



ENERGY STAR® Program Requirements Product Specification for Air Source Heat Pump and Central Air Conditioner Equipment

Eligibility Criteria Draft 1 Version 6.0

1 Following is the Draft 1 Version 6.0 product specification for ENERGY STAR certified central air conditioner
2 and air source heat pump equipment. A product shall meet all of the identified criteria if it is to earn the
3 ENERGY STAR.
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6 **1) Definitions:** Below are the definitions of the relevant terms in this document.
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- 8 A. Air-Source Heat Pump (ASHP)¹: An air-source unitary heat pump model is a product other than a
9 packaged terminal heat pump, which consists of one or more assemblies, powered by single phase
10 electric current, rated below 65,000 Btu per hour, utilizing an indoor conditioning coil, compressor, and
11 refrigerant-to-outdoor air heat exchanger to provide air heating, and may also provide air cooling,
12 dehumidifying, humidifying circulating, and air cleaning.
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- 14 B. Central Air Conditioner¹: A central air conditioner is a product which is powered by single phase
15 electric current, air cooled, rated below 65,000 Btu per hour, not contained within the same cabinet as
16 a furnace, the rated capacity of which is above 225,000 Btu per hour, and is a heat pump or a cooling
17 unit only.
18
- 19 C. Single Package²: A single package unit is an ASHP or central air conditioner that has all major
20 assemblies enclosed in a single cabinet.
21
- 22 D. Split System²: A split system is an ASHP or central air conditioner that has one or more of the major
23 assemblies separated from the others.
24
- 25 E. Gas/Electric Package Unit: A single package unit with gas heating and electric air conditioning that is
26 often installed on a slab or roof.
27
- 28 F. Basic Model¹: All units of a given type of covered product (or class thereof) manufactured by one
29 manufacturer and which have the same primary energy source and, which have essentially identical
30 electrical, physical, or functional (or hydraulic) characteristics that affect energy consumption, energy
31 efficiency, water consumption or water efficiency.
32
- 33 G. Heating Seasonal Performance Factor (HSPF)³: HSPF is the total space heating required in region IV
34 during the space heating season, expressed in Btu, divided by the total electrical energy consumed by
35 the heat pump system during the same season, expressed in watt-hours.
36
- 37 H. Seasonal Energy Efficiency Ratio (SEER)²: SEER is the total heat removed from the conditioned
38 space during the annual cooling season, expressed in Btu, divided by the total electrical energy
39 consumed by the air conditioner or heat pump during the same season, expressed in watt-hours.
40
- 41 I. Energy Efficiency Ratio (EER)²: EER is the ratio of the average rate of space cooling delivered to the
42 average rate of electrical energy consumed by the air conditioner or heat pump. This ratio is
43 expressed in Btu per watt.h (Btu/W.h).
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45

46 ¹ 10 CFR part 430, Subpart A, § 430.2 Definitions

47 ² 10 CFR part 430, Subpart B, Appendix M

48 ³ Based on definition in 10 CFR part 430, Subpart B, Appendix M
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- 50 J. Coefficient of Performance (COP)¹: COP means the ratio of the average rate of space heating
51 delivered to the average rate of electrical energy consumed by the heat pump. These rate
52 quantities must be determined from a single test or, if derived via interpolation, must be
53 determined at a single set of operating conditions. COP is a dimensionless quantity. When
54 determined for a ducted coil-only system, COP must include the sections 3.7 and 3.9.1 of 10 CFR
55 Part 430 Subpart B, Appendix M: Default values for the heat output and power input of a fan
56 motor.
- 57 K. Percentage of Heating Capacity @ 5°F: The capacity of a given unit as measured under the
58 conditions defined by Appendix M1 at 5°F, divided by the heating capacity as measured per
59 Appendix M at 47°F, expressed as a percentage.

60 **Note:** EPA has included the definition of COP as defined in Appendix M to Subpart B of 10 CFR Part 430.
61 EPA has also provided a definition of Percentage of Rated Capacity @ 5°F as required for Cold Climate
62 ASHPs. Our understanding is that the most useful measure of 5F capacity is relative to the 47F capacity.
63 However, this does entail a comparison between an Appendix M measurement and an Appendix M1
64 measurement. EPA welcomes feedback on this definition, and suggestions of alternatives that would
65 demonstrate heating capacity at cold temperatures.

