

## Standard Revision

**Draft PDS\_01MINHERS Addendum 49f**

**Credits for HVAC Installation Quality Grading**

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Date Approved: ?????, 2020

Effective Date: ?????, 2020

Transition Period: NA

Transition Period End Date: NA

Proponent: Steve Baden

Organization: RESNET

## Purpose:

Addendum 49f is the follow up to Addendum 49i, the interim addendum that modified the requirements of Standard ANSI/RESNET/ICC 301-2014 and its Addenda E and N, and Standard ANSI/RESNET/ICC 301-2019 in Chapter 3 of the MINHERS standards for determining HERS ratings. The exception adds definitions, inspection requirements and calculation criteria for determining credits for HVAC systems installation quality grading to MINHERS Section 303.1 and adds Standard RESNET/ACCA 310 to Section 304 Normative References.

**Amendment:**

***Clarify Section 303.1 and add new Exception 7 to Standard ANSI/RESNET/ICC 301 requirements in MINHERS Section 303.1 as follows:***

1. Technical Requirements
	1. Applicable Standards

~~Note:~~The RESNET Home Energy Ratings System adopts Standards ANSI/RESNET/ICC 301 and ANSI/RESNET/ICC 380 including all of their addenda and normative appendices. See 304 Normative References. Standards 301 and 380 Addenda are effective on the date they are approved by ANSI. The Standards Management Board may establish a Transition Period during which addenda may be used. If a Transition Period is authorized these addenda must be used after a Mandatory Compliance Date designated by the Standards Management Board. If no Transition Period is authorized they must be used beginning on the Mandatory Compliance Date established by the Standards Management Board. See the Addenda posted on RESNET’s website.

All RESNET Home Energy Ratings conducted in accordance with this Standard shall comply with the provisions of ANSI/RESNET/ICC 301~~-2014 “Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential BuildingsDwelling and Sleeping Unitsusing an Energy Rating Index.”~~.

Informative Note: Standard ANSI/RESNET/ICC 301-2014 and its addenda remain in effect until the Mandatory Compliance Date for MINHERS Addendum 42, which adopts ANSI/RESNET/ICC 301-2019. Addendum 42 authorizes voluntary use of ANSI/RESNET/ICC 301-2019 with its addenda in lieu of ANSI/RESNET/ICC 301-2014 and its addenda as of the Voluntary Compliance Date, October 1, 2019. Standard ANSI/RESNET/ICC 301-2014 with its addenda can continue to be used for projects permitted before January 1, 2021 pursuant to the criteria of MINHERS Section 502.3 as modified by MINHERS Addendum 43.

**Exceptions**

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**Exception 7**:

***Make the following modifications to Standard ANSI/RESNET/ICC 301-2019 and ANSI/RESNET/ICC 301-2014.***

***Add Definitions below and capitalize all defined terms throughout both ANSI/RESNET/ICC 301-2014 and ANSI/RESNET/ICC 301-2019****:*

***Air Conditioner*** – A vapor-compression refrigeration device that transfers heat from a location being cooled to another location using the physical properties of an evaporating and condensing fluid known as a refrigerant.

***Boiler*** – A space-heating appliance in which liquid is heated by burning fuel or converting electrical energy.

***Blower Fan*** – The fan inside the equipment of a Forced-Air HVAC System that forces the heated and/or cooled air to be distributed within a Dwelling Unit.

***Condensing Temperature*** – The refrigerant Saturation Temperature measured at the service valve at the condenser coil entrance.

***Condensing Temperature Over Ambient (CTOA)*** – A constant value that represents the difference between the Condensing Temperature and the outdoor air used to cool the refrigerant in the condenser coil.

***Design Temperature Difference (DTD)*** – A constant value that represents the difference between the evaporator coil refrigerant’s Saturation Temperature and the return air dry-bulb temperature within normal operating load conditions.

***Egress Window*** – An operable window that provides for a means of escape and access for rescue in the event of an emergency and with the following attributes:

* + Has a sill height of not more than 44 inches above the floor; and,
	+ Has a minimum net clear opening of 5.7 sq. ft.; and,
	+ Has a minimum net clear opening height of 24 in.; and,
	+ Has a minimum net clear opening width of 20 in.; and,
	+ Is operational from the inside of the room without the use of keys, tools or special knowledge.

***Forced-Air HVAC System*** – A type of HVAC System that incorporates a Blower Fan to move conditioned air.

***Furnace*** – A space-heating appliance in which air is heated by burning fuel or converting electrical energy.

***HVAC System*** – Cooling-only, heating-only, or combined cooling-heating equipment, including any supply and/or return distribution systems.

***Saturation Temperature*** – The temperature at which the refrigerant undergoes a phase change in either the condenser or evaporator coils.

***Unitary*** – One or more factory-made assemblies which normally may include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function. The equipment can be ducted or ductless; it can be a split-system or single package.

***Modify Table 4.2.2(1) in ANSI/RESNET/ICC 301-2014 and ANSI/RESNET/ICC 301-2019 as follows****:*

| **Building Component** | **Energy Rating Reference Home** | **Rated Home** |
| --- | --- | --- |
|  |  |  |
| Heating systems (p), (q) | Fuel type: same as Rated HomeEfficiencies:Electric: Air Source Heat Pump in accordance with Table 4.2.2(1a)Non-electric furnaces: natural gas furnace in accordance with Table 4.2.2(1a)Non-electric boilers: natural gas boiler in accordance with Table 4.2.2(1a)Capacity: sized in accordance with Section 4.4.3.1. Installation Quality Grade of Forced-Air HVAC System with Furnace or Heat Pump: configured in accordance with Section 4.2.2.3.1 and modeled in accordance with Section 4.2.2.3.2. | Same as Rated Home (q)Same as Rated HomeSame as Rated HomeSame as Rated HomeSame as Rated Home (r)Same as Rated Home, configured in accordance with Section 4.2.2.3.1 and modeled in accordance with Section 4.2.2.3.2. |
| Cooling systems (p), (s) | Fuel type: ElectricEfficiency: in accordance with Table 4.2.2(1a) Capacity: sized in accordance with Section 4.4.3.1.Installation Quality Grade of Forced-Air HVAC System with Air Conditioner or Heat Pump: configured in accordance with Section 4.2.2.3.1 and modeled in accordance with Section 4.2.2.3.2. | Same as Rated Home (s)Same as Rated HomeSame as Rated Home (r)Same as Rated Home, configured in accordance with Section 4.2.2.3.1 and modeled in accordance with Section 4.2.2.3.2. |

***Insert new section 4.2.2.3 for calculating the benefits of HVAC installation quality grades as follows and renumber all sections of 4.2.2 following the new section accordingly in ANSI/RESNET/ICC 301-2014 and in ANSI/RESNET/ICC 301-2019.***

***Change the number used in all references to the renumbered subsections of section 4.2.2 to be consistent with the new section numbers in ANSI/RESNET/ICC 301-2014 and in ANSI/RESNET/ICC 301-2019.***

***Renumber the equations within Section 4.2 to be sequential to the equations in new section 4.2.2.3 in ANSI/RESNET/ICC 301-2014 and in ANSI/RESNET/ICC 301-2019.***

***(Note: The tables in Section 4.2 do not need to be renumbered.)***

* + - 1. HVAC Installation Quality Grade.

