OPERATIONS MANUAL

UNITARY SMALL AIR-CONDITIONERS AND AIR-SOURCE HEAT PUMPS (INCLUDES MIXED-MATCH COILS) (RATED BELOW 65,000 BTU/H) CERTIFICATION PROGRAM

AHRI USE OM – JULY 2025

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PREFACE

The following manual outlines the procedures and policies of the Performance Certification Program for AHRI Unitary Small Air-Conditioners (including mixed-match coils) (USAC) and the AHRI Unitary Small Air-Source Heat Pumps (including mixed-match coils) (USHP) operated by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI). This manual is to be used in conjunction with the AHRI General Operations Manual 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.

The USAC and USHP Certification Program by AHRI provides for independent verification of the USAC and USHP 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 USAC and USHP Certification Marks hereinafter referred to as the "Marks". The Marks are the Participant's public representation that the ratings of randomly selected units 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 Marks 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 license 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 Agreements.

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 the AHRI Unitary Small Air-Conditioners (including mixed-match coils) and AHRI Unitary Small Air-Source Heat Pumps (including mixed-match coils) Certification Program Operations Manual, USE OM January 2025 and is effective July 7, 2025.

Printed in U.S.A.

USAC (INCLUDING MIX-MATCH COILS) AND USHP (INCLUDING MIX-MATCH COILS) CERTIFICATION PROGRAM OPERATIONS MANUAL

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1. Program Overview

1.1 *Applicable Rating Standard*. It is mandatory for program Participants to comply with the provisions of AHRI Standard 210/240-2017 with Addendum 1 (if the rating is to be compliant with 10 CFR Appendix M to Subpart B of Part 430) or 210/240-2024 (if the rating is to be compliant with 10 CFR Appendix M1 to Subpart B of Part 430) *Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment* (Standard), or both. Program Participants may optionally comply with the provisions of Appendix H of this Operations Manual. A copy of the Standard is available for download from the AHRI website, www.ahrinet.org.

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

1.2.1 *Independent Coil Manufacturer (ICM)*. Any Participant in the program that manufactures only the Indoor Unit in an Unitary Air-Source Heat Pump and/or Unitary Air-Conditioner.

1.2.2 *Indoor Unit*. A component of a Split System central air-conditioner or heat pump that is designed to transfer heat between refrigerant and heat sink inside the conditioned space.

1.2.3 *Normalized Gross Indoor Fin Surface (NGIFS)*. The gross fin surface area of the indoor coil divided by the cooling capacity measured for the A_{Full} test.

$$NGIFS = \frac{2 * Lf * Wf * Nf}{Qc(95)}$$

Where:
Lf is the finned height per slab x number of slabs in the coil
Wf is the evaporator number of rows x evaporator tube centers
Nf is the evaporator fins/inch x finned length per slab
Qc(95) is the cooling capacity

1.2.4 *Outdoor Unit*. A component of a Split System central air-conditioner or heat pump that is designed to transfer heat between refrigerant and heat sink outside the conditioned space.

1.2.5 *Outdoor Unit with No Match (OUWNM)*. An outdoor unit that is not distributed and has never been distributed in commerce with any indoor unit.

1.2.6 *Single Packaged System*. Any Unitary Air-Conditioner or Unitary Air-Source Heat Pump that has the means for air circulation and heat removal, air cleaning, and the controls thereof, in the same cabinet.

1.2.7 *Split System*. Any Unitary Air-Conditioner or Unitary Air-source Heat Pump that has one or more of the major assemblies separated from the others.

1.2.8 *System Manufacturer*. Any Participant in the program that manufactures all the major assemblies in an Unitary Air-Source Heat Pump and/or Unitary Air-Conditioner.

1.2.9 *Unitary Air-Conditioner*. One or more factory-made assemblies which normally include an evaporator or cooling coil(s), compressor(s), and condenser(s). Where such equipment is provided in more than one assembly, the separated assemblies are to be designed to be used together, and the requirements of rating outlined in the Standard are based upon the use of these assemblies in operation together.

1.2.10 *Unitary Air-Source Heat Pump*. One or more factory-made assemblies which normally include conditioning coil(s), compressors(s), and outdoor coil(s), including means to provide a heating function. When such equipment is provided in more than one assembly, the separated

assemblies shall be designed to be used together, and the requirements of rating outlined in the Standard are based upon the use of matched assemblies.

1.3 *Program Scopes.*

1.3.1 *Unitary Small Air-Conditioner (and Mix-Matched Coils) Certification Program (USAC)*. This program applies to Production Models of 50 and 60 Hz Unitary Air-Conditioners below 65,000 Btu/h cooling, as defined in Section 1.2 and as listed below:

- Unitary Air-Conditioners;
- Single Packaged System;
- Split Systems; and
- Air-conditioning coils (and air-handling products with air-conditioning coils) that an ICM rates as a system with other System Manufacturer's Outdoor Units.

1.3.2 *Unitary Small Air-Source Heat Pump (and Mix-Matched Coils) Certification Program (USHP)*. This program applies to the Production Models of 50 and 60 Hz Air-Source Unitary Heat Pumps below 65,000 Btu/h cooling, as defined in Section 1.2 and as listed below:

- Unitary Air-Source Heat Pumps;
- Single Packaged System;
- Split Systems; and
- Heat pump coils (and air-handling products with heat pump coils) that an ICM rates as a system with other System Manufacturer's Outdoor Units.

1.3.3 *Program Distinction*. The Unitary Small Air-Conditioner (USAC) and the Unitary Small Air-Source Heat Pump (USHP) Certification Program are two separate programs.

1.3.4 *Exceptions*. Dry charge R-22 production models below 65,000 Btu/h are not within the scope of the certification program in U.S. and Canada.

1.4 *Intended Market*. The Intended Market for both Certification Programs includes all products defined in Section 1.3 that are sold for use in the U.S. (including U.S. Territories) and Canada.

1.4.1 *CVP and Cut-in/Cut-out Tests*. Controls Verification Procedure (CVP) and Cut-in/Cut-out tests are not required for models only sold in Canada.

1.5 *Basic Model Groups (BMGs)*. A Participant's listing shall be grouped by BMG.

1.5.1 *System Manufacturer BMG Criteria*. A Split System BMG consists of products with the same Outdoor Unit used with several Indoor Unit combinations (i.e. horizontal, vertical, A-coil, etc.). Same Outdoor Unit refers to models with the same or comparable compressor, used with the same outdoor coil surface area and the same outdoor air quantity.

1.5.1.1 *Determination of BMGs for Calculating the Number of Tests (System Manufacturer)*. When calculating the number of tests for a Participant's annual testing requirement, AHRI shall take the number of active BMGs at the time of selection. The number of tests shall be reviewed again at a later date to determine if additional tests are required.

1.5.2 *ICM BMG Criteria*. An ICM BMG consists of coils (Indoor Units) with matching capacity ranges of 6,000 Btu/h and the following identical geometry parameters: air-handler, evaporator fan type, evaporator number of rows, type of equipment (air-cooled), evaporator tube centers, evaporator fin types, evaporator fins/inch, evaporator tube OD, evaporator expansion device, fin length per slab, fin height per slab, number of slabs in the coil, fin material type, tube material type, and total number of active tubes (refer to Table E1).

1.5.2.1 *Determination of ICM BMG Coil Capacity Range for Calculating the Number of Tests*. Number of test selections shall be based on a Participant's total number of 6,000 Btu/h capacity buckets (BMG Buckets) rated in the AHRI Directory of Certified Product Ratings (Directory) as shown on Table E2. For example, if a Participant builds Indoor Units in Btu/h increments from 6,000 to 65,000 Btu/h's and offers all the variations of Coil Type and AHRI Type, the Participant would have 40 BMG Buckets.

1.6 *NAECA Compliance*. Only products meeting or exceeding ratings set by the Department of Energy (DOE) in the National Appliance Energy Conservation Act (NAECA) are eligible for certification through the AHRI certification program, where applicable.

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 and Annual Sales Volume Form 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 showing how each rating was developed;
- An Applicant requesting AHRI to submit data to CEC, DOE, FTC, 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 2.1.2 *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*.

- *System Manufacturers*. 30% of an Applicant's BMGs shall be tested, with a minimum of two (2) models for the USAC and/or the USHP Certification Programs, as applicable. Fractional numbers shall be rounded up to the nearest whole number.

- *ICM*. 30% of an Applicant's BMG Buckets (refer to Section 1.5.2.1) shall be tested, with a minimum of two (2) models for the USAC and/or the USHP Certification Programs, as applicable. Fractional numbers shall be rounded up to the nearest whole number. If the Applicant has ratings that were filtered via the Rating Screening for ICMs process (refer to Section 5.12) but still wish to certify them, then there shall be up to an additional three (3) models tested from those filtered

models. If a Participant does not have ratings that were filtered out, they are not subject to this additional testing.

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 3.4 of this manual. All samples shall be provided with the equipment listed in Sections 3.6 and 3.7 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 tests noted in Section 3.10 or 3.11, the following Operating Tests shall be conducted for all qualification tests:

- Maximum Operating Conditions (MOC);
- Voltage Tolerance (VT);
- Insulation Efficiency;
- Low Temperature Operation; and
- Condensate Disposal.

If any of these units fail any of the Operating Tests, the second sample selected shall pass in order to qualify into the program. If the second sample does not pass, then that model and BMG shall not be entered into the Directory and the Applicant shall cease production and sale of the failed model and BMG in order to qualify into the certification program. A new sample shall be selected and 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 Forms 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, FTC, 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*.

3.1.1 *System Manufacturers.* 20% of a Participant's BMGs shall be tested annually, with a minimum of two (2) models for the USAC and/or the USHP Certification Programs, as applicable. Fractional numbers shall be rounded up to the nearest whole number . The number of tests required of the Participant shall be reviewed by AHRI throughout the year. AHRI to prioritize M1 testing for BMGs that include both M and M1 ratings.

3.1.1.1 *Basis for System Manufacturer Test Selections.* The selection of units for test are based on 1/3 at random, 1/3 for cause, and 1/3 Designated Tested Combination (DTC).

3.1.2 *ICM*. 20% of a Participant's BMG Buckets in the Directory shall be tested annually, with a minimum of two (2) models for the USAC and/or the USHP Certification Programs, as applicable. Fractional numbers shall be rounded up to the nearest whole number. AHRI to prioritize M1 testing for BMGs that include both M and M1 ratings.

3.1.2.1 *Basis for ICM Test Selections.* Each model(s) shall be selected from a different BMG selection Bucket (see Table E2).

3.1.2.2 *Additional ICM Testing.* If the Participant has ratings that were filtered via the Rating Screening (Section 5) for ICMs process, but were approved by AHRI to be listed in the Directory, then AHRI shall select up to three (3) additional models from those filtered models for test. If a Participant does not have ratings that were filtered out, they are not subject to this additional testing. The number of tests required of the Participant shall be reviewed by AHRI throughout the year.

3.2 *Location of Test*. Testing shall be performed at the Laboratory and samples shall be installed in the test facility in accordance with the Participant's published installation instructions.

3.2.1 *Duties of Third-Party Laboratory Personnel*. The Laboratory is responsible for installing and starting the sample per the Participant's supplied instructions, and testing the sample in accordance with the Standard. The Laboratory shall also set up the sample according to the setup checklist in Appendix F. The Laboratory shall inform the Participant when it intends to test the sample at least two (2) weeks prior to the sample's installation. The Laboratory shall notify the

Participant once the test is about to occur. In the event of a failure, the Laboratory shall notify both AHRI and the Participant immediately after the completion of the test. For items not deserving the manufacturer and/or AHRI's immediate attention (i.e not affecting the validity and/or the completion of the test) proper communication shall be made via email. For items deserving Participant and/or AHRI's immediate attention (i.e affecting the validity and/or the completion of the test) proper ways of communication shall be via phone with an email to follow-up.

3.2.2 *Evaluation of Air-Conditioning and Heating Equipment Test Stands*. The Laboratory shall perform the evaluation of air-conditioning and heating equipment test stands process for each facility that tests USE equipment once every 12 months on a continuous basis (refer to AHRI Standard 140).

3.3 *Selection of Test Samples*. Selections shall be made based on Active and Production Stopped data contained in the Directory. AHRI shall inform the Participant, in writing, of the sample(s) selected for test.

3.3.1 *Selection Requirements for Annual Testing*. During the selection process, the Participant shall provide at least 50% of their selections, per the selection letter, within 45 calendar days of AHRI's notification. Within 90 calendar days of AHRI's notification, 100% of the selections shall be provided. Selections shall be complete systems; the Participant's shall choose which systems are provided first. The USAC and USHP are separate certification programs.

3.4 *Methods for Acquiring Test Samples*. AHRI or the Laboratory personnel shall make at least 50% of the Participant's Random Sample Selections or Random Component Selections from the Participant's stock inventory within 45 calendar days of a selection by AHRI. AHRI or the Laboratory personnel shall make 100% of the Participant's Random Sample Selections or Random Component Selections from the Participant's stock inventory within 90 calendar days of a selection by AHRI.

For Random Component Selection, the sample shall be comprised of a minimum set of three (3) of each major component, Indoor Unit coil, Outdoor Unit coil and compressor. Selected samples shall be shipped to the Laboratory accompanied by the Participant's published installation instructions in printed or electronic format. The Two Sample Supply Option also applies. Refer to Section 9 of the AHRI General Operation Manual.

Production Stopped and custom made models may be acquired from the distribution chain. Expenses for this option are borne by the Participant. If a Production Stopped model cannot be supplied for testing, then that model's listing shall be Discontinued in the Directory.

3.4.1 *Selecting Three Additional Samples*. At the time of a sample selection, the Participant has the option to select three (3) additional samples of the same sample to be on hold at a Participant's facility in case the first sample test fails. These samples would be submitted to the Laboratory if the Test Sampling Plan Option is chosen.

3.5 *Sample Acquisition Timeframe*. The Participant shall ship the selected sample(s) to the Laboratory within 14 calendar days of Random Sample Selection or Random Component Selection by Laboratory personnel.

3.6 *System Manufacturer's Required Equipment Provisions*. The System Manufacturer shall provide a complete system for Single Speed and Dual Speed systems (Variable Speed system provisions are found in Section 3.21), consisting of the following:

- Outdoor Unit;
- Indoor coil;
- Expansion device;
- Air-moving equipment (if required);
- Other listed system enhancement devices;
- Published installation instructions; and

- Punchlist

The Participant shall be responsible for shipping all necessary equipment and parts to the Laboratory in order to ensure that the sample functions properly and test(s) can be performed in accordance with the Standard.

3.7 *ICM's Required Equipment Provisions*. The ICM manufacturer shall provide the following:

- Indoor coil;
- Expansion device;
- Air-moving equipment (if required);
- Other listed system enhancement devices;
- Published installation instructions; and
- Punchlist

The Participant is responsible for shipping all necessary equipment and parts to the Laboratory in order to ensure that the sample functions properly and test(s) can be performed in accordance with the Standard.

3.8 *Break-in Operation of Test Units.* A Participant, at its expense, shall have the Laboratory operate the equipment for a specified time prior to testing up to the maximum specified in either AHRI Standard 210/240 (2017 with Addendum 1), AHRI Standard 210/240 (2024), or both. The break-in request should be listed in the comments section of the Directory or the punch list.

3.9 *CVP Tests.*

3.9.1 *Controls Verification Procedure (CVP) Selections.* 20% of a Participant's annually selected variable speed BMGs shall be subject to CVP testing, with a minimum of one (1) model for the USAC and/or the USHP Certification Programs, as applicable, as defined in Appendix I of AHRI Standard 210/240. Fractional numbers shall be rounded up to the nearest whole number.

For the 2025 program year, one (1) variable capacity system for the USAC and/or USHP Certification Programs, as applicable, shall be tested for CVP for data collection and analysis only.

3.9.2 *Testing Multi-Split Systems.* If an indoor unit was turned off for the certified ratingstest, then it will be turned off for the CVP test after completion of the intermediate test but prior to the start of the low test.

3.9.3 *Controls Selected for Test.* The controls selected for test shall comply with AHRI Standard 210/240-2024 Appendix I.

3.9.4 *CVP Failures.* For CVP related failures, refer to Table 1.