- 66
- 67 L. Independent Coil Manufacturer (ICM): A manufacturer that manufactures only the indoor unit (coil) in a
68 Central Air Conditioner or Air-Source Heat Pump Split System.
- 69
- 70 M. System Manufacturer (SM): A manufacturer that manufactures all the major assemblies in an Air-
71 Source Unitary Heat Pump and/or Unitary Air-Conditioner.

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73 **2) Scope:**

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- 75 A. Included Products: Single package, split system, and gas/electric package units that meet the
76 definitions of an ASHP or central air conditioner as specified herein are eligible for ENERGY STAR
77 certification, with the exception of products listed in Section 2.B. Units may be intended for
78 installation into a duct system, or may be ductless.
- 79
- 80 B. Excluded Products: Three phase central air conditioners and ASHPs, and products rated at 65,000
81 Btu/h or above are not eligible for ENERGY STAR.

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83 **3) Certification Criteria:**

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- 85 A. Climates: ENERGY STAR requirements for ASHPs are divided into the following two climate
86 applications.
- 87 a. Cold Climate – Criteria designed for applications where performance should be optimized for
88 peak heating and part-load cooling performance.
- 89 b. Moderate and Hot Climate – Criteria designed for applications where performance should be
90 optimized for peak cooling performance.
- 91

¹ 10 CFR part 430 Subpart B, Appendix M

92 **Note:** EPA recognizes that there is an increasing market for heat pumps that perform well in colder climates
 93 and proposes a differentiated specification to recognize those units that are best suited to those installed
 94 locations. Under this proposal, EPA would identify those ASHPs meeting Cold Climate requirements with a
 95 modified ENERGY STAR certification mark designating those units as “ENERGY STAR Cold Climate.” All
 96 other qualifying ASHP units would comply with the SEER, EER, and HSPF requirements specified below for
 97 Moderate and Hot Climate (but not the additional COP requirement applied to Cold Climate products) and
 98 use an ENERGY STAR Moderate and Hot Climate designation. As with furnaces, it would be incumbent on
 99 brand owners to ensure that the correct designation is associated with each model or combination. The
 100 designations tailored for this purpose are intended to inform consumers of the suitability of an ASHP to their
 101 climate type without imposing strict requirements associated with installed or sold location. This has the
 102 advantage of providing better information for consumers in the many states with a moderate climate on
 103 average but with areas where a cold climate heat pump would perform better.

104 The climate differentiated approach outlined above is a modification of the approach EPA took for furnaces.
 105 We prefer the flexibility and simplicity it provides, but we could also use a state-specific regional approach
 106 that would be more like the Version 4.0 Furnace specification. In this case, regions are based on $\geq 5,000$
 107 HDD (population-weighted average by state), in accordance with the regions established by DOE in 76 CFR
 108 37408. This type of regional label would include a shaded map to ensure that consumers are aware of the
 109 ENERGY STAR equipment that is most appropriate for their state, similar to the furnace US South
 110 certification mark below.



111
 112 CACs would continue to use the standard ENERGY STAR label.
 113 EPA would appreciate feedback regarding a climate-differentiated specification and label and welcomes
 114 feedback on these alternate approaches to it.

115 B. Energy Efficiency Requirements:

116 **Table 2: Energy-Efficiency Criteria for Certified Residential Central Air Conditioners**
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Product Type	SEER	EER
CAC Split Systems	≥ 16.00	≥ 12.50
CAC Single Package Equipment ¹	≥ 16.00	≥ 12.00

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Table 3: Energy-Efficiency Criteria for Certified Residential ASHPs

For purposes of ENERGY STAR certification, an ASHP model must be designated as either Moderate and Hot Climate or Cold Climate and meet the associated requirements in Table 3.

Product Type	Moderate and Hot Climate			Cold Climate				
	SEER	EER	HSPF	SEER	EER	HSPF	COP @ 5°F	Percentage of Heating Capacity @ 5°F
ASHP Split Systems	≥ 16.00	≥ 12.50	≥ 8.50	≥ 16.00	≥ 11.50	≥ 9.00	1.75	80%
ASHP Single Package Equipment ¹	≥ 16.00	≥ 12.00	≥ 8.20	≥ 16.00	≥ 11.00	≥ 9.00	1.75	80%

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1. Including gas/electric package units.

