs shade most of the window during the summer, but allow 100 percent solar gain in the late fall.
7. The space heating sun chart shows less than 10 percent shading loss from trees or buildings.
8. North windows less are less than 2 percent of the total floor area.
9. Skylights are less than 1 percent of the floor area and have an SHGC of no more than 0.30.
10. West facing windows have a SHGC of 0.35 or less to limit summertime overheating.
11. Passive cooling is possible with an operable window or skylight is located near the highest point.

NOTE: Trade-offs between measures is allowed if the home is built with more than the minimum insulation required by the state energy code.

If you have any questions, please call the Oregon Department of Energy toll-free: 1-800-221-8035. (In Salem, call 503-378-4040.) Or consult the Department of Energy Web site (www.oregon.gov/energy).



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Oregon Department of Energy

625 Marion St. NE
Salem, OR 97301-3737
Toll-free: 1-800-221-8035
Salem: (503) 378-4040 Fax (503) 373-7806
Web site: www.oregon.gov/energy

Don't forget...
...to sign your application
and include your receipt

1. APPLICANT INFORMATION			
Name:		Social Security No.*:	
Mailing address:		Daytime phone:	
City:	Oregon County:	State:	Zip:
Site address (if different):			
City:	Oregon County:	State:	Zip:
If different than mailing address, please explain:			
Name of electricity utility company:			
Name of natural gas utility company:			
Purchase date:		Operational Date:	
		Number of people in household:	
Net cost of system: \$			

2. SYSTEM DESCRIPTION	
House Information	
1. House floor area: _____ ft ²	New Floor Area: _____ ft ²
2. Year house was built : _____	Number of Floors: _____
3. North Windows _____ ft ²	Window U-value: _____ Btuh/ft ² °F
4. East Windows _____ ft ²	Window U-value: _____ Btuh/ft ² °F
5. South Windows _____ ft ²	Window U-value: _____ Btuh/ft ² °F
6. West Windows _____ ft ²	Window U-value: _____ Btuh/ft ² °F
7. Wall construction: _____	Wall insulation R-value: _____ ft ² °F/Btuh
8. Floor construction: _____	Floor insulation R-value: _____ ft ² °F/Btuh
9. Roof construction: _____	Roof insulation R-value: _____ ft ² °F/Btuh
10. Backup Heating System Type (gas, wood, oil, electric, heat pump): _____	

* The request for your Social Security Number is authorized by Section 405, Title 42, of the United States Code. You must provide this information. It is used to establish your identity for tax purposes only.

OVER

FOR OFFICE USE ONLY
File no.:
Date received:
Tax credit amount: \$
Tax year:

5. PASS-THROUGH OPTION

No - I want to keep the full tax credit myself

Yes - I want to transfer my tax credit to another Oregon resident (see below)

If you are an Oregon resident, the Pass-through Option will allow you transfer your tax credit to an individual or business with an Oregon tax liability who will make a lump-sum payment to you equal to a percent of the certified tax credit amount (amount determined by Oregon Department of Energy). To use this option, complete this application form first. Your application will be reviewed for eligibility. A Pass-through Option Application will be sent to you in return. You and your pass-through partner (the tax credit recipient) will complete and sign the Pass-through Option Application and mail it to the Oregon Department of Energy. The Oregon Department of Energy will then issue the tax credit certification to the pass-through partner. **Important: There may be tax implications. We advise you to consult with your tax preparer.**

6. HOMEOWNER APPLICATION SIGNATURE

I understand that the Oregon Department of Energy does not make any warranty concerning the performance, operation, installation, or any other characteristic or feature of this system. Department of Energy approval is only for purposes of obtaining the Oregon Residential Energy Tax Credit.

By signing below, I (we) certify that the system(s) described in this application is (are) installed and that the information contained herein is accurate and true.

_____ I give the Oregon Department of Energy permission to inspect this installation upon agency request.
Note: Refusing access for inspection may result in denial of this application.