3.9.5 *CVP Test Results*. Upon completion of CVP test, determine the result of the following categories according to Appendix I of AHRI 210/240-2024:

- Variable Speed Determination – What type of system behavior was observed during the test:
  - Variable Capacity Compressor System
  - Variable Capacity Certified, Two Capacity System
  - Variable Capacity Certified, Single Capacity System

- Comparison to certification test – Did the CVP test results fall within the following tolerances for each CVP interval test performed for capacity:

  - Cooling Full: $\frac{\dot{q}_{A,Full}-\dot{q}_{CVP,A,Full}}{\dot{q}_{A,Full}} * 100 \leq 6.0$

- Heating Full (17F): $\frac{\dot{q}_{H3,Full}-\dot{q}_{CVP,H(17)}}{\dot{q}_{H3,Full}} * 100 \leq 6.0$
- Heating Full (5F): $\frac{\dot{q}_{H4,Full}-\dot{q}_{CVP,H(5)}}{\dot{q}_{H4,Full}} * 100 \leq 6.0$
- Cooling Minimum: $\frac{\dot{q}_{CVP,F,Low}-\dot{q}_{F,Low}}{\dot{q}_{A,Full}} * 100 \leq 6.0$
- Heating Minimum: $\frac{\dot{q}_{CVP,H(47)}-\dot{q}_{H1,Low}}{\dot{q}_{H3,Full}} * 100 \leq 6.0$

- Comparison to certification test – Did the CVP test results fall within the following tolerances for each CVP interval test performed for Efficiency:
  - Cooling Full: $\frac{EER2_{A,Full}-EER2_{CVP,A,Full}}{EER2_{A,Full}} * 100 \leq 10.0$
  - Cooling Minimum: $\frac{EER_{F,Low}-EER_{CVP,F,Low}}{EER_{F,Low}} * 100 \leq 10.0$
  - Heating Full (5F): $\frac{COP_{H4,Full}-COP_{CVP,H(5)}}{COP2_{H4,Full}} * 100 \leq 10.0$
  - Heating Full (17F): $\frac{COP_{H3,Full}-COP_{CVP,H(17)}}{COP_{H3,Full}} * 100 \leq 10.0$
  - Heating Minimum: $\frac{COP_{H1,Low}-COP_{CVP,H(47)}}{COP_{H1,Low}} * 100 \leq 10.0$

In order to determine the consequences on certification testing, refer to Table 1 to determine which of the possible outcomes is the appropriate next step.

Table 1: CVP Scenarios

		VS Determination Result: Variable Capacity Compressor System	**VS Determination Result: Variable Capacity Certified, Two Capacity System**	**VS Determination Result: Variable Capacity Certified, Single Capacity System**
Full Load and/or Minimum Load Tolerances Not Met	**If system uses a proprietary communicating controls scheme or 24V controls scheme and manufacturer has provided the controls for monitoring of compressor and indoor fan speeds and provides method to lock in new compressor and indoor fan speeds within seven calendar days**	Re-run certification tests corresponding to failed CVP interval test(s) (see column 1 of Table 2) using average comp and id fan speeds from CVP test. Calculate SEER2 and HSPF2 based on Variable Speed calculation method.	Re-run certification tests corresponding to failed CVP interval test(s) (see column 2 of Table 2) using average comp and id fan speeds from CVP test. Calculate SEER2 and HSPF2 based on 2 stg calculation method.	Re-run certification tests corresponding to failed CVP interval test(s) (see column 3 of Table 2) using average comp and id fan speeds from CVP test. Calculate SEER2 and HSPF2 based on 1 stg calculation method.
	If system uses a proprietary communicating controls scheme and the manufacturer <u>has not</u> provided the controls for monitoring of compressor and indoor fan speeds and provides method to lock in new compressor and indoor fan speeds within seven calendar days	Modify certification test results by using average capacity and power(s) from CVP interval test(s) that did not meet operation tolerances (see column 1 of Table 2). Calculate SEER2 and HSPF2 based on Variable Speed calculation method.	Modify certification test results by using average capacity and power(s) from CVP interva testl(s) that did not meet operation tolerances (see column 2 of Table 2). Calculate SEER2 and HSPF2 based on 2 stg calculation method.	Modify certification test results by using average capacity and power(s) from CVP interval test(s) that did not meet operation tolerances (see column 3 of Table 2). Calculate SEER2 and HSPF2 based on 1 stg calculation method.
	If system uses a 24V control scheme and the manufacturer <u>has not</u> provided the controls for monitoring of compressor and indoor fan speeds and provides method to lock in new compressor and indoor fan speeds within seven calendar days	Re-run certification tests corresponding to failed CVP interval test(s) (see column 1 of Table 2) using appropriate 24V control signals for high and low stage. Calculate SEER2 and HSPF2 based on Variable Speed calculation method.	Re-run certification tests corresponding to failed CVP interval test(s) (see column 2 of Table 2) using appropriate 24V control signals for high and low stage. Calculate SEER2 and HSPF2 based on 2 stg calculation method.	Re-run certification tests corresponding to failed CVP interval test(s) (see column 3 of Table 2) using appropriate 24V control signals for high stage. Calculate SEER2 and HSPF2 based on 1 stg calculation method.
Full Load and Minimum Load Tolerances Met	**For all control methodologies re-run according to the ratings test**	Certification tests that were previously run will be used (with no modifications) to calculate efficiency metrics.	Run any additional tests needed for 2 stg systems (optional tests may be run at manufacturer's discretion and cost, including Cd). Re-calculate SEER2 and HSPF2 using 2 stg calculation method. Can still use other previously run certification tests since tolerances passed on those.	Run any additional tests needed for 1 stg systems (optional tests may be run at manufacturer's discretion and cost, including Cd). Re-calculate SEER2 and HSPF2 using 1 stg calculation method. Can still use other previously run certification tests since tolerances passed on those.

See AHRI Standard 210/240-2024 for required tests.

Table 2: CVP Tests

CVP Test	Certification Tests that use the Indicated CVP Test Compressor Speed or would have certification test results adjusted per section 3.9.6, if the CVP Test is out of Capacity or EER/COP Tolerance per section 3.9.5		
	Variable capacity system	Variable capacity certified, two capacity system	Variable capacity certified, single capacity system
Column	1	2	3
A_{Full}	A_{Full} , B_{full}	A_{Full} , B_{Full}	A_{Full} , B_{Full}
F_{Low}	B_{Low} , F_{Low}	B_{Low} , F_{Low}	N/A
$H_{1,Low}$	$H_{0,Low}$, $H_{1,Low}$	$H_{0,Low}$, $H_{1,Low}$, $H_{3,Low}$	N/A
$H_{3,Full}$	$H_{3,Full}$	$H_{3,Full}$	$H_{2,Full}$, $H_{3,Full}$
$H_{4,Full}$	$H_{4,Full}$	$H_{4,Full}$	$H_{4,Full}$

3.9.6 *CVP Calculations Without Means for Overriding Due to Failure*. The instructions of this paragraph shall be applied to systems for which the means for overriding the compressor and indoor blower speed is not provided by the control used for conducting the CVP. For each of the CVP tests listed in the first column of Table 2 of this section for which either the capacity tolerances of section 3.9.5 are not met or the efficiency tolerances of section 3.9.5 are not met, depending on which of the three kinds of system the model is designated, the certification test results to be adjusted based on the results of the CVP test are indicated by the last three columns of the Table 2 for each CVP test listed in the first column. The average capacities and power(s) measured during the CVP time period(s) described in section 3.9.5 shall be used. For the certification tests requiring adjustment with no CVP interval (any required certification test other than AFull , FLow, H1,Low, H3,Full and H4,Full), the capacity and power shall be adjusted. The capacity shall be adjusted by applying the ratio of the capacity measured during the CVP test interval divided by the capacity measured during the certification test (for the corresponding CVP interval). The power shall be adjusted by applying the ratio of the efficiency measured during the CVP test interval divided by the efficiency measured during the certification test (for the corresponding CVP interval), as follows:

Cooling full capacity:

$$\dot{q}_{B,Full} = \dot{q}_{B,Full,Certification} \times \frac{\dot{q}_{CVP,A,Full}}{\dot{q}_{A,Full,Certification}}$$

Cooling full power:

$$P_{B,Full} = P_{B,Full,Certification} \times \frac{P_{CVP,A,Full}}{P_{A,Full,Certification}}$$

Cooling minimum capacity:

$$\dot{q}_{B,Low} = \dot{q}_{B,Low,Certification} \times \frac{\dot{q}_{CVP,F,Low}}{\dot{q}_{F,Low,Certification}}$$

Cooling minimum power:

$$P_{B,Low} = P_{B,Low,Certification} \times \frac{P_{CVP,F,Low}}{P_{F,Low,Certification}}$$

Heating minimum capacity:

$$\dot{q}_{H0,Low} = \dot{q}_{H0,Low,Certification} \times \frac{\dot{q}_{CVP,H1,Low}}{\dot{q}_{H1,Low,Certification}}$$

$$\dot{q}_{H3,Low} = \frac{\dot{q}_{CVP,H1,Low}}{(1 + 30 \times CSF)}$$

Heating minimum power:

$$P_{H0,Low} = P_{H0,Low,Certification} \times \frac{P_{CVP,H1,Low}}{P_{H1,Low,Certification}}$$

$$P_{H3,Low} = \frac{P_{CVP,H1,Low}}{(1 + 30 \times PSF)}$$

Where:

CSF = 0.0204/°F, capacity slope factor for Split Systems

CSF = 0.0262/°F, capacity slope factor for Single Package Units

PSF = 0.00455/°F, power slope factor for all products

If required, the measured capacity and power from $H_{3,Full}$ test from the CVP shall be used to calculate q $k=2_{hcalc}$ (47) and P $k=2_{hcalc}$ (47), respectively, to represent performance at 47 °F as described in section 11.2.2.4 of AHRI 210/240-2024, or of AHRI 1600-2024, and for use in calculating performance at 35 °F. If required, the measured $H_{1,Low}$ from the CVP and the adjusted $H_{3,Low}$ tests shall be used to calculate $q_{thi,H2,Low}$ and $P_{H2,Low}$, respectively, as described in section 6.1.3.4 of AHRI 210/240-2024 or of AHRI 1600-2024. No adjustments are required for intermediate or nominal compressor speed tests or the degradation coefficient(s) if cyclic tests are conducted.

3.9.7 *Penalty Provisions.* All subsequent tests associated with the failure, including penalty tests, will have the CVP test conducted (e.g. penalty test, DTC test, random sample test).

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

3.10.1 *Unitary Small Air-Conditioners (Systems and Mixed-Match Coils), Air-Cooled under 65,000 Btu/h [19,033 W]*.

- Standard Rating Cooling Capacity, Btu/h [W];
- Energy Efficiency Ratio (EER), Btu/(W·h);
- Energy Efficiency Ratio 2 (EER2), Btu/(W·h);
- Seasonal Energy Efficiency Ratio (SEER), Btu/(W·h); and
- Seasonal Energy Efficiency Ratio 2 (SEER2), Btu/(W·h).

3.10.2 *Unitary Small Air-Source Heat Pumps (Systems and Mixed-Match Coils), Air-Cooled under 65,000 Btu/h [19,033 W]*.

- Standard Rating Cooling Capacity, Btu/h [W];
- Energy Efficiency Ratio (EER), Btu/(W·h);
- Energy Efficiency Ratio 2 (EER2), Btu/(W·h);
- Seasonal Energy Efficiency Ratio (SEER), Btu/(W·h);
- Seasonal Energy Efficiency Ratio 2 (SEER2), Btu/(W·h);
- High Temperature Heating Standard Rating Capacity, Btu/h [W];Region IV Heating Seasonal Performance Factor (HSPF) Minimum Design Heating Requirement, Btu/(W·h);
- Region IV Heating Seasonal Performance Factor 2 (HSPF2) Minimum Design Heating Requirement, Btu/(W·h);
- Extra Low Temperature Heating Standard Rating Capacity at 5°F, Btu/h [W] [optional];
- Extra Low Temperature Coefficient of Performance at 5°F (COP 5°F) [optional]; and
- Region V Heating Seasonal Performance Factor 2 (HSPF2) Minimum Design Heating Requirement, Btu/(W·h) [optional]

3.11 *Tests, Air-Conditioning (Systems and Mix-Matched Coils)*. All Unitary Air-Conditioning equipment shall be tested with the DOE "A" and "B" cooling tests as described in the Standard. Standard Rating tests shall be conducted using the nameplate rated voltage and frequency specified in the Standard. For dual nameplate voltage ratings (other than NAECA equipment), tests shall be conducted at 230V.

3.12 *Tests, Heat Pumps (Systems and Mix-Matched Coils)*. All Unitary Air-Source Heat Pump equipment shall be tested with the DOE "A" and "B" cooling tests, "High" and "Low" Temperature Heating, and Frost Accumulation tests as described in the Standard. Standard Rating tests shall be conducted using the nameplate rated voltage and frequency specified in the Standard. For dual nameplate voltage ratings (other than NAECA equipment), tests shall be conducted at 230V.

3.13 *EER_A Test and $EER2_A$ Test*. EER_A and $EER2_A$ is calculated from the DOE "A" test conditions by dividing the capacity by the total system power. For multi-stage systems, the highest rated capacity is used to determine EER_A and $EER2_A$. EER_A and $EER2_A$ ratings shall be given for all Single Packaged Systems and all combinations of Split Systems which the manufacturer intends to be used together.

3.14 *Default Factors – Systems*. At the completion of DOE "A" and "B" tests, the Laboratory calculates the SEER and SEER2 using the Cyclic-Degradation Coefficient (C_D) default factor 0.20 even if the sample is certified with a lower C_D, not less than zero.

For heat pumps, at the completion of heating mode and frost accumulation tests, the Laboratory calculates the HSPF and HSPF2 with C_D default factor 0.25. For variable capacity systems, if the optional G_{Low} and I_{Low} tests are not performed, a default value of 0.25 shall be used for the cooling Degradation Coefficient, C_D^C.

For all unitary small equipment that are certified as OUWNM, the Laboratory calculates SEER2 and HSPF2 with C_D default factor 0.25.

3.15 *DOE "C" and "D" Tests*. If the calculated SEER and/or SEER2 is less than 95% of the certified SEER and/or SEER2, the sample may proceed through the DOE "C" and "D" tests at the Participant's option and expense to obtain a tested C_D value. The tested C_D value shall be lower than the default C_D for it to be used to calculate SEER.

Even if the requirements are met using the appropriate dsefault C_D value, the Participant may opt for "C" and "D" tests to be performed at their expense. If the tested C_D is higher than the default value, the default value is to be used to calculate SEER, SEER2, HSPF and HSPF2.

AHRI may require, at the expense of the Program, "C" and "D" tests to be performed on systems to assure sufficient qualified condensing units for ICM tests.

3.16 *High Temperature (H1CFull) Heating Cyclic Test*. For heat pumps whose calculated HSPF and HSPF2 is less than 95% of the certified HSPF and HSPF2, the model may, at the Participant's option and expense, undergo High Temperature Heating Cyclic Test to obtain a tested C_D value. The tested C_D value shall be lower than the default C_D for it to be used to calculate HSPF and HSPF2.

Even if the requirements are met using a default C_D value of 0.25, the Participant may, at his expense, opt to perform the High Temperature Heating Cyclic Test.

AHRI may require, at the expense of the Program, the High Temperature Heating Cyclic Test to be performed on systems to assure sufficient qualified condensing units for ICM tests.

3.17 *Cut-in and Cut-out Tests*. 20% of selected Unitary Small Air-Source Heat Pumps, with a minimum of one (1), for annual verification shall be tested for cut-in and cut-out each year.

For the 2025 program year, one (1) Unitary Small Air-Source Heat Pump test per Participant shall be tested for cut-in and cut-out for data collection and analysis only.

3.17.1 *Cut-in Test*. The model shall undergo the Cut-in test as defined in Appendix J in AHRI Standard 210/240. The Laboratory shall use the results of the cut-in test for calculating HSPF2.

3.17.2 *Cut-out Test*. The model shall undergo the Cut-out test as defined in Appendix J in AHRI Standard 210/240. The Laboratory shall use the results of the cut-out test for calculating HSPF2.

3.17.3 *Penalty Provisions.* All subsequent tests associated with the failure, including penalty tests, will have the Cut-in and Cut-out tests conducted (e.g. penalty test, DTC test, random sample test).

3.18 *Outdoor Unit Qualification for ICM Testing:*

3.18.1 *Definitions*:

3.18.1.1 *Qualified Unit*. An Outdoor Unit that is provided from a certified system that:

- Passes all certified values and is compliant with its condenser curves per Appendix B.
- Must not have been re-rated due to the CVP test or Cut-in and Cut-out tests.

3.18.1.2 *Unqualified Unit.* An Outdoor Unit that does not pass all certified values.

3.18.1.3 *Disqualified Unit*. An Outdoor Unit that is provided from a certified system that:

- did not pass all certified values;
- was a previously Qualified Unit that has been used for testing more than three (3) test years.)

3.18.2 *Qualified Units Testing.* ICM tests shall be performed with Qualified Units. If a Qualified Unit is unavailable, the ICM test may be performed using an Unqualified Unit following the procedure defined in Figure C2 of Appendix C.

3.18.3 *Challenging a Qualified Condenser/Non-Qualified Condenser.* The performance of a condenser may be challenged by the ICM. The Participant shall provide a detailed report stating the reason the Participant believes the condenser is not performing correctly. If AHRI agrees with the report, a new Outdoor Unit with the same model number shall be obtained for the test.

3.18.3.1 *Non-Qualified Condenser*. Participants shall not be charged with a first sample failure where the Outdoor Unit is deemed Unqualified.

