# MINIMUM EFFICIENCY REQUIREMENTS TABLES FOR HEATING AND COOLING PRODUCT CATEGORIES

The Federal Energy Management Program (FEMP) created tables that mirror American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1-2019 tables, which include minimum efficiency requirements for FEMP-designated and ENERGY STAR-qualified heating and cooling product categories.

**Air-Source Heat Pumps (Residential), Central Air Conditioners (Residential), Geothermal Heat Pumps (Residential), and Light Commercial Heating and Cooling Equipment**

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| **Electrically Operated Unitary Heat Pumps: Minimum Efficiency Requirements** |
| **Equipment Type** | **Size Category** | **Heating Section Type** | **Subcategory or Rating Condition** | **Minimum Efficiency** |
| Air-cooled (cooling mode) | <65,000 Btu/h | All | Split system | 15.0 SEERa; 12.5 EERb; 8.5 HSPFc (single phase); 14.0 SEER (three phased) |
| Single package | 15.0 SEER; 12.0 EER; 8.2 HSPF (single phase); 14.0 SEER (three phased) |
| ≥65,000 Btu/h and <135,000 Btu/h | Electric resistance (or none) | Split system and single package | 11.8 EER; 12.8 IEERe; 3.4 COPf at 47ºF |
| All other | Split system and single package | 11.6 EER; 12.6 IEER; 3.4 COP at 47ºF |
| ≥135,000 Btu/h and <240,000 Btu/h | Electric resistance (or none) | Split system and single package | 10.9 EER; 12.0 IEER; 3.3 COP at 47ºF |
| All other | Split system and single package | 10.7 EER; 11.8 IEER; 3.3 COP at 47ºF |
| ≥240,000 Btu/hg | Electric resistance (or none) | Split system and single package | 9.5 EER; 10.6 IEER |
| All other | Split system and single package | 9.3 EER; 10.4 IEER |
| Geothermal, closed loop water-to-air |  |  |  | 17.1 EER; 3.6 COP (single phase) |
| Geothermal, open loop water-to-air |  |  |  | 21.1 EER; 4.1 COP (single phase) |
| Geothermal, closed loop water-to-water |  |  |  | 16.1 EER; 3.1 COP (single phase) |
| Geothermal, open loop water-to-water |  |  |  | 20.1 EER; 3.5 COP (single phase) |
| Geothermal, direct geoexchange |  |  |  | 16.0 EER; 3.6 COP (single phase) |
| a Seasonal Energy Efficiency Ratio (SEER) is the total heat removed from the conditioned space during the annual cooling season, expressed in British thermal units (Btu), divided by the total electrical energy consumed by the air conditioner or heat pump during the same season, expressed in Watt-hours.b Energy Efficiency Ratio (EER) is the ratio of the average rate of space cooling delivered to the average rate of electrical energy consumed by the air conditioner or heat pump. This ratio is expressed in Btu/Watt-hour.c Heating Seasonal Performance Factor (HSPF) is the total space heating required in U.S. climate region IV (mixed dry climate) during the space heating season, expressed in Btu, divided by the total electrical energy consumed by the heat pump system during the same season, expressed in Watt-hours.d Three-phase heat pumps in the <65,000 Btu/h category are not covered by federal purchasing requirements. Minimum efficiency presented is consistent with ASRHAE 90.1 requirements Table 6.8.1-2.e Integrated Energy Efficiency Ratio (IEER) is a weighted average calculation of mechanical cooling EERs determined for four load levels and corresponding rating conditions, as measured in Appendix A of Subpart F of 10 CFR part 431, expressed in Btu/Watt-hour.f Coefficient of Performance (COP) is the ratio of the produced cooling effect of an air conditioner or heat pump (or its produced heating effect, depending on the mode of operation) to its net work input, when both the cooling (or heating) effect and the net work input are expressed in identical units of measurement.g Heat pumps with size equal to or greater than 240,000 Btu/h are not covered by federal purchasing requirements. Minimum efficiency presented is consistent with ASRHAE 90.1 requirements Table 6.8.1-2.All definitions are taken from ENERGY STAR or other reputed sources. |