136 C. Staged or Variable Capacity Requirement: To earn the ENERGY STAR, the unit must be capable
137 of operating at two or more distinct capacities or must have a capacity which is continuously
138 variable.
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140 **Note:** In order to recognize ASHPs that best serve their installed location, EPA proposes climate specific
141 requirements that reflect the efficiency needs of the climates defined previously in this specification. For
142 Cold Climate ASHPs, EPA has increased the HSPF criteria and relaxed the EER criteria, as well as adding
143 further requirements to characterize performance in colder temperatures.

144 To standardize recognition of cold climate performance across different energy efficiency specifications,
145 EPA has based the COP @ 5 °F on the Northeast Energy Efficiency Partnerships (NEEP) cold climate Air
146 Source Heat Pump (ccASHP) Specification Version 3.0. Cold climate heat pumps will also be required to
147 provide a minimum of 80% of their 47°F heating capacity at the 5°F test condition to verify their suitability for
148 use in cold climates. Stakeholders are requested to comment on the proposed differentiated specification
149 and/or additional recognition for heat pumps appropriate for cold climates. EPA is also interested in whether
150 the proposed levels require amendment, specifically in reference to regional suitability and market
151 availability.

152 Staged and variable capacity CACs and ASHPs provide an opportunity to correct for oversizing and improve
153 consumer comfort. EPA is proposing to require at least two stages of capacity for a unit to be recognized as
154 ENERGY STAR.

155 Stakeholders are invited to comment on any issues or concerns they may have regarding the exclusion of
156 single capacity units, particularly information about realistic situations where fixed capacity systems are a
157 better choice. Stakeholders have shared that single capacity units would provide similar performance in
158 some situations, if properly sized, at a lower cost. However, none have shared any detail about which
159 situations, and without evidence that proper sizing is becoming more common. Additionally, EPA proposes
160 a higher SEER level, in response to stakeholder discussions that indicate there are no dual capacity units
161 on the market with SEER under 16. Given this, raising the SEER level allows the savings from greater
162 seasonal efficiency to be reflected in the expected savings of ENERGY STAR certified products. EPA is
163 interested to know whether the HSPF of dual capacity units is similarly higher.

164 D. Multiple Assemblies: For split system ASHP and central air conditioner, ENERGY STAR certification
165 shall be determined by the rated performance of the particular combination of indoor and outdoor
166 units as tested in accordance with the appropriate regional test procedure, regardless of the fact
167 that the components may be used in other combinations.

168 E. Gas/Electric Package Units: To certify as ENERGY STAR, gas/electric package units shall meet
169 the cooling portion of the single package specification requirements in Tables 2 and 3, above.
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- 171 F. ICM coil combinations: To certify as ENERGY STAR, ICM coil combinations shall meet the Central
 172 Air Conditioner and Air-Source Heat Pump Split System specification requirements in Tables 2 and 3,
 173 above and include a condensing (outdoor) unit listed in the ENERGY STAR program by a
 174 system manufacturer.
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- 176 G. The HSPF and SEER ratings for split systems shall be identical to the levels reported to DOE and
 177 appropriately reflected on the current Federal Trade Commission (FTC) Energy guide label. For
 178 packaged units, the HSPF and SEER ratings shall be identical to the levels reported on the Federal
 179 Trade Commission (FTC) Energy guide label and to those reported to DOE. For all units where EER
 180 is reported to DOE, the EER reported to EPA shall be identical.
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- 182 H. Significant Digits and Rounding:
- 183 a. All calculations shall be carried out with actual measured or observed values. Only the final
 184 result of a calculation shall be rounded. Unless otherwise directed below, calculated results
 185 shall be rounded to the nearest significant digit as expressed in the corresponding specification
 186 limit.
- 187 b. Unless otherwise specified, compliance with specification limit shall be evaluated using exact
 188 values without any benefit from rounding.
- 189 c. As specified in 10 CFR, 430.23(m)(3), SEER, and HSPF shall be rounded off to the nearest
 190 0.05 Btu/W.h. Similarly, EER should also be rounded off to the nearest 0.05 Btu/W.h.
- 191 d. As specified in 10 CFR part 430 Subpart B, Appendix M, capacity shall be expressed in
 192 accordance with in Table 4, below

193 **Table 4: Rounding Requirements for Capacity**

Capacity Ratings, Btu/h	Multiples, Btu/h
< 20,000	100
≥ 20,000 and < 38,000	200
≥ 38,000 and < 65,000	500

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195 **4) Connected Product Criteria:**

196 **Note:** Language for Connected Product Criteria is currently under development and stakeholders should
 197 expect Draft 2 of this specification to include optional connected criteria. EPA's proposed connected criteria
 198 will be strongly informed by the recently-released AHRI 1380 technical standard. In addition, we will
 199 consider comments received on the [Connected Criteria for Large Load Products Discussion Guide](#).