3.18.4 *Fees.* Costs of tests to further qualify Unqualified Outdoor Units as required by Appendix C shall be borne by the Program. Costs of ICM tests, where the condenser was determined to be the cause of the failure, shall be borne by the Program. Costs of valid ICM tests shall be borne by the Participant.

3.19 *Test Failures.*

For the 2025 program year, if HSPF2 as calculated with the measured cut-in/cut out temperatures is less than 95% of rated HSPF2 and less than HSPF2 calculated using the specified cut-in/cut-out temperatures then additional cut-in/cut-out tests will be assigned (not to increase the total number of annual selections) in the 2026 program year with no other consequences of failure.

For the 2025 program year, a failure related to CVP will result in an additional CVP selection being assigned (not to increase the total number of annual selections) in the 2026 program year with no other consequences of failure.

3.19.1 *Certified Rating Test Failures – Systems.*

3.19.1.1 *First Sample Certified Rating Test Failure*. When the Participant is notified of a first sample certified rating failure, the Participant has seven (7) calendar days to select one (1) of the following options:

- Re-rate all models within the failed sample's BMG proportionate to the failed test's results.;
- Re-test the same sample if the sample has operated less than 16 hours including any break-in running time. After 16 hours of operation, the Participant may request a second DOE "A" and "B" test, all at the Participant's expense. This re-test shall establish whether the first test is a pass or fail.
- Test additional samples (up to 3) to determine if the test results meet the certified ratings. The Participant shall need to establish the number of additional samples that shall be tested at the time of choosing this option. All additional samples shall need to be provided at the same time for selection within 30 days; otherwise the Participant forfeits this option. After selection, additional samples may be shipped individually or together following completion of each additional sample test, inclusive of the first sample failure.
- DTC Sample Option. Following failures from the additional sample option, the Participant can elect to save the DTC and the rest of the BMG from a re-rate by testing the DTC sample and another sample from the same BMG (refer to Section 3.19.1.2).
- Obsolete the model, which also obsoletes all models within the corresponding BMG.

3.19.1.2 *Option to Save DTC and Remaining BMG Ratings*. If the failed system is not the DTC, the Participant may, at his expense and within seven (7) calendar days after notification of test results, request the DTC be tested. If the DTC passes the test,

then the Participant has the option to have another sample selected for test by AHRI from the same BMG to save the rest of the BMG. If the other sample fails, the entire BMG other than the DTC is re-rated to the latest test results. For a BMG with multiple DTCs, the highest rated (SEER/HSPF and/or SEER2/HSPF2 or capacity) DTC shall be tested. If the failed system failed due to CVP, then the CVP will have to be tested for the DTC and Random Sample test.

3.19.1.3 *Test Sampling Plan Failure*. When the Participant is notified of a Test Sampling Plan Failure, the Participant has seven (7) calendar days to select one (1) of the options in Section 3.19.1.1 for each sample that fails.

For ENERGY STAR® failures, refer to Section 16 of the AHRI General Operations Manual.

3.19.2 *Certified Rating Test Failures – ICMs*.

3.19.2.1 *First Sample Certified Rating Test Failure*. If an ICM Participant's coil fails with a given System Manufacturer's Outdoor Unit, then the ICM has seven (7) calendar days to decide to choose one of the following options:

- Re-rate all models within the failed sample's BMG proportionate to the failed test's results. ;
- Test additional samples (up to 3) to determine if the test results meet the certified ratings. The Participant shall need to establish the number of additional samples that shall be tested at the time of choosing this option. All additional samples shall need to be provided at the same time within 30 days; otherwise the Participant forfeits this option. Additional tests shall not count toward the number of tests that a qualified condenser can be used. (refer to Section 3.19.1.3)
- Test additional samples (up to 3 utilizing same model coil and same model System Manufacturer condenser). The Participant shall provide both the Indoor Unit and Outdoor Unit. The Outdoor Unit shall be immediately tested with the ICM coil and forgo qualification testing. The ICM shall pay for all expenses including obtaining the Outdoor Unit, break-in, and cost for running the second sample test. All additional samples shall be provided at the same time within 30 days; otherwise the Participant forfeits this option
- Second Sample (utilizing same model coil and different System Manufacturer condenser). Direct AHRI to select and test a new sample coil with an Outdoor Unit from a different System Manufacturer. The coil shall be rated with the Outdoor Unit selected. Expenses for obtaining another Outdoor Unit and testing shall be paid for by the Participant.
  - If the combination passes, only the combination that failed shall be re-rated.
  - If the combination fails, then re-rate that combination and all the other combinations in that BMG.
- Obsolete the model, which also obsoletes all models within the corresponding BMG.

3.19.2.2 *Test Sampling Plan Failure*. When the Participant is notified of a Test Sampling Plan Failure, the Participant has seven (7) calendar days to select one (1) of the options in Section 3.19.2.1.

3.19.2.3 *Alternate Outdoor Unit Failures*. Any ICM test selections made by AHRI using an DTC alternate Outdoor Unit that fails certified ratings per Figure C2 (Appendix C) shall be incremental to the OEM's yearly selection. The test's results shall be credited to the OEM's following year's selection and the test failure shall follow the current operations manual procedure. The re-rate shall apply immediately.

3.19.3 *Test Additional Samples Option.*

If the HSPF2 failure is due to cut-in/cut-out tests then the cut-in/cut-out tests must be run on subsequent samples. If the failure was not due to cut-in/cut-out then cut-in/cut-out tests will not be ran for subsequent sample tests.

If the SEER2 and/or HSPF2 failure is due to the CVP test, then the CVP test must be run on subsequent samples. If the failure was not due to CVP, then the CVP test will not be run for subsequent sample tests.

3.19.3.1 *Following a First Sample Failure*. The Participant shall identify the maximum number of additional tests requested up to a maximum of three (3).

1. The first additional test shall be performed; this sample is considered the "second sample" test.

    a. If all of the first additional test's descriptors result in a rating greater or equal to 95% of the certified rating, testing shall halt and unused equipment shall be shipped back to the manufacturer, the original rating shall remain and no re-rates shall be needed.

    b. If any descriptor rating falls below 95% of the certified rating, the first sample and the second sample shall be evaluated using the Statistical Analysis Procedure (refer to Section 3.19.3.1.1) with a *T* value of 3.078.

    c. Following the Statistical Analysis Procedure performed in 1.b., if all descriptors result in a rating greater or equal to 95% of the certified rating, testing shall halt and unused equipment shall be shipped back to the Participant, the original rating shall remain and no re-rates shall be needed.

    d. If any descriptor rating falls below 95% of the certified rating, the Participant may choose to continue testing in the plan or to concede to a re-rate to the second sample's test results. In the later case the first additional test statistic shall stand.

2. If any descriptor still falls below the 95% threshold a second additional test shall be performed, the first, second and third samples shall be evaluated using the Statistical Analysis Procedure with a *T* value of 1.886.

    a. If all descriptors result in a rating greater or equal to 95% of the certified rating, testing shall halt and unused equipment shall be shipped back to the Participant, the original rating shall remain and no re-rates shall be needed.

b. If any descriptor rating falls below 95% of the certified rating the Participant may choose to continue testing in the plan or to concede to a re-rate. In the latter case, the product shall be re-rated to the rating from the above procedure.

3. If any descriptor still falls below the 95% threshold a third and final additional test shall be performed, the first, second, third and fourth sample shall be evaluated using the Statistical Analysis Procedure with a *T* value of 1.638.

a. If all descriptors result in a rating greater or equal to 95% of the certified rating, the original rating shall remain and no first test failure statistic shall be considered.

b. If a descriptor falls below 95% then the product shall be considered non compliant and the product shall be re-rated to the rating from the above procedure.

4. At any time in the above procedure the Participant may concede to a re-rate and testing shall cease and the rating shall be revised to the most recent multi sample rating determined above.

3.19.3.1.1 *Statistical Analysis Procedure*. AHRI shall perform a statistical analysis based on the number of samples tested.

Mean (*x*) $x = \frac{\sum_{i=1}^{n} x_i}{n}$

Standard Deviation (*s)* $s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - x)^2}{n-1}}$

Standard Error (s_x) $s_x = \frac{s}{\sqrt{n}}$

Lower Confidence Limit (LCL) $LCL = x - T * s_x$

Statistical Rating $= \frac{LCL}{0.95}$

For 2 Test Samples, *T* = 3.078
For 3 Test Samples, *T* = 1.886
For 4 Test Samples, *T* = 1.638

The *T* value used shall be based on the number of samples tested with a 90% confidence limit. To derive at the statistical rating, LCL is divided by 0.95. The lower of either the mean or statistical rating is used to compare against the certified rating. If the analysis shows that the product rates above 95% of the Participant's rating, the rating shall pass, if it does not, then the rating fails. The statistical analysis calculations are taken from the Code of Federal Regulations (CFR) Title 10, Part 429, Subpart B, §429.16 Central air conditioners and heat pumps.

3.19.3.1.2 *Outlier Determination.* Upon failure using the Statistical Analysis Procedure in 3.19.3.1.1, using 4 samples the

manufacturer may elect to claim an outlier in the data. AHRI shall evaluate the claim using the following procedure. If it is determined that there is an outlier the manufacturer may elect to replace the outlier sample with a substitute sample. Upon completion of the testing of the substitute sample there shall be no further substitute sample testing options available to the manufacturer.

3.19.3.1.3 *Outlier Determination Procedure.* For each certified descriptor perform 4 calculations using the 4 test results. Determine the average and standard deviation of 3 samples, leaving the fourth one out. Calculate the Z factor (abs(mean of three – value of left out sample) / standard deviation of three for each descriptor.

For each certified descriptor:

Mean (*x*)

$$x_a = \frac{(\sum_{i=1}^{4} x_i) - x_1}{3},$$
$$x_b = \frac{(\sum_{i=1}^{4} x_i) - x_2}{3},$$
$$x_c = \frac{(\sum_{i=1}^{4} x_i) - x_3}{3},$$
$$x_d = \frac{(\sum_{i=1}^{4} x_i) - x_4}{3}$$

Standard Deviation (s)

$$s_a = \sqrt{\frac{(\sum_{i=1}^{4}(x_i - x_a)^2) - (x_1 - x_a)^2}{2}},$$
$$s_b = \sqrt{\frac{(\sum_{i=1}^{4}(x_i - x_b)^2) - (x_2 - x_b)^2}{2}},$$
$$s_c = \sqrt{\frac{(\sum_{i=1}^{4}(x_i - x_c)^2) - (x_3 - x_c)^2}{2}},$$
$$s_d = \sqrt{\frac{(\sum_{i=1}^{4}(x_i - x_d)^2) - (x_4 - x_d)^2}{2}}$$

Z Factor *(Z)*

$$Za = (abs(x_a - x_1)/s_a),$$
$$Zb = (abs(x_b - x_2)/s_b),$$
$$Zc = (abs(x_c - x_3)/s_c),$$
$$Zd = (abs(x_d - x_4)/s_d)$$

Determine the maximum Z factor from all of the certified descriptors. If the maximum Z factor is greater than 3.0 then it identifies the specific outlier system that is elegible for substitution.

The manufacturer may choose to eliminate the outlier and have a substitution system for selection to complete the rating process.

AHRI shall determine the verdict using the three non-outlying samples and the substitution sample using the Statistical Analysis Procedure in 3.19.3.1.1.

3.19.4 *Re-Rate Following Test Additional Sample.* Following the decision to test additional samples, if the Participant concedes to re-rate their rating or it has been determined that the rating is non-compliant through the statistical analysis, the model combination will be re-rated based on the DOE rating procedures, 10 CFR Part 429, Subpart B, §429.16. Furthermore, all models within the failed sample's BMG will be re-rated the same proportionately.

3.19.4.1 *Re-Rate Following First Additional Test "Second Sample"*. If the Participant concedes to re-rate their rating after the first additional test or "second sample", the model combination will be re-rated to the second sample test results.

3.19.5 *Impact to ICM Following Systems Manufacturer Re-rate.* Following a re-rate to a systems manufacturers' ratings, the ICM manufacturer will be notified and is required to evaluate and adjust their affected data according to section 8.2 of the General Operations Manual.

3.20 *NAECA and Energy Policy Act (EPACT) Re-rating Requirements*. EPACT units are those that operate on three phase power.

- In all cases of tested combinations where the test results require re-rating at less than the applicable minimum efficiency, the model shall be made obsolete and listed with the appropriate "WAS" ratings. Failure option tests continue to apply.
- For Single Packaged Systems that do not meet the minimum efficiency requirement, all models in the BMG shall be re-rated in proportion to the test results and made obsolete.
- If a non-DTC model is tested, all combinations in the BMG shall be re-rated in proportion to the difference between the rated and test results.
    - The Participant may, at his expense and within seven (7) calendar days after notification of test results, request the DTC be tested. If the DTC passes the test, then the Participant has the option to have another non-DTC sample selected for test by AHRI from the same BMG to save the rest of the BMG. If the other sample fails, the entire BMG other than the DTC sample is re-rated to the latest test results.
- If any system in a BMG is re-rated below the applicable minimum efficiency, the Participant may elect to test any such combination to determine the pass/fail status of that combination only.

3.21 *Test Sample Refrigerant Charge*. The Laboratory shall charge the sample in accordance with the Participant's installation instructions. If a range is provided, the mean of the range shall be used for the test. For ICMs, the Laboratory shall follow the ICM's charging instructions. If no charging instructions are provided by the ICM, the Laboratory shall charge per the System Manufacturer's installation instructions.

Refer to Section 9 of the AHRI General Operations Manual.

3.22 *Testing ICM Coils Matched with Variable Speed Systems*. The full System Manufacturer's system test shall be performed first, followed immediately by the full ICM system test. In a coil replacement test, only the Indoor coil and the expansion device will be replaced with the ICM components. The System Manufacturer's coil-blower will be replaced only when the ICM provides a coil-blower. The Laboratory shall inform the System Manufacturer of the ICM test at least two weeks prior to testing. The Laboratory shall follow the laboratory procedures for testing variable speed ICM matched systems per Appendix F.

3.22.1 *Equipment Requirements*. To conduct testing, the Participants shall provide the following items:

- System Manufacturer:
    - Outdoor Unit
    - Controller, embedded logic, and procedures for locking compressor speeds
    - Indoor Unit (coil blower assemblies with variable speed blowers may require fan speed programming)
    - Installation and operation instructions
- ICM:
    - Indoor Coil replacement or Coil-Blower Assembly
    - Expansion device

- Any installation and operation instructions that may differ from the System Manufacturer's instructions

3.22.2 *Variable Speed System Data Requirements*. ICMs shall rate equal to or less than the System Manufacturer's combinations, per section 5.12.1.

3.22.3 *Testing Requirements*. The following testing requirements shall apply:

- Tests will require full, intermediate, and minimum airflow rates specified for cooling and heating. For heat pumps, an additional airflow rate is required when Heating Full and Heating Nominal airflows are not the same.
  - The ICM test shall be run at the airflow rates specified by the ICM.
- Variable speed systems that use the System Manufacturer Indoor Blower assembly matched with the Outdoor unit, shall have only the ICM Coil and expansion device replaced for the ICM test.
  - When ICM provides the complete Indoor Blower Coil assembly, the entire Indoor Unit shall be replaced for the ICM test The test shall be executed at the airflow rates provided by the ICM.
- ICMs shall not match to System Manufacturer's systems, which utilize Electronic Expansion Valves (EEV) on the Indoor Unit, unless agreed, in writing, with the System Manufacturer. ICMs may provide and incorporate the EEV and EEV controls when the System Manufacturer's system does not provide and incpororate EEV controls.

3.22.4 *ICM Requirements*. ICMs shall sign the AHRI Non-Disclosure Agreement in order to test variable speed equipment. AHRI will exclude an ICM from listing Variable Speed Systems if the Non-Disclosure Agreement is violated and confidential information is misused. Breach by Participant shall incur an immediate violation of AHRI's program rules and regulations and AHRI agrees that the System Manufacturer may elect, in its sole discretion, to cease providing the System Manufacturer's equipment for testing without any penalty or violation. Refer to Appendix J.

3.22.5 *Observed Testing.* Systems Manufacturers may witness test setup of System Manufacturer tests. Neither System Manufacturers nor ICMs shall witness test setup of ICM tests.

3.22.6 *ICM Defined Test Report Data*. ICMs shall receive limited test data. Refer to Appendix I.

3.22.7 *ICM Variable Speed First Sample Certified Rating Test Failure*. If an ICM Participant's coil fails with a given System Manufacturer's Outdoor Unit and AHRI determines the test to be valid, then the ICM shall have the option to choose to run a second sample test. In the event of an invalid test as determined by AHRI, AHRI shall instruct the lab to run a second test with the first sample.

3.22.8 *CVP Requirements*. ICMs are not subject to CVP tests unless the ICM has changed the controller or logic for locking in the compressor speeds.

