RESNET® HERS® Addendum 82
Direct Expansion HP & AC Modeling

Date Approved:	December 17, 2025
Voluntary Compliance Date:	TBD
Mandatory Compliance Date:	TBD
Transition Period:	TBD
Proponent:	SDC 300
Organization:	RESNET

Purpose:

RESNET has conducted a multi-year project to improve the performance modeling of heat pumps and air conditioners for implementation in home energy performance simulations used in HERS® Ratings. The modeling criteria are needed to ensure modeling consistency in HERS Rating software.

Amendment:

Modify HERS Chapter 3 section 303.1 as follows:

Exception 4: RESNET Home Energy Ratings shall be calculated using the modifications of Standards ANSI/RESNET/ICC 301 established by HERS addenda:

- **Addendum 66, CO_2e Index**
- **Addendum 79, Table 5.1.2(1) Informative Note Correction**
- **Addendum 82, Direct Expansion Heat Pump and Air Conditioner Modeling**
- **Addendum 89, Handheld Watt Meters**

Modify the ANSI/RESNET/ICC 301-2022 Appendix C by adding the following:

C.6 Direct Expansion Modeling

C.6.1 Nomenclature

Symbols

Symbol	Description	Units
Q	Heat (used for heating/cooling capacities and fan heat)	Btu/h
P	Power	W
p	Specific Fan Power	W/cfm
SHR	Sensible Heat Ratio for cooling	-
V	Volumetric airflow	cfm
v	Volumetric airflow per rated net total capacity	cfm/ton
m	Mass airflow	
T	Temperature	°F

Subscripts

Subscript	Description
gross	Does not include fan heat/power
net	Includes fan heat/power
clg	Cooling
tot	Total (cooling capacity)
sen	Sensible (cooling capacity)
htg	Heating
ss	Steady-state (heating), does not include defrost effects
int	Integrated (heating), includes defrost effects
A	AHRI "A" cooling rating conditions (95°F outdoor drybulb, 80°F indoor drybulb, 67°F indoor wetbulb)
full	Rated full load compressor speed. Note: For some variable speed systems, the rated full load compressor speed can be lower than the maximum load compressor speed.
max	Maximum load compressor speed
min	Minimum load compressor speed
i	Compressor speed/staging index
rated	Corresponding to the AHRI rating procedure. May be different from operational values observed in the field.
op	Corresponding to installed operation. Used to distinguish from values corresponding to rating procedures.

fan	Indoor fan
odb	Outdoor unit entering drybulb
iwb	Indoor unit entering wetbulb
idb	Indoor unit entering drybulb

C.6.2 Scope

Current scope includes the scope of AHRI 210/240. Not currently included are:

- Multi-splits
- Window AC/Portable AC
- PTAC/PTHP
- Ground source heat pumps

C.6.3 Objective

Define the best representation of as-installed performance for unitary air-conditioning and air-source heat pump equipment at all combinations of conditions encountered in a predictive building performance model. This often requires interpretations, extrapolations, and assumptions for many aspects of operation beyond equipment ratings, design conditions, and product documentation.

C.6.4 Net-to-Gross Performance Conversions

System performance shall be modeled using gross performance of the direct expansion system where the indoor fan performance is treated separately. Where net performance is provided, gross performance shall be determined by removing the impact of rated fan power/heat as follows:

$Q_{gross,tot,clg,i} = Q_{net,tot,clg,I} + Q_{fan,clg,i}$

$P_{gross,clg,i} = P_{net,clg,i} - P_{fan,clg,i}$

$Q_{gross,ss,htg,i} = Q_{net,ss,htg,i} - Q_{fan,ss,htg,i}$

$P_{gross,ss,htg,i} = P_{net,ss,htg,i} - P_{fan,ss,htg,i}$

The rated fan flow rate is:

$V_{rated,clg,\ i} = v_{clg,rated,i} * Q_{net,tot,clg,A,i} / (12{,}000\ (Btu/h)/ton)$

$V_{rated,htg,ss,\ i} = v_{rated,htg,ss,i} * Q_{net,ss,htg,H1,i} / (12{,}000\ (Btu/h)/ton)$

Where the values of $v_{rated,mode,i}$ (for all speeds) are:

System Type	**Mode**	**v_{rated} (cfm/ton)**
Ducted	Cooling	400
Ducted	Heating	400
Ductless	Cooling	400
Ductless	Heating	400

The rated fan power is determined using the specific fan power listed below.

