

# OPERATIONS MANUAL

## WATER-SOURCE HEAT PUMPS CERTIFICATION PROGRAM

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**AHRI WSHP OM – NOVEMBER 2023**

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## **PREFACE**

The following manual outlines the procedures and policies of the Performance Certification Program for Water-Source Heat Pumps (WSHP) operated by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI). This manual is to be used in conjunction with the AHRI General Operations Manual (OM) for AHRI Certification Programs. Where the AHRI General Operations Manual and this product-specific manual differ, this product-specific operations manual shall prevail.

The revision of this manual supersedes all previous revisions. The current edition of this manual, as well as the AHRI General Operations Manual, can be accessed through the AHRI website, [www.ahrinet.org](http://www.ahrinet.org).

The WSHP Certification Program by AHRI provides for independent verification of the Water-Source Heat Pumps manufacturers' stated equipment performance. Safety criteria are not within the scope of this program.

Participation in the program is voluntary. Any manufacturer, regardless of AHRI membership, may obtain approval of Program Ratings and use of the AHRI WSHP Certification Mark hereinafter referred to as the "Mark". The Mark is the Participant's public representation that the ratings of randomly selected samples have been verified by an independent laboratory in accordance with test procedures prescribed by this operations manual. A Certification Agreement is executed between the manufacturer and AHRI specifying the conditions under which such Ratings and the Mark may be used. No manufacturer has the right to use Program Ratings or to state that their products have been tested in conformance with the procedures outlined in this Rating Procedure unless and until they have received written authority from AHRI to use the Mark as applied to the specific approved Program Ratings.

This Operations Manual has been prepared to assure that administration of the program is carried out in a uniform manner. It is an amplification of the Certification Agreement signed by licensees and AHRI. General information, procedural details, and copies of forms are included in this Operations Manual. Provisions of the Operations Manual may be amended as provided in the Certification Agreement.

This certification program complies with requirements of the ISO/IEC Standard 17065:2012, *Conformity assessment – Requirements for bodies certifying products, processes and services*.

### Note:

This manual supersedes Water-Source Heat Pumps Operations Manual, December 2019.

**CERTIFICATION OPERATIONS MANUAL FOR**

**WATER-SOURCE HEAT PUMPS**

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## 1. Program Overview

1.1 Applicable Rating Standard. It is mandatory for program Participants to comply with the provisions of ANSI/AHRI/ASHRAE/ISO Standard 13256-1: 1998 (RA 2012) *Water-source heat pumps - Testing and rating for performance - Part 1: Water-to-Air and brine-to-air heat pumps* and ANSI/AHRI/ASHRAE/ISO Standard 13256-2: 1998 (RA 2012) *Water-source heat pumps - Testing and rating for performance - Part 2: Water-to-Water and brine-to-water heat pumps* (Standard).

1.2 Product Definitions. All terms in this document shall follow the AHRI General Operations Manual and the Standard definitions unless otherwise defined in this section.

1.2.1 Water-Source Heat Pump (WSHP). WSHPs may consist of one (1) or more factory-made assemblies that include indoor space conditioning and/or domestic water heating heat exchanger(s), compressor(s), and a liquid-side heat exchanger. When provided in more than one (1) assembly, the separate assemblies are designed to be used together. WSHPs may provide space heating, space cooling, domestic water heating, or a combination of these functions and may also include the functions of liquid circulation, thermal storage, air circulation, air cleaning, dehumidifying or humidifying. There are two (2) classes of WSHPs:

1.2.1.1 Water-to-Air Heat Pump. A heat pump which consists of one (1) or more factory-made assemblies which normally include an indoor conditioning coil with air-moving means, compressor(s), and refrigerant-to-water or refrigerant-to-brine heat exchanger(s), including means to provide both cooling and heating, cooling-only, or heating-only functions. When such equipment is provided in more than one (1) assembly, the separated assemblies should be designed to be used together. Such equipment may also provide functions of domestic water heating and hydronic space heating, air cleaning, dehumidifying, and humidifying.

1.2.1.2 Water-to-Water Heat Pump. A heat pump which consists of one (1) or more factory-made assemblies which normally include an indoor-side refrigerant-to-water heat exchanger, compressor(s), and an outdoor-side refrigerant-to-water or refrigerant-to-brine heat exchanger(s), including means to indirectly provide both cooling and heating, cooling-only, or heating-only functions. When such equipment is provided in more than one assembly, the separated assemblies should be designed to be used together.

