

Software Verification Process

This document is intended for use with the ERV Operations Manual.

1. *The Participant's software shall reflect the following participant decisions:*

- a. **Min and max airflow (SCFM) for the component Q_{min} and Q_{max}**
 - i. Software may not generate ratings above Q_{max} .
 - ii. Software may generate ratings below Q_{min} , but not by more than 25% of $Q_{max} - Q_{min}$. Ratings in this range must be identified as application ratings and shall not display the AHRI Mark.

$$\text{Minimum Application Rating SCFM} = Q_{min} - 0.25 * (Q_{max} - Q_{min})$$

- iii. Example: Q_{min} is declared as 1500 SCFM, and Q_{max} is declared as 4000 SCFM. The software may produce certified ratings between 1500 SCFM and 4000 SCFM. The software may produce application ratings between 875 SCFM and 1499 SCFM. Ratings may not be provided above 4000 SCFM.
 - iv. Participant need not explicitly state Q_{min} and Q_{max} in the software interface.
 - v. Participant does not need to provide Q_{min} and Q_{max} to AHRI, except when asked by staff during the verification selection process.
- b. **Min and max Supply Flow Ratio for the component SFR_{min} and SFR_{max}**
 - i. Supply flow ratio is defined in AHRI 1060 (I-P/2018) as Station 2 Airflow divided by Station 3 Airflow.
 - ii. Software may not generate outputs below SFR_{min} or above SFR_{max} .
 - iii. Table 2 of the ERV Operations Manual defines the range of Standard Rating Conditions for Supply Flow Ratio as 0.8 to 1.25.
 1. Software may generate outputs below that range only if SFR_{min} is declared at lower than 0.8; these outputs must be identified as application ratings.
 2. Software may generate outputs above that range only if SFR_{max} is declared at higher than 1.25; these outputs must be identified as application ratings.
 - iv. Participant need not explicitly state SFR_{min} and SFR_{max} in the software interface.
 - v. Participant does not need to provide SFR_{min} and SFR_{max} to AHRI, except when asked by staff during the verification selection process.
- c. **Max positive and max negative Pressure Differential for the component dp_{min} and dp_{max}**
 - i. Software may not generate outputs below dp_{min} or above dp_{max}
 - ii. Table 2 of the ERV Operations Manual defines the range of Standard Rating Conditions for Pressure Differential as -2.5 to +2.5 in H_2O .
 1. Software may generate outputs below that range only if dp_{min} is declared at lower than -2.5 in H_2O ; these outputs must be identified as application ratings.
 2. Software may generate outputs above that range only if dp_{max} is declared at higher than +2.5 in H_2O ; these outputs must be identified as application ratings.
 - iii. Participant need not explicitly state dp_{min} and dp_{max} in the software interface.
 - iv. Participant does not need to provide dp_{min} and dp_{max} to AHRI, except when asked by staff during the verification selection process.

- d. Bounds of psychrometric conditions within which software outputs can be considered certified are defined in AHRI 1060 (I-P/2018) Table 1.
 - i. Participant may elect to certify in a smaller contiguous range of conditions, but its software may not provide outputs beyond that smaller range.
 - ii. Software may generate outputs beyond a boundary of the standard bounds but only if its rating zone extends completely to that boundary; those ratings shall be identified as application ratings.
 - iii. Participant need not explicitly state the boundaries in the software interface.
 - iv. Participant does not need to provide the boundaries to AHRI, except when asked by staff during the verification selection process.
- e. Participant may elect to limit the software to discrete rating points rather than a continuous map. Only the rating points that can be generated from the software are certified, and the participant is not allowed to publish or provide ratings at any other points by any means.

2. AHRI Staff shall make the following selection decisions on an annual basis:

- a. Staff selects a wildcard thermal point **TP_{WILD}** from either the winter or summer verification zone (used for all verification tests that year).
 - i. Exception: An alternate wildcard thermal point may be selected when the participant's range of software input does not include the selected wildcard thermal point, per section 1.d.
- b. Staff confidentially selects the **Variable Airflow Fraction (VAF)** for use in verification tests that year to determine the **Basic Airflow**. **VAF** is a number between 0.0 and 1.0.

$$\text{Basic Airflow} = Q_{\min} + \text{VAF} \times (Q_{\max} - Q_{\min})$$

- i. Exception: for a specific model, AHRI staff may select a different VAF, if required due to testing limitations.
- ii. Examples: Staff has selected a VAF of 0.75.
 - 1. If a participant's declared min and max are $Q_{\min} = 250$ and $Q_{\max} = 1000$ SCFM, the Basic Airflow for this verification test is 813 SCFM.
 - 2. If a participant's declared min and max are $Q_{\min} = 500$ and $Q_{\max} = 1000$ SCFM, the Basic Airflow for this verification test is 875 SCFM.
- c. Staff selects the **Supply Flow Ratio (SFR)** for use in verification tests that year. For tests at unbalanced airflows:

$$\begin{aligned} \text{Station 2 Airflow} &= \text{Basic Airflow} \\ \text{Station 3 Airflow} &= \text{Basic Airflow} / \text{SFR} \end{aligned}$$

- i. Exception: If a specific sample cannot be tested at that SFR, staff will pick a different SFR for use with that sample. (This could occur because the selected SFR is beyond the range declared by the participant, or because application of the SFR to the Basic Airflow results in a test airflow less than Q_{\min} or greater than Q_{\max} .)

- d. Staff selects the **Verification Differential Pressure Fraction (VdPF)** and a pressure direction (positive or negative) for use in verification tests that year. **VdPF** is a value between 0.0 and 1.0.
 - i. For positive direction: $dP_{\text{test}} = \text{VdPF} \times dP_{\text{max}}$
 - ii. For negative direction: $dP_{\text{test}} = \text{VdPF} \times dP_{\text{min}}$
 - iii. Exception: for a specific model, staff may select a different VdPF if testing limitations require or if the resulting dP_{test} is outside the range of standard rating conditions.
- e. After model selection, staff will request the participant to provide: Q_{min} , Q_{max} , SFR_{min} , SFR_{max} , dP_{min} , dP_{max} , and bounds of psychrometric conditions supported by software.
 - i. Staff will subsequently confirm these values are aligned with the software.
 - ii. A standardized spreadsheet will be used for data submittal.
- f. If the software provides ratings at discrete points per section 1.e, AHRI staff will adjust the selected test conditions to match the nearest point at which ratings are available. This may require adjustments to **VAF**, **SFR**, **VdPF**, or **TP_{WILD}**. Interpolation between rating points will not be used.

3. Verification Tests shall be performed as outlined in the OM.

- a. All thermal tests are performed with room air at the current standard conditions (specified in the OM).
- b. If the laboratory was not able to achieve the selected test conditions within the tolerances required by AHRI 1060, after the tests are performed the actual conditions (temperatures, humidities, airflows, pressure differentials, and pressure/altitude) at which the tests were performed will be entered by staff into the software to generate the ratings to which the measured values are compared.

4. Summary of Metrics Measured (6 total metrics, in 3 tests)

- a. Refer to ERV OM Table 3.

5. Additional Test Data for Failed Tests (starting with 2023 program year)

- a. Staff will make the following selections to calculate test conditions for additional test data to be collected if a failure occurs.
 - i. Two additional VAF values (VAF_2 , VAF_3)
 - ii. Two additional pressure differentials
- b. These additional test conditions shall be finalized prior to the laboratory beginning the initial test. If a failure occurs during the initial test, the laboratory will automatically continue testing the additional test points corresponding to the metric(s) that failed. Participant may request specific VAF or VdPF values, subject to AHRI approval and lab limitations. The participant must include a reason or justification for the requested conditions.

6. Qualification Tests

- a. Refer to ERV OM Table 1.
- b. For qualification tests, staff will select a total of three VAF values (VAF_1 , VAF_2 , VAF_3) and two wildcard pressure differential verification points.