System Type	**Fan Motor Type**	**p_{rated} (W/cfm)**
Ducted	PSC	0.414
Ducted	BPM	0.281
Ductless	PSC	0.414
Ductless	BPM	0.171

Rated fan power is:

$P_{fan,rated} = p_{rated}*V_{rated,clg,full}$

Fan power assumed in net performance at any speed or mode is then calculated as:

BPM Motors (Ducted Systems): $P_{fan,rated,mode,i} = P_{fan,rated}*(V_{rated,mode,i}/V_{rated,clg,full})^{2.75}$

BPM Motors (Ductless Systems): $P_{fan,rated,mode,i} = P_{fan,rated}*(V_{rated,mode,i}/V_{rated,clg,full})^{3}$

PSC Motors: $P_{fan,rated,mode,i} = P_{fan,rated}*(V_{rated,mode,i}/V_{rated,clg,full})*(0.3*(V_{rated,mode,i}/V_{rated,clg,full}) + 0.7))$

C.6.5 Variability with Indoor Conditions

Gross performance shall be modified to account for variations in indoor conditions relative to the indoor conditions under which the data is provided.

$Q_{gross,tot,clg,i} = Q_{gross,tot,clg,Todb,i}*f_{Q,clg,i}(T_{iwb},T_{odb},v)/f_{Q,clg,i}(67°F,T_{odb},v_{clg,i})$

$P_{gross,clg,i} = P_{gross,clg,Todb,i}*f_{EIR,clg,i}(T_{iwb},T_{odb},v)/f_{EIR,clg,i}(67°F,T_{odb},v_{clg,i})*f_{Q,clg,i}(T_{iwb},T_{odb},v)/f_{Q,clg,i}(67°F,T_{odb},v_{clg,i})$

$Q_{gross,ss,htg,i} = Q_{gross,ss,htg,Todb,i}*f_{Q,htg,i}(T_{idb},T_{odb},v)/f_{Q,htg,i}(70°F,T_{odb},v_{htg,ss,i})$

$P_{gross,ss,htg,i} = P_{gross,ss,htg,Todb,i}*f_{EIR,htg,i}(T_{idb},T_{odb},v)/f_{EIR,htg,i}(70°F,T_{odb},v_{htg,ss,i})*f_{Q,htg,i}(T_{idb},T_{odb},v)/f_{Q,htg,i}(70°F,T_{odb},v_{htg,ss,i})$

where the functions above are defined as:

$f(T_1,T_2,v) = (c_1 + c_2*T_1 + c_3*T_1^2 + c_4*T_2 + c_5T_2^2 + c_6T_1*T_2)*(c_7 + c_8*v/[400 cfm/ton] + c_9*(v/[400 cfm/ton])^2)$

Function:	$f_{Q,clg}(T_{iwb},T_{odb},v)$	$f_{EIR,clg}(T_{iwb},T_{odb},v)$	$f_{Q,htg}(T_{idb},T_{odb},v)$	$f_{EIR,htg}(T_{idb},T_{odb},v)$
c_1	3.717717741	-3.400341169	0.568706266	0.722917608
c_2	-0.09918866	0.135184783	-0.000747282	0.003520184
c_3	0.000964488	-0.001037932	-1.03432E-05	0.000143097
c_4	0.005887776	-0.007852322	0.00945408	-0.005760341
c_5	-1.2808E-05	0.000183438	5.0812E-05	0.000141736
c_6	-0.000132822	-0.000142548	-6.77828E-06	-0.000216676
c_7	0.718664047	1.143487507	0.694045465	2.185418751
c_8	0.41797409	-0.13943972	0.474207981	-1.942827919
c_9	-0.136638137	-0.004047787	-0.168253446	0.757409168

Cooling variations shall be held constant for T_{iwb} less than 57°F and greater than 72°F, and for T_{odb} less than 75°F. These functions are also referenced in the methodology for two-stage and single-stage systems.