4.2.2.3.1 Configuration of Energy Rating Reference Home, Index Adjustment Design, and Rated Home.

4.2.2.3.1.1 Energy Rating Reference Home. For each Forced-Air HVAC System with an Air Conditioner, Furnace, or Heat Pump in the Energy Rating Reference Home, the installation quality of the Blower Fan airflow, Blower Fan watt draw, and (for Air Conditioners and Heat Pumps) refrigerant charge shall be designated Grade III, per Standard ANSI/RESNET/ACCA 310, and configured with the values in Table 4.5.2(6) [[1]](#footnote-1).

4.2.2.3.1.2 Index Adjustment Design. For each Forced-Air HVAC System with an Air Conditioner, Furnace, or Heat Pump in the Index Adjustment Design, the installation quality of the Blower Fan airflow, Blower Fan watt draw, and (for Air Conditioners and Heat Pumps) refrigerant charge shall be designated Grade I, per Standard RESNET/ACCA 310, and configured with the values in Table 4.2.2(6) 1.

|  |
| --- |
| **Table 4.2.2(6) Air Conditioner and Heat Pump Installation Quality Grade Values for Index Adjustment Design** |
| **Parameter** | **Value** |
| Blower Fan Airflow Deviation | FAF = 0% |
| Blower Fan Watt Draw Efficiency | Blower Fan Efficiency = 0.45 W/CFM |
| Refrigerant Charge Deviation | FCHG = 0% |

4.2.2.3.1.3 Rated Home. For each Forced-Air HVAC System with an Air Conditioner, Furnace, or Heat Pump in the Rated Home, the installation quality of the total duct leakage, Blower Fan airflow, Blower Fan watt draw, and (for Air Conditioners and Heat Pumps) refrigerant charge shall either be assessed in accordance with Standard RESNET/ACCA 310, designated Grade I, II or III, and configured with the values in Table 4.2.2(7); or, if not assessed, shall be designated Grade III, configured with the values in Table 4.5.2(6), and recorded as “Not assessed” in the rating.

|  |
| --- |
| **Table 4.2.2(7) Air Conditioner and Heat Pump Installation Quality Grade Non-Default Values for Rated Home** |
| **Parameter** | **Value** |
| Blower Fan Airflow Deviation | FAF = As Rated |
| Blower Fan Watt Draw Efficiency | Blower Fan Efficiency = As Rated |
| Refrigerant Charge Deviation | FCHG = 0% if Rated Grade I FCHG = -25% if Rated Grade III |

4.2.2.3.2 Modeling of HVAC Installation Quality Grades. Each Forced-Air HVAC System with an Air Conditioner or Heat Pump in the Energy Rating Reference Home, Index Adjustment Design, and Rated Home shall be modeled according to Sections 4.2.2.3.2.1 and 4.2.2.3.2.2 to reflect its installation quality grade.

 4.2.2.3.2.1 Capacity. The gross capacity shall be modeled according to Equation 4.2**-**1.

|  |  |  |
| --- | --- | --- |
|  | $$Cap\_{timestep,fault,gross}=Cap\_{rated,gross}\*Cap\_{f\left(T\right)}\*Cap\_{fault}$$ | (Eq. 4.2**-**1) |

Where:

$Cap\_{timestep,fault,gross}$ is the gross capacity at the given simulation timestep

$Cap\_{rated,gross}$ is the gross capacity at rated conditions [[2]](#footnote-2)

$Cap\_{f(T)}$ is the no-fault capacity adjustment factor for the operating temperatures at the given simulation timestep [[3]](#footnote-3)

$Cap\_{fault}$ is the capacity adjustment factor for the airflow and refrigerant charge installation faults and shall be calculated according to Equation 4.2**-**2.

|  |  |  |
| --- | --- | --- |
|  | $$Cap\_{fault}=\frac{CAP\_{CHG}}{CAP\_{AF,CHG}}\*CAP\_{AF}$$ | (Eq. 4.2**-**2) |

Where:

$CAP\_{CHG}$ is a normalized capacity adjustment factor as a function of the timestep operating temperatures (T) and the refrigerant charge fault level $\left(F\_{CHG}\right)$.

For cooling mode, $CAP\_{CHG}$ is calculated according to Equation 4.2**-**3 using the coefficients in Table 4.2.2(8).

|  |  |  |
| --- | --- | --- |
|  | $$CAP\_{CHG}=1+(a1+a2\*T\_{DB\_{in}}+a3\*T\_{DB\_{out}}+a4\*F\_{CHG})\*F\_{CHG}$$ | (Eq. 4.2**-**3) |

Table 4.2.2(8). Capacity Charge Fault Coefficients for Cooling Mode

|  |  |  |
| --- | --- | --- |
| Coefficients | Undercharge Fault | Overcharge Fault |
| a1 | -9.46E-01 | -1.63E-01 |
| a2 | 4.93E-02 | 1.14E-02 |
| a3 | -1.18E-03 | -2.10E-04 |
| a4 | -1.15E+00 | -1.40E-01 |

For heating mode, $CAP\_{CHG}$ is calculated according to Equation 4.2**-**4 using the coefficients in Table 4.2.2(9):

|  |  |  |
| --- | --- | --- |
|  | $$CAP\_{CHG}=1+(a1+a2\*T\_{DB\_{out}}+a3\*F\_{CHG})\*F\_{CHG}$$ | (Eq. 4.2**-**4) |

Table 4.2.2(9). Capacity Charge Fault Coefficients for Heating Mode

|  |  |  |
| --- | --- | --- |
| Coefficients | Undercharge Fault | Overcharge Fault |
| a1 | -3.39E-02 | -2.95E-03 |
| a2 | 2.03E-02 | 7.38E-04 |
| a3 | -2.62E+00 | -6.41E-03 |

$CAP\_{AF,CHG}$ is a normalized capacity adjustment factor as a function of the airflow correction factor, where $CF\_{AF,CHG}$ represents the adjustment to the airflow fraction due to the capacity impact of the refrigerant charge fault.

For cooling mode, $CAP\_{AF,CHG}$ is calculated according to Equation 4.2**-**5 using the coefficients in Table 4.2.2(10):

|  |  |  |
| --- | --- | --- |
|  | $$CAP\_{AF,CHG}=a1+a2\*CF\_{AF,CHG}+a3\*CF\_{AF,CHG}^{2}$$ | (Eq. 4.2**-**5) |

Table 4.2.2(10). Capacity Airflow Fault Coefficients for Cooling Mode

|  |  |
| --- | --- |
| Coefficients | Airflow Fault |
| a1 | 7.19E-01 |
| a2 | 4.18E-01 |
| a3 | -1.37E-01 |

And where $CF\_{AF,CHG}$ is calculated according to Equation 4.2**-**6 using the coefficients in Table 4.2.2(8):

|  |  |  |
| --- | --- | --- |
|  | $$CF\_{AF,CHG} =\frac{1}{1+(a1+a2\*26.67+a3\*35.00+a4\*F\_{CHG})\*F\_{CHG}}$$ | (Eq. 4.2**-**6) |

For heating mode, $CAP\_{AF,CHG}$ is calculated according to Equation 4.2**-**7 using the coefficients in Table 4.2.2(11):

|  |  |  |
| --- | --- | --- |
|  | $$CAP\_{AF,CHG}=a1+a2\*CF\_{AF,CHG}+a3\*CF\_{AF,CHG}^{2}$$ | (Eq. 4.2**-**7) |

Table 4.2.2(11). Capacity Airflow Fault Coefficients for Heating Mode

|  |  |
| --- | --- |
| Coefficients | Airflow Fault |
| a1 | 6.94E-01 |
| a2 | 4.74E-01 |
| a3 | -1.68E-01 |

And where $CF\_{AF,CHG}$ is calculated according to Equation 4.2**-**8 using the coefficients in Table 4.2.2(9):

|  |  |  |
| --- | --- | --- |
|  | $$CF\_{AF,CHG} =\frac{1}{1+(a1+a2\*8.33+a3\*F\_{CHG})\*F\_{CHG}}$$ | (Eq. 4.2**-**8) |

$CAP\_{AF}$ is a normalized capacity adjustment factor as a function of the airflow fraction, where $F\_{AF,comb}$ represents the combined airflow fraction accounting for both the airflow fault level and the adjusted airflow fraction due to the capacity impact of the refrigerant charge.