1.2.2 Water-Source Heat Pump Applications. WSHPs use circulating liquid as a thermal energy source/sink to provide space conditioning and/or domestic water heating. WSHPs are designed for use in the following applications, with those that utilize the thermal energy of the ground or groundwater classified as geothermal heat pumps.

1.2.2.1 Water-loop Heat Pump Application (WLHP). A WSHP using liquid circulating in a common piping loop and functions as a heat source/heat sink. The temperature of the water is usually mechanically controlled within a temperature range of 15°C [59°F] to 40°C [104°F].

1.2.2.2 Ground-loop Heat Pump Application (GLHP). A WSHP using a liquid circulating through a subsurface piping loop placed in horizontal trenches, vertical bores, or submerged in a body of surface water. The temperature of the liquid is related to the climatic conditions and may vary from -5°C [23°F] to 40°C [104°F].

1.2.2.3 Ground-water Heat Pump Application (GWHP). A WSHP using water pumped from a well, body of surface water, or reclaimed water supply. The temperature of the water is related to the climatic conditions and may vary from 5°C [41°F] to 25°C [77°F] for deep wells.

1.3 Program Scope. This program applies to 50 and 60 Hz Production Models of WSHPs, as defined in Section 1.2, rated below 39,500 W [135,000 Btu/h] in cooling and 58,600 W [200,000 Btu/h] in heating at ISO Standard Rating Conditions.

1.3.1 Program Scope Exclusions. The Standard does not apply to the rating and testing of individual assemblies such as condensing units or coils, for separate use.

1.4 Intended Market. The Intended Market for this certification program, includes all products defined in Section 1.3 that are sold for use in the U.S. (including U.S. Territories) and Canada.

1.5 Basic Model Group (BMG). A Participant’s listings shall be grouped by BMG. A BMG shall consist of a model or models with the same or comparable compressor used with the same or comparable refrigerant-to-liquid heat exchanger. This definition applies to both package units and split systems. A Water-to-Air Heat Pump shall not be in the same BMG as a Water-to-Water Heat Pump.

1.5.1 Optional Subdivision by Indoor Blower Motor Type. A Participant has the option to further subdivide BMGs by indoor blower motor type.

1.5.2 AHRI Types. Applicants and Participants must choose an AHRI type from Table 2 while uploading each individual model. Models are broken down between water-to-air and water-to-water.

**Table 1: AHRI Type**

<b>AHRI Type</b>	<b>AHRI Description</b>	<b>Designation</b>
WBAHP-C	Water-to-air, coil only	Water/Brine to Air Heat Pump Split System, W/ No Indoor Fan
WBAC	Water-to-air, cooling only	Water/Brine to Air Cooling Only Packaged Unit
WBAC-CB	Water-to-air, cooling only	Water/Brine to Air Cooling Only Split System
WBAC-CO	Water-to-air, cooling only	Water/Brine to Air Cooling Only Split System, Ductless
WBAC-C	Water-to-air, cooling only, coil only	Water/Brine to Air Cooling Only Split System, W/ No Indoor Fan
WBAHP	Water-to-air, heating and cooling, coil only	Water/Brine to Air Heat Pump Packaged Unit
WBAHP-CB	Water-to-air, heating and cooling	Water/Brine to Air Heat Pump Split System
WBAHP-CO	Water-to-air, heating and cooling	Water/Brine to Air Heat Pump Split System, Ductless
WBAHP-O	Water-to-air, heating and cooling	Water/Brine to Air Heat Pump Packaged Unit, Ductless
WBAH	Water-to-air, heating only	Water/Brine to Air Heating Only Packaged Unit
WBAH-CB	Water-to-air, heating only	Water/Brine to Air Heating Only Split System
WBAH-CO	Water-to-air, heating only	Water/Brine to Air Heating Only Split System, Ductless
WBAH-O	Water-to-air, heating only	Water/Brine to Air Heating Only Packaged Unit, Ductless
WBAH-C	Water-to-air, heating only, coil only	Water/Brine to Air Heating Only Split System, W/ No Indoor Fan
WBWC	Water-to-water, cooling only	Water/Brine to Water Cooling Only Package Unit
WBWH	Water-to-water, heating only	Water/Brine to Water Heating Only Package Unit
WBWHP	Water-to-water, heating and cooling	Water/Brine to Water Heat Pump Package Unit

## 2. Qualification Process

2.1 Original Equipment Manufacturer (OEM) Applicants. With the additions noted below, the OEM qualification process shall proceed according to the AHRI General Operations Manual, Section 4.