C6.6 Calculation of Net Performance

Net capacity and power must be determined at all combinations of outdoor drybulb temperatures and compressor speeds. The following nomenclature is adopted to combine metrics, normalizations (if applicable), outdoor temperatures, and compressor speeds into distinct terms used in the modeling approach:

Metrics:

- Q = Net Capacity
- P = Net Power
- EIR = Net Energy Input Ratio (defined as Power/Capacity)
- COP = Net Coefficient of Performance (defined as Capacity/Power)

Normalizations:

- r = ratio (quantity relative to value at maximum compressor speed)
- m = maintenance (quantity relative to next least extreme outdoor temperature)
- mslope = maintenance slope (used to define how maintenance changing below 5°F)

Heating Outdoor Temperatures:

- 47 = 47°F
- 17 = 17°F
- 5 = 5°F
- LCT = Lowest Catalogued Temperature (product-specific value from NEEP data)
- Tmin = Minimum Compressor Operating Temperature (used in the model)

Cooling Outdoor Temperatures:

- 82 = 82°F
- 95 = 95°F

Compressor Speeds:

- min = Minimum capacity compressor speed
- full = Rated full load capacity compressor speed
- max = Maximum capacity compressor speed

For example, "EIRm5max" is the Energy Input Ratio maintenance at 5°F and maximum capacity compressor speed. It is the ratio of the EIR at 5°F relative to the EIR at 17°F (the next least extreme temperature) at maximum capacity compressor speed.

The following data from an AHRI Certificate shall be used as input to the model:

- *Q47full*: Heating Capacity (H1Full) High Stage (47°F)
- *Q17full*: Heating Capacity (H3Full) High Stage (17°F)
- *HSPF2* (Region IV)
- *Q95full*: Cooling Capacity (AFull) High Stage (95°F)
- *EER2* (AFull) High Stage (95°F)
- *SEER2*

C.6.7 Variable Capacity Systems (Systems with Three or More Stages)

Net heating performance data is defined at each combination of three compressor speeds (Minimum, Full, and Maximum) and four outdoor temperatures (Tmin, 5°F, 17°F, and 47°F).

Net cooling performance is defined at each combination of three compressor speeds (Minimum, Full, and Maximum) and two outdoor temperatures (82°F and 95°F).

The following mean values of normalized data from the NEEP database shall be used to determine the full set of performance data:

Quantity	**Definition**	**Mean Value**
Qr47full	Q47full/Q47max	0.908
Qr47min	Q47min/Q47max	0.272
Qr17full	Q17full/Q17max	0.817
Qr17min	Q17min/Q17max	0.341
Qm5max	Q5max/Q17max	0.866
Qr5full	Q5full/Q5max	0.988
Qr5min	Q5min/Q5max	0.321
QmslopeLCTmax	(1 - Q5max/QLCTmax)/(5°F - LCT)	-0.025
QmslopeLCTmin	(1 - Q5min/QLCTmin)/(5°F - LCT)	-0.024
Qr95full	Q95full/Q95max	0.934

Qm95max	Q95max/Q82max	0.940
Qm95min	Q95min/Q82min	0.948
EIRr47full	(P47full/Q47full)/(P47max/Q47max)	0.939
EIRr47min	(P47min/Q47min)/(P47max/Q47max)	0.730
EIRm17full	(P17full/Q17full)/(P47full/Q47full)	1.351
EIRr17full	(P17full/Q17full)/(P17max/Q17max)	0.902
EIRr17min	(P17min/Q17min)/(P17max/Q17max)	0.798
EIRm5max	(P5max/Q5max)/(P17max/Q17max)	1.164
EIRr5full	(P5full/Q5full)/(P5max/Q5max)	1.000
EIRr5min	(P5min/Q5min)/(P5max/Q5max)	0.866
EIRmslopeLCTmax	(1 - (PLCTmax/QLCTmax)/(P5max/Q5max))/(5°F - LCT)	0.012
EIRmslopeLCTmin	(1 - (PLCTmin/QLCTmin)/(P5min/Q5min))/(5°F - LCT)	0.012
EIRr95full	(P95full/Q95full)/(P95max/Q95max)	0.928
EIRm95max	(P95max/Q95max)/(P82max/Q82max)	1.326
EIRm95min	(P95min/Q95min)/(P82min/Q82min)	1.315

The following values are determined using bi-linear interpolation of the tables provided. The values in these tables are developed such that the model of the equipment results in consistent seasonal ratings when simulating the AHRI 210/240 2023 test procedures.