In the event of a Systems Manufacturer change to lock-in settings, the change must be pushed to the ICM test.

3.23 *Penalty Provisions and Red Zone*. Participants can be categorized into the Red Zone, for each individual program, with the penalties described below. Participant status shall be determined using a lookback of the average number of tests over the past three years. Status shall be reaffirmed each program year and shall be based on completed 1st sample tests in determining 1st sample failure rate. New Participants shall have their rates based on their one or two-year totals as the lookback for determining Red Zone status.

Any unique combination of indoor and outdoor that is tested during a year is considered to be a 1st sample for determining zone status (i.e. penalty tests, requests for additional tests by the manufacturer,

etc.). Provisions of the General Operations Manual (Section 16.4) on testing 10% of a manufacturer's ENERGY STAR® BMGs will be kept.

3.23.1 *Red Zone Requirements*. Greater than or equal to 20% 1st sample failure rate and greater than or equal to 10% re-rate rate.

- Tier 1 Major Violation to be assessed at the end of the program year.
- 40% of BMGs tested the following year.
- Manufacturer to define corrective action plan within 45 days of receipt and demonstration of the plan within 180 days.
- Violation issuance exception for demonstration of corrective actions.
    - Elligible for exception if vector results from the current state shows a minimum of 25% improvement the current program year over the lookback period
        - % improvement = [(Vector results of the lookback period - Vector results of the current program year) / (Vector results of the lookback period)] times 100
        - Vector math = square root of [(1st sample failure rate)^2 + (Re-rate rate)^2]
- AHRI shall prioritize selections of manufacturers in the Red Zone.

3.24 *Additional Testing*. Participants may choose to test more than their required tests in the same year to reduce their first sample failure rate. AHRI shall prioritize selections of manufacturers in the red zone:

- Cutoff date of within 30 days of completing their annual tests.
- Units must be provided within 45 days.
- A Random Selection will be performed.

4. Challenge Tests

Except as noted below, the Challenge Test process shall proceed according to the AHRI General Operations Manual, Section 10.

4.1 *System Manufacturer Challenges*. The policies and procedures regarding the challenge of a System Manufacturer's ratings are outlined in the AHRI General Operations Manual.

4.2 *ICM Challenges*. If an ICM's rating is challenged, the following procedures shall be followed:

4.2.1 *Test the System DTC*. The Laboratory shall first test the Outdoor Unit as a system paired with the System Manufacturer's *DTC* Indoor Unit. All performance ratings shall pass at or above 95%.

4.2.1.1 *Acquiring Challenge Units*. A new System Manufacturer Indoor Unit and Outdoor Unit shall be acquired in accordance with Section 10 of the General Operations Manual.

4.2.1.2 *System Challenge Test Pass*. If all system performance ratings pass at or above 95%, proceed to test the ICM match (Section 4.2.2).

4.2.1.3 *System Challenge Test Failure*. In the event the System Manufacturer's system does not pass at or above 95%, the challenge test shall be redirected towards the System Manufacturer and treated as a System Manufacturer's challenge. Failure options are the same as Participants with annual testing (Section 3.17.2). If the System Manufacturer ultimately re-rates the system, the ICM shall re-rate its affected models by the same percentage re-rate as the system's ratings. Further testing of the ICM Indoor Unit shall not be required.

4.2.2 *Test the ICM Match*. The Laboratory shall test the ICM Indoor Unit with the System Manufacturer's Outdoor Unit.

4.2.2.1 *ICM Challenge Test Pass*. If all ICM certified ratings pass, the Challenge test is over and the ICM Participant and challenger are notified of the outcome per Section 10 of the General Operations Manual.

4.2.2.2 *ICM Challenge Test Failure*. Following a first sample failure, the challenged party has all the same options as a Participant with annual testing (Section 3.18.2.1). If an option to test with a different Outdoor Unit is selected, expenses for obtaining another Outdoor Unit and testing shall be paid for by the challenged Participant. The coil shall be rated with the Outdoor Unit selected.

4.3 *Test Challenge Fees*. For challenge tests, the same fees apply as those for regularly scheduled testing.

The cost of all fees (e.g. selection, sample shipment and disposition, and testing) associated with the challenge test shall be borne by one of the three parties concerned (ICM Participant, System Manufacturer Participant, or challenger).

The challenger may optionally add the CVP and the cut-in and cut-out tests.

4.3.1 *Final Outcome System Challenge Test Failure*. If the final outcome of the system challenge test is a "fail," the challenged System Manufacturer is responsible for all costs associated with the first sample test (Indoor Unit, Outdoor Unit and test fees).

4.3.2 *Final Outcome ICM Challenge Test Failure*. If the final outcome of the ICM challenge test is a "fail," the challenged ICM is responsible for all costs associated with the first sample test (Indoor Unit, Outdoor Unit and test fees).

4.3.3 *Final Outcome ICM Challenge Test Pass*. If the final outcome of the challenge test is a "pass," the challenging party is responsible for all costs associated with the first sample test (Indoor Unit, Outdoor Unit and test fees).

If the challenged party elects to test any additional samples, all associated costs for the additional testing shall be paid by the challenged party.

5. AHRI Directory of Certified Product Ratings Data Listings

All certified products shall be listed in the Directory, 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 following information pertaining to each model certified shall be published in the Directory:

- AHRI Certified Reference Number
- Model Status
- Manufacturer Type
- Series Name
- Brand Name of Model
- Outdoor Unit
  - Name of Manufacturer
  - Model Number(s) or Designations
- Indoor Unit

- Name of Manufacturer
- Model Number(s) or Designations

- Furnace
- AHRI Standard Rating Cooling Capacity, Btu/h [W]
- Energy Efficiency Ratio, EER, Btu/(W·h)[1]
- Energy Efficiency Ratio 2, EER2, Btu/(W·h)[2]
- Seasonal Energy Efficiency Ratio, SEER, Btu/(W·h)[1]
- Seasonal Energy Efficiency Ratio 2, SEER2, Btu/(W·h)[2]
- Phase
- AHRI Type
- DTC
- Sold in?
- Region Eligibility
- Exclusively for Canada or Export:
  - The following footnote may be added to AHRI Certificates: "The AHRI 210/240 certified EER and EER2 ratings are calculated under the same methodology as the EER and EER2 ratings at T1 conditions of ISO 5151:2010 and ISO 13253:2011."
- High Temperature Heating Standard Rating Capacity, Btu/h [W][4]
- Low Temperature Heating Standard Rating Capacity, Btu/h [W][4]
- Region IV Heating Seasonal Performance Factor, HSPF[1,4]
- Region IV Heating Seasonal Performance Factor 2, HSPF2[2,4]
- Extra Low Temperature Heating Standard Rating Capacity at 5°F, Btu/h [W][4,5]
- Extra Low Temperature Coefficient of Performance at 5°F (COP 5°F)[4,5]
- Region V Heating Seasonal Performance Factor 2 (HSPF2) Minimum Design Heating Requirement, Btu/(W·h)[4,6]
- Indoor Full-Load Air Volume Rate (A2 SCFM)
- Indoor Cooling Intermediate Air Volume Rate (Ev SCFM)
- Indoor Cooling Minimum Air Volume Rate (B1 SCFM)
- Eligibility for Tax Credit
- Energy Guide Label

Notes
1. For models applicable to M
2. For models applicable to M1
3. For Water Cooled and Evaporatively Cooled products
4. For Heat Pumps
5. For Cold Climate Heat Pumps
6. For Heat Pumps sold in Canada

Additional data may be shown for products sold in areas requiring further product information/ratings or EPA ENERGY STAR® listings.

5.2 *Data Forms*. Each Participant shall list its products. OEM Participants shall submit/edit product data via the Directory.

5.2.1 *Making Changes to Submissions*. If a Participant submits new listings to the Directory via the input interface on the Directory, the Participant shall be able to make corrections to the listings until 11:59 pm ET on the date of the submission. The data is published and sent to the DOE after midnight.

5.3 *NAECA and EPACT Requirements*. The Directory only lists equipment within the scope of the USE OM. For products for sale in the United States and its territories, the Directory will only list products that meets NAECA (single phase) or EPACT (3 phase) minimums. If a product, or group of products, shall be removed from the Directory for failure to meet NAECA or EPACT minimums, AHRI shall notify DOE of the delisting. It is solely the Participant's responsibility to address all DOE requests and obligations. This requirement exists only for where NAECA and EPACT minimums are applicable.

5.4 *Alternate Efficiency Determination Method (AEDM).* By means of input interface on the Directory or through data submittal spreadsheets, all Participants shall indicate whether product ratings were established through testing or with an AEDM.

5.5 *Designated Tested Combination (DTC).* A DTC is the system combination designated by a Participant. A System Manufacturer Participant shall designate one (1) DTC for every split system outdoor model within each Brand Name (3 phase products are excluded from this requirement). The DTC for M and M1 may be different. Two (2) or more DTCs are permitted within the same BMG. See Table 3 for DTC requirements. For single-split-system non-space-constrained air conditioners and heat pumps, when testing is required in accordance with 10 CFR part 430, subpart B, appendix M1, these requirements do not apply until July 1, 2024, provided that the manufacturer is certifying compliance of all basic models using an AEDM in accordance with CFR 429.16.

Table 3: Designated Tested Combination (DTC) Requirements			
Category	**Equipment subcategory**	**Must test:**	**With:**
Single-Package Unit	Single-Package AC (including Space-Constrained)	The individual model with the lowest SEER (when testing in accordance with appendix M to subpart B of part 430) or SEER2 (when testing in accordance with appendix M1 to subpart B of part 430)	N/A.
	Single-Package HP (including Space-Constrained)		
Outdoor Unit and Indoor Unit (Distributed in Commerce by OUM)	Single-Split-System AC with Single-Stage or Two-Stage Compressor (including Space-Constrained and Small- Duct, High Velocity Systems (SDHV))	The model of outdoor unit	A model of coil-only indoor unit.
	Single-Split-System AC with Other Than Single-Stage or Two-Stage Compressor (including Space-Constrained and SDHV)	The model of outdoor unit	A model of indoor unit.
	Single-Split-System HP (including Space-Constrained and SDHV)		
	Multi-Split, Multi-Circuit, or Multi-Head Mini-Split Split System—non-SDHV (including Space-Constrained)	The model of outdoor unit	At a minimum, a “tested combination” composed entirely of non-ducted indoor units. For any models of outdoor units also sold with models of ducted indoor units, test a second “tested combination” composed entirely of ducted indoor units (in addition to the non-ducted combination). If testing under appendix M1 to subpart B of part 430, the ducted “tested combination” must comprise the highest static variety of ducted indoor unit distributed in commerce (i.e., conventional, mid-static, or low-static).
	Multi-Split, Multi-Circuit, or Multi-Head Mini-Split Split System—SDHV	The model of outdoor unit	A “tested combination” composed entirely of SDHV indoor units.

Table 3: Designated Tested Combination (DTC) Requirements (Continued)			
Category	**Equipment subcategory**	**Must test:**	**With:**
Indoor Unit Only (Distributed in Commerce by ICM)	Single-Split-System Air Conditioner (including Space-Constrained and SDHV)	A model of indoor unit	The least efficient model of outdoor unit with which it will be paired where the least efficient model of outdoor unit is the model of outdoor unit in the lowest SEER combination (when testing under appendix M to subpart B of part 430) or SEER2 combination (when testing under appendix M1 to subpart B of part 430) as certified by the OUM. If there are multiple models of outdoor unit with the same lowest SEER (when testing under appendix M to subpart B of part 430) or SEER2 (when testing under appendix M1 to subpart B of part 430) represented value, the ICM may select one for testing purposes.
	Single-Split-System Heat Pump (including Space-Constrained and SDHV)	Nothing, as long as an equivalent air conditioner basic model has been tested	
		If an equivalent air conditioner basic model has not been tested, must test a model of indoor unit	
	Multi-Split, Multi-Circuit, or Multi-Head Mini-Split Split System—SDHV	A model of indoor unit	A "tested combination" composed entirely of SDHV indoor units, where the outdoor unit is the least efficient model of outdoor unit with which the SDHV indoor unit will be paired. The least efficient model of outdoor unit is the model of outdoor unit in the lowest SEER combination (when testing under appendix M to subpart B of part 430) or SEER2 combination (when testing under appendix M1 to subpart B of part 430) as certified by the OUM. If there are multiple models of outdoor unit with the same lowest SEER represented value (when testing under appendix M to subpart B of part 430) or SEER2 represented value (when testing under appendix M1 to subpart B of part 430), the ICM may select one for testing purposes.
Outdoor Unit with No Match		The model of outdoor unit	A model of coil-only indoor unit meeting the requirements of section 2.2e of appendix M or M1 to subpart B of part 430.

5.6 *ICM Listing Requirements*. ICMs shall list certified ratings for all coils together with each Outdoor Unit intended to be used in a system. Published installation instructions shall be available with the coil. Optional and standard devices, not a part of the coil assembly, which affect ratings, shall be indicated in the Participant's installation instructions.

5.6.1 *Heat Pump Listing Requirements.* ICMs shall comply with Requirements for Certification of ICM Heat Pump Ratings (refer to Appendix A).

5.7 *Identical Coil Ratings*. Should the performance of two (2) coils be identical and the only physical difference is that one is encased or in a sleeve, both can be listed on the same line and both be designated with the condensing unit as the DTC.

5.8 *Listing Equipment with Enhancement Components*. The air moving device and enhancements (e.g. Thermal Expansion Vvalve (TXV), Time Delay Relay (TDR), etc.) shall be indicated by model number and when assembled, shall result in a complete Indoor Unit with sufficient information contained in the installation instructions to describe the assembly.

Enhancements, available via distribution by the ICM, are to be indicated in Directory listings by the plus (+) sign, following the Indoor Unit designation. All combinations of these enhancements shall be listed, with respective certified system performance data.

5.9 *ICM Notice of Revised System DTC and/or Baseline Rating*. ICM Participants using an AEDM shall be notified by AHRI if a change is made to a system DTC and/or baseline rating. The baseline rating is derived from an existing AHRI certified system combination provided by the ICM. The ICM Participant shall have 30 calendar days to review the notice and choose to a) re-rate its affected units or b) decide no rating change is required. If the ICM Participant does not make a choice within 30 calendar days and the system was de-rated, AHRI shall automatically de-rate the ICM's ratings by the same percentage of de-rate in the system's rating.

5.9.1 *Test Locked Ratings*. Section 5.9 also applies to ratings that are locked for testing. For ratings that are locked, the ICM can only adjust the ratings no more than the same percentage of de-rate in the system manufacturer's rating.

5.10 *Specific Indoor Coil Data*. Participants can download additional specific indoor coil data and condenser curve coefficients for Single Speed and Dual Speed Systems from the Directory. System Manufacturers will not provide condenser curve coefficients for Variable Speed Systems.

5.11 *Condenser Curve Coefficients*. Refer to Appendix B for definitions of the condenser curve coefficients to be supplied by System Manufacturers.

5.12 *ICM Screen*. All ratings that fall within the following thresholds shall appear in the Directory within three (3) calendar days of submission to the Directory

5.12.1 *Efficiency Screening*. AHRI shall screen all new or edited ICM USAC and USHP SEER2, EER2, and HSPF2 ratings, based on the criteria in 5.12.1.1 through 5.12.1.5 and Appendix K.

5.12.1.1 *ICM Coil Only AEDM Rating.* Screen the ICM coil only ratings that are in excess of OUM coil only ratings, or OUM air handler ratings with PSC motor when OUM coil only ratings do not exist, by more than 6%. When the OUM outdoor unit is variable speed, by more than 0%.

5.12.1.2 *ICM with OUM Furnace AEDM Rating.* Screen the ICM with OUM furnace ratings that are in excess of OUM ratings with the same furnace and outdoor unit, by the higher of, more than 6% of the DTC or 0% of the highest OUM furnace rating. When the DTC does not exist with that furnace, all ratings that are more than 6% of the highest OUM furnace rating. When the OUM outdoor unit is variable speed, by more than 0% of the highest OUM furnace rating.

5.12.1.3 *ICM with ICM Furnace AEDM Rating.* Screen the ICM with ICM furnace ratings that are in excess of the highest OUM furnace rating with the same outdoor unit, by more than 6%. When the OUM outdoor unit is variable speed, by more than 0% of the highest OUM furnace rating with the same outdoor unit.

5.12.1.4 *ICM Air Handler AEDM Rating.* Screen the ICM air handler ratings that are in excess of OUM air handler ratings by the higher of, more than 6% of the DTC or 0% of the highest OUM air handler rating. When the DTC is not an air handler, all ratings that are more than 6% of the highest OUM air handler rating. When the OUM outdoor unit is variable speed, by more than 0% of the highest OUM air handler rating.

5.12.1.5 *ICM Air Handler AEDM Rating.* Screen the ICM air handler ratings that are in excess of OUM coil only ratings, when the OUM does not have air handler ratings, by more than 6%. When the OUM outdoor unit is variable speed, by more than 0% of OUM coil only ratings.