STEP 2.1.1 Certification Application Package. In addition to the Application for AHRI Certification, Annual Sales Volume Form, and product-specific ratings and data, noted in the AHRI General Operations Manual, Section 4, STEP 4.1, Applicants shall submit the following documentation to AHRI:

- One test report for each BMG;
- An Applicant requesting AHRI to submit data to CEC, DOE, and NRCan shall submit third-party authorization, compliance forms and other necessary information; and
- Additional information may be needed to meet EPA ENERGY STAR® program requirements.

Electronic forms shall be obtained from AHRI. (available on [www.ahrinet.org](http://www.ahrinet.org) under the Product-Specific Certification Program).

STEP 2.1.2 Processing Application Package.

STEP 2.1.2.1 Performance Certification Agreement for Original Equipment Manufacturer (OEM Agreement). No further action required beyond that listed in Section 4, STEP 4.2 of the AHRI General Operations Manual.

STEP 2.1.2.2 Participation and Licensing Fee Invoice. Payment of the Participation and Licensing Fee is due within 30 calendar days of the invoice issue date. Testing shall not be conducted until the invoice is paid in full. No further action required beyond that listed in Section 4, STEP 4.2 of the AHRI General Operations Manual.

STEP 2.1.3 Selection and Acquisition of Test Samples.

STEP 2.1.3.1 Number of Qualification Tests. 30% of an Applicant's BMGs shall be tested,. A minimum of one (1) Water-to-Water Heat Pump model and a minimum of one (1) Water-to-Air Heat Pump model shall be tested. Fractional numbers shall be rounded to the nearest whole number using traditional rounding methods.

STEP 2.1.3.2 Acquisition of Qualification Test Samples/Selection Criteria. Within 30 calendar days of a request from AHRI, the Applicant shall have samples available for selection. Samples shall be acquired in accordance with Section 3 of this manual.

STEP 2.1.4 Qualification Testing. AHRI shall supply the Independent Third-party Laboratory Contracted by AHRI (Laboratory) with the Published Ratings. The Laboratory shall conduct the testing of the samples in accordance with the Standard, against the Published Ratings.

STEP 2.1.4.1 Operating Tests. In addition to the Performance Rating tests, all qualification tests shall include one of the following Operating Tests, chosen by AHRI, to be conducted at the end of the performance tests for:

- Maximum Operating Conditions Test;
- Minimum Operating Conditions Test;
- Voltage Tolerance Test; or
- Enclosure Sweat and Condensate Test.

If a first sample test fails any Operating Test, a second sample, shall be tested. If the second sample fails any Operating Test, then that model and BMG shall not be entered into the AHRI Directory of Certified Product Performance (Directory) and the Applicant shall cease production and sale of the failed model and BMG in order to qualify into the certification program. An additional qualification sample shall be selected and tested (if all BMGs have not been tested) to continue the qualification process.

STEP 2.1.4.2 Successful Completion of All Qualification Tests. If all qualification tests pass, proceed to STEP 2.1.5.

STEP 2.1.4.3 First Sample Qualification Test Failure. Refer to Section 4, STEP 4.4.2 of the AHRI General Operations Manual for details regarding the first sample qualification failure options:

STEP 2.1.4.4 Second Sample Qualification Test Failure. Refer to Section 4, STEP 4.4.3 of the AHRI General Operations Manual for details regarding the second sample qualification failure options.

STEP 2.1.5 Welcome to the Program. No further action required beyond that listed in Section 4, STEP 4.5 of the AHRI General Operations Manual.

2.2 Private Brand Marketer (PBM) Applicants. With the additions noted below, the PBM qualification process shall proceed according to the AHRI General Operations Manual, Section 5.

PBM Applicants are not required to undergo qualification testing. PBM product certification is contingent upon the certification of the associated OEM product.