COP47full:

	HSPF2				
Qm17full	7	9.25	11.5	13.75	16
0.500	2.762	4.149	5.934	8.392	11.948
0.540	2.696	3.941	5.490	7.463	10.060
0.620	2.579	3.627	4.821	6.190	7.779
0.780	2.467	3.305	4.167	5.054	5.967
1.100	2.345	3.091	3.834	4.573	5.307

COP82min:

	SEER2		
SEER2/EER2	14	24.5	35
1.000	4.047	7.061	10.058
1.747	6.175	10.289	14.053
2.120	14.240	23.262	30.962

2.307	19.508	31.842	42.388
2.400	23.029	37.513	49.863

Full performance is calculated using the following equations based on the mean values of normalized data from the NEEP database (in **bold**) and the AHRI certified rating data (in *italics*):

Value	**Equation**
Q47max	*Q47full* / **Qr47full**
Q47min	Q47max * **Qr47min**
Q17max	*Q17full* / **Qr17full**
Q17min	Q17max * **Qr17min**
Q5max	Q17max * **Qm5max**
Q5full	Q5max * **Qr5full**
Q5min	Q5max * **Qr5min**
QTminmax	Q5max / (1 - **QmslopeLCTmax***(5°F - Tmin))
QTminmin	Q5min / (1 - **QmslopeLCTmin***(5°F - Tmin))
QTminfull	QTminmin + (Q5full - Q5min)/(Q5max - Q5min)*(QTminmax - QTminmin)
P47full	*Q47full* / (*COP47full* * 3.412 Btu/Wh)
P47max	P47full / (**Qr47full * EIRr47full**)
P47min	P47max * (**Qr47min * EIRr47min**)
P17full	P47full * ((*Q17full*/*Q47full*) * **EIRm17full**)
P17max	P17full / (**Qr17full * EIRr17full**)
P17min	P17max * (**Qr17min * EIRr17min**)
P5max	P17max * (**Qm5max * EIRm5max**)
P5full	P5max / (**Qr5full * EIRr5full**)
P5min	P5max * (**Qr5min * EIRr5min**)
PTminmax	P5max / ((QTminmax/Q5max) * (1 - **EIRmslopeLCTmax***(5°F - Tmin)))
PTminmin	P5min / ((QTminmin/Q5min) * (1 - **EIRmslopeLCTmin***(5°F - Tmin)))
PTminfull	PTminmin + (P5full - P5min)/(P5max - P5min)*(PTminmax - PTminmin)
Q95max	*Q95full* / **Qr95full**
Q82max	Q95max / **Qm95max**
P95full	*Q95full / EER2*
P95max	P95full / (**Qr95full * EIRr95full**)
P82max	P95max / (**Qm95max * EIRm95max**)
Q95min	Q95max * (0.029 + 0.369*(Q82max/(P82max*3.412 Btu/Wh))/*COP82min*)
Q82min	Q95min / **Qm95min**
Q82full	Q82min + (*Q95full* - Q95min)/(Q95max - Q95min)*(Q82max - Q82min)

P82min	Q82min / (COP82min * 3.412 Btu/Wh)
P95min	P82min * (Qm95min * **EIRm95min**)
P82full	P82min + (P95full - P95min)/(P95max - P95min)*(P82max - P82min)

C.6.8 Two Stage Systems

Net heating performance data is defined at each combination of two compressor speeds (Minimum and Full) and four outdoor temperatures (Tmin, 5°F, 17°F, and 47°F).

