**Draft PDS-01**

**RESNET/ICC 301-2022 Addendum G-202x**

**Integrated Heat Pump Water Heater (iHPWH)**

***Modify Standard ANSI/RESNET/ICC 301-2022 as follows. Note: Where sections, tables and equations are added or deleted affecting existing section, table or equation numbers respectively and the references to those numbers, the renumbering will be established editorially upon the finalization of the addendum.***

1. ***Add definitions to Section 3.2 Definitions***

***Heat Pump Water Heater (HPWH)***- A water heater that transfers thermal energy from one temperature level to another temperature level for the purpose of heating water, including all ancillary equipment such as fans, storage tanks, or controls necessary for the device to perform its function.

***Integrated Heat Pump Water Heater (iHPWH)*** – An air-source Heat Pump Water Heater where the heat pump is integrated into the unitary water heater.

1. ***Add acronyms to Section 3.3 Acronyms***

***HPWH –*** Heat pump water heater

***iHPWH –*** Integrated heat pump water heater

1. ***Add a new table note reference ‘ac’ and modify table note ‘v’ to the ‘Service water heating systems’ section from Table 4.2.2(1)****: [See language below]*

|  |  |  |
| --- | --- | --- |
| **Building Component** | **Energy Rating Reference Home** | **Rated Home** |
| Service water heating systems p, t, u, v.1, v.2, v.3 | Efficiency:Electric: EF = 0.97 - (0.00132 \* store gal)Fossil fuel: EF = 0.67 - (0.0019 \* store gal) | Same as Rated HomeacSame as Rated Home |

***4. Modify the table note ‘u’ in ‘Table 4.2.2(1)’ as follows:***

u. The Uniform Energy Factor (UEF) or Energy Factor (EF) shall be obtained for residential hot water equipment.~~, or~~ For commercial hot water equipment, UEF, COP or the Thermal Efficiency (TE) and Standby Loss (SL) shall be obtained ~~for commercial hot water equipment~~ from manufacturer’s literature or from AHRI directory for equipment being used where available. When UEF is obtained, the First Hour Rating (FHR) shall also be obtained. For commercial water heaters where EF or UEF is not available, an Approved commercial hot water system calculator shall be used to determine the EF or UEF.

***5. Modify the table note ‘v’ in ‘Table 4.2.2(1)’ as follows and create a new table note:***

v.1. Where the heat balance of the space(s) connected to a Service Hot Water System is (are) explicitly modeled by software, t~~T~~he heat sources and sinks associated with the Service Hot Water System shall be included ~~in the energy balance for the space in which the Service Hot Water System is located~~. For a Service Hot Water System with a storage tank, the simulation shall include storage tank heat losses to the appropriate space.

v.2. For air-source HPWH, the simulation shall include the spaces where supply air intake is extracted and exhaust air is discharged. Where necessary, all air-source HPWH simulations shall include supplementary electric resistance elements to meet the hot water demand of the Dwelling Unit. The COP of an air-source HPWH shall be adjusted for the temperature of its supply air intake and the tank heat transfer shall be adjusted for the temperature of the space.

*v.3 F*or all HPWH, the UEF shall be separated into the heat pump compressor COP and the tank UA according to Tables X and Y.

Table X: HPWH Compressor COP Values

|  |  |
| --- | --- |
| **First Hour Rating[[1]](#footnote-1) (gal/hr)** | **COPcomp** |
| >= 18, < 51 | 1.0005 \* UEF - 0.0789 |
| >= 51, < 75 | 1.0909 \* UEF - 0.0868 |
| >= 75 | 1.1022 \* UEF - 0.0877 |

Table Y: HPWH Tank UA Values

|  |  |
| --- | --- |
| **Tank Volume (gal)** | **Tank UA (Btu/hr-F)** |
| <= 58 | 3.6 |
| > 58, <= 73 | 4.0 |
| > 73 | 4.7 |