STEP 2.2.1 Certification Application Package. In addition to the Application for AHRI Certification Form noted in the AHRI General Operations Manual, Section 5, STEP 5.1, Applicants shall submit the following documentation to AHRI:

- An Applicant requesting AHRI to submit data to CEC, DOE and NRCAN shall submit third-party authorization, compliance forms and other necessary information.
- Additional information may be needed to meet EPA ENERGY STAR® program requirements.

STEP 2.2.2 Processing Application Package.

STEP 2.2.2.1 Performance Certification Agreement for Private Brand Marketer (PBM Agreement). No further action required beyond that listed in Section 5, STEP 5.2.1 of the AHRI General Operations Manual.

STEP 2.2.2.2 OEM Agreement on Behalf of the PBM Applicant. No further action required beyond that listed in Section 5, STEP 5.2.2 of the AHRI General Operations Manual.

STEP 2.2.2.3 Licensing Fee Invoice. Payment of the Licensing Fee is due within 30 calendar days of the invoice issue date.

STEP 2.2.3 Welcome to the Program. No further action required beyond that listed in Section 5, STEP 5.3 of the AHRI General Operations Manual.



### 3. Equipment Selection and Testing

3.1 Annual Testing Requirement. 20% of a Participant's Active BMGs shall be tested annually, with a minimum of one (1) model of each type. Fractional numbers shall be rounded to the nearest whole number using traditional rounding methods.

3.2 Location of Tests. Testing shall be performed at the Laboratory and the sample shall be installed in the test facility in accordance with the Participant's published installation instructions in printed or electronic format.

3.3 Selection of Test Samples. Selections shall be made based on Active and Productions Stopped data contained in the Directory. Prior to the start of the testing year, AHRI shall notify the Participant in writing of the number of tests required for the testing year. AHRI shall establish the start and end dates for each quarter in the test year. All model selections for a program year will be issued prior to the start of the first quarter using data found on the Directory. The selection letter will indicate in which quarter each sample is to be tested. Samples shall arrive at the Laboratory by the start of the indicated quarter.

3.4 Method of Acquiring Test Samples. AHRI or the Laboratory personnel shall make a Random Sample Selection or Random Component Selection. Selected samples shall be shipped to the Laboratory accompanied by the Participant's published installation instructions in printed or electronic format. Refer to Section 9 of the AHRI General Operations Manual.

3.4.1 Pretesting. Pretesting refers to a procedure by which models that have been chosen by AHRI for the test year undergo performance testing to validate ratings prior to arriving at the third-party laboratory. This excludes normal quality checks that are performed on every unit. Once AHRI has chosen the specific model to test, the sample shall not be manipulated in any way by the Participant. Pretesting is specifically prohibited for the selection pool.

3.5 Sample Acquisition Timeframe. For all tests outside of first sample annual tests, the Participant shall make selected samples available for Random Sample Selection within 60 calendar days or provide serial numbers for Random Component Selection with 14 calendar days of receipt of selection letter by AHRI. The Participant shall deliver the selected samples to the Laboratory within 14 calendar days of Random Sample Selection or within 60 calendar days of Random Component Selection by AHRI or Laboratory personnel. Failure to have second samples or replacement samples available within the given timeframe shall forfeit the Participant's opportunity for further testing and shall be grounds for a program violation.

3.6 Break-in Operation and Start-up of Test Samples. A Participant may instruct the Laboratory to operate the equipment for a manufacturer-specified number of "break-in" hours prior to testing. The Participant is required to pay all costs involved.

3.7 Required Equipment and Test Provisions. The Laboratory shall give the Participant two (2) or more weeks advanced notification when that Participant's sample is scheduled to be tested. The Laboratory shall give the Participant no less than three (3) calendar days advanced notice prior to the sample's installation into the test room.

The Participant shall provide a complete equipment submittal for each model, which includes the following mandatory and suggested information prior to the sample's installation into the test room:

#### Mandatory

- Published installation instructions in printed or electronic format.
- Punch List.

#### Suggested

- Highlight pertinent items in the installation manual for testing.
- Photograph of manufacturer's test setup.

3.7.1 Rating Tolerances. Cooling Capacity, Heating Capacity, EER in cooling and COP in heating shall be based on data obtained in accordance with the provisions of the Standard. In order to pass a certification test, measured test results shall not be less than 95% of the certified ratings.

3.7.2 Airflow and External Static Pressure Requirements for Water-to-Air Tests. Refer to Appendix B for Airflow and External Static Pressure Requirements.