5.12.2 *Coil Geometry Screening*. AHRI shall screen all single-speed and single-stage units as per Appendix G.

5.12.3 *Internal Refrigerant Volume (IRV) Screening*. AHRI shall screen all heat pump ratings for ICMs where the IRV is above or below the System Manufacturer's IRV, in accordance with the criteria described in Appendix A.

5.12.4 *Entering Data Outside the ICM Screen.* If a Participant provides ratings to AHRI that fall outside of the ICM screening requirements, participants shall be required to provide test reports and/or AEDM simulation input/output justifying the rating. Based on AHRI's review and approval, the listings shall be published in the Directory.

5.12.4.1 *Third Party Testing*. If a participant provides third-party test reports justifying their ratings that comply with the DOE test procedure requirements for certification (i.e. – Basic Model Testing), and the test was conducted by an Independent Third-party Laboratory Contracted by AHRI, then the ratings shall be automatically published.

5.13 *DOE Regional Standard Requirements*.

5.13.1 *Air-Conditioner Regional Label Requirement*. If a Participant is manufacturing a model that can be installed in the Southwest region (as defined in 10 CFR Part 430.32), no label is required.

If a Participant is manufacturing a model that can only be installed in the North region (as defined in 10 CFR Part 430.32), the Participant shall have the statement, "Install Prohibited in Southeast and Southwest." on or near the nameplate of the condensing unit.

If a Participant is manufacturing a model that can only be installed in the North and Southeast regions (as defined in 10 CFR Part 430.32), the Participant shall have the statement, "Install Prohibited in Southwest." on or near the nameplate of the condensing unit.

The Laboratory shall verify there is a statement present, where applicable. If the required statement is not present, the Laboratory shall notify AHRI immediately. This requirement is for products manufactured after the effective date of March 1, 2015. The Participant shall provide a method of determining the date of manufacture upon request.

5.13.2 *Condenser Characteristics*. Participants shall identify the regions that the condenser is eligible for installation in the "Regions" field of the Condenser Characteristics.

5.13.2.1 *Regional Standards for Single Line Add/Edits*. If a Participant submits a single line new/edit to the Directory via the input interface that would alter the region where the model can be installed, the Directory shall prevent the ratings from being added. Participants shall edit the region field in the condenser characteristics table, and resubmit the listings. The data shall be published and sent to DOE after the Directory overnight process, on the date of the submission.

5.13.2.2 *Regional Standards for Mass Upload Add/Edits*. If a Participant submits a mass upload of new/edit listings to the Directory via the input interface that would alter the region where the model can be installed, the Directory shall prevent the ratings from being added. An email shall be sent listing the invalid submissions. Participants shall edit the region field in the condenser characteristics table, and then resubmit the listings. The data shall be published and sent to DOE after the Directory overnight process, on the date of the submission.

5.13.2.3 *Regional Efficiency Range*. When a Participant is adding or editing model listings, the Directory shall validate whether the new rating exceeds the range specified on the condenser characteristics table. For ratings submitted that exceed the regional efficiency range, the Directory shall prevent the ratings from being added. Participants shall edit the range for SEER/SEER2 and/or HSPF/HSPF2 in the condenser characteristics table, and then resubmit the listings to enter the listings in.

Note: The ranges provided in the condenser characteristics table shall only be used for validation purposes, the FTC EnergyGuide label generated from the Directory shall determine the range automatically from the data in the Directory and place it on the label.

5.14 *DOE Test Waivers and Stay Exceptions.*

5.14.1 *DOE Test Waiver.* In the event the Department of Energy (DOE) grants a test procedure waiver to a manufacturer regarding portions of DOE certification requirements and/or test procedure applicable to the USE certification program, the test procedure waiver shall go into effect, for only the specific manufacturer and only the specific basic models specified by DOE in the test waiver, from the time the Test Waiver is made effective by DOE. The changes from the granted test procedure waiver shall remain in effect in the USE certification program until such time as DOE modifies the certification requirements and/or test procedure or DOE rescinds the test procedure waiver. The status of the test waiver shall remain consistent from the time of combination selection through the conclusion of the test series for combinations affected by the test waiver.

5.14.2 *Stays.* In the event the Department of Energy (DOE) issues a stay on all or portions of the certification requirements and/or test procedure(s) applicable to the USE certification program, the stay shall go into effect from the time the stay is made effective by DOE, and shall remain as such until the program year concludes after DOE removes the stay. The status of the stay shall remain consistent from the time of combination selection through the conclusion of the test series for combinations affected by the stay.

6. Assessment and Payment of Certification Fees

Except as noted below, the assessment and payment of certification fees shall proceed according to the AHRI General Operations Manual, Section 12.

6.1 *Equipment Delivery/Disposal Fees*. The Participant is responsible for the delivery and expenses associated with shipping test samples to the Laboratory. However, following the completion of the sample test, the sample shall be shipped prepaid by AHRI to the destination specified by the Participant. In the event the sample fails the certified rating test and/or the statistical analysis, the Participant shall complete the required MDF before the sample is shipped and all opportunities to retest the sample are forfeit upon departure from the Laboratory facility. The Participant shall provide instruction to the Laboratory regarding the disposal/shipment of the sample(s).

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

Refer to Section 8 of the AHRI General Operations Manual.

APPENDIX A: REQUIREMENTS FOR CERTIFICATION OF ICM HEAT PUMP RATINGS

A1 Information regarding the mixed Indoor Unit may be verified by the matched System Manufacturer.

A2 *Mixed Coil Requirements*

A2.1 Should the matched System Manufacturer elect to list more than one (1) Internal Refrigerant Volume (IRV) coil for a system:

- The IRV of the mixed Indoor Unit assembly shall not be less than 96.5% of the volume of the smallest matched certified Indoor Unit assembly of the System Manufacturer; and
- The IRV shall not exceed the larger of either:
  - 103.49% of the IRV of the largest matched certified Indoor Unit assembly of the System Manufacturer; or
  - 120.49% of the IRV of the smallest matched certified Indoor Unit assembly of the System Manufacturer.

IRV shall be rounded to the nearest 1%.

A2.2 Should the matched System Manufacturer elect to list only one (1) IRV coil for a system:

- The mixed Indoor Unit assembly shall not be less than 96.5% of the matched certified Indoor Unit assembly of the System Manufacturer, and
- The mixed Indoor Unit assembly shall not be greater than 120.49% of the IRV of the matched certified Indoor Unit assembly of the System Manufacturer.

IRV shall be rounded to the nearest 1%.

A2.3 *Calculation of IRV*

$$Number\ of\ Tubes\ in\ a\ Row = \frac{Slab\ Finned\ Height}{Value\ of\ First\ Dimension\ Identified\ in\ Evaporator\ Tube\ Centers}$$

(Ex: If Evaporator Tube Centers = 1.00 x 0.625, the value of the first dimension identified in the Evaporator Tube Center field would be 1.00)

$$Total\ Number\ of\ Tubes = Number\ of\ Tubes\ in\ a\ Row * Evaporator\ Number\ of\ Rows * Number\ of\ Slabs$$

Note: Number of Tubes in a Row is rounded to the nearest whole number.

$$IRV = (Slab\ Finned\ Length * Number\ of\ Tubes * \left(\left(\left(\frac{Evap\ OD - (2.00 * Wall\ Thickness)}{2}\right)^2\right) * \pi\right)\right) + Charge\ Compensator$$

Note: Wall thickness is 0.012 for Copper and 0.029 for Aluminum.

A2.4 The Heating Capacity (Btu/h) of the mixed coil shall not exceed the largest certified matched Indoor Unit capacity when rated with a given Outdoor Unit.

A3 *Mixed Expansion Device Requirements*

A3.1 Mixed systems may use an appropriately sized thermostatic expansion valve (TXV) except for series restrictor systems described below.

A3.2 Flow Factor requirements on mixed coils with fixed restrictions:

- If the Designated Tested Combination (DTC) matched system has a fixed restrictor, then the mixed system flow factor shall be within the range of 100-125%; unless the DTC matched system uses a series capillary tube restriction arrangement (i.e. no check valves), then the flow factor for the mixed system shall be within the range of 100-115%.
- If the DTC system is a TXV system, but there are other matched systems which use a fixed indoor restrictor, then the flow factor for the mixed system is based on the fixed indoor restrictor with cooling capacity closest to the tested system. The mixed flow factor shall be within the range of 100-125%.

A3.3 If the certified matched system combinations have only TXV indoor, then the mixed system shall be TXV.

A4 The mixed Indoor Unit assembly shall meet the same burst strength requirements as the matched Indoor Unit assembly.

A5 If a supplemental heater is operated simultaneously with the heat pump, the heater shall be located in the indoor air circuit downstream from the indoor coil. The heater shall be capable of operating reliably at elevated ambient conditions (30-40°F above return air temperatures).

A6 If the return air passes over the indoor coil before passing over the blower motor, the motor shall be capable of operating reliably at elevated ambient conditions (30-40°F above return air temperatures).

APPENDIX B: CONDENSER CURVE INFORMATION

B1 *Purpose*

This appendix shall:

- Characterize the refrigeration effect (capacity) and power of the Designated Tested Combination (DTC) Outdoor Unit independent of the Indoor Unit and its associated power;
- Provide a standardized, general equation form to characterize Outdoor Unit performance and power; and
- Provide a method of identifying the equation coefficients required for the capacity and power equations.

B2 *Scope*

The methods outlined herein are applicable to:

- Outdoor Units that are used for cooling only applications;
- Heat Pump Outdoor Units, cooling only performance and power; and
- AHRI/DOE A, B, C, D, F, and H test conditions as defined in AHRI Standard 210/240.

B3 *Definitions*

- Condensing Unit – Consists of the Outdoor Unit and all interconnecting lines, liquid and suction, used to connect the outdoor refrigeration system to the Indoor Unit.
- Condenser performance is characterized by the general linear equation:

  $$\text{Gross Capacity or Power} = m \cdot (\text{Evaporator Saturation Temperature}) + b$$

  where;
  m = slope
  b = intercept

- Condenser power – power, watts, associated with the Outdoor Unit only; no indoor power is to be included.
- Condenser capacity – total capacity, Btu/h, with no indoor power.
- Evaporator Saturation Temperature – the refrigerant saturation temperature, °F, based on the outlet refrigerant pressure of the evaporator.
- DTC – Designated Tested Combination.
- Liquid temperature – the mean of the actual liquid temperature, °F, measured at the inlet to the evaporator flow control during DTC tests.

B4 *Requirements*

The following information is required for AHRI submittal of each DTC Outdoor Unit and heat pump:

Table B1: AHRI Submittal Requirements for High or Single Stage

Item	Definition
m1	Slope of capacity equation, A_{Full}-test
m2	Slope of power equation, A_{Full}-test
m3	Slope of capacity equation, B_{Full}-test
m4	Slope of power equation, B_{Full}-test
b1	Intercept of capacity equation, A_{Full}-test
b2	Intercept of power equation, A_{Full}-test
b3	Intercept of capacity equation, B_{Full}-test
b4	Intercept of power equation, B_{Full}-test
TL A	Liquid temperature entering flow control, A_{Full}-test

For two-stage systems, a set of capacity and power coefficients as well as liquid temperature are required at each operational stage. One (1) set of coefficients, shown above, is required at each capacity level at the A_{Full} and B_{Full} test conditions. Low stage requires reporting at B_{Low} and F_{Low} conditions. Older systems may be grandfathered using A_{Full} and B_{Full} similar to High Stage.

Table B2: AHRI Submittal Requirements for Low Stage	
Item	Definition
m1	Slope of capacity equation, B_{Low}-test
m2	Slope of power equation, B_{Low}-test
m3	Slope of capacity equation, F_{Low}-test
m4	Slope of power equation, F_{Low}-test
b1	Intercept of capacity equation, B_{Low}-test
b2	Intercept of power equation, B_{Low}-test
b3	Intercept of capacity equation, F_{Low}-test
b4	Intercept of power equation, F_{Low}-test
TL B	Liquid temperature entering flow control, B_{Low}-test

B5 *Guidelines to Determine Coefficients*

Figure B1 provides an overview of the process to determine the equation coefficients. Tables B1, B2, B3, B4 and B5 provide a tabular form of the information required to determine the coefficients. As noted on these Tables, information is required from the DTC tests and simulation of the DTC system at different evaporating temperatures.

Rules governing coefficient determination:

1. Simulations are run in the range of 40-52°F evaporator temperatures.
2. Simulations shall take into account the pressure drops associated with the liquid and suction interconnecting lines.
3. Simulated evaporator superheat is to remain a constant value in the case of DTC systems utilizing an expansion valve. For fixed orifice, capillary tubes, or other fixed flow control devices, the superheat shall remain at a constant value for all A-test simulations and remain constant for all B-test simulations. The A-test and B-test superheat are not required to be the same superheat value.
4. Indoor airflow changes, suggested range of ±20-25%, can be used to simulate different evaporator temperatures.
5. Corrections to the simulated values are required so that the performance and power curves pass through the actual mean DTC test points. This is accomplished through changes in the intercept values (b1…b4). Reference Figures B2 and B3.

Note: Condenser Curves are based on the Designated Tested Combination.

B6 *Condenser Curve Check*

If condenser curves are found on a quarterly audit to be outside of a ±10% tolerance with tested data, then AHRI shall notify the Participant of those coefficients out of tolerance. AHRI shall send Participants' data at least seven (7) days before meeting to review condenser curve results. Participants shall investigate those coefficients out of tolerance, and have 30 days to make the appropriate corrections or provide evidence to validate their curve. If Participants do not make the corrections and respond to AHRI within 30 days, AHRI shall hide the invalid BMGs in the Directory until corrected.

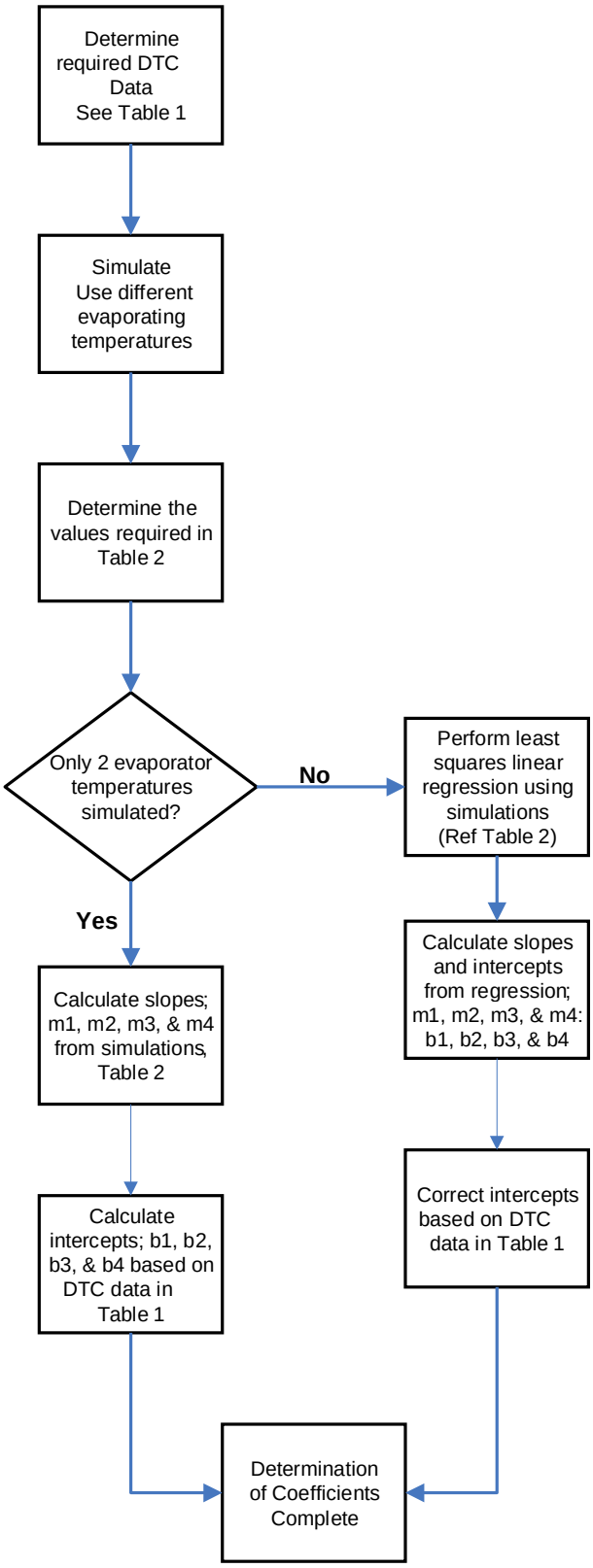


Figure B1: Equation Coefficients

Table B3: DOE DTC Test Data		
DOE DTC Test Data		Comments
Item	Value	
Indoor Power, watts		
Mean System Net Capacity, A-test, Btu/h		Mean of the values measured during DTC testing
Outdoor Unit Gross Capacity, A-test, Btu/h		Calculated value; Mean system net + indoor power converted to Btu/h
Mean System Net Capacity B-test, Btu/h		Mean of the values measured during DTC testing
Outdoor Unit Gross Capacity, B-test, Btu/h		Calculated value; Mean system net + indoor power converted to Btu/h
Mean System Power A-test, watts		Mean of the values measured during DTC testing
Outdoor Unit System Power, A-test, watts		Calculated value; Mean system net – indoor power
Mean System Power B-test, watts		Mean of the values measured during DTC testing
Outdoor Unit System Power, B-test, watts		Calculated value; Mean system net – indoor power
Mean Indoor Liquid Temperature, A-test, F		Mean of the values measured during DTC testing
Mean Indoor Suction Pressure, A-test, psig		Mean of the values measured during DTC testing
Mean Evaporator Temperature, A-test F		Input or Calculated value; Calculation based on saturation temperature for pressure above
Mean Indoor Suction Pressure B-test, psig		Mean of the values measured during DTC testing
Mean Evaporator Temperature, B-test F		Input or Calculated value; Calculation based on saturation temperature for pressure above