**Central Air Conditioners and Light Commercial Heating and Cooling Equipment**

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| **Electrically Operated Unitary Air Conditioners: Minimum Efficiency Requirements** |
| **Equipment Type** | **Size Category** | **Heating Section Type** | **Subcategory or Rating Condition** | **Minimum Efficiency** |
| Air conditioners, air-cooled | <65,000 Btu/h | All | Split system | 15.0 SEER and 12.5 EER (single phase); 13.0 SEER (three phasea) |
| Single package | 15.0 SEER and 12.0 EER (single phase); 14.0 SEER (three phasea) |
| ≥65,000 Btu/h and <135,000 Btu/h | Electric resistance (or none) | Split system and single package | 12.2 EER and 14.0 IEER |
| All other | Split system and single package | 12.0 EER and 13.8 IEER |
| ≥135,000 Btu/h and <240,000 Btu/h | Electric resistance (or none) | Split system and single package | 12.2 EER and 13.2 IEER |
| All other | Split system and single package | 12.0 and 13.0 IEER |
| ≥240,000 Btu/h and <760,000 Btu/hb | Electric resistance (or none) | Split system and single package | 10.0 EER and 11.6 IEER |
| All other | Split system and single package | 9.8 EER and 11.4 IEER |
| ≥760,000 Btu/hb | Electric resistance (or none) | Split system and single package | 9.7 EER and 11.2 IEER |
| All other | Split system and single package | 9.5 EER and 11.0 IEER |
| a Three phase air conditioners in the <65,000 Btu/h category are not covered by federal purchasing requirements.b Air conditioners with size equal to or greater than 240,000 Btu/h are not covered by federal purchasing requirements. Minimum efficiency presented is consistent with ASRHAE 90.1 Table 6.8.1-1. |

**Boilers (Residential) and Boilers (Commercial)**

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| **Gas- and Oil-Fired Boilers: Minimum Efficiency Requirements** |
| **Equipment Type** | **Subcategory or Rating Condition** | **Size Category (Input)** | **Efficiency Metric** | **Minimum Efficiency** |
| Boilers, hot water | Gas-fired | <300,000 Btu/h | AFUEa | 90% |
| ≥300,000 Btu/h and ≤2,500,000 Btu/h | Etb | 94% |
| >2,500,000 Btu/h and ≤10,000,000 Btu/h | Ecd | 96% |
| >10,000,000 Btu/hd | Ec | 82% |
| Oil-fired | <300,000 Btu/h | AFUE | 87% |
| ≥300,000 Btu/h and ≤2,500,000 Btu/h | Et | 94% |
| >2,500,000 Btu/h and ≤10,000,000 Btu/h | Ec | 89% |
| >10,000,000 Btu/hd | Ec | 84% |
| Boilers, steam | Gas-fired | <300,000 Btu/h | AFUE | 90% |
| Gas-fired (all, except natural draft) | ≥300,000 Btu/h and ≤2,500,000 Btu/h | Et | 94% |
| >2,500,000 Btu/h and ≤10,000,000 Btu/h | Et | 83% |
| >10,000,000 Btu/hd | Et | 79% |
| Gas-fired, natural draft | ≥300,000 Btu/h and ≤2,500,000 Btu/h | Et | 94% |
| >2,500,000 Btu/h and ≤10,000,000 Btu/h | Et | 83% |
| >10,000,000 Btu/hd | Et | 79% |
| Oil-fired | <300,000 Btu/h | AFUE | 87% |
| ≥300,000 Btu/h and ≤2,500,000 Btu/h | Et | 94% |
| >2,500,000 Btu/h and ≤10,000,000 Btu/h | Et | 85.5% |
| >10,000,000 Btu/hd | Et | 81% |
| a Annual Fuel Utilization Efficiency (AFUE) is the ratio of annual output energy to annual input energy, which includes any non-heating season pilot input loss and, for gas or oil-fired furnaces or boilers, does not include electric energy. Residential Boilers are covered by ENERGY STAR and use AFUE as the efficiency metric.b Thermal Efficiency (Et) is based on Hydronics Institute, Method to Determine Efficiency of Commercial Space Heating Boilers (HI BTS-2000, Rev. 06.07), and includes the radiation and convection losses from boiler shell in addition to the flue losses.c Combustion Efficiency (Ec) is the total energy input (100%) minus the percent of flue losses.d Boilers with input greater than 10,000,000 Btu/h are not covered by federal purchasing requirements. Minimum efficiency presented is consistent with ASRHAE 90.1-2019 Table 6.8.1-6. |