3.8 Certified Data. In accordance with the Standard, the following certified ratings are verified by test

- Full-load Cooling Capacity, W [Btu/h];
- Full-load Heating Capacity, W [Btu/h];
- EER, Btu/h/W;
- COP, Btu/h/W;
- Part-load Cooling Capacity (if applicable), W [Btu/h];
- Part-load Heating Capacity (if applicable), W [Btu/h];
- Part-load EER (if applicable), Btu/h/W; and
- Part-load COP (if applicable), Btu/h/W.

Certified data at manufacturer's specified Part-load and Full-load shall be verified by test. Capacity ratings below the manufacturer's lowest certified Part-load value and above the Full-load value shall be considered Application Ratings. A Participant may certify a Full-load Capacity, and up to three (3) Part-load Capacities. For products with Part-load ratings, the highest Part-load Capacity rating in heating or cooling shall be no greater than 85% of the certified Full-load Capacity rating in heating or cooling, respectively.

For models that are capable of operating at more than one (1) Part-load rating point in heating and/or cooling mode, AHRI shall verify the following certified ratings by test:

- Full-load Cooling Capacity;
- Full-load Heating Capacity;
- One random Part-load Cooling point to be selected by AHRI; and
- One random Part-load Heating point to be selected by AHRI.

3.9 Test Failures.

3.9.1 Options Following 1<sup>st</sup> Sample Failure. When the Participant is notified of a first sample certified rating failure, the Participant has seven (7) calendar days to select one of the following options:

- Re-rate all applications for all models within the failed sample's BMG proportionate to the failed test's results;
- Re-rate only the tested application for all models within the failed sample's BMG proportionate to the failed test's results. If this option is chosen, the resultant Penalty Test required by Section 9.16 of the General Operations Manual may be assigned to another application of the same model;
- Test a second sample of the same model (sample shall be available within 45 calendar days following notification of failure); or
- Obsolete the model, which also obsoletes all models within the corresponding BMG.

3.9.2 Options Following 2<sup>nd</sup> Sample Failure. When the Participant is notified of a second-sample certified rating failure, the Participant has seven (7) calendar days to select one of the following options:

- Re-rate all applications for all models within the failed sample's BMG proportionate to the failed test's results;
- Re-rate only the tested application for all models within the failed sample's BMG proportionate to the failed test's results. If this option is chosen, the resultant Penalty Test required by Section 9.16 of the General Operations Manual may be assigned to another application of the same model; or
- Obsolete the model, which also obsoletes all models within the corresponding BMG.

#### 4. Challenge Tests

Refer to Section 10 of the AHRI General Operations Manual.

#### 5. AHRI Directory of Certified Product Performance

All certified products shall be listed in the Directory, [www.ahridirectory.org](http://www.ahridirectory.org). Certification shall not be implied nor claimed for any product not listed in the Directory. Except as noted below, the Participant shall follow the steps outlined in Section 11 of the AHRI General Operations Manual.

5.1 Publication of Ratings in Certified Directory. The information shown in Table 1 pertaining to each Water-to-Air and Water-to-Water model certified shall be published in the Directory:

5.1.1 Models with Multiple Options for Indoor Blower Motor. If a Participant offers both Permanent Split Capacitor (PSC) and Electronically Commutated Motor (ECM) indoor blower versions of a given model, then both PSC and ECM versions shall be listed on the AHRI Directory as separate models with unique AHRI reference numbers. The Participant's marketing literature and software shall not conflict with the certified ratings shown on the AHRI Directory. ECM and PSC versions of the same model may be certified as separate BMGs. Models with ECM-type indoor blowers that operate on a fixed torque setting shall be required to list the torque setting and rated airflow.

5.2 Data Submittal Sheets. Each Participant shall list its products by BMG. OEM Participants shall submit/edit product data via the Directory.