_____ **I have attached proof of payment** for this installation that includes an **itemized parts list**.

We do not sell information from this application as a mailing list. However, the Oregon Department of Energy may be required to disclose the name, address and phone number from your application under the Oregon Public Records law ORS 192.410 et seq. We can withhold the address and phone number following a written request explaining personal safety concerns, such as a temporary restraining order. The Oregon Department of Energy does not endorse any company that requests the information.

Signature of Purchaser: _____ Date: _____

Signature of Joint Purchaser: _____ Date: _____

Complete the following if two or more persons are purchasing this system and file separate tax returns.

Name: _____ Address: _____ % ownership: _____

Name: _____ Address: _____ % ownership: _____

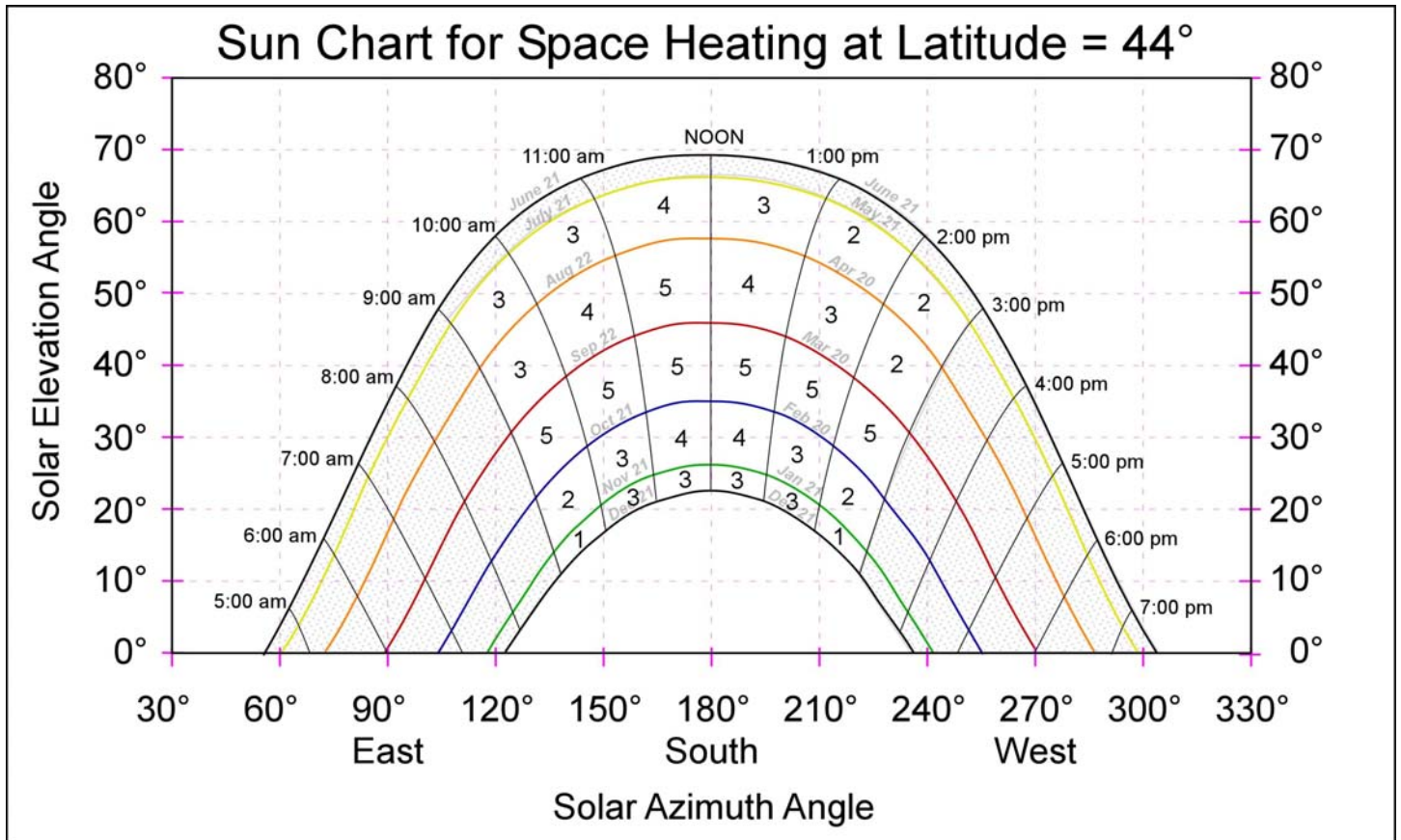
Name: _____ Address: _____ % ownership: _____

Note: The Oregon Department of Energy certifies the energy efficiency of systems and equipment for the Oregon Residential Energy Tax Credit program. It is the applicant's responsibility to ensure compliance with all other eligibility requirements. If you have questions concerning claiming the credit on your Oregon tax return, contact the Oregon Department of Revenue at 1-800-356-4222 or 503-378-4988.