Net cooling performance is defined at each combination of two compressor speeds (Minimum and Full) and two outdoor temperatures (82°F and 95°F).

The following values of normalized data shall be used to determine the full set of performance data:

Quantity	**Definition/Calculation**	**Value**
Qm95full	Q95full/Q82full = 1.0 / $f_{Q,clg,i}$(67°F,82°F,400W/cfm)	0.936
EIRm17full	(P17full/Q17full)/(P47full/Q47full) = $f_{EIR,htg,i}$(70°F,17°F, 400W/cfm)	1.356
EIRm95full	(P95full/Q95full)/(P82full/Q82full) = 1.0 / $f_{EIR,clg,i}$(67°F,82°F,400W/cfm)	1.244
QrHmin	Qmin/Qfull for all heating temperatures	0.712
EIRrHmin	(Pmin/Qmin)/(Pfull/Qfull) for all heating temperatures	0.850
QrCmin	Qmin/Qfull for all cooling temperatures	0.728

The following values are determined using bi-linear interpolation of the tables provided. The values in these tables are developed such that the model of the equipment results in consistent seasonal ratings when simulating the AHRI 210/240 2023 test procedures.

COP47full:

	HSPF2				
Qm17full	5	6.5	8	9.5	11
0.500	1.794	2.592	3.583	4.852	6.536
0.533	1.779	2.540	3.464	4.611	6.073
0.600	1.757	2.456	3.270	4.227	5.371
0.733	1.720	2.325	2.980	3.691	4.467
1.000	1.659	2.176	2.703	3.239	3.785

COP82min:

	SEER2	
SEER2/EER2	6	22
1.000	1.777	6.517
2.400	2.105	7.717

Full performance is calculated using the following equations based on the normalized data (in **bold**) and the AHRI certified rating data (in *italics*):

Value	**Equation**
Q47min	*Q47full* * **QrHmin**
Q17min	*Q17full* * **QrHmin**
P47full	*Q47full* / (*COP47full* * 3.412 Btu/Wh)
P17full	P47full * ((*Q17full*/*Q47full*) * **EIRm17full**)
P47min	P47full * (**QrHmin** * **EIRrHmin**)
P17min	P17full * (**QrHmin** * **EIRrHmin**)
Q82full	Q95full / **Qm95full**
Q95min	Q95full * **QrCmin**
Q82min	Q82full * **QrCmin**
P95full	*Q95full* / *EER2*
P82full	P95full / (**Qm95full** * **EIRm95full**)
P82min	Q82min / (*COP82min* * 3.412 Btu/Wh)
P95min	P82min * (**Qm95full** * **EIRm95full**)

C.6.9 Single Stage Systems

Net heating performance data is defined at the "Full" compressor speed for four outdoor temperatures (Tmin, 5°F, 17°F, and 47°F).

Net cooling performance is defined at the "Full" compressor speed for two outdoor temperatures (82°F and 95°F).

The following values of normalized data shall be used to determine the full set of performance data:

Quantity	**Definition/Calculation**	**Value**
Qm95full	Q95full/Q82full = 1.0 / $f_{Q,clg,i}$(67°F,82°F,400W/cfm)	0.936
EIRm17full	(P17full/Q17full)/(P47full/Q47full) = $f_{EIR,htg,i}$(70°F,17°F,400W/cfm)	1.356

The following values are determined using bi-linear interpolation of the tables provided. The values in these tables are developed such that the model of the equipment results in consistent seasonal ratings when simulating the AHRI 210/240 2023 test procedures.

COP47full:

	HSPF2				
Qm17full	5	6.5	8	9.5	11
0.500	1.971	2.844	3.933	5.327	7.178
0.533	1.963	2.801	3.819	5.085	6.699
0.600	1.946	2.720	3.622	4.683	5.951
0.733	1.915	2.589	3.318	4.111	4.975
1.000	1.904	2.498	3.102	3.718	4.345

Full performance is calculated using the following equations based on the normalized data (in **bold**) and the AHRI certified rating data (in *italics*):