For cooling mode, $CAP\_{AF}$ is calculated according to Equation 4.2**-**9 using the coefficients in Table 4.2.2(10):

|  |  |  |
| --- | --- | --- |
|  | $$CAP\_{AF}=a1+a2\*F\_{AF,comb}+a3\*F\_{AF,comb}^{2}$$ | (Eq. 4.2**-**9) |

And where $F\_{AF,comb}$ is calculated according to Equation 4.2**-**10 using the coefficients in Table 4.2.2(8):

|  |  |
| --- | --- |
| $$F\_{AF,comb} =\frac{1}{1+(a1+a2\*26.67+a3\*35.00+a4\*F\_{CHG})\*F\_{CHG}}\*(1+Q\_{DEV}) $$ | (Eq. 4.2**-**10) |

For heating mode, $CAP\_{AF} $is calculated according to Equation 4.2**-**11 using the coefficients in Table 4.2.2(11):

|  |  |  |
| --- | --- | --- |
|  | $$CAP\_{AF}=a1+a2\*F\_{AF,comb}+a3\*F\_{AF,comb}^{2}$$ | (Eq. 4.2**-**11) |

And where $F\_{AF,comb}$ is calculated according to Equation 4.2**-**12 using the coefficients in Table 4.2.2(9):

|  |  |  |
| --- | --- | --- |
|  | $$F\_{AF,comb} =\frac{1}{1+(a1+a2\*8.33+a3\*F\_{CHG})\*F\_{CHG}}\*(1+Q\_{DEV})$$ | (Eq. 4.2**-**12) |

 4.2.2.3.2.2 System Efficiency. The gross system efficiency shall be modeled according to Equation 4.2-13.

|  |  |  |
| --- | --- | --- |
|  | $$COP\_{timestep,fault,gross}=COP\_{rated,gross}\*COP\_{f\left(T\right)}\*COP\_{fault}$$ | (Eq. 4.2**-**13) |

Where:

$COP\_{timestep,fault,gross}$ is the gross system efficiency at the given simulation timestep

$COP\_{rated,gross}$ is the gross system efficiency at rated conditions [[4]](#footnote-4)

$COP\_{f(T)}$ is the no-fault system efficiency adjustment factor for the operating temperatures at the given simulation timestep [[5]](#footnote-5)

$COP\_{fault}$ is the system efficiency adjustment factor for the airflow and refrigerant charge installation faults and shall be calculated according to Equation 4.2-14.

|  |  |  |
| --- | --- | --- |
|  | $$COP\_{fault}=\frac{COP\_{CHG}}{COP\_{AF,CHG}}\*COP\_{AF}$$ | (Eq. 4.2**-**14) |

Where:

$COP\_{CHG}$ is a normalized system efficiency adjustment factor as a function of the timestep operating temperatures (T) and the refrigerant charge fault level $\left(F\_{CHG}\right)$.

For cooling mode, $COP\_{CHG}$ is calculated according to Equation 4.2**-**15 using the coefficients in Table 4.2.2(12):

|  |  |  |
| --- | --- | --- |
|  | $$COP\_{CHG}=CAP\_{CHG} /(1+(a1+a2\*T\_{DB\_{in}}+a3\*T\_{DB\_{out}}+a4\*F\_{CHG})\*F\_{CHG})$$ | (Eq. 4.2**-**15) |

Table 4.2.2(12). Capacity Charge Fault Coefficients for Cooling Mode

|  |  |  |
| --- | --- | --- |
| Coefficients | Undercharge Fault | Overcharge Fault |
| a1 | -3.13E-01 | 2.19E-01 |
| a2 | 1.15E-02 | -5.01E-03 |
| a3 | 2.66E-03 | 9.89E-04 |
| a4 | -1.16E-01 | 2.84E-01 |

For heating mode, $COP\_{CHG}$ is calculated according to Equation 4.2**-**16 using the coefficients in Table 4.2.2(13):

|  |  |  |
| --- | --- | --- |
|  | $$COP\_{CHG}=CAP\_{CHG} /(1+(a1+a2\*T\_{DB\_{out}}+a3\*F\_{CHG})\*F\_{CHG})$$ | (Eq. 4.2**-**16) |

Table 4.2.2(13). Capacity Charge Fault Coefficients for Heating Mode

|  |  |  |
| --- | --- | --- |
| Coefficients | Undercharge Fault | Overcharge Fault |
| a1 | 6.16E-02 | -5.94E-02 |
| a2 | 4.46E-03 | 1.59E-02 |
| a3 | -2.60E-01 | 1.89E+00 |

$COP\_{AF,CHG}$ is a normalized system efficiency adjustment factor as a function of the airflow correction factor, where $CF\_{AF,CHG}$ represents the adjustment to the airflow fraction due to the capacity impact of the refrigerant charge fault.

For cooling mode, $COP\_{AF,CHG}$ is calculated according to Equation 4.2**-**17 using the coefficients in Table 4.2.2(14):

|  |  |  |
| --- | --- | --- |
|  | $$COP\_{AF,CHG}=1/(a1+a2\*CF\_{AF,CHG}+a3\*CF\_{AF,CHG}^{2})$$ | (Eq. 4.2**-**17) |

Table 4.2.2(14). Capacity Airflow Fault Coefficients for Cooling Mode

|  |  |
| --- | --- |
| Coefficients | Airflow Fault |
| a1 | 1.14E+00 |
| a2 | -1.39E-01 |
| a3 | -4.05E-03 |

And where $CF\_{AF,CHG}$ is calculated according to Equation 4.2**-**18 using the coefficients in Table 4.2.2(8):

|  |  |  |
| --- | --- | --- |
|  | $$CF\_{AF,CHG} =\frac{1}{1+(a1+a2\*26.67+a3\*35.00+a4\*F\_{CHG})\*F\_{CHG}}$$ | (Eq. 4.2**-**18) |

For heating mode, $COP\_{AF,CHG}$ is calculated according to Equation 4.2**-**19 using the coefficients in Table 4.2.2(15):

|  |  |  |
| --- | --- | --- |
|  | $$COP\_{AF,CHG} =1/(a1+a2\*CF\_{AF,CHG}+a3\*CF\_{AF,CHG}^{2})$$ | (Eq. 4.2**-**19) |

Table 4.2.2(15). Capacity Airflow Fault Coefficients for Heating Mode

|  |  |
| --- | --- |
| Coefficients | Airflow Fault |
| a1 | 2.19E+00 |
| a2 | -1.94E+00 |
| a3 | 7.57E-01 |

And where $CF\_{AF,CHG}$ is calculated according to Equation 4.2**-**20 using the coefficients in Table 4.2.2(9):

|  |  |  |
| --- | --- | --- |
|  | $$CF\_{AF,CHG} =\frac{1}{1+(a1+a2\*8.33+a3\*F\_{CHG})\*F\_{CHG}}$$ | (Eq. 4.2**-**20) |

$COP\_{AF}$ is a normalized system efficiency adjustment factor as a function of the airflow fraction, where $F\_{AF,comb}$ represents the combined airflow fraction accounting for both the airflow fault level and the adjusted airflow fraction due to the capacity impact of the refrigerant charge.