Passive Solar - Sun Chart Worksheet

The goal of this worksheet is to quantify what percentage of the available solar resource is available to the passive solar windows on a home. The base assumption of this simplified approach is that the windows are vertical and are facing within 30 degrees of true south.

Step 1 – From the midpoint of the solar windows, draw the skyline on the graph below. Use the elevation angles and solar azimuth angles to determine the location of the obstructions. Draw deciduous trees with a dotted outline and fill with light shading. Year-round (solid) obstructions like buildings, or conifer trees should be drawn with solid outlines and filled with heavy shading.



Step 2 – Add up the numbers in the sections that have shading. Any deciduous tree shading below the Sept 22/March 20 line can be counted at half value to account for the fact that some light will get through these obstructions when the trees lose their leaves. The sum of all these values is the percent of energy lost to external shading for space heating systems. Subtract this number from 100 percent to get the solar resource.

Passive Solar Fraction (percent not lost from shading) = 100% - sum of obstructed areas = _____%

Passive Solar – Thermal Storage Worksheet

Thermal storage is the ability of materials to store energy in the form of heat. Some materials store more energy than others. Material thickness, density and conductivity, and placement all have an impact on the amount of energy that a given amount of material can store. This worksheet is used to estimate the Diurnal Heat Capacity (DHC) of the passive solar features of your home. Making sure that this value is at least 30 times the area of solar glazing in the house will keep the room temperatures from fluctuating wildly and allow heat to be slowly released into the house once the sun has gone down.

All materials listed must be in rooms with solar windows. Remember, solar windows are windows that are south facing and have a solar heat gain coefficient (SHGC) of at least 0.55. Use the thermal storage capacity values for “in direct sunlight” if the material is in a location that get’s direct sunlight for 2 or more hours during an average sunny winter day.

Radiant floors do not provide good thermal storage because they are kept above room temperature during the heating season by the backup (non-solar) heating source. This reduces their ability to store solar energy.

Do not include sheetrock, furniture or other surfaces that are common to average construction. The thermal storage requirement already assumes the presence of these items.

$$\text{Target DHC} = 30 \times \text{Total Solar Glazing Area} = 30 \times \text{_____ ft}^2 = \text{_____}$$

Complete the following table:

<u>Room</u>	<u>Material</u>	<u>Type</u> ¹	<u>Thickness</u>	<u>Area</u>	<u>²dhc/ft²</u>	<u>DHC</u>
_____	_____	_____	_____	_____	x _____ =	_____
_____	_____	_____	_____	_____	x _____ =	_____
_____	_____	_____	_____	_____	x _____ =	_____
_____	_____	_____	_____	_____	x _____ =	_____
_____	_____	_____	_____	_____	x _____ =	_____
TOTAL =						_____

Thermal Storage Capacity of some common materials (dhc/ft²)

	Wood 1" thick	Tile floor average thickness	Stone or concrete 2" thick	Stone or concrete 4" thick	Stone or concrete 6" thick	Sheet rock 5/8"	Radiant floor (gypcrete or wood)	Radiant floor (concrete)	Carpeted floor	Water 4" thick
In direct sunlight	1.6	2.1	4.3	8.8	11.3	1.3	0.5	2.0	0	20.8
Not in direct sunlight	1.0	1.8	3.0	3.8	3.7	0.7	0.3	.6	0	n/a

¹ All thermal storage needs to be in the same room as the solar windows, Type refers to if it is “Sun-lit” or “Not-Sun-lit”

² dhc/ft² values for common materials can be found on the table.