**Electric Chillers, Air-Cooled and Water-Cooled**

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| **Water-Chilling Packages: Minimum Efficiency Requirements** |
| **Equipment Type** | **Size Category**  | **Units** | **Minimum Efficiency** |
| **Path A (Full-Load Optimized Applications)** | **Path B (Part-Load Optimized Applications)** |
| Air-cooled | <150 t | EERa (Btu/W) | ≥10.89 FLb | ≥9.70 FL |
| ≥13.7 IPLVc | ≥16.86 IPLV |
| Air-cooled | ≥150 t | EER (Btu/W) | ≥10.964 FL | ≥9.70 FL |
| ≥14.00 IPLV | ≥17.13IPLV |
| Water-cooled, electrically operated positive displacement | <75 t | kW/t | ≤0.728 FL | ≤0.78 FL |
| ≤0.60 IPLV | ≤0.50 IPLV |
| Water-cooled, electrically operated positive displacement | ≥75 t and <150 t | kW/t | ≤0.714 FL | ≤0.75 FL |
| ≤0.56 IPLV | ≤0.49 IPLV |
| Water-cooled, electrically operated positive displacement | ≥150 t and <300 t | kW/t | ≤0.628 FL | ≤0.68 FL |
| ≤0.54 IPLV | ≤0.44 IPLV |
| Water-cooled, electrically operated positive displacement | ≥300 t and <600 t | kW/t | ≤0.61 FL | ≤0.625 FL |
| ≤0.52 IPLV | ≤0.41 IPLV |
| Water-cooled, electrically operated positive displacement | ≥600 t | kW/t | ≤0.56 FL | ≤0.585 FL |
| ≤0.50 IPLV | ≤0.38 IPLV |
| Water-cooled, electrically operated centrifugal | <150 t | kW/t | ≤0.61 FL | ≤0.695 FL |
| ≤0.55 IPLV | ≤0.44 IPLV |
| Water-cooled, electrically operated centrifugal | ≥150 t and <300 t | kW/t | ≤0.544 FL | ≤0.635 FL |
| ≤0.55 IPLV | ≤0.38 IPLV |
| Water-cooled, electrically operated centrifugal | ≥300 t and <400 t | kW/t | ≤0.544 FL | ≤0.595 FL |
| ≤0.52 IPLV | ≤0.37 IPLV |
| Water-cooled, electrically operated centrifugal | ≥400 t and <600 t | kW/t | ≤0.541 FL | ≤0.585 FL |
| ≤0.50 IPLV | ≤0.36 IPLV |
| Water-cooled, electrically operated centrifugal | ≥600 t | kW/t | ≤0.52 FL | ≤0.585 FL |
| ≤0.50 IPLV | ≤0.325 IPLV |
| a Energy Efficiency Ratio (EER) is the ratio of the average rate of space cooling delivered to the average rate of electrical energy consumed by the equipment (in this case. chiller). In the case of chillers, it is expressed in British thermal unit/Watt (Btu/W).b Full-Load efficiency (FL) is calculated while the equipment is operating at 100% load.c Integrated Part-Load Value (IPLV) efficiency is calculated using the efficiency of the equipment while operating at load capacities of 100%, 75%, 50%, and 25% as prescribed in the Air-Conditioning, Heating, and Refrigeration Institute 550/590 test procedure. |