200 **5) Test Requirements:**

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- 202 A. One of the following sampling plans shall be used for purposes of testing for ENERGY STAR
 203 certification:
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- 205 a. A single unit is selected, obtained, and tested. The measured performance of this unit and
 206 of each subsequent unit manufactured must be equal to or better than the ENERGY STAR
 207 specification requirements. Results of the tested unit may be used to certify additional
 208 individual model variations within a Basic Model as long as the definition for Basic Model
 209 provided in Section 1, above, is met; or
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- 211 b. Ratings are determined pursuant to the sampling requirements defined in 10 CFR Part
 212 429, Subpart B § 429.16 either by selecting units for testing or by the application of an
 213 alternative rating method (ARM) as defined in 10 CFR Part 429.70. The certified rating
 214 must be equal to or better than the ENERGY STAR specification requirements. Results of
 215 the tested or simulated unit may be used to certify additional model variations within a
 216 Basic Model as long as the definition for provided above and in 10 CFR Part 430.2 is met.
 217 Further, all individual models within a Basic Model must have the same certified rating per
 218 DOE's regulations in Part 429 and this rating must be used for all manufacturer literature,

- 219 the certified product list, and certification of compliance to DOE energy conservation
 220 standards.
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 222 c. For heat pumps to achieve the ENERGY STAR with the Cold Climate regional label, the
 223 testing must include the H4 very low temperature condition as defined in 10 CFR part 430
 224 Subpart B, Appendix M1, Table 11 through Table 15 as applicable. This test condition shall
 225 be used to determine COP and Percentage of Rated Capacity at 5° F as required by Table
 226 3 in this specification. Heat pumps looking to achieve the ENERGY STAR with the Cold
 227 Climate regional label must follow 10 CFR part 430 Subpart B, Appendix M to determine
 228 SEER, EER, and HSPF.
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 230 B. When testing ASHPs and central air conditioners, the following test method shall be used to
 231 determine ENERGY STAR certification:
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233 **Table 5: Test Method for ENERGY STAR Certification**

ENERGY STAR Requirement	Region	Test Method Reference
SEER, EER, HSPF	Cold Climate and Moderate and Hot Climate	10 CFR part 430 Subpart B, Appendix M
COP @ 5° F, Percentage of Heating Capacity @ 5° F	Cold Climate	10 CFR part 430 Subpart B Appendix M1 for H4 very low temperature Heating Test condition only

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235 **Note:** As stated above, EPA seeks to validate cold climate performance with consistent test data without
 236 imposing undue burden on our partners. The testing procedure described in Appendix M1 is intended to
 237 allow for structure and consistency to be added to the 5° F reported data, without requiring full compliance
 238 with Appendix M1 prior to its effective date.

239 Stakeholders are invited to provide feedback on the feasibility of implementing this additional test point and
 240 any concerns about compliance with the test method. EPA is aware of potential impacts of the static
 241 pressure specified in the Appendix M1 procedure on measured COP and is specifically interested in
 242 receiving feedback or data regarding such impacts.

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244 **6) Effective Date:** This ENERGY STAR ASHP and Central Air-Conditioners Specification shall take effect on
 245 **TBD.** To certify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in
 246 effect on the date of manufacture. The date of manufacture is specific to each unit and is the date (e.g.,
 247 month and year) on which a unit is considered to be completely assembled.
 248

249 **Note:** EPA aims to finalize the Version 6.0 CAC/ASHP specification by the end of 2019, with an effective
 250 date in Q3 or Q4 of 2020.

251

252 **7) Future Specification Revisions:** EPA reserves the right to change the specification should technological
 253 and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with
 254 current policy, revisions to the specification are arrived at through industry discussions. In the event of a
 255 specification revision, please note that the ENERGY STAR certification is not automatically granted for the
 256 life of a product model.
 257