Value	**Equation**
P47full	*Q47full* / (*COP47full* * 3.412 Btu/Wh)
P17full	P47full * ((*Q17full*/*Q47full*) * **EIRm17full**)
P95full	*Q95full* / *EER2*
Q82full	Q95full / **Qm95full**
P82full	Q82full / ((*SEER2*/(1.0 – 0.5*C_D))) where C_D=0.08

C.6.10 Extrapolation of Performance at other Outdoor Temperatures

Net capacity (total and steady state) and net input power are extrapolated for all speeds according to the table below:

Mode	Temperature	Extrapolation
Cooling	< 82°F	Linear from 82°F and 95°F cooling performance. Exception: Cooling power extrapolates linearly to the temperature where the lowest speed cooling power is 50% of the lowest speed cooling power at 82°F, and held constant at lower temperatures.
Cooling	> 95°F	Linear from 82°F and 95°F cooling performance
Heating	Minimum compressor operating temperature (if different from lowest temperature where heating performance is provided)	Linear from lowest two temperatures where heating performance is provided
Heating	>47°F	Linear from 17°F and 47°F heating performance

C.6.11 Sensible Cooling Capacity

Calculate gross SHR at AHRI "A" conditions for each speed from:

$SHR_{gross,A,i} = 0.708$[1]

Calculate "A_0" coil constant from Bypass Factor at "A" conditions for each speed, using the Apparatus Dew Point methodology.

Bypass Factor for any speed at given operating conditions is:

$BF_i = e^{A0,i/mclg,i}$

Gross sensible cooling capacity is calculated from the gross total cooling capacity and the Bypass Factor using the corresponding Apparatus Dew Point conditions.

Defrost

The integrated heating capacity and power of the heat pump shall be reduced for any outdoor drybulb temperature lower than the maximum defrost temperature (40°F) using the equations below[2].

$f_{def}(T_{odb}) = max(min(0.134-0.003*T_{odb}, 0.08), 0)$

$Q_{gross,int,htg,i} = Q_{gross,ss,htg,i}*[1 - 1.8*f_{def}(T_{odb})]$

$P_{gross,int,htg,i} = P_{gross,ss,htg,i}*[1 - 0.3*f_{def}(T_{odb})]$

[1] (Informative) Based on regressions developed by Proctor Engineering, min(1, -0.3890114 + 0.002743*$v_{rated,clg,i}$)

[2] (Informative) Based on Central Valley Research Homes project data

While defrosting in systems with supplemental heat, the supplemental heat is active and the indoor fan is running during the defrost period. The supplemental heater is cycled or modulated to add exactly enough heat to offset the reduced capacity.

Pan heaters are assumed to operate at 150W whenever the outdoor temperature is below 32°F.

C.6.12 Operating Performance

Operating performance is determined based on the gross performance of the system (interpolated based on outdoor temperature), and the sensible load on the system:

- If the sensible load is less than the minimum capacity of the system at the current operating conditions, the system will cycle between performance at minimum capacity and off. While cycling, a degradation coefficient of 0.08 shall be applied to single stage and two stage systems, and a degradation coefficient of 0.40 shall be applied to variable speed systems.
- If the sensible load is greater than the maximum capacity of the system at the current operating conditions, the system will operate at maximum capacity.
- If the sensible load is between the capacity of two speeds, the gross performance is interpolated using the ratio of the load to the gross sensible capacities at the speeds above and below the load.

When cycling, the cycling ratio is the ratio of the sensible load to the minimum sensible capacity at the current operating conditions:

$f_{cyc} = Load_{sen}/Q_{sen,min}$

The additional energy related to cycling degradation is accounted for by adjusting the power:

$P_{gross,cyc} = P_{gross,min}/[1+C_D*(f_{cyc} - 1)]$

C.6.13 Indoor Fan Energy

The measured operational flow rate, $V_{op,measured}$, and fan power, $P_{fan,op,measured}$, shall be measured at a known mode (htg/clg) and compressor speed, i, according to RESNET/ACCA 310, or shall use the default 360 cfm/ton for cooling or heat pump heating or 240 cfm/ton for furnace heating.