For cooling mode, $COP\_{AF}$ is calculated according to Equation 4.2**-**21 using the coefficients in Table 4.2.2(14):

|  |  |  |
| --- | --- | --- |
|  | $$COP\_{AF}=1/(a1+a2\*F\_{AF,comb}+a3\*F\_{AF,comb}^{2})$$ | (Eq. 4.2**-**21) |

And where $F\_{AF,comb}$ is calculated according to Equation 4.2**-**22 using the coefficients in Table 4.2.2(8):

|  |  |
| --- | --- |
| $$F\_{AF,comb} =\frac{1}{1+(a1+a2\*26.67+a3\*35.00+a4\*F\_{CHG})\*F\_{CHG}}\*(1+Q\_{DEV})$$ | (Eq. 4.2**-**22) |

For heating mode, $COP\_{AF}$ is calculated according to Equation 4.2**-**23 using the coefficients in Table 4.2.2(15):

|  |  |  |
| --- | --- | --- |
|  | $$COP\_{AF}=1/(a1+a2\*F\_{AF,comb}+a3\*F\_{AF,comb}^{2})$$ | (Eq. 4.2**-**23) |

And where $F\_{AF,comb}$ is calculated according to Equation 4.2**-**24 using the coefficients in Table 4.2.2(9):

|  |  |  |
| --- | --- | --- |
|  | $$F\_{AF,comb} =\frac{1}{1+(a1+a2\*8.33+a3\*F\_{CHG})\*F\_{CHG}}\*(1+Q\_{DEV})$$ | (Eq. 4.2**-**24) |

***Modify section 4.2.2.4 and Table 4.2.2.4(1) in ANSI/RESNET/ICC 301-2014 and in ANSI/RESNET/ICC 301-2019 as follows:***

~~4.2.2.4.~~4.2.2.5. For ~~non-electric warm furnaces and~~ non-electric ~~boilers~~Boilers, the values in Table 4.2.2.4(1) shall be used for Electric Auxiliary Energy (EAE) in the Reference Home.

Table 4.2.2.4(1) Electric Auxiliary Energy for

Fossil Fuel Heating Systems

| **System Type** | **Eae** |
| --- | --- |
| Oil Boiler | 330 |
| Gas Boiler | 170 |
| ~~Oil furnace~~ | ~~439 + 5.5\*Capacity (kBtu/h)~~ |
| ~~Gas furnace~~ | ~~149 + 10.3\*Capacity (kBtuh/h)~~ |

***Modify Table 4.3.1(1) in Standard ANSI/RESNET/ICC 301-2019 and in ANSI/RESNET/ICC 301-2014 Addendum E-2018 as follows:***

| **Building Component** | **Index Adjustment Design (IAD)** |
| --- | --- |
| Heating systems | Fuel type: Same as Rated HomeEfficiencies:Electric: Air Source Heat Pump in accordance with Table 4.2.2(1a)Non-electric furnaces: natural gas furnace in accordance with Table 4.2.2(1a)Non-electric boilers: natural gas boiler in accordance with Table 4.2.2(1a)Capacity: sized in accordance with Section 4.4.3.1Installation Quality Grade of Forced-Air HVAC System with Heat Pump: configured in accordance with Section 4.2.2.3.1 and modeled in accordance with Section 4.2.2.3.2. |
| Cooling systems | Fuel type: ElectricEfficiency: in accordance with Table 4.2.2(1a)Capacity: sized in accordance with Section 4.4.3.1Installation Quality Grade of Forced-Air HVAC System with Air Conditioner: configured in accordance with Section 4.2.2.3.1 and modeled in accordance with Section 4.2.2.3.2. |

***Modify Section 4.4.6 of Standard ANSI/RESNET/ICC 301-2019 as follows:***

4.4.6. Fossil Fuel Fired ~~Furnaces and~~ Boilers Serving One Unit. For a fossil fuel fired ~~furnace or~~ ~~boiler~~Boiler, the Auxiliary Electric Consumption for the Rated Home shall be determined as follows:

Auxiliary Electric Consumption (kWh/y) = Eae \* (HLH) / 2080

where:

HLH = annual heating load hours attributed to the ~~furnace/boiler~~Boiler.

~~Note: If fan power is needed (kW), it is determined by Eae / 2080.~~

***Modify Section 4.3.6 of Standard ANSI/RESNET/ICC 301-2014 as follows:***

4.3.6. Fossil Fuel Fired ~~Furnaces and~~ Boilers Serving One Unit. For a fossil fuel fired ~~furnace or~~ ~~boiler~~Boiler, the Auxiliary Electric Consumption for the Rated Home shall be determined as follows:

Auxiliary Electric Consumption (kWh/y) = Eae \* (HLH) / 2080

where:

HLH = annual heating load hours attributed to the ~~furnace/boiler~~Boiler.

~~Note: If fan power is needed (kW), it is determined by Eae / 2080.~~

***Add new Section 4.5.2.4 to Standard ANSI/RESNET/ICC 301-2019 as follows:***

4.5.2.4. The Air Conditioner and Heat Pump Installation Quality Grade set forth as building element 13 in Table 4.5.2(1) shall be determined by using Standard RESNET/ACCA 310. When information on the Installation Quality Grade cannot be determined, the values set forth in Table 4.5.2(6) shall be used.

***Add new Section 4.4.2.4 to Standard ANSI/RESNET/ICC 301-2014 as follows:***

4.4.2.4. The Air Conditioner and Heat Pump Installation Quality Grade set forth as building element 13 in Table 4.5.2(1) shall be determined by using Standard RESNET/ACCA 310. When information on the Installation Quality Grade cannot be determined, the values set forth in Table 4.5.2(6) shall be used.

***Revise ANSI/RESNET/ICC 301-2019 to: add new Building Element 13. to Table 4.5.2(1) Minimum Rated Features; renumber the ‘Building Elements’ following new Element 13 accordingly; revise the numbers used in references to the renumbered Building Elements to correlate with their new numbers throughout the standard.***

| **Table 4.5.2(1) Minimum Rated Features** |
| --- |
| **Building Element** | **Minimum Rated Feature** |
| 13. Air Conditioner and Heat Pump Installation Quality Grade | These features shall be assessed in accordance with Standard RESNET/ACCA 310 unless the default value of Grade III is assigned for the installation quality of the total duct leakage, Blower Fan airflow, Blower Fan watt draw, and refrigerant charge: * For Evaluation of Design Information: Completeness of all required HVAC design documentation, and compliance with design criteria.
* For Total Duct Leakage Installation Quality: Total duct leakage, Conditioned Floor Area served by the system, number of returns, whether tested at rough-in or final, total duct leakage grade (Grade I, II, or III).

If the testing exception is taken, then confirmation that the total amount of supply ductwork or distribution building cavities does not exceed 10 ft. in length and is entirely in Conditioned Space Volume.* For Blower Fan Volumetric Airflow Installation Quality: test method used, mode that testing was done in (heating or cooling), Blower Fan volumetric airflow, design-specified Blower Fan volumetric airflow, Blower Fan volumetric airflow grade (Grade I, II, or III).