***6. Add new table notee ‘ac’ language***

ac. Where an iHPWH is installed, the rated UEF shall be used to determine the compressor COP if one of the following conditions is met for each water heater:

1. A ducted intake and ducted exhaust is installed and the incoming air is drawn from the same space as the space to which the exhaust is discharged.
2. The enclosed space containing the water heater is verified to have a total net free opening area to an adjacent heated or conditioned space of no less than 75 in2 per 100 watts of compressor power, using any combination of grilles, louvers, door undercuts, or a louvered door. Where the compressor power is not specified by the manufacturer, the total net free opening area shall be no less than 560 in2.
3. The iHPWH is in an enclosed space having a volume equal to or greater than 1,000 ft3 which is within the Conditioned Space Volume of the Dwelling Unit.

For all other iHPWH installations, the maximum allowable COP (COPeff) shall be determined by the equation below.

COPeff = (COPcomp - 1.53) \* (1 - ( 1.009 \* exp(-5.492\*(RV) ) ) ) + 1.53

Where:

COPcomp = Heat pump compressor COP at the rated UEF

RV = Relative Volume = MIN [(iHPWH containment volume, ft3)/1500 ft3), 1.0]

***7. Modify the ‘Service Hot Water Equipment’ section from ‘Table 4.5.2(1)’ as follows:***

|  |
| --- |
| **Table 4.5.2(1) Minimum Rated Features** |
| **Building Element** | **Minimum Rated Feature** |
| 15. Service Hot Water Equipment  | For Residential Equipment - Equipment type, location, efficiency (Uniform Energy Factor and First Hour Rating; or Energy Factor), extra tank insulation R-Value, flow rates of showers and Bathroom sink faucets. For Integrated Heat Pump Water Heaters – containment volume (ft3) and the net free opening area (in2) of the space containing the water heater. If ducted, the space to which the exhaust air is discharged and the space from which the intake air is supplied.For Commercial Equipment - Equipment type, location, Uniform Energy Factor, COP, or Thermal Efficiency and Standby Loss, extra tank insulation value, flow rates of showers and Bathroom sink faucets. |

***8. Modify ‘Building Element: Service Hot Water (SHW) Equipment’ table within Normative Appendix B as follows:***

|  |  |  |
| --- | --- | --- |
| Efficiency  | Determine and record the Energy Factor, Uniform Energy Factor, COP, or thermal efficiency of the service hot water equipment | Look for the water heater's nameplate and product literature. Record the manufacturer, model number and if listed directly on the nameplate, the efficiency rating. Search for the model number in the manufacturer’s data sheets or ~~an~~ appropriate efficiency rating directory to determine and record the EF, UEF, COP, or thermal efficiency rating. When UEF is recorded, also record the First Hour Rating. When thermal efficiency is recorded, also record the standby loss if available.When the efficiency rating cannot be determined, approximate the age of the unit and use a default efficiency.  |
| Individual service hot water equipment type  | Determine and record type, capacity, and fuel source of standalone water heater serving single Dwelling Unit | Identify whether the equipment is storage or instantaneous, identify its fuel source and record storage tank capacity in gallons. Also record whether the SHW equipment is an Integrated Heat Pump Water Heater, or supplemented by a desuperheater and/or if it is integrated with the space heating system.*Integrated Heat Pump Water Heater* – For Integrated Heat Pump Water Heaters, record whether the system has a ducted intake and exhaust and record the spaces to and from which the air is ducted. If not ducted, for the space that contains the iHPWH, measure dimensions of the room to calculate its volume (ft3) and record the total net free opening area (in2) of any grilles/louvers/door undercuts. Where the net free area of a grille or louvered opening is not specified by the manufacturer, the net free area shall be calculated as 35% of the area of the grille or louvered opening. |

1. (Informative Note) There are no HPWH products currently on the market with First Hour Rating < 18 gal/hr. [↑](#footnote-ref-1)