**Table 2: Publication of Certified Ratings in the Directory**

AHRI Certified Reference Number	
Model Status	
Brand Name	
Series Name	
Model Number	
Indoor Unit Model Number	
Program Type	
AHRI Type	
Is Part Load Capable	
Indoor Blower Motor Fan Type	
WLHP, GWHP, GLHP	
Full-load Cooling <sup>1</sup>	Capacity (Btu/h)
	EER (Btu/h/Watt)
	Fluid Flow Rate (Gpm)
Full-load Heating <sup>1</sup>	Capacity (Btu/h)
	COP (Watts/Watt)
	Fluid Flow Rate (Gpm)
Part-load Cooling <sup>1,2</sup>	Capacity (Btu/h)
	EER (Btu/h/Watt)
	Fluid Flow Rate (Gpm)
Part-load Heating <sup>1,2</sup>	Capacity (Btu/h)
	COP (Watts/Watt)
	Fluid Flow Rate (Gpm)
Eligible for Tax Credit	
Notes: 1. Applicable based on unit type or application type.	
2. Participants may list up to three (3) Part-load rating points (Capacities and efficiencies) for models with variable capacity.	

**6. Assessment and Payment of Certification Fees**

Refer to Section 12 of the AHRI General Operations Manual.

**7. Issuance of Violations and/or Termination**

Refer to Section 14 of the AHRI General Operations Manual.

**8. Program Hierarchy, Complaints, and the Appeals Process**

Refer to Section 15 of the AHRI General Operations Manual.

**9. Proper Use of the AHRI Certification Mark and Claims to Certification**

Except as noted below, the Participant shall follow the steps outlined in Section 8 of the AHRI General Operations Manual.

9.1 Publication of Non-Certified Ratings (Application Ratings). Manufacturer’s publications may contain Application Ratings. However, certification can only be implied for products operating at Standard Rating Conditions. Where ratings are included that are outside the scope of the certification program, they shall be accompanied by the following statement: “Ratings outside of the scope of the AHRI WSHP Certification Program.”

9.2 *Part-load Data.* Whenever ratings are shown, both Full-load and Part-load Ratings shall be clearly listed in all published literature.

**APPENDIX A:**  
**General Rules and Guidelines for Water-Source Heat Pumps**

A1 *Setup.* The manufacturer shall specify in their installation instructions any special requirements for the certification test. The Laboratory shall provide, to the manufacturer, a photograph of the test setup included in the test report.

A2 *Variable-Capacity Units.* The manufacturer shall make a provision for manual test operation on variable-capacity compressor and/or fan products to disable automatic compressor and/or fan speed change algorithms to allow steady-state AHRI certification testing at appropriate certification testing points and capacity levels. If a separate compressor and/or a fan control/component is required, it shall be provided by the Participant to the testing facility prior to the certification testing date. If the product requires a set superheat from an Electronic Expansion Valve, this superheat shall be controlled by the product software and not be controlled manually. The product shall maintain steady-state conditions at the certified point throughout the duration of the data acquisition.

A3 *Units Having an Integral Liquid Pump.* In their installation instructions and/or in the required WSHP Punch List, the manufacturer can specify two out of the three following parameters on the liquid circuit where there is an integral liquid pump: 1) liquid flow rate (subject to the pertinent requirements in ISO 13256-1/-2 Standards), 2) liquid pump operating percentage, 3) a non-negative external static pressure difference (pressure out, minus pressure in).

A4 *Water-to-Air Units.* manufacturers must document the external static pressure in the “Full/Part (if applicable) Load External Static Pressure” or “Comments” sections of the AHRI Data Submittal Spreadsheet, and again in the required WSHP Punch List, using Appendix B Section B1 as a guide. For units having bottom air return, the instructions provided by the manufacturer to the Laboratory must clearly illustrate installation that ensures proper return airflow.

A5 *Fan Power Correction Factor for Water-to-Air Units.* The fan power correction factor as calculated in accordance with the Test Standard shall be limited to no more than three percent (3%) of the sample's tested Capacity at Rating Conditions.

A6 *Test Liquids.* Test liquids for water-loop and ground-water heat pumps shall be water. The test liquid for ground-loop heat pumps shall be either a 15% solution by mass of sodium chloride in water or a 15% solution by mass of methanol in water. The specific gravity of the methanol in water shall be 0.976 at a solution temperature of 68°F [20°C].

**Appendix B:**  
**WSHP Airflow and External Static Pressure (ESP) for Water-to-Air Units**

**B1**     *Guidelines for specific fan motor types*

**B1.1**    *Constant Airflow Electronically Commutated Motor (ECM)*

The manufacturer shall provide to the Laboratory all instructions required to install the equipment and reach the rated SCFM. The manufacturer shall also provide test-specific setup instructions on the WSHP Punch List, if applicable to the model. Where instructions on either the Punch List or the manufacturer’s instructions conflict with the AHRI Directory, the AHRI Directory shall take precedence. The manufacturer shall provide the following:

- Fan settings required to reach the rated SCFM for all test points.
- ESP (inches H<sub>2</sub>O) to reach the rated SCFM for all test points.