If using the Pressure Matching or Flow Grid method, then also Psop, Ptest, Qtest, whether turbulent conditions were encountered, and, for the Pressure Matching Method only, if the Fan Flowmeter was connected at a return grille or at the blower compartment. If using the OEM Static Pressure Table method, then also Blower Fan motor type, Blower Fan fan-speed setting, Ptop, Pfilter, elevation above sea level, and whether turbulent conditions were encountered. If the testing exception is taken, then confirmation that the total amount of supply ductwork or distribution building cavities does not exceed 10 ft. in length and is entirely in Conditioned Space Volume.* For Blower Fan Watt Draw Installation Quality: test method used, mode that testing was done in (heating or cooling), Blower Fan watt draw, Blower Fan volumetric airflow, Blower Fan watt draw grade (Grade I, II, or III).

If using the analog utility revenue meter method, then also Kh factor, number of meter wheel revolutions, and duration of test.* For Refrigerant Charge Installation Quality: test method used and refrigerant charge grade (Grade I or III).

If the non-invasive method is used, then also the equipment’s rated SEER value, design-specified Blower Fan volumetric airflow in cooling mode, design maximum total heat gain, metering device type, target subcooling value if metering device type is TXV/EEV, target superheat value if the metering device type is piston/capillary tube, return air dry-bulb temperature, return air wet-bulb temperature, outdoor air dry-bulb temperature, suction line temperature, liquid line temperature, and documentation of any site-specific installation values provided by the installing contractor. If the weigh-in method is used, then also collection of all required refrigerant system documentation from the installing contractor; total length of the liquid line, outside diameter of the liquid line, weight of the refrigerant required for the incremental liquid line length, total anticipated weight of refrigerant, total reported refrigerant weight, deviation in total refrigerant weight, and evaluation of geotagged photo(s). |

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***Revise ANSI/RESNET/ICC 301-2014 to: add new Building Element 14. to Table 4.5.2(1) Minimum Rated Features; renumber the ‘Building Elements’ following new Element 14 accordingly; revise the numbers used in references to the renumbered Building Elements to correlate with their new numbers throughout the standard.***

| **Table 4.5.2(1) Minimum Rated Features** |
| --- |
| **Building Element** | **Minimum Rated Feature** |
| 14. Air Conditioner and Heat Pump Installation Quality Grade | These features shall be assessed in accordance with Standard RESNET/ACCA 310 unless the default value of Grade III is assigned for the installation quality of the total duct leakage, Blower Fan airflow, Blower Fan watt draw, and refrigerant charge: * For Evaluation of Design Information: Completeness of all required HVAC design documentation, and compliance with design criteria.
* For Total Duct Leakage Installation Quality: Total duct leakage, Conditioned Floor Area served by the system, number of returns, whether tested at rough-in or final, total duct leakage grade (Grade I, II, or III).

If the testing exception is taken, then confirmation that the total amount of supply ductwork or distribution building cavities does not exceed 10 ft. in length and is entirely in Conditioned Space Volume.* For Blower Fan Volumetric Airflow Installation Quality: test method used, mode that testing was done in (heating or cooling), Blower Fan volumetric airflow, design-specified Blower Fan volumetric airflow, Blower Fan volumetric airflow grade (Grade I, II, or III).

If using the Pressure Matching or Flow Grid method, then also Psop, Ptest, Qtest, whether turbulent conditions were encountered, and, for the Pressure Matching Method only, if the Fan Flowmeter was connected at a return grille or at the blower compartment. If using the OEM Static Pressure Table method, then also Blower Fan motor type, Blower Fan fan-speed setting, Ptop, Pfilter, elevation above sea level, and whether turbulent conditions were encountered. If the testing exception is taken, then confirmation that the total amount of supply ductwork or distribution building cavities does not exceed 10 ft. in length and is entirely in Conditioned Space Volume.* For Blower Fan Watt Draw Installation Quality: test method used, mode that testing was done in (heating or cooling), Blower Fan watt draw, Blower Fan volumetric airflow, Blower Fan watt draw grade (Grade I, II, or III).

If using the analog utility revenue meter method, then also Kh factor, number of meter wheel revolutions, and duration of test.* For Refrigerant Charge Installation Quality: test method used and refrigerant charge grade (Grade I or III).

If the non-invasive method is used, then also the equipment’s rated SEER value, design-specified Blower Fan volumetric airflow in cooling mode, design maximum total heat gain, metering device type, target subcooling value if metering device type is TXV/EEV, target superheat value if the metering device type is piston/capillary tube, return air dry-bulb temperature, return air wet-bulb temperature, outdoor air dry-bulb temperature, suction line temperature, liquid line temperature, and documentation of any site-specific installation values provided by the installing contractor. If the weigh-in method is used, then also collection of all required refrigerant system documentation from the installing contractor; total length of the liquid line, outside diameter of the liquid line, weight of the refrigerant required for the incremental liquid line length, total anticipated weight of refrigerant, total reported refrigerant weight, deviation in total refrigerant weight, and evaluation of geotagged photo(s). |

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***Modify Table 4.5.2(5) in ANSI/RESNET/ICC 301-2019 as follows:***

|  |
| --- |
| **Table 4.5.2(5) Default Eae Values** |
| **System Type** | **Eae** |
| Oil ~~boiler~~Boiler | 330 |
| Gas ~~boiler~~Boiler (serves one unit) | 170 |
| Gas ~~boiler~~Boiler (shared, in-unit baseboard) | 220 |
| Gas ~~boiler~~Boiler (shared, in-unit WLHP) | 265 |
| Gas ~~boiler~~Boiler (shared, in-unit fan coil) | 438 |
| ~~Oil furnace~~ | ~~439 + 5.5 \* Capacity (kBtuh/h)~~ |
| ~~Gas furnace~~ | ~~149 + 10.3 \* Capacity (kBtuh/h)~~ |

***Modify Table 4.5.2(5) in ANSI/RESNET/ICC 301-2014 as follows:***

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| --- |
| **Table 4.5.2(5) Default Eae Values** |
| **System Type** | **Eae** |
| Oil ~~boiler~~Boiler | 330 |
| Gas ~~boiler~~Boiler (serves one unit) | 170 |
| Gas ~~boiler~~Boiler (shared, in-unit fan coil) | 438 |
| ~~Oil furnace~~ | ~~439 + 5.5 \* Capacity (kBtuh/h)~~ |
| ~~Gas furnace~~ | ~~149 + 10.3 \* Capacity (kBtuh/h)~~ |

***Add new Table 4.5.2(6) to ANSI/RESNET/ICC 301-2019 and to ANSI/RESNET/ICC 301-2014:***

|  |
| --- |
| **Table 4.5.2(6) Default Air Conditioner and Heat Pump Installation Quality Grade Values** |
| **Parameter** | **Value** |
| Blower Fan Airflow Deviation | FAF = -25% |
| Blower Fan Watt Draw Efficiency | Blower Fan Efficiency = 0.58 W/CFM |
| Refrigerant Charge Deviation | FCHG = -25% |

