



Let **Geo** LEED **the Way**

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By now, nearly everyone has at least heard of LEED but not many understand what it means to be LEED-certified or how best to earn certification. Developed by the US Green Building Council (USGBC), LEED stands for “Leadership in Energy and Environmental Design”. Simply put, LEED is a grading system for sustainable building design and construction.

The goal of the program is to encourage the construction of buildings that use less energy, water and natural resources in order to minimize the impact of a structure on the local environment during construction and throughout its useful life. Needless to say, geothermal heating and cooling systems can go a long way to supporting all of these goals.

The LEED rating system works by requiring a minimum level of performance through prerequisites organized under eight different categories. Once you are able to meet the minimum performance requirements in each category, any improvements above and beyond are rewarded through a points system. The eight categories are:



Innovation & Design Process (ID) Find innovative ways to enhance your home’s efficiency, comfort and durability. A maximum of 11 points is available in this category.



Location & Linkages (LL) Select property that is close to work, school, shopping, access to mass transit, etc. A maximum of 10 points is available in this category.



Sustainable Sites (SS) Protect natural habitat, minimize the effect of storm runoff and water usage on site, etc. through non-destructive construction practices and site development. A maximum of 22 points is available in this category.



Water Efficiency (WE) Reduce water usage in your home and find creative ways to reuse it, inside and out. A maximum of 15 points is available in this category.



Energy & Atmosphere (EA) Cut the energy usage of your home and resulting environmental pollution, mainly through improvements to the building envelope and heating and cooling system design. A maximum of 38 points is available in this category.



Materials & Resources (MR) Use construction materials manufactured via sustainable methods from recycled or environmentally-friendly raw material. Minimize waste during construction. A maximum of 16 points is available in this category.



Indoor Environmental Quality (EQ) Minimize the creation of and exposure to pollutants and maximize fresh air indoors through energy efficient means. A maximum of 21 points is available in this category.



Awareness & Education (AE) Educate you, the homeowner, tenant, or building manager about the operation and maintenance of the green features of your home. A maximum of 3 points is available in this category.

With nearly 52% of all U.S. residential electricity consumption going to comfort systems and hot water generation it only makes sense that the Energy and Atmosphere (EA) category makes up a big chunk of your possible LEED points. A maximum of 38 points is available in the EA category which is nearly 28% of the 136 available points. The 38 EA points are spread across multiple subcategories the most important of which are space heating & cooling, domestic hot water generation and refrigerant management.

And wouldn't you guess... a major portion of the points available in this category can be captured with the right HVAC system (and by right I mean geothermal). The remarkable GSHP system, dubbed by the EPA as "the most energy efficient, environmentally clean and cost effective space conditioning system available" can help you capture 10 of the 38 points within this category.

LEED Status	Points Required
Certified	45-59
Silver	60-74
Gold	75-89
Platinum	90-136

Table 1. LEED Status

At first blush, 10 points may not seem like much, but it is always important to keep things in perspective. As you can see from Table 1, if the goal is to achieve LEED Silver status on your new home, the 10 points you earn with a GSHP system will account for 17% of the 60 points needed. If you decide to shoot for the moon and achieve LEED Platinum status, the points from the GSHP system will account for 11% of the 90 points needed.

To obtain the remaining 28 points in Energy and Atmosphere, you will need to upgrade your insulation, take measures to tighten up your home and reduce air infiltration (envelope leakage), upgrade your windows, use high-efficiency lighting, buy Energy Star rated appliances, etc.

By installing a GSHP system, you will be able to maximize your LEED score in three subcategories in this category: space heating and cooling, domestic hot water and refrigerant management.

Space Heating and Cooling

The intent in LEED ratings for space heating and cooling equipment is to "reduce energy consumption associated with the HVAC system," which means more efficient equipment and better building practices.