Table B4: Simulation Inputs for High or Single Stage		
Simulation Inputs		Comments
Item	Value	
A-Test		
Evaporator Temperature, T1, F		Saturated suction temperature, evaporator leaving
Condenser Capacity, A-test, @ T1, btuh		Includes pressure loss of interconnecting lines with addition of indoor power converted to btuh
Condenser Power, A-test, @ T1, watts		Compressor & OD air mover power only
Evaporator Temperature, T2, F		Saturated suction temperature, evaporator leaving
Condenser Capacity, A-test, @ T2, btuh		Includes pressure loss of interconnecting lines with addition of indoor power converted to btuh
Condenser Power, A-test, @ T2, watts		Compressor & OD air mover power only
B-Test		
Evaporator Temperature, T1, F		Saturated suction temperature, evaporator leaving
Condenser Capacity, B-test, @ T1, btuh		Includes pressure loss of interconnecting lines with addition of indoor power converted to btuh
Condenser Power, B-test, @ T1, watts		Compressor & OD air mover power only
Evaporator Temperature, T2, F		Saturated suction temperature, evaporator leaving
Condenser Capacity, B-test, @ T2, btuh		Includes pressure loss of interconnecting lines with addition of indoor power converted to btuh
Condenser Power, B-test, @ T2, watts		Compressor & OD air mover power only

Table B5: Simulation Inputs for Low Stage		
Simulation Inputs		**Comments**
Item	**Value**	
B-Test		
Evaporator Temperature, T1, F		Saturated suction temperature, evaporator leaving
Condenser Capacity, B-test, @ T1, btuh		Includes pressure loss of interconnecting lines with addition of indoor power converted to btuh
Condenser Power, B-test, @ T1, watts		Compressor & OD air mover power only
Evaporator Temperature, T2, F		Saturated suction temperature, evaporator leaving
Condenser Capacity, B-test, @ T2, btuh		Includes pressure loss of interconnecting lines with addition of indoor power converted to btuh
Condenser Power, B-test, @ T2, watts		Compressor & OD air mover power only
F-Test		
Evaporator Temperature, T1, F		Saturated suction temperature, evaporator leaving
Condenser Capacity, F-test, @ T1, btuh		Includes pressure loss of interconnecting lines with addition of indoor power converted to btuh
Condenser Power, F-test, @ T1, watts		Compressor & OD air mover power only
Evaporator Temperature, T2, F		Saturated suction temperature, evaporator leaving
Condenser Capacity, F-test, @ T2, btuh		Includes pressure loss of interconnecting lines with addition of indoor power converted to btuh
Condenser Power, F-test, @ T2, watts		Compressor & OD air mover power only