***Add the new section, “Building Element: Air Conditioner and Heat Pump Installation Quality Grade”, to the table in ANSI/RESNET/ICC 301-2019 Normative Appendix B and to the table in ANSI/RESNET/ICC 301-2014 Addendum N-2018 at the location between the table sections on “Building Element: Heating and Cooling Equipment” and “Building Element: Service Hot Water (SHW) Equipment”. Renumber the added table note respective to each standard/addendum.***

| Building Element: Air Conditioner and Heat Pump Installation Quality Grade |
| --- |
| **Rated Feature**  | **Task**  | **On-Site Inspection Protocol**  |
| For Evaluation of Design Information: |
| Completeness of all required HVAC design documentation | Collect HVAC design documentation and verify that all required design elements have been provided  | Collect HVAC design documentation and verify that all required design elements, as prescribed in Standard RESNET/ACCA 310, have been provided.  |
| Compliance with design criteria | Evaluate HVAC design documentation  | Evaluate whether the collected HVAC design documentation complies with the design criteria prescribed in Standard RESNET/ACCA 310, relative to the Dwelling to be rated. |
| For Total Duct Leakage Installation Quality: |
| Total duct leakage | Determine total air leakage from ducts  | As prescribed in Standard RESNET/ACCA 310, follow Procedure for Measuring Airtightness of Duct Systems in Standard RESNET/ICC 380.86  |
| Conditioned Floor Area served by the system | Calculate the Conditioned Floor Area that the HVAC system serves  | Calculate the Conditioned Floor Area that the HVAC system serves.  |
| Number of returns | Count the number of returns  | Count the number of returns, as prescribed in Standard RESNET/ACCA 310. |
| Whether tested at rough-in or final | Identify whether the total duct leakage was tested at rough-in or final  | Identify whether the total duct leakage was tested at rough-in or final, as prescribed in Standard RESNET/ACCA 310.  |
| Total duct leakage grade | Designate total duct leakage grade  | Designate the total duct leakage grade (Grade I, II, or III), as prescribed in Standard RESNET/ACCA 310.  |
| Confirmation that total supply distribution system ≤ 10 ft. and entirely in Conditioned Space Volume | Assess whether the total supply distribution system ≤ 10 ft. and entirely in Conditioned Space Volume | If using the exception to not test total duct leakage, as prescribed in Standard RESNET/ACCA 310, then visually verify that the total amount of supply ductwork or distribution building cavities does not exceed 10 ft. in length and is entirely in Conditioned Space Volume. |
| For Blower Fan Volumetric Airflow Installation Quality: |
| Test method selection | Select the test method | Select the test method to assess Blower Fan volumetric airflow, as prescribed in Standard RESNET/ACCA 310 – either the Pressure Matching Method, a Flow Grid, a Flow Hood, or the OEM Static Pressure Table Method. |
| Test mode  | Determine the mode to conduct the test in | Determine the mode to conduct the test in, as prescribed in Standard RESNET/ACCA 310 – either cooling or heating mode. |
| Blower Fan volumetric airflow  | Determine Blower Fan volumetric airflow | Measure the Blower Fan volumetric airflow, as prescribed in Standard RESNET/ACCA 310. |
| Design-specified Blower Fan volumetric airflow | Identify the design-specified Blower Fan volumetric airflow.  | Identify the design-specified Blower Fan volumetric airflow, as prescribed in Standard RESNET/ACCA 310. This value is reported in the HVAC design documentation. |
| Blower Fan volumetric airflow grade | Designate Blower Fan volumetric airflow grade  | Designate the Blower Fan volumetric airflow grade (Grade I, II, or III), as prescribed in Standard RESNET/ACCA 310. |
| Supply-side static pressure during normal operation (Psop) | Determine Psop | If using the Pressure Matching Method or a Flow Grid, then measure Psop, as prescribed in Standard RESNET/ACCA 310. |
| Supply-side static pressure during test (Ptest) | Determine Ptest | If using the Pressure Matching Method or a Flow Grid, then measure Ptest, as prescribed in Standard RESNET/ACCA 310. |
| Average measured airflow during test (Qtest) | Determine Qtest | If using the Pressure Matching Method or a Flow Grid, then measure Qtest, as prescribed in Standard RESNET/ACCA 310. |
| Fan Flowmeter connection location | Determine the Fan Flowmeter connection location | If using the Pressure Matching Method, then determine whether the Fan Flowmeter will be connected to the system, as prescribed in Standard RESNET/ACCA 310 – either at a return grille or at the blower compartment. |
| Blower Fan motor type | Determine Blower Fan motor type | If using the OEM Static Pressure Table method, then determine the Blower Fan motor type, as prescribed in Standard RESNET/ACCA 310. This value is reported in the HVAC design documentation. |
| Blower Fan fan-speed setting | Assess Blower-Fan fan-speed setting | If using the OEM Static Pressure Table method, then assess the Blower-Fan fan-speed setting, as prescribed in Standard RESNET/ACCA 310. |
| Total Operational System Pressure (Ptop) | Measure Ptop | If using the OEM Static Pressure Table method, then measure Ptop, as prescribed in Standard RESNET/ACCA 310. |
| Filter pressure adjustment factor (Pfilter) | Determine Pfilter | If using the OEM Static Pressure Table method, then determine Pfilter, as prescribed in Standard RESNET/ACCA 310. |
| Elevation above sea level | Determine elevation above sea level | If using the OEM Static Pressure Table method, then determine the elevation above sea level of the Dwelling to be rated. |
| Whether turbulent conditions were encountered | Assess whether turbulent conditions were encountered | If using the Pressure Matching Method, a Flow Grid, or the OEM Static Pressure Table method, then assess whether turbulent conditions were encountered, as prescribed in Standard RESNET/ACCA 310. |
| Confirmation that total supply distribution system ≤ 10 ft. and entirely in Conditioned Space Volume | Assess whether the total supply distribution system ≤ 10 ft. and entirely in Conditioned Space Volume | If using the exception to not test total Blower Fan volumetric airflow, as prescribed in Standard RESNET/ACCA 310, then visually verify that the total amount of supply ductwork or distribution building cavities does not exceed 10 ft. in length and is entirely in Conditioned Space Volume. |
| For Blower Fan Watt Draw Installation Quality: |
| Test method selection | Select the test method | Select the test method to assess Blower Fan watt draw, as prescribed in Standard RESNET/ACCA 310 – either a portable plug-in watt meter, clamp-on watt meter, analog utility revenue meter, or digital utility revenue meter. |
| Test mode  | Determine the mode to conduct the test in | Determine the mode to conduct the test in, as prescribed in Standard RESNET/ACCA 310 – either cooling or heating mode. |
| Blower Fan watt draw | Determine Blower Fan watt draw  | Measure the Blower Fan watt draw, as prescribed in Standard RESNET/ACCA 310. |
| Blower Fan volumetric airflow | Determine Blower Fan volumetric airflow | Determine Blower Fan volumetric airflow, as prescribed in Standard RESNET/ACCA 310.  |
| Blower Fan watt draw grade | Determine the Blower Fan watt draw grade | Determine Blower Fan watt draw grade (Grade I, II, or III), as prescribed in Standard RESNET/ACCA 310. |
| Kh factor of analog utility revenue meter | Determine the Kh factor of the analog utility revenue meter | If using the analog utility revenue meter method, then visually determine the Kh factor of the meter, as prescribed in Standard RESNET/ACCA 310. |
| Number of meter wheel revolutions | Determine the number of meter wheel revolutions | If using the analog utility revenue meter method, then count the number of the meter wheel revolutions (Nrev) during the test, as prescribed in Standard RESNET/ACCA 310. |
| Duration of test | Determine the duration of the test | If using the analog utility revenue meter method, then measure the duration of the test (Trev), as prescribed in Standard RESNET/ACCA 310. |
| For Refrigerant Charge Installation Quality:  |
| Test method selection | Select the test method | Select the test method to assess refrigerant charge, as prescribed in Standard RESNET/ACCA 310 – either the non-invasive method or the weigh-in method. |
| Refrigerant charge grade | Determine refrigerant charge grade | Determine refrigerant charge grade (Grade I or III) as prescribed in Standard RESNET/ACCA 310 |
| Rated SEER value | Determine rated SEER value | If using the non-invasive method, then determine the SEER rating of the Air Conditioner or Heat Pump, as prescribed in Standard RESNET/ACCA 310. This value is reported in the HVAC design documentation. |
| Design-specified Blower Fan volumetric airflow in cooling mode | Determine the design-specified Blower Fan volumetric airflow in cooling mode | If using the non-invasive method, then determine the design-specified Blower Fan volumetric airflow of the Air Conditioner or Heat Pump in cooling mode, as prescribed in Standard RESNET/ACCA 310. This value is reported in the HVAC design documentation. |
| Design maximum total heat gain | Determine the design maximum total heat gain | If using the non-invasive method, then determine the design maximum total heat gain, as prescribed in Standard RESNET/ACCA 310. This value is reported in the HVAC design documentation. |
| Metering device type | Determine the type of metering device | If the non-invasive method is used, determine the type of metering device on the Air Conditioner or Heat Pump, either piston or capillary tube, Thermal Expansion Value (TXV), or Electronic Expansion Valve (EEV), as prescribed in Standard RESNET/ACCA 310. This value is reported in the HVAC design documentation. |
| Target subcooling value | Determine the target subcooling value | If the non-invasive method is used and the metering device type is TXV or EEV, determine the target subcooling value, as prescribed in Standard RESNET/ACCA 310. This value is reported in the HVAC design documentation. |
| Target superheat value | Determine the target superheat value | If the non-invasive method is used and the metering device type is piston or capillary tube, determine the target superheat value, as prescribed in Standard RESNET/ACCA 310.  |
| Return air dry-bulb temperature | Determine the return air dry-bulb temperature | If the non-invasive method is used, measure the return air dry-bulb temperature, as prescribed in Standard RESNET/ACCA 310. |
| Return air wet-bulb temperature | Determine the return air wet-bulb temperature | If the non-invasive method is used, measure the return air wet-bulb temperature, as prescribed in Standard RESNET/ACCA 310. |
| Outdoor air dry-bulb temperature | Determine the outdoor air dry-bulb temperature | If the non-invasive method is used, measure the outdoor air dry-bulb temperature, as prescribed in Standard RESNET/ACCA 310. |
| Suction line temperature | Determine the suction line temperature | If the non-invasive method is used, measure the suction line temperature, as prescribed in Standard RESNET/ACCA 310. |
| Liquid line temperature | Determine the liquid line temperature | If the non-invasive method is used, measure the liquid line temperature, as prescribed in Standard RESNET/ACCA 310. |
| Documentation of any site-specific installation values from installing contractor | Document any site-specific installation values from the installing contractor | If the non-invasive method is used, then document any site-specific installation values provided by the installing contractor, as prescribed in Standard RESNET/ACCA 310. |
| Required refrigerant system documentation | Collect refrigerant system documentation and verify that all required elements have been provided  | If the weigh-in method is used, collect the refrigerant system documentation and verify that all required elements, as prescribed in Standard RESNET/ACCA 310, have been provided including: total reported weight of refrigerant added or removed, an indication of whether the refrigerant was added or was removed, an indication of whether the factory-supplied refrigerant was first removed, and one or more time-stamped and geotagged photographs showing the scale displaying the total weight of refrigerant added or removed from the system. |
| Total length of the liquid line | Determine the total length of the liquid line | If the weigh-in method is used, determine the total length of the liquid line, as prescribed in Standard RESNET/ACCA 310. |
| Outside diameter of the liquid line | Determine the outside diameter of the liquid line | If the weigh-in method is used, measure the outside diameter of the liquid line, as prescribed in Standard RESNET/ACCA 310. |
| Weight of the refrigerant required for the incremental liquid line length | Determine the weight of the refrigerant required for the incremental liquid line length | If the weigh-in method is used, determine the weight of the refrigerant required for the incremental liquid line length, as prescribed in Standard RESNET/ACCA 310. |
| Total anticipated weight of refrigerant | Determine the total anticipated weight of refrigerant | If the weigh-in method is used, determine the total anticipated weight of refrigerant, as prescribed in Standard RESNET/ACCA 310. |
| Total reported refrigerant weight | Determine the total reported weight of refrigerant | If the weigh-in method is used, determine the total reported weight of refrigerant, as prescribed in Standard RESNET/ACCA 310. |
| Deviation in total refrigerant weight | Determine the deviation in total refrigerant weight | If the weigh-in method is used, determine the deviation in total refrigerant weight, as prescribed in Standard RESNET/ACCA 310. |
| Evaluation of geotagged photo(s) | Evaluate the geotagged photo(s) | If the weigh-in method is used, evaluate whether the geotagged photo(s) collected as part of the refrigerant system documentation complies with the criteria prescribed in Standard RESNET/ACCA 310. |

