

## Glossary for Efficiency Terminology

### What is SEER rating?

In the heating and cooling industry, SEER stands for Seasonal Energy Efficiency Ratio. A SEER rating is the ratio developed when the cooling output of the system over an average cooling season is divided by the total energy used. More simply, SEER is representative of how much energy and money the unit requires to operate effectively over a single year.

A SEER ratio is determined over the course of a full cooling season. The concept is quite simple. The less energy used by the unit to produce the proper amount of cooling, the higher the SEER rating. The SEER ratio is representative of a unit's maximum efficiency.

### What is EER rating?

The Energy Efficiency Ratio (EER) is the ratio of the cooling capacity (in British thermal units (Btu) per hour) to the power input (in watts). **The higher the EER rating, the more efficient the air conditioner.**

### What is HSPF rating?

The Heating Seasonal Performance Factor (HSPF) is a **heating efficiency rating for heat pumps**. The higher the rating, the more efficient the heat pump. A more efficient heat pump will result in less energy use and increased energy savings over the life of the system, compared to a less efficient heat pump.

### What is COP rating?

The **coefficient of performance** or **COP** (sometimes **CP** or **CoP**) of a [heat pump, refrigerator or air conditioning system](#) is a ratio of useful heating or cooling provided to work (energy) required. Higher COPs equate to higher efficiency, lower energy (power) consumption and thus lower operating costs.

The COP usually exceeds 1, especially in heat pumps, because, instead of just converting work to heat (which, if 100% efficient, would be a COP of 1), it pumps additional heat from a heat source to where the heat is required. Most air conditioners have a COP of 2.3 to 3.5. Less work is required to move heat than for conversion into heat, and because of this, heat pumps, air conditioners and refrigeration systems can have a coefficient of performance greater than one.

However, this does not mean that they are more than 100% efficient, in other words, no heat engine can have a thermal efficiency of 100% or greater. For complete systems, COP calculations should include energy consumption of all power consuming auxiliaries. The COP

is highly dependent on operating conditions, especially absolute temperature and relative temperature between sink and system, and is often graphed or averaged against expected conditions.

## **What do the new SEER2, EER2, and HSPF2 ratings mean?**

### ***About SEER2***

“SEER2” stands for Seasonal Energy Efficiency Ratio 2. Specifically, SEER2 is the total heat removed from the conditioned space during the annual cooling season. The new M1 testing procedure (see below) will increase systems’ external static pressure by a factor of five to better reflect field conditions of installed equipment. With this change, new nomenclature will be used to denote M1 ratings (including EER2 and HSPF2).

### ***What is EER2?***

EER2 is **the energy efficiency of your air conditioner or other cooling system**. EER2 ratings are always calculated with the unit working at an outdoor temperature of 95°F, an indoor temperature of 80°F, and at 50% humidity.

### ***What is HSPF2?***

HSPF, or Heating Seasonal Performance Factor, measures how efficiently a [heat pump](#) can heat your home during the cold weather months. The Department of Energy (DOE) has recently refined the testing procedure for determining HSPF, resulting in the creation of HSPF2, a more accurate scale to measure heat pump efficiency.

## **M1 Testing Requirements**

To meet new testing requirements, manufacturers are redesigning system components. In fact, all air conditioning and heat pump systems must be renovated by January 1, 2023, even if they meet current SEER ratings. In addition, matching components such as furnaces and air handlers will be redesigned to meet changes in the airflow setpoint. Depending on your region, additional field install equipment, such as Thermal Expansion Valves (TXVs), may also be required.

## **M1 Testing Procedures**

The goal of new SEER2 testing procedures is to better represent external conditions seen in the field. Current SEER testing does not accurately emulate the influence of ductwork and external static pressure on HVAC products. Because of this, it is not often representative of real-world applications. By increasing systems’ external static pressure from current SEER (0.1 in. of water) to SEER2 (0.5 in. of water), new M1 testing procedures more accurately reflect current field conditions.