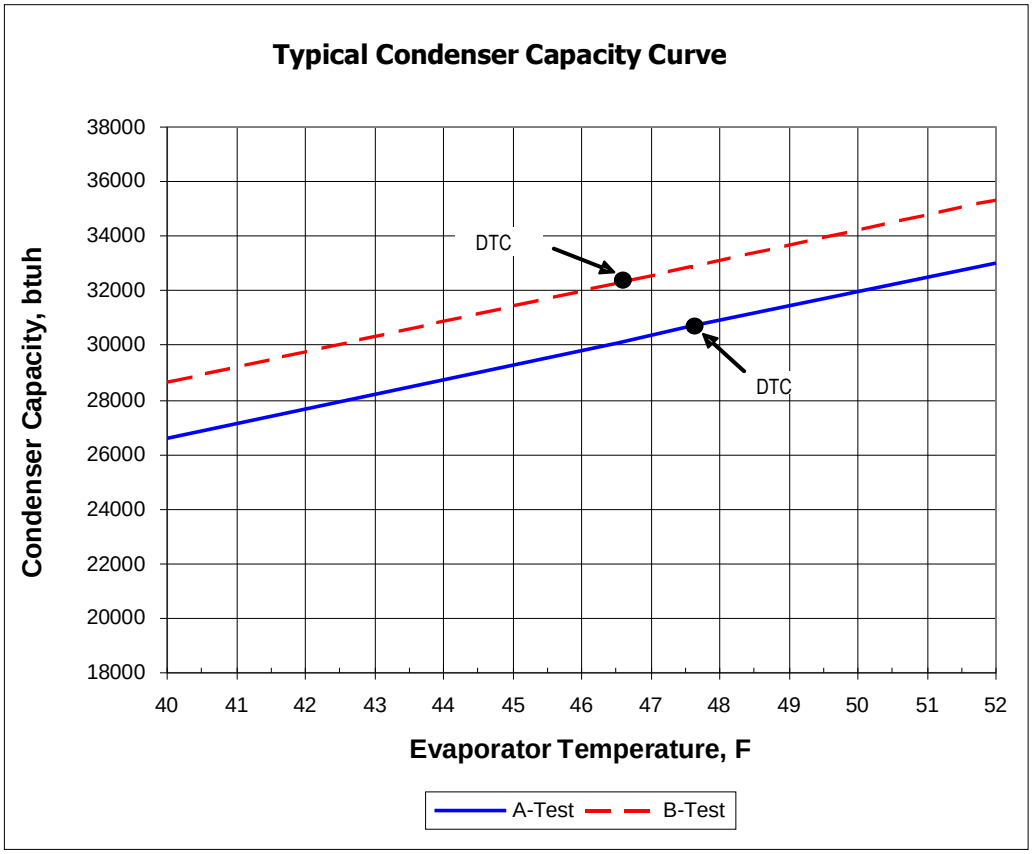


Figure B2: Typical Condenser Capacity Curve

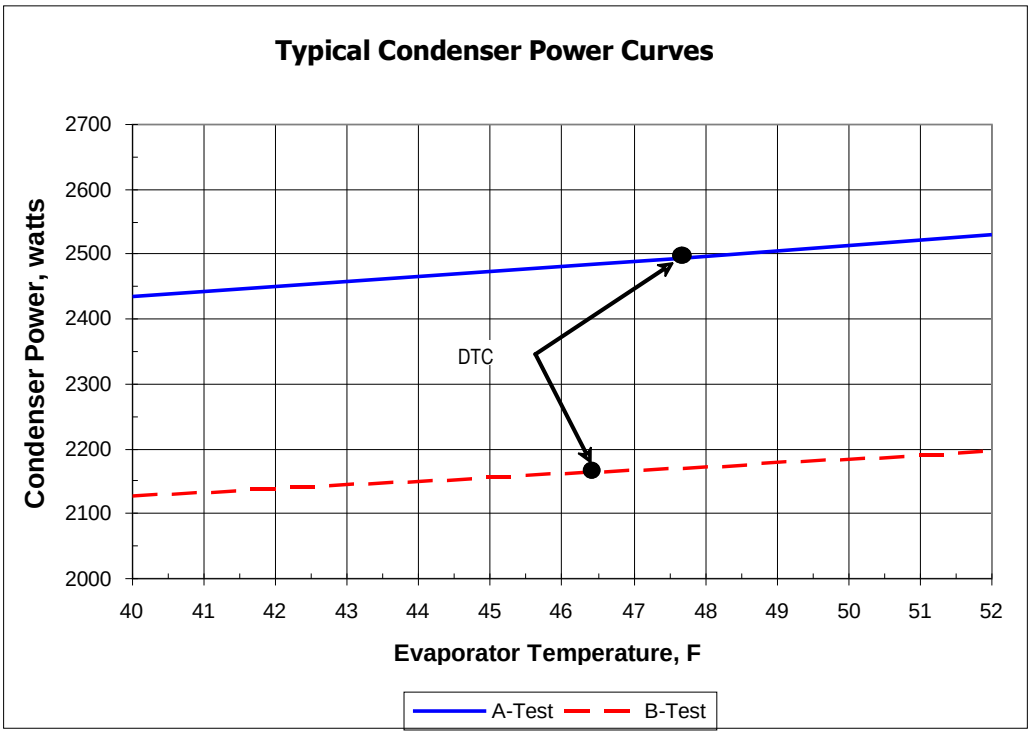


Figure B3: Typical Condenser Power Curves

APPENDIX C: CONDENSING UNITS FOR COIL-ONLY CERTIFICATION

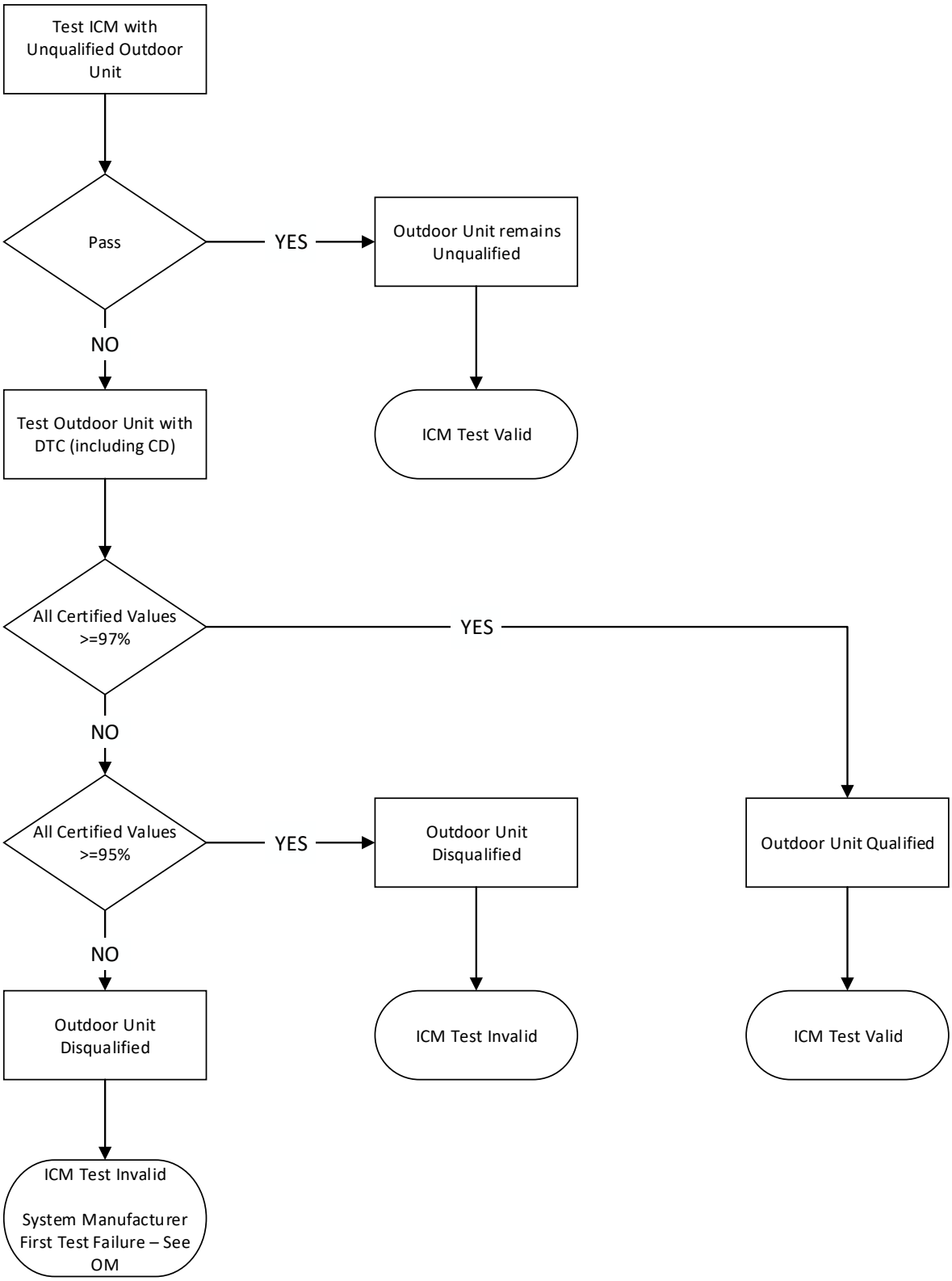


Figure C1: Use of Unqualified Outdoor Units for ICM Testing

APPENDIX D: COMPLIANCE PROGRAM FLOW CHARTS

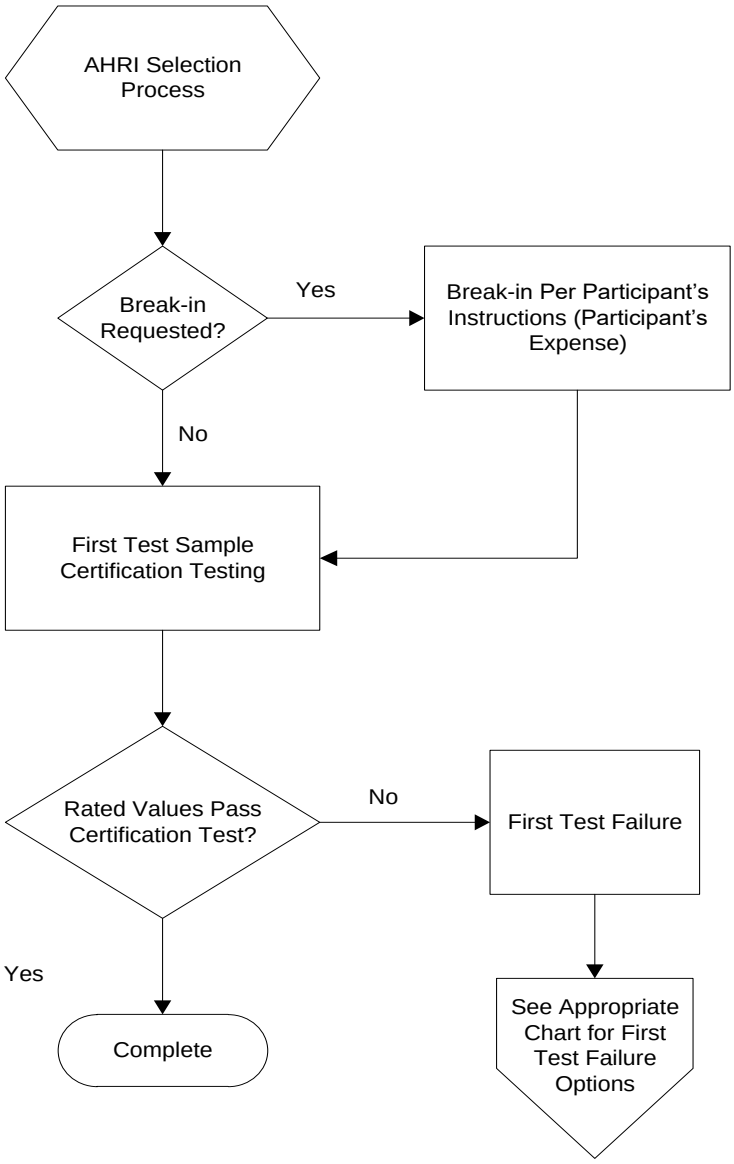


Figure D1: Selection and Testing Process

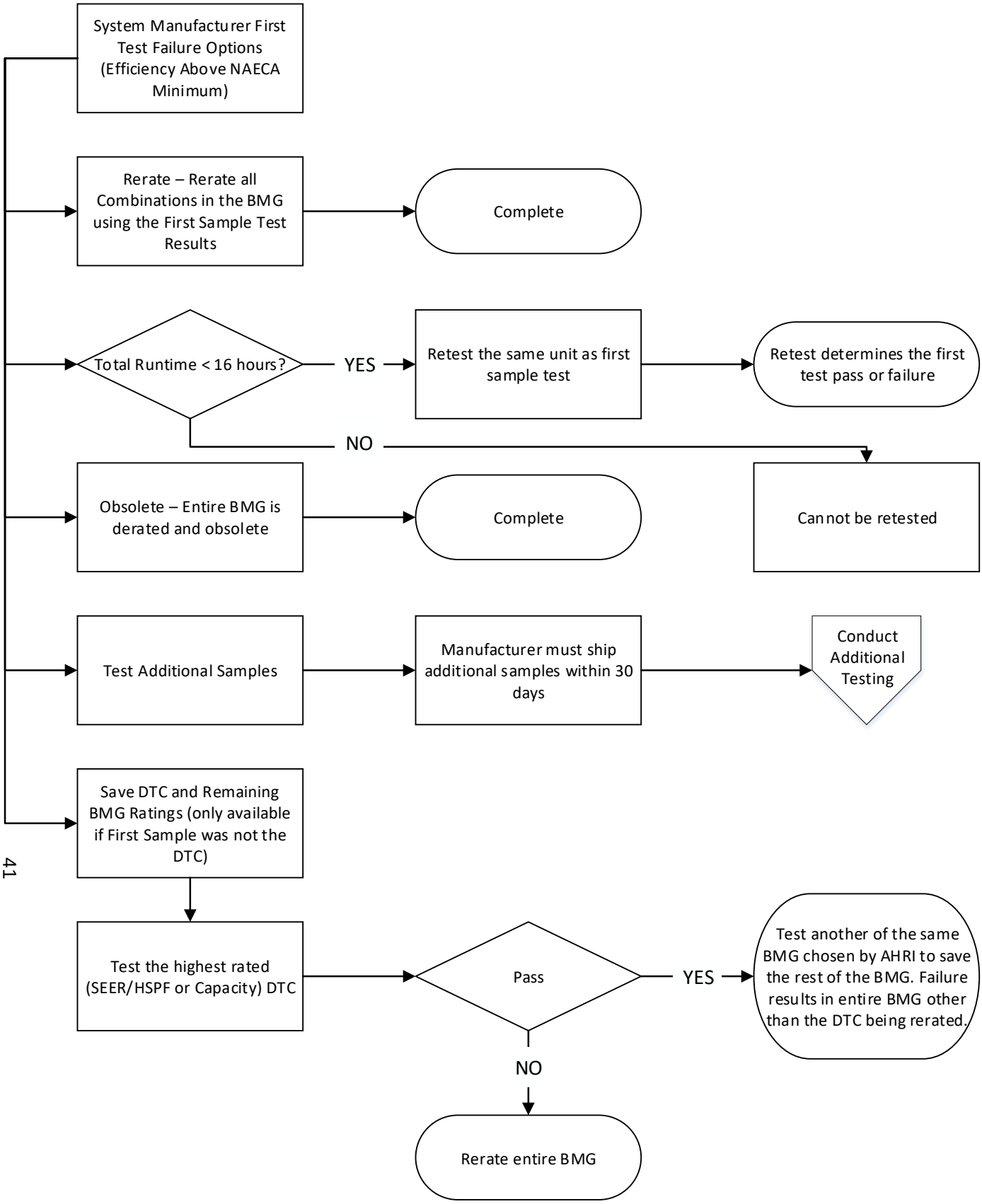


Figure D2: System Manufacturer First Test Failure Options

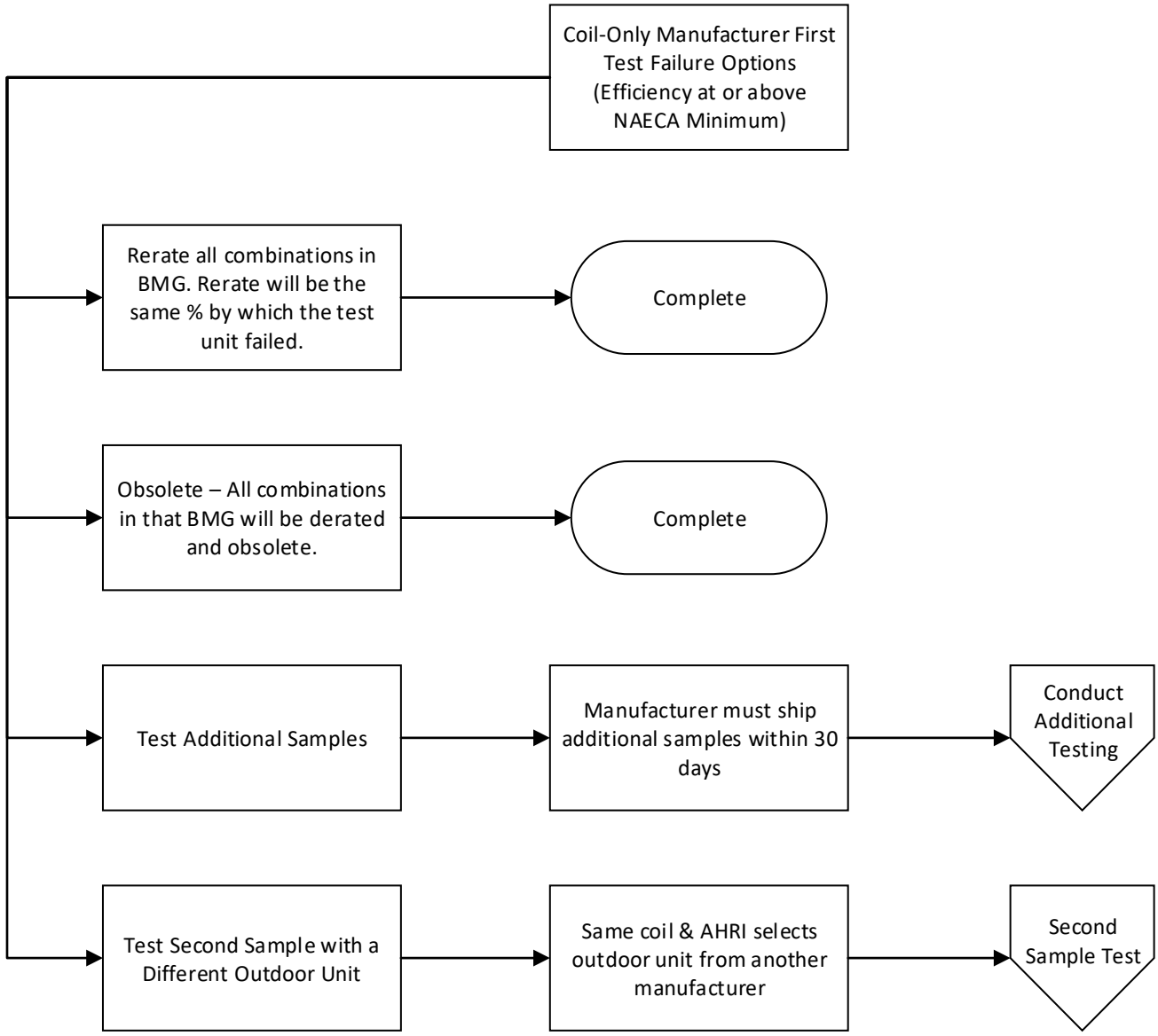


Figure D3: ICM First Test Failure Options

ICM Second Sample Test with Different Outdoor

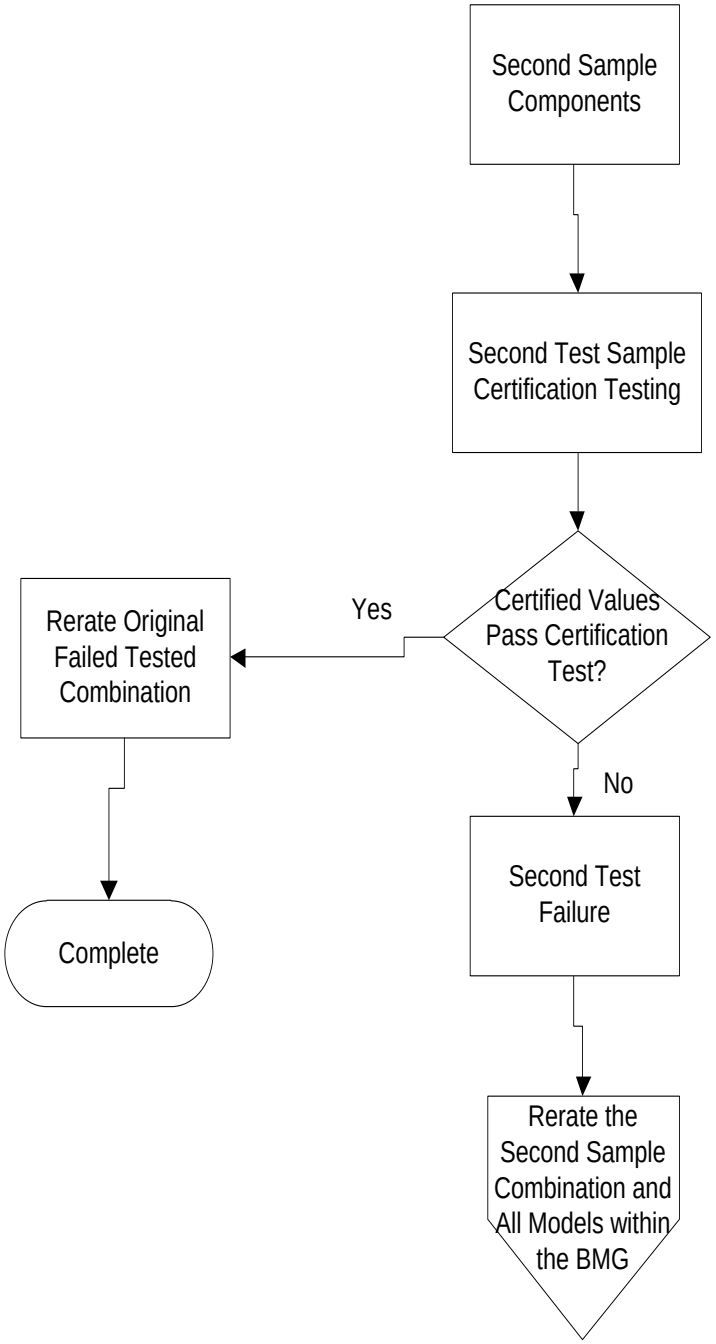


Figure D4: ICM Second Sample Test

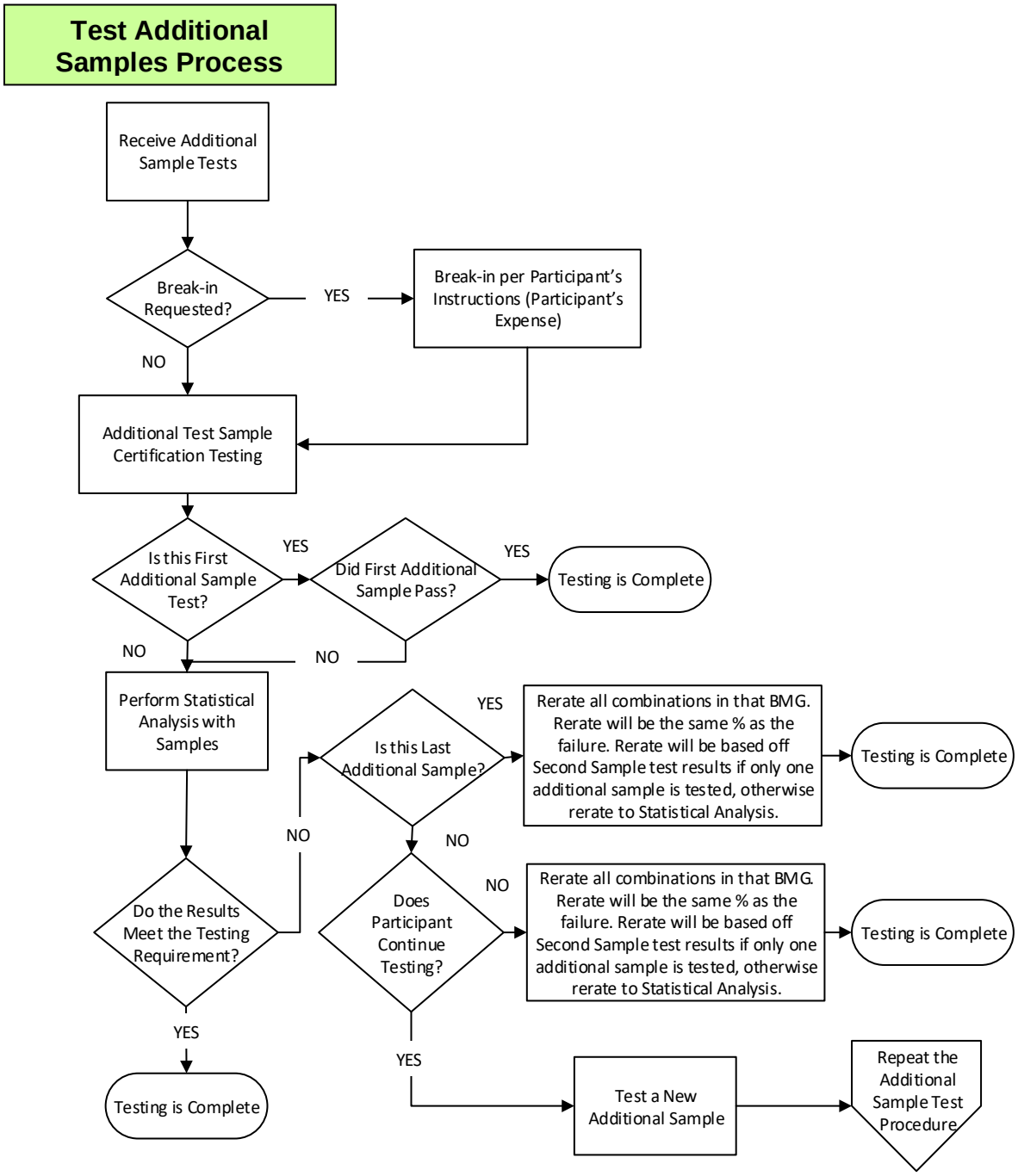


Figure D5: Test Additional Samples Process

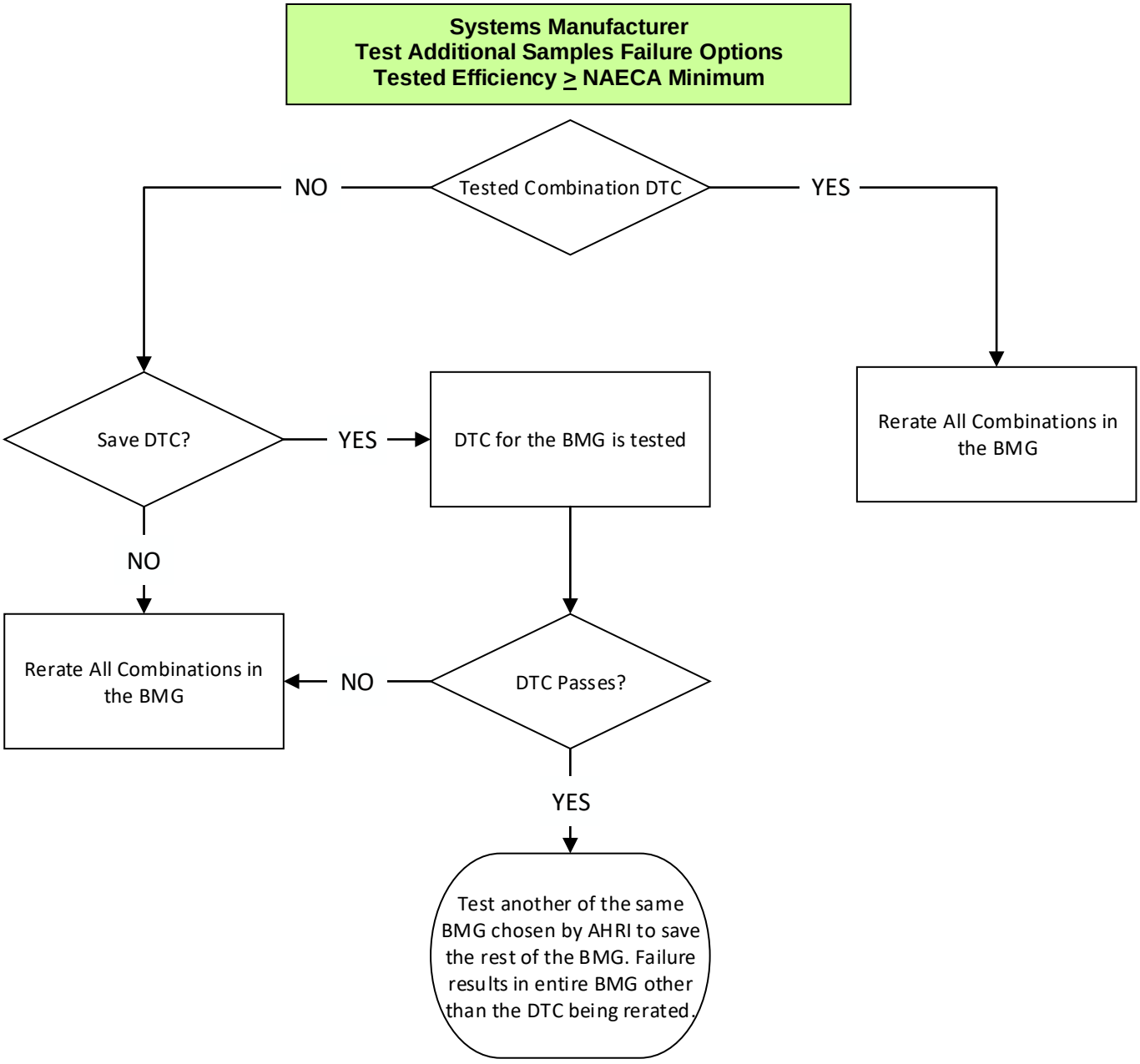


Figure D6: System Manufacturer Test Additional Samples Failure Options

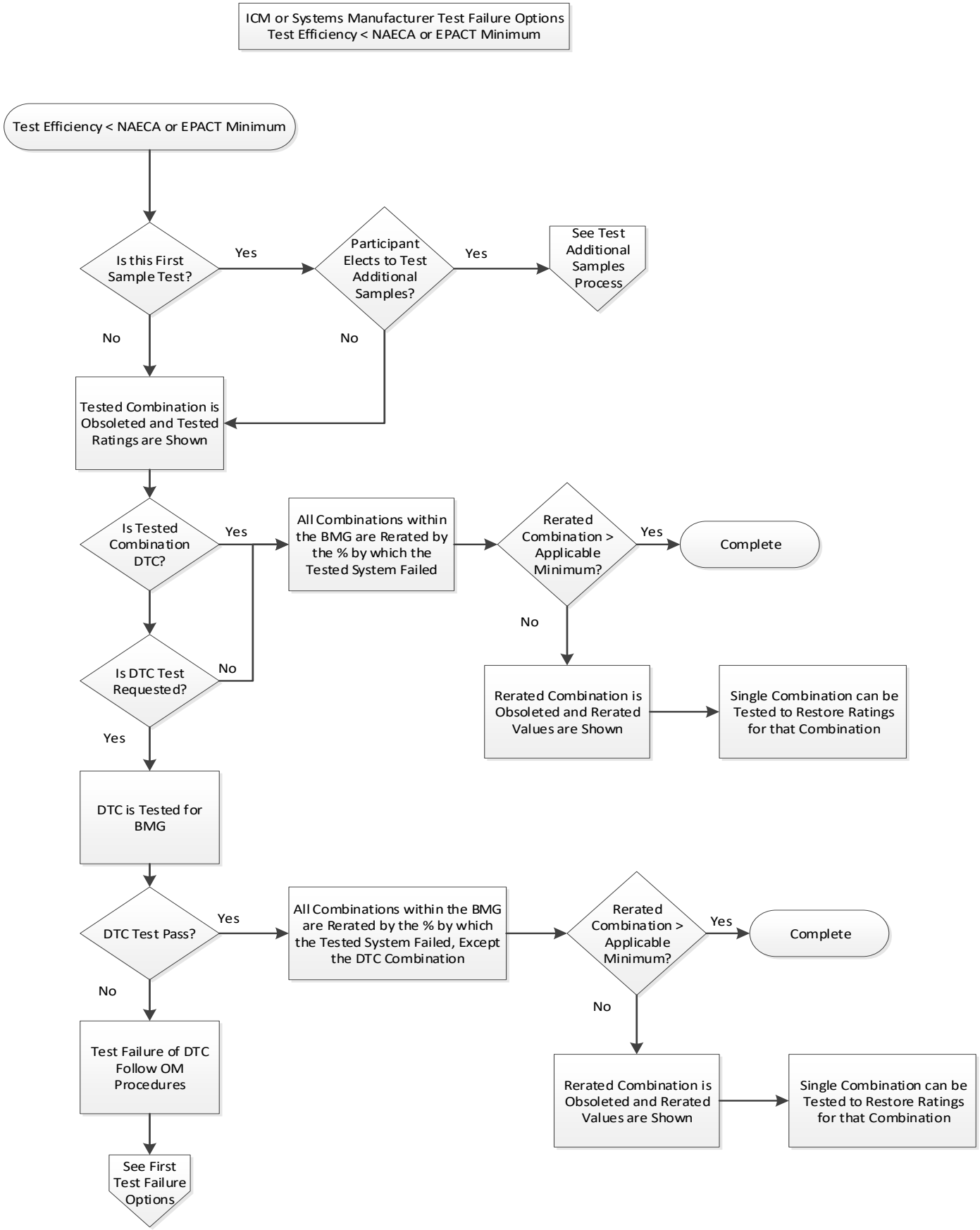


Figure D7: ICM or System Manufacturer First or Additional Sample Failure Options

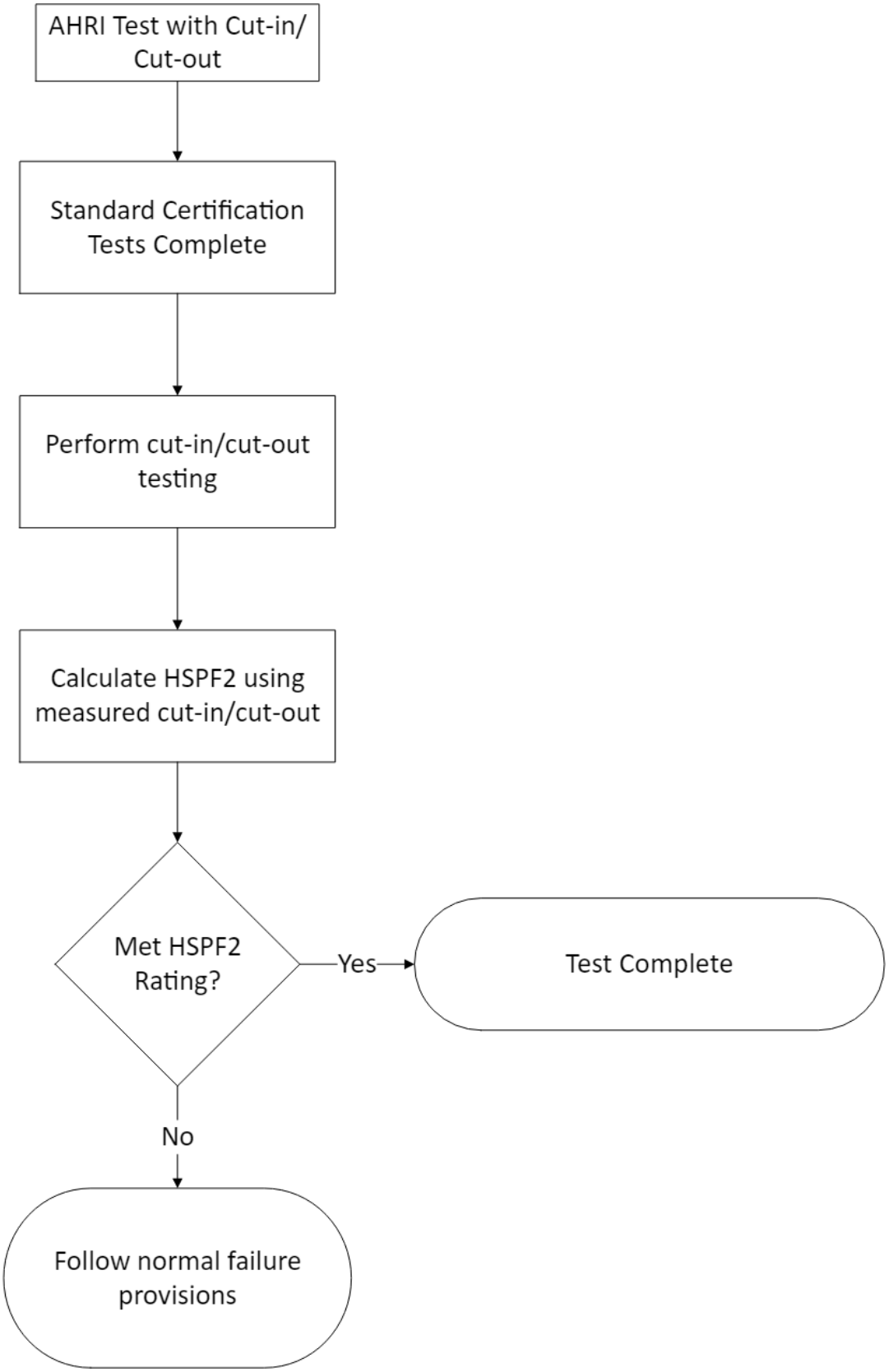


Figure D8: Cut-in/Cut-out Failure Options

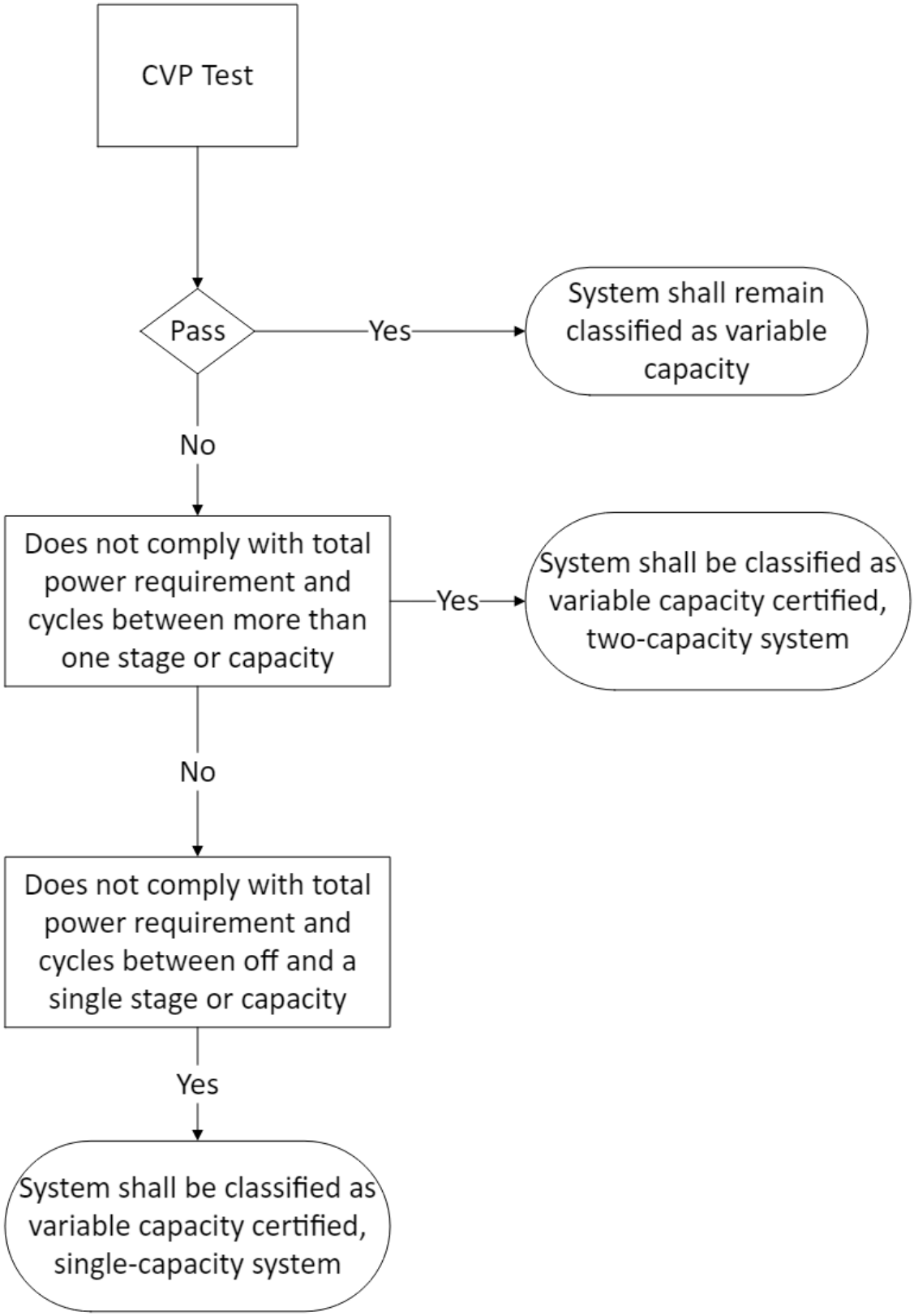


Figure D9: CVP Classification

APPENDIX E: INDEPENDENT COIL MANUFACTURER BMG DEFINITION

Table E1: ICM BMG Definition		
Evaporator Parameters that Define a ICM Basic Model Group		
Parameter	**Characteristics**	**Comments**
Capacity	6,000 Btu/h increments	One Per 6,000 Btu/h capacity. (For example, see Table F2)
Air-Handler	Yes or No (mixed case)	
Evaporator Fan Type	Single Speed; Dual Speed; Multiple Speed; Variable Speed (mixed case)	
Evaporator Number of Rows	Whole number	
Air-Cooled	Air-Cooled	
Evaporator Tube Centers	0.800 x 0.693; 0.85 x 0.736; 1.00 x 0.625; 1.00 x 0.750; 1.00 x 0.866; 1.25 x 1.08; Other; N/A (this option only applicable to Non-Air-Cooled Product)	
Evaporator Fin Type	Flat; Corrugated; Hi Performance; Lanced; Louvered; N/A (This option only applicable to Non-Air-Cooled product) (mixed case)	
Evaporator Fins/Inch	Whole Number	Two (2) fins/inch per BMG (example: 8-9,10-11, 12-13,14-15..etc)
Evaporator Tube OD	1/4 in; 5/16 in; 3/8 in; 7/8 in; 1/2 in; 1 x 0.072 in; rifled 1/4 in; rifled 5/16 in; rifled 3/8 in; rifled 1/2 in; rifled 7mm; N/A (This option only applicable to Non-Air-Cooled products and Non-Conventional Geometry Products)	
Evaporator Expansion Device	Orifice, Capillary Tube, Expansion Valve (mixed case)	
Finned Length per Slab (in)	One decimal. Minimum 0, maximum 60 in	
Finned Height per Slab (in)	One decimal. Minimum 0, maximum 60 in	
Number of Slabs in the Coil	Whole Number, minimum 1, maximum 10	
Finned Material Type	Options: Copper, Aluminum	
Tube Material Type	Options: Copper, Aluminum	
Total Number of Active Tubes	Whole Number, minimum 1, maximum 1000	