**Electric Water Heaters, Gas Storage Water Heaters, Gas Water Heaters, and Solar Water Heaters**

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| **Water-Heating Equipment: Performance Requirements** |
| **Equipment Type** | **Size Category (Input)** | **Subcategory or Rating Condition** | **Performance Required** |
| Electric water heaters | ≤24 A and ≤250 V | Integrated Heat Pump Water Heater (HPWH)  | UEFa ≥3.3 and FHRb ≥45 gal/h |
| Integrated HPWH, 120 Volt / 15 Amp Circuit  | UEF ≥2.2 and FHR ≥45 gal/h |
| Split-system HPWH  | UEF ≥2.2 and FHR ≥45 gal/h |
| >12kW | HPWH | COPh­ ≥3.0  |
| Gas storage water heaters | ≤75,000 Btu/h | ≥20 gal and ≤55 gal | UEF ≥0.64 (Medium DPc); UEF ≥0.68 (High DP) and FHR ≥51 gal/h |
| >55 gal and ≤100 gal | UEF ≥0.78 (Medium DP); UEF 0.80 (High DP) and FHR ≥51 gal/h |
|  >75,000 and ≤105,000 Btu/hrd | ≤120 gal≤180ºF | UEF ≥0.80 |
| >75,000 Btu/h | <4,000 (Btu/h)/gal | TEe ≥0.94 and SLf ≤0.84 \* [(input rate/800) + 100√volume)] Btu/h |
| Gas instantaneous water heaters | ≥50,000 Btu/h and <200,000 Btu/h | <4,000 (Btu/h)/gal | UEF ≥0.87 and GPMg ≥2.8 over a 67ºF rise |
| ≥200,000 Btu/h | ≥4,000 (Btu/h)/gal | TE ≥0.94 and SL ≤0.84 \* [(input rate/800) + 100√volume)] Btu/h  |
| Solar water heaters | ≤75,000 Btu/h | Electric backup | SUEFh ≥3.0 |
| Gas backup | SUEF ≥1.8 |
| a Uniform Energy Factor (UEF) is the measure of water heater energy efficiency, as defined in 10 CFR 430 Subpart B.b First-Hour Rating (FHR) is an estimate of the maximum volume of hot water in gallons that a storage water heater can supply within an hour that begins with the water heater fully heated.c Draw Pattern (DP) refers to the water draw profile in the UEF test.d Gas storage water heaters with input capacity >75,000 and ≤105,000 Btu/hr must comply with the requirements of the >75,000 Btu/hr if the water heater either (1) has a storage volume > 120 gal; (2) is designed to provide outlet hot water temperatures greater than 180°F; or (3) uses three-phase power.e Thermal Efficiency (TE) is the ratio of the heat transferred to the water flowing through the water heater to the amount of energy consumed by the water heater.f SL is the standby loss.g Gallons per Minute (GPM) is the amount of gallons per minute of hot water that can be supplied by an instantaneous water heater while maintaining a nominal temperature rise of 77°F during steady state operation.h Solar Uniform Energy Factor (SUEF) refers to the energy delivered by the total system divided by the electrical or gas energy put into the system. |

**Gas Furnaces**

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| **Warm-Air Furnaces: Minimum Efficiency Requirements** |
| **Equipment Type** | **Size Category (Input)** | **Subcategory or Rating Condition** | **Minimum Efficiency** |
| Warm-air furnace, gas fired | <225,000 Btu/h | Maximum capacity | ≥95.0% (U.S. North/Canada) |
| ≥90.0% (U.S. South) |
| ≥225,000 Btu/ha | Maximum capacity | 80% Et |
| Warm-air furnace, oil fired | <225,000 Btu/h | Maximum capacity | ≥85% AFUE |
| ≥225,000 Btu/ha | Maximum capacity | 81% Et |
| a Furnaces with input equal to or greater than 225,000 Btu/h are not covered by federal purchasing requirements. Minimum efficiency presented is consistent with ASRHAE 90.1-2013 Table 6.8.1-5.  |

**Room Air Conditioners**

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| **Electrically Operated Room Air Conditioners: Minimum Efficiency Requirements** |
| **Equipment Type** | **Size Category (Input)** | **Subcategory or Rating Condition** | **Minimum Efficiency** |
| Room air conditioners with louvered sides | <6,000 Btu/h | - | 12.1 CEER |
| ≥6,000 Btu/h and <8,000 Btu/h | - | 12.1 CEER |
| ≥8,000 Btu/h and <14,000 Btu/h | - | 12.0 CEER |
| ≥14,000 Btu/h and <20,000 Btu/h | - | 11.8 CEER |
| ≥20,000 Btu/h and <28,000 Btu/h | - | 10.3 CEER |
| ≥ 28,000 |  | 9.9 CEER |
| Room air conditioners without louvered sides | <8,000 Btu/h | - | 11.0 CEER |
| ≥8,000 Btu/h and <11,000 Btu/h | - | 10.6 CEER |
| ≥11,000 Btu/h and <14,000 Btu/h | - | 10.5 CEER |
| ≥14,000 Btu/h and <20,000 Btu/h | - | 10.2 CEER |
| ≥20,000 Btu/h |  | 10.3 CEER |
| Room air-conditioner heat pumps with louvered sides | <20,000 Btu/h | - | 10.8 CEER |
| ≥20,000 Btu/h | - | 10.2 CEER |
| Room air-conditioner heat pumps without louvered sides | <14,000 Btu/h | - |  10.2 CEER |
| ≥14,000 Btu/h | - |  9.6 CEER |
| Room air conditioner, casement only | All capacities | - | 10.5 CEER |
| Room air conditioner, casement slider | All capacities | - | 11.4 CEER |