The efficiency requirements that you must meet with your heating and cooling system will depend on where you live. LEED requirements are broken up according to the U.S. Climate Zones, which are shown in Figure 1:

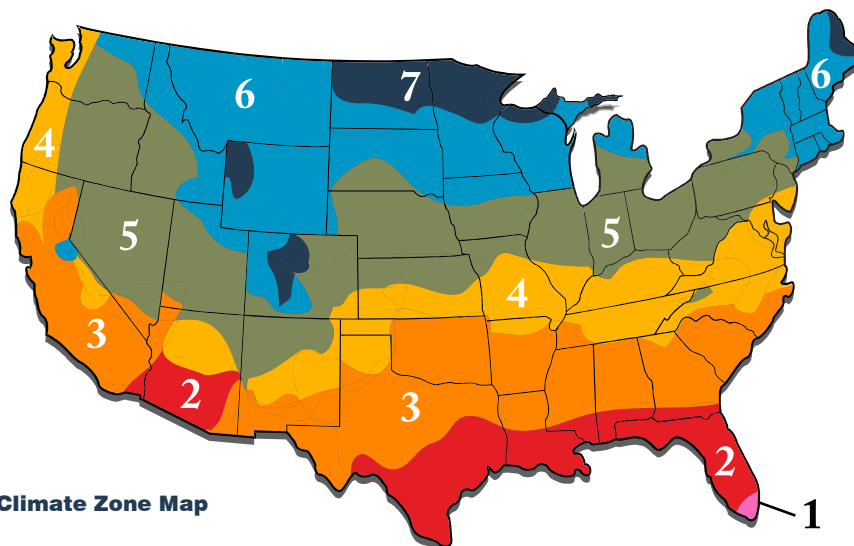


Figure 1. Climate Zone Map

Climate Zones 1-3 are in the Southern, cooling-dominant regions of the United States. As you can see in Table 2, LEED cooling efficiency requirements (indicated by higher SEER and EER ratings) are more stringent in those areas.

	Possible Points	End Use	Central AC & ASHPs ¹	Furnaces ²	Boilers ²	Open Loop GSHP	Closed Loop GSHP	Direct Expansion GSHP
PREREQUISITE	NA	Cooling Heating	≥14 SEER ≥8.2 HSPF	≥80 AFUE	≥80 AFUE	≥16.2 EER ≥3.6 COP	≥14.1 EER ≥3.3 COP	≥15.0 EER ≥3.5 COP
HIGH EFFICIENCY	2	Cooling Heating	≥15 SEER ≥8.6 HSPF	≥90 AFUE	≥85 AFUE	≥17.8 EER ≥4.0 COP	≥15.5 EER ≥3.6 COP	≥16.5 EER ≥3.9 COP
VERY HIGH EFFICIENCY	3-4 ³	Cooling Heating	≥16 SEER ≥9.0 HSPF	≥92 AFUE	≥87 AFUE	≥19.4 EER ≥4.3 COP	≥17.0 EER ≥4.0 COP	≥18.0 EER ≥4.2 COP

Table 2. HVAC Requirements for IECC Climate Zones 1-3

1. ASHP = Air Source Heat Pump
2. Gas, oil, or propane
3. Heat pump systems qualify for the maximum of 4 points, all other systems can only obtain 3 points
4. Furnace with low electricity use

Climate Zones 4-8 are in the Northern, heating dominant regions of the country. As illustrated in Table 3, if you live in one of those Climate Zones, the heating efficiency requirements are increased as indicated by higher HSPF, AFUE, and COP ratings.

	Possible Points	End Use	Central AC & ASHPs ¹	Furnaces ²	Boilers ²	Open Loop GSHP	Closed Loop GSHP	Direct Expansion GSHP
PREREQUISITE	NA	Cooling Heating	≥13 SEER ≥8.2 HSPF	≥90 AFUE	≥85 AFUE	≥16 EER ≥3.6 COP	≥14.1 EER ≥3.3 COP	≥15.0 EER ≥3.5 COP
HIGH EFFICIENCY	2	Cooling Heating	≥14 SEER ≥8.6 HSPF	≥92 AFUE	≥87 AFUE	≥17.8 EER ≥4.0 COP	≥15.5 EER ≥3.6 COP	≥16.5 EER ≥3.9 COP
VERY HIGH EFFICIENCY	3-4 ³	Cooling Heating	≥15 SEER ≥9.0 HSPF	≥94 AFUE	≥90 AFUE	≥19.4 EER ≥4.3 COP	≥17.0 EER ≥4.0 COP	≥18.0 EER ≥4.2 COP

Table 3. HVAC Requirements for IECC Climate Zones 4-8

1. ASHP = Air Source Heat Pump
2. Gas, oil, or propane
3. Heat pump systems qualify for the maximum of 4 points, all other systems can obtain 3 points
4. Furnace with low electricity use

Generally speaking, as the efficiency of your heating and cooling system increases, the amount of LEED points awarded to you also increases. It is important to recognize that only heat pump systems can qualify for the maximum of four points for space heating and cooling equipment (GSHP efficiency requirements highlighted in red). All other systems can only obtain up to three points in this category.