Table E2: ICM BMG Bucket – Coil Capacity		
Coil Type		
Vertical	Horizontal	
AHRI Type		
Coil Blower (-CB)	Coil Only (-C)	
BMG Bucket – Coil Capacities	Min Capacity (in Btu/h)	Max Capacity (in Btu/h)
1	6000	11900
2	12000	17900
3	18000	23900
4	24000	29900
5	30000	35900
6	36000	41900
7	42000	47900
8	48000	53900
9	54000	59900
10	60000	64900

Definitions:

I. *Fin Definitions*.

a. *Flat*. A flat surface without amplitudes.

b. *Corrugated*. A flat surface modified with angular amplitudes.

c. *Hi-performance*. A flat surface modified with sine wave amplitudes, but no lances or louvers.

d. *Lanced/Louvered*. A surface modified with raised lances or louvers.

II. *Slab:* An independent tube coil assembly or module, used for heat transfer between refrigerant and air. For example, an A Coil consists of two (2) slabs; a pleated coil has three (3) or more slabs.

III. *Active Tubes:* Tubes in the slab intended to carry refrigerant.

APPENDIX F: SETUP, COMMISSIONING AND OPERATING CHECKLIST FOR LABORATORY PERSONNEL

F1 *Setup Checklist and Operating Procedures for the Laboratory Personnel*:

1. Verify that the nameplate model is the same as the AHRI requested model.
   a. Check if there are additional comments in the data.
2. Follow the manufacturer's installation instructions and related drawings (manufacturer representative may be present).
   a. Charging instructions.
      i. For heat pumps, determine the IRV of the test coil from the Directory. Follow the System Manufacturer's charging instructions for a coil (whether ICM or a different System Manufacturer coil) with the closest IRV. If no instructions are available, consult the coil manufacturer for specific charging instructions.
   b. Tubing sizing.
   c. Airflow tap settings.
   d. Expansion device. If there is a use of a TXV, ensure there is insulation on the bulb. Check that the bulb is attached and positioned correctly.
   e. Verify all enhancements per the rating are installed properly (e.g. demand defrost board, liquid line solenoid, TXV, time delay relay).
   f. Note any deviation from the Participant's published installation instructions.
   g. Verify that the unit is physically installed per the installation instructions.
3. Verify the ductwork meets ASHRAE 37 requirements.
4. Inspect indoor ductwork for leaks.
5. Verify that the indoor coil is sitting in the housing and is positioned correctly.
6. Inspect the trap for condensate is clear of obstructions and check if the condensate is leaving.
7. Verify that the correct nozzles are selected for the given airflow range.
8. Verify that the voltage to be applied matches the voltage listed on nameplate.
9. Verify major components are of compatible voltage.
10. Compare the indoor fan watts against known values (if available).
11. Verify installation to the manufacturer