

Amendment: Auxiliary Electric Energy of Ground Source Heat Pumps

Proponent:

RESNET Technical Committee

Effective Date:

February 18, 2012

Applies to:

2006 Mortgage Industry National Home Energy Rating Systems Standards

Section 303.5 Operating Condition Assumptions

Section 303.7 Minimum Rated Features

Proposed Amendment

Insert the following, and renumber subsequent sections as necessary:

303.5.1.7 For residential ground-loop and ground-water water-to-air heat pumps that are shipped with an integral blower fan and without a fluid circulating pump heat pumps, the Auxiliary Electric Consumption Power shall be determined as follows:

$$\text{GSHP Auxiliary Electric Consumption Power (kWh/yr - Watts)} = \text{GSHP}_{\text{pump}} - \text{GSHP}_{\text{intp}} + \text{GSHP}_{\text{fanESP}}$$

Where:

$\text{GSHP}_{\text{pump}}$ in watts is the observed pump nameplate data (Volts * Amps), shall be added for all hours-periods of heat pump operation. Amps may be taken from nameplate as Run Load Amps (RLA) or Full Load Amps (FLA). Alternatively, pumping energy that is measured on-site with a watt-hour meter, or using measured V*A may be substituted. Such measured pumping energy may be further adjusted for on-site measured duty cycle during heat pump operation, when pumping is intermittent during continuous heat pump operation.

$\text{GSHP}_{\text{intp}}$ in watts is the estimated pump power required to overcome the internal resistance of the ground-water heat exchanger under AHRI test conditions. $\text{GSHP}_{\text{intp}} = \text{W/ton} * \text{rated cooling btu/h} / 12,000$. W/ton shall be 30 for ground loop (closed loop) systems and 15 for ground water (open loop) heat pump systems.

$\text{GSHP}_{\text{fanESP}}$: If ducts are attached to the system to deliver heating or cooling, the external fan energy in watts, $\text{GSHP}_{\text{fanESP}} = (\text{air flow in CFM} * 0.25 \text{ Watts/CFM})$, shall be added for all hours-periods of heat pump operation. If the design airflow is unknown, the default air flow in CFM shall be $(360 / 400 * \text{rated cooling btu/h} / 12,000)$, where 360 / 400 is the air flow in CFM per nominal ton (12 kbtu/h) of capacity. Note that for the purposes of calculating an adjusted equipment efficiency, $\text{GSHP}_{\text{fanESP}}$ shall also be added to the rated heating capacity, and subtracted from the rated cooling capacity of the equipment. For that adjustment, $\text{GSHP}_{\text{fanESP}}$ shall be converted into Btu/h by $\text{Btu/h} = \text{GSHP}_{\text{fanESP}} * 3.412$.

For the purpose of a projected rating only, if GSHP_{pump} can not be determined, the following adjustments may be made to the rated efficiency of the GSHP: Adjusted EER (closed loop) = 0.0000315*EER^3 - 0.0111*EER^2 + 0.959*EER

$$\text{Adjusted EER (open loop)} = 0.00005 * \text{EER}^3 - 0.0145 * \text{EER}^2 + 0.93 * \text{EER}$$

$$\text{Adjusted COP (closed loop)} = 0.000416 * \text{COP}^3 - 0.041 * \text{COP}^2 + 1.0086 * \text{COP}$$

$$\text{Adjusted COP (open loop)} = 0.00067 * \text{COP}^3 - 0.0531 * \text{COP}^2 + 0.976 * \text{COP}$$

Table 303.7.1(1) Minimum Rated Features

12. Heating Equipment	Equipment type, location, efficiency (AFUE, HSPF), auxiliary electric (Eae); power consumption rating of ground fluid circulating pump(s) for ground-loop and ground-water heat pumps
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Background/Rationale:

There were errors in the original amendment on Auxiliary Electric Energy of Ground Source Heat Pumps. First, the AHRI/ISO 13256 standard rating process includes an allowance for fan internal static pressure, which was double-counted in the original proposal. This amendment corrects the value from 0.5 W/CFM to 0.2 W/CFM, to reflect only fan external static pressure. Second, the AHRI/ISO 13256 standard rating process includes an allowance for pump internal static pressure, which was double-counted in the original proposal. This amendment corrects the added pump energy by subtracting a reasonable allowance for the rated pump energy under test conditions, before adding the actual pump energy as installed. Third, this amendment adds an efficiency adjustment that may be used for projected ratings in the absence of detailed pre-construction information about the pump. Finally, this amendment states explicitly that, for calculating adjusted equipment efficiency, the additional external fan energy GSHP_{fanESP} must also be added to the rated heating capacity and subtracted from the rated cooling capacity.