86. (Informative Note) This minimum rated feature may be determined as part of the heating and cooling system building element.

***Modify the table “Building Element: Heating and Cooling Distribution System” in ANSI/RESNET/ICC 301-2019 Normative Appendix B and the table in ANSI/RESNET/ICC 301-2014 Addendum N-2018 and the Informative Note designated as “i” here to represent the respective number in Standard 301-2019 and Standard 301-2014 Addendum N-2018 as follows:***

| **Building Element: Heating and Cooling Distribution System** |
| --- |
| **Rated Feature**  | **Task**  | **On-Site Inspection Protocol**  |
| System type  | Identify type of distribution system used to provide space heating and cooling  | *Forced air* - a fan unit or air handler connected to ducts that supply heated or cooled air to multiple rooms in the Dwelling Unit. Forced air systems have supply or return ductwork. *Unit heater/air conditioner* - heating or cooling is supplied directly from a heating or cooling device located within the space it serves. Unit~~ary~~ equipment has no supply or return ductwork.i *Forced hot water* - heated water is pumped through a series of radiator elements to supply heat. Identify and record the radiator elements as conventional radiators, baseboard “fin tube” radiators, cast iron baseboards or radiant hot water panels located at the baseboards or on walls or ceilings. *Hot water radiant system* - heated water is circulated through plastic or metal tubing that is installed in a concrete slab or finished floor or occasionally, in walls or ceilings. *Steam heating* - steam systems utilize a distribution system with cast iron radiators connected to a boiler that creates steam. The steam rises into the radiators through one set of pipes, condenses into water and drains back to the boiler. There are 2 common system types:One Pipe Steam - Radiators have only one pipe connected with a shutoff valve. There will also be an air vent on the opposite end of the radiator from the pipe connection.Two Pipe Steam - Radiators will have a larger steam supply pipe and a smaller condensate return pipe. There will be a control valve on the steam side and a steam trap on the condensate side. |

i (Informative Note) Examples of unit~~ary~~ heater/Air Conditioner equipment include window air conditioners, package terminal heat pumps (PTHP), packaged terminal air conditioners (PTAC), and ductless minisplits. Where unit~~ary~~ heater/Air Conditioner equipment has any amount of ductwork, they are forced air systems.