**B1.1.1** The Laboratory will test ducted units at the specified ESP, and will test non-ducted units at 0.0 ESP. If the SCFM cannot be met within the tolerances provided in Table B1, the Laboratory will contact the manufacturer, per Figure B1.

**B1.1.2** If the Laboratory and manufacturer agree setup is correct and there are no other settings that can be adjusted to provide SCFM and ESP within tolerances of Table B1, the laboratory will adjust ESP to obtain stable SCFM. Minimum ESP shall not be below tolerances of Table B2.

**B1.1.3** If the laboratory and participant do not agree on the same settings and/or conditions, then both the participant and the laboratory shall contact AHRI for a final decision.

**B1.2**    *All Non-Constant Airflow Motor Types.*

The manufacturer shall provide to the Laboratory all instructions required to install the equipment and reach the rated SCFM. The manufacturer shall also provide test-specific setup instructions on the WSHP Punch List, if applicable to the model. Where instructions on either the Punch List or the manufacturer’s instructions conflict with the AHRI Directory, the AHRI Directory shall take precedence. The manufacturer shall provide the following:

- Fan settings required to reach the rated SCFM for all test points.
- Rated SCFM for test points.

**B1.2.1** The Laboratory will test ducted units at the rated SCFM (Starting at manufacturers ESP rating if provided), and will test non-ducted units at 0.0 ESP. ESP may be adjusted to meet Rated SCFM within tolerances in Table B1. If the rated SCFM cannot be reached, the Laboratory will contact the manufacturer, per Figure B1.

**B1.2.2** Minimum ESP shall not be below 0.0 ESP

**B1.2.3** If the Laboratory and manufacturer agree setup is correct and there are no other settings that can be adjusted to provide SCFM within the tolerances of Table B1, the laboratory will adjust ESP to 0.0 ESP and run the test.

**B2**     *SCFM and ESP Test Requirements.*

**B2.1**    SCFM and ESP test data readings shall not exceed the tolerances specified in Table B1.

**Table B1: Variations Allowed in SCFM and ESP Readings**

<b>Blower Motor Type</b>	<b>Readings</b>	<b>Maximum variation of individual reading from rating or test condition</b>	<b>Maximum variation of arithmetical average of individual readings from rating or test condition</b>
<b>Constant Airflow ECM</b>	Air volume flow rate	± 20%	± 10%
	ESP	± 10% or 0.05 in. H <sub>2</sub> O <sup>1</sup>	± 5% or 0.05 in. H <sub>2</sub> O <sup>1</sup>
<b>All Other Motor Types</b>	Air volume flow rate	±10%	±5%
	ESP	± 10% or 0.05 in. H <sub>2</sub> O <sup>1</sup>	± 5% or 0.05 in. H <sub>2</sub> O <sup>1</sup>
Notes:			
1. The laboratory shall use whichever value is greater.			

B2.2 Minimum ESPs for Constant Airflow ECM Ducted samples are shown in Table B2.

**Table B2: Minimum ESP for Constant Airflow ECM Ducted Water-to-Air Test Samples**

<b>Rated Capacity** (Btu/h x 1000)</b>	<b>Minimum ESP for Ducted Units (inches H<sub>2</sub>O)</b>
≤ 28.9	0.10
29 ≤ capacity ≤ 42.9	0.15
43 ≤ capacity ≤ 70.9	0.20
71 ≤ capacity ≤ 105.9	0.25
106 ≤ capacity ≤ 135	0.30
** At the respective mode (heating or cooling) and stage of operation (Full or Part-load) being tested.	