Domestic Hot Water

The intent in LEED ratings for domestic hot water heating is to “reduce energy consumption associated with the domestic hot water system, including improving the efficiency of both the hot water system design and the layout of the fixtures in the home.” The domestic hot water portion of the energy pie is surprisingly large, making up nearly 12% of all residential U.S. electrical consumption.

A maximum of six points are possible in this subcategory, with three points allocated to the hot water heating equipment, one point allocated to pipe insulation, and two points allocated to efficient hot water distribution. As was the case for heating and cooling equipment, as the efficiency of your hot water heating system increases, so does your LEED score, as shown in Table 4:

	Efficiency requirement	Description	Points
ELECTRIC WATER HEATER	EF ¹ ≥0.89 (80 gallon)	High efficiency storage water heater	1
	EF ¹ ≥0.92 (50 gallon)	High efficiency storage water heater	1
	EF ¹ ≥0.93 (40 gallon)	High efficiency storage water heater	1
	EF ¹ ≥0.99	Tankless water heater	2
	EF ¹ ≥2.0	Heat pump water heater ⁴	3
GAS WATER HEATER	EF ¹ ≥0.53 (80 gallon)	High efficiency storage water heater	1
	EF ¹ ≥0.57 (60 gallon)	High efficiency storage water heater	1
	EF ¹ ≥0.61 (40 gallon)	High efficiency storage water heater	1
	EF ¹ ≥0.80	Tankless water heater	2
	CAE ² ≥0.80	Combination water and space heaters ⁴	2
SOLAR WATER HEATER (BACKUP)	≥40% of annual DHW load ⁵	With preheat tank	2
	≥60% of annual DHW load ⁵	With preheat tank	3

Table 4. High Efficiency Water Heating Equipment

1. EF = Energy factor. Energy factors for equipment from various manufacturers are available at http://www.bfsheating-cooling.com/home_files/TaxCreditFAQ.htm

2. CAE = Combined annual efficiency

3. A GSHP equipped with a desuperheater or a combination GSHP unit used for space conditioning and domestic hot water generation

4. A water-water GSHP unit used only for domestic hot water generation

5. DHW = Domestic hot water

As you can see, using a heat pump or solar water heater is the only way to qualify for the maximum of three points for your hot water heating system (GSHP efficiency requirements highlighted in red).

Refrigerant Management

LEED ratings for refrigerant management are meant to “ensure performance and minimize contributions to ozone depletion and global warming.” To qualify for the only point possible in this category, two conditions must be met:

- 1) Provide proof of proper refrigerant charge of the system
- 2) Install a GSHP system with non-HCFC refrigerant (e.g. R-410a)

Your ground source heat pump system will be awarded full credit for this category almost by default. All residential GSHPs are manufactured with environmentally-friendly R-410a refrigerant. Additionally, packaged units will come from the manufacturer with the proper refrigerant charge. If you put a split system in your home, it must be tested after installation by a qualified professional before the point can be awarded.

Indoor Environmental Quality (EQ)

There are 21 points available in this category. You will obtain a majority of these points by including a fresh air ventilation system, moisture control with a humidistat and appropriate equipment, air filtration, proper duct design, etc.

One subcategory in EQ is combustion venting, where 2 points are available. If you use equipment that burns natural gas, propane, etc. to produce heat, you will need to take proper measures to vent the combustion gases outside. Since your GSHP system will not rely on combustion to produce heat, it will qualify for the 2 points available in this subcategory by default.

There you have it. If you are able to capture all four points in space heating and cooling, three points in domestic hot water heating and one point in refrigerant management and two points in combustion venting with your GSHP system, you will be well on your way to LEED certification.

Learn More

Beyond LEED, GSHPs offer [many advantages](#) over conventional equipment. A few examples are increased comfort, air quality, aesthetics, mechanical reliability and equipment service life. For more information about the benefits of GSHP systems, visit the [About Geo](#) page on the [Geo-Connections](#) site.

If you want to learn more about LEED certification, most of the information in this article came from the USGBC: LEED for Homes [website](#) and [Rating Systems Guide](#). There is a wealth of information available to you on their site and a bit of Googling can help you find a qualified contractor or architect in your area that can help you get started on your LEED certified home.

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