

A collection of short  
pointed topical papers.

November 2009



# Cold W.A.R.

Whether it's **A**ir Conditioning or **R**efrigeration  
**SERVICING KNOW-HOW**

**SEER**  
FOR  
**DUMMIES**

*What is SEER?*

*A Reference  
for the  
A/C Technician!*

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A cartoon illustration of a male technician with dark hair and glasses, wearing a blue work shirt with a name tag that says "ANDY". He is holding a large silver wrench in his right hand and a pressure gauge in his left hand. The pressure gauge has a needle and the word "PRESSURE" and "PSI" are visible on it.

PHASE II  
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## SEER for DUMMIES

### WHAT IS SEER?

It's an acronym for:

- S = Seasonal**
- E = Energy**
- E = Efficiency**
- R = Ratio**

SEER is an efficiency ratio in units of Btu's per watt-hour that attempts to address the question: how much do I need to pay my electric utility to cool my house?

Well, not really. A SEER rating can't predict your utility bill anymore than it can predict the weather, but it does provide a consistent means to compare the efficiencies of various residential air conditioning systems.

### WHEN WAS THE SEER RATING FIRST USED?

The Department of Energy (DOE) published the SEER test procedures in the Federal Register on December 27, 1979, and it took effect on January 27, 1980. This ruling did not establish minimum standards; it merely determined the test procedures by which the efficiencies had to be measured so that fair comparisons could be made.

In this publication, the DOE defines SEER as: "the total cooling of a central air conditioner in Btu's during its normal annual usage period for cooling divided by the total electric power input in watt-hours during the same period".

### WHEN DID THE FIRST MINIMUM SEER RATINGS TAKE EFFECT?

The National Appliance Energy Conservation Act (NAECA) signed by President Reagan in 1987 established, among other things, minimum SEER ratings for air conditioning equipment. A 10 SEER minimum went into effect January 1, 1992 for split systems and a 9.7 SEER minimum went into effect January 1, 1993 for packaged systems. These regulations applied to all unitary air conditioning and all air source heat pump equipment rated less than 65,000 Btu/h.

### WHEN DID THE 13 SEER RULING TAKE EFFECT?

January 23, 2006. It was signed into law by President Clinton during the final hours of his administration.

### HOW IS SEER DETERMINED?

For units having a single speed compressor and indoor fan, cooling capacity and power consumption are measured at the following four test conditions:

- A Test: 80°F/67°F entering air, 95°F ambient
- B Test: 80°F/67°F entering air, 82°F ambient
- C Test: 80°F/57°F entering air, 82°F ambient
- D Test: 80°F/57°F entering air, 82°F ambient; 6 min on, 24 min off (cyclic test)

The "A" and "B" tests are steady state tests; the former at 95°F ambient temperature, the latter at 82°F ambient temperature. Both tests will typically cause water vapor to condense on the evaporator surface.

The "C" test is an additional steady state test, but it requires a lower wet bulb temperature which causes the system to operate with a dry evaporator coil. The "D" test is the cyclic test at "C" test conditions, and it attempts to simulate real world compressor cycling.

Units employing variable speed compressors and/or variable air volume indoor fans require additional tests.

Test results are used to calculate the SEER rating. The test procedures and calculation method are spelled out in AHRI Standard 210/240-2008. This document may be freely downloaded from AHRI: <http://www.ahrinet.org/>

## SEER for DUMMIES

### HOW DOES ONE IMPROVE THE SEER RATING FOR AN AIR CONDITIONING UNIT?

Anything that can improve the efficiencies of the A, B, C, or D tests will improve the SEER rating. The following are employed to improve SEER rating:

- Increasing evaporator or condenser surface area
- Using more efficient compressor, fan and blower motors
- Using a thermostatic expansion valve (TEV) or electronic expansion valve (EEV) instead of a fixed restriction expansion device

### WHAT IS HSPF?

It's an acronym for:

**H = Heating**  
**S = Seasonal**  
**P = Performance**  
**F = Factor**

HSPF is an efficiency ratio in units of Btu's per watt-hour for the heating cycle of an air source heat pump system. One can think of it as a SEER rating for the heating cycle.

### WHAT ARE THE MINIMUM HSPF RATINGS?

A 6.8 HSPF minimum went into effect January 1, 1992 for split systems and a 6.6 HSPF minimum went into effect January 1, 1993 for packaged systems. A 7.7 HSPF minimum went into effect January 23, 2006.

### HOW IS HSPF DETERMINED?

For units having a single speed compressor and indoor fan, heating capacity and power consumption are measured at the following four test conditions:

- H1 Test: 47°F/43°F entering outdoor air, 70°F/60°F entering indoor air
- H1C Test: 47°F/43°F entering outdoor air, 70°F/60°F entering indoor air; 6 min on, 24 min off (cyclic test)
- H2 Test: 35°F/33°F entering outdoor air, 70°F/60°F entering indoor air
- H3 Test: 17°F/15°F entering outdoor air, 70°F/60°F entering indoor air

“H1” and “H3” are the high temperature and low temperature steady state tests respectively. “H2” is the frost accumulation test.

“H1C” is the cyclic test at “H1” test conditions, and it attempts to simulate real world compressor cycling.

Units employing variable speed compressors and/or variable air volume indoor fans require additional tests.

As with the SEER tests, the test results are used to calculate the HSPF rating. The test procedures and calculation method are spelled out in AHRI Standard 210/240-2008.

### WHAT SEER/HSPF RATINGS QUALIFY AS “HIGH EFFICIENCY”?

To qualify for the Energy Star® label, an air conditioning system must have a SEER rating of at least 14.

An air source heat pump must also have a SEER rating of at least 14, an HSPF rating of at least 8.2 for split systems, and 8.0 for packaged systems.