***Modify the table “Building Element: Heating and Cooling Equipment” in ANSI/RESNET/ICC 301-2019 Normative Appendix B and to the table in ANSI/RESNET/ICC 301-2014 Addendum N-2018 as follows:***

| **Building Element: Heating and Cooling Equipment** |
| --- |
| **Rated Feature**  | **Task**  | **On-Site Inspection Protocol**  |
| Individual Heating and Cooling Equipment | Identify type(s) of individual equipment for heating and cooling of a single Dwelling Unit | Determine the individual heating/cooling type that is present in each Dwelling Unit. Typical unit types are defined below:*Boiler* – creates hot water or steam, powered by any fuel type and can be used with forced air distribution in conjunction with a fan coil unit or PTAC where the fan blows air over the hot water coil to provide heating, or distributed by forced hot water, steam or a hot water radiant slab system. *Direct evaporative cooler* - used primarily in very dry climates. Evaporative coolers work by blowing air over a damp pad or by spraying a fine mist of water into the air. Direct evaporative coolers add moisture to the home. *Furnace* - comprised of a combustion chamber and heat exchanger or an electric resistance element and a fan that forces air across the heat exchanger or resistance element to provide heat in a forced air system.*Ground Source Heat Pumps* - are coupled to the ground through the use of a water well. In Attached Dwelling Units, confirm and record when a circulation loop is shared amongst multiple Dwelling Units. See Central Equipment below for details. *Packaged terminal air conditioner (PTAC)* - a factory-selected wall sleeve and separate un-encased combination of heating and cooling components, assemblies, or sections. It may include heating capability by hot water, steam or electricity and is intended for mounting through the wall to serve a single room or zone. If a hot water coil is present, determine if the boiler is individual or central.*Packaged terminal Heat Pump (PTHP)* - a PTAC capable of using the refrigerating system in a reverse cycle or Heat Pump mode to provide heat.*Split system Air Source Heat Pump* - move energy from one location to another using the vapor-compression cycle. They are electrically driven and provide heating in winter and cooling in summer by reversing the direction of heat flow. Split system Heat Pumps consist of an outdoor unit and an indoor air handling unit, resembling a furnace. These systems require ductwork for air distribution. Most Air Source Heat Pumps incorporate electric resistance supplemental heat in the indoor section. However, some Heat Pump systems use a fossil fuel furnace for supplemental heating. These are known as “dual fuel” or add-on systems.*Split system air conditioner* - similar to a split system Air Source Heat Pump. Consists of an outdoor unit and a coil in the forced air distribution system. These systems are electrically powered and provide cooling. *Through-the-wall ductless Air Source Heat Pump* - a single packaged Air Source Heat Pump installed without a distribution system. Provides both heating and cooling and is installed through an exterior wall. *Unit~~ary~~ space heater* - fossil fuel burning heaters that have individual controls and no distribution system. Determine and record when the system is equipped with a fan for forcing air circulation over a heat exchanger or uses simple convective forces. These heaters are mounted on outside walls to facilitate venting and use natural gas, kerosene, propane or other types of fossil fuel.*Variable-speed Mini-Split and Multi-Split Heat Pumps –* systems listed under “residential” in the AHRI Directory and have multiple configurations depending on whether the system is “single-port” or “multi-port” and whether it is ducted, nonducted or a mix. They are considered individual systems when they serve only one Dwelling Unit.j *Window/through-the-wall air conditioner* – a single packaged ductless air conditioner designed to be installed without a distribution system and without a factory-selected sleeve. *Electric resistance heater* – electric heaters that typically have individual controls and no distribution system. They are typically either electric baseboard heaters, electric wall heaters or electric bathroom heaters. |

j (Informative Note) The term “mini-split” generally refers to a nonducted, “single-port” Heat Pump.

***Modify MINHERS Section 304 Normative References as follows:***

***(Informative Note: Both ANSI/RESNET/ICC 301-2014 and ANSI/RESNET/ICC 301-2019 are currently in effect. Standard 301-2014 is the primary standard but Standard 301-2019 has been approved for Voluntary use beginning October 1, 2019. Standard 301-2019 becomes Mandatory, subject to extensions for use of Standard 301-2014 pursuant to MINHERS Addendum 43, on January 1, 2021.)***

**304 Normative References**

ANSI/RESNET/ICC 301-2014(Republished January 2016), “Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings using an Energy Rating Index.”, including addenda and normative appendices. (see below for addenda)

ANSI/RESNET/ICC 301-2019, “Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings welling and Sleeping Units using an Energy Rating Index.”, including addenda and normative appendices.

ANSI/RESNET/ICC 380-2019, “Standard for Testing Airtightness of Building, Dwelling Unit and Sleeping Unit Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems”, including addenda and normative appendices.

MINHERS-Mortgage Industry National Home Energy Rating Systems

RESNET/ACCA 310-2020, Standard for Grading the Installation of HVAC Systems. Residential Energy Services Network, Oceanside, CA.

RESNET MINHERS Chapter 1-2013, “National Accreditation Procedures for Home Energy Rating Systems” including addenda.

RESNET MINHERS Chapter 2-2013, “National Rater Training and Certifying Standard” including addenda.

RESNET MINHERS Chapter 6, “RESNET National Standard for Sampled Ratings”

RESNET MINHERS Chapter 9-2013, “RESNET National Standard for Quality Assurance” including addenda.

RESNET Publication 002-2017, “Procedures for Verification of RESNET Accredited HERS Software Tools”

Note:

ANSI/RESNET/ICC 301-2014 Addenda:

ANSI/RESNET/ICC 301-2014 Addendum A-2015, Domestic Hot Water Systems, January 15, 2016

ANSI/RESNET/ICC 301-2014 Addendum B-2015, Innovative Design Requests, January 15, 2016

ANSI/RESNET/ICC 301-2014 Addendum D-2017, Standard ANSI/RESNET/ICC 380-2016 and Addenda, January 1, 2018

ANSI/RESNET/ICC 301-2014 Addendum F-2018, Appendix A Inspection Procedures for Insulation Grading and Assessment

ANSI/RESNET/ICC 301-2014 Addendum E-2018, House Size Index Adjustment Factors, February 1, 2018

ANSI/RESNET/ICCC 301-2014 Addendum G-2018 , Solid State Lighting, February 2, 2018

ANSI/RESNET/ICC 301-2014 Addendum K-2017, Roof Solar Absorptance Test Standard, November 10, 2017

ANSI/RESNET/ICC 301-2014 Addendum L-2018, Duct Leakage to Outside Text Exception

ANSI/RESNET/ICC 301-2014 Addendum N-2018, Appendix B Inspection Procedures for Minimum Rated Features

ANSI/RESNET/ICC 301-2014 Addendum R-2018, Threshold Ratings

ANSI/RESNET/ICC 301-2014 Addendum T-2018, Thermal Distribution System Efficiency, December 30, 2018

ANSI/RESNET/ICC 301-2019 Addenda:

ANSI/RESNET/ICC 301-2019 Addendum A-2019, Clothes Washers and Dryers and Dishwashers, July 1, 2020

ANSI/RESNET/ICC 380-2016 Addenda:

ANSI/RESNET/ICC 380-2016 Addendum A-2017, Attics and Crawlspaces

1. (Informative Note) While total duct leakage must be assessed and graded in the Rated Home as a prerequisite to assessing Blower Fan airflow, no grade need be assigned for the Energy Rating Reference Home or Index Adjustment Design, because the parameter does not directly impact the energy consumption of the home. [↑](#footnote-ref-1)
2. (Informative Note) Gross capacity is the net capacity plus the capacity required to remove the fan heat. [↑](#footnote-ref-2)
3. (Informative Note) This factor represents the fact that operating temperatures that differ from rated conditions will result in equipment capacity that differs from rated capacity and is not a reflection of installation quality. The methodology for calculating this factor is not prescribed within this standard. [↑](#footnote-ref-3)
4. (Informative Note) Gross efficiency is the gross system capacity divided by the power of the outdoor unit. [↑](#footnote-ref-4)
5. (Informative Note) This factor represents the fact that operating temperatures that differ from rated conditions will result in a system efficiency that differs from the rated efficiency and is not a reflection of installation quality. The methodology for calculating this factor is not prescribed within this standard. [↑](#footnote-ref-5)