$v_{op} = V_{op,measured}/(Q_{net,mode,A/H1,i}/(12{,}000\ (Btu/h)/ton))$

The operational airflow rate shall be calculated at all other combinations of mode and compressor speed:

$V_{op,clg,i} = v_{op}*Q_{net,tot,clg,A,i}/(12{,}000\ (Btu/h)/ton)$

$V_{op,htg,ss,i} = v_{op}*Q_{net,ss,htg,H1,i}/(12{,}000\ (Btu/h)/ton)$

Operational fan power for each mode and compressor speed shall be calculated

BPM Motors (Ducted Systems): $P_{fan,op,mode,i} = P_{fan,op,measured}*(V_{op,mode,i}/V_{op,measured})^{2.75}$

BPM Motors (Ductless Systems): $P_{fan,op,mode,i} = P_{fan,op,measured}*(V_{op,mode,i}/V_{op,measured})^3$

PSC Motors: $P_{fan,op,mode,i} = P_{fan,op,measured}*(V_{op,mode,i}/V_{op,measured})*(0.3*(V_{op,mode,i}/V_{op,measured}) + 0.7))$

C.6.14 Supplemental Heating

Supplemental heating shall operate when there is not adequate capacity (in the compressor and/or gas backup) to meet the full load, including when the outdoor temperature falls below the minimum compressor operating temperature. Supplemental heating shall only provide the additional amount of heat to meet the load. The supplemental heating capacity in both the Rated Home and the Reference Home shall be sized to meet the building heating load.

If the system does not have supplemental heating, the system in the Rated Home shall include electric resistance supplemental heat that operates only when the integrated heating capacity is not adequate to meet the load (and not during defrost operation).

C.6.15 Standby Power

Crankcase power = 10 W per ton of rated full load net cooling capacity when the system is not on and the temperature is below 50°F.

C.6.16 Minimum Rated Features

Feature	**Description**	**Source**	**Default**	**Reference Home Value**
$Q_{net,tot,clg,A,full}$	Rated full load net total cooling capacity at AHRI "A" (95°F) conditions	AHRI Certificate/Directory	Required	For Air Conditioners: Sized to meet the sensible cooling load. For Heat Pump equipment: Sized to equal the larger of the building heating and sensible cooling loads.
SEER2	Seasonal Energy Efficiency Ratio as defined by AHRI 210/240-2023	AHRI Certificate	Required	12.35
EER2	Energy Efficiency Ratio at AHRI "A" (95°F) conditions as	AHRI Certificate	Required	10.7

	defined by AHRI 210/240-2023			
$Q_{net,ss,htg,H1,full}$	Rated full load net steady-state heating capacity at AHRI “H1” (47°F) conditions	AHRI Certificate	Required	Sized to equal the larger of the building heating and sensible cooling loads.
$Q_{net,ss,htg,H3,full}$	Rated full load net steady-state heating capacity at AHRI “H3” (17°F) conditions	AHRI Certificate	Required	0.626* $Q_{net,ss,htg,H1,full}$
HSPF2	Heating Seasonal Performance Factor as defined by AHRI 210/240-2023	AHRI Certificate	Required	6.55
Number of Speeds/stages	Number of speeds/stages used in compressor control: Single Stage Two Stage Variable Capacity	Product Literature	Required	Single Stage
Fan Motor Type	Type of motor used by the indoor fan	Product Literature	Permanent Split Capacitor (PSC) for single speed equipment, otherwise Brushless	PSC

			Permanent Magnet (BPM)	
Type of Supplemental Heating	Electric Resistance Fossil Fuel Furnace None	Product literature, visual inspection	Electric Resistance	Same as Rated Home
Minimum Compressor Operating Temperature	Minimum outdoor temperature for compressor heating operation	For Electric Resistance Supplemental Heating: Product Literature, NEEP Database Lowest Catalogued Temperature (LCT) For Fossil Fuel Supplemental Heating: Fixed at 40°F	For Electric Resistance Supplemental Heating: Number of Speeds <= 2: 0°F Number of Speeds > 2: -20°F For Fossil Fuel Supplemental Heating: No Default	For Electric Resistance Supplemental Heating: 0°F For Fossil Fuel Supplemental Heating: 40°F