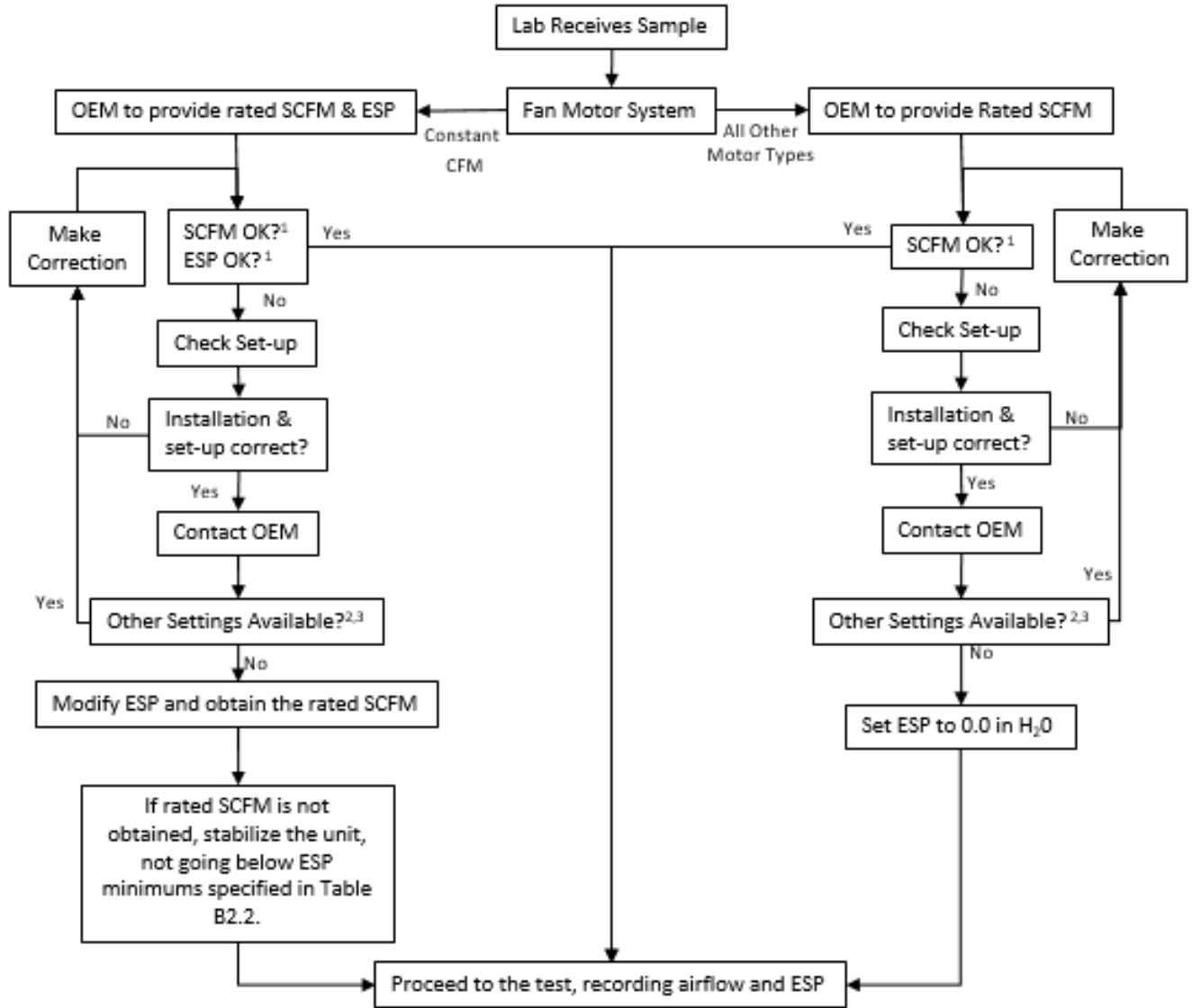


Figure B1: WSHP airflow and ESP Determination Procedure.

Figure B1 Notes:

1. "OK" indicates that the setting is within variations/tolerances specified in Table B1
2. Initial fan motor settings may be changed to achieve stability, but a fan motor setting cannot be changed for each testing point (i.e., when switching from full-load cooling to full-load heating). If the participant and the Laboratory cannot agree upon settings and the resulting operating condition, AHRI must be contacted as the deciding party.
3. The "Other Settings Available" loop (choosing "yes" after "Other Settings Available," and returning back to the "OK?" steps) in the Figure B1 shall only be used one time before the Laboratory is allowed to report that a sample is potentially inoperable to AHRI. This means that the airflow settings shall only be changed one time in the formal set-up period. Refer to Section 9.13 in AHRI's General Operations Manual for guidance on the Inoperable Sample process. Other airflow settings may be explored after the loop is completed once, but the Participant shall be charged for all Laboratory time after a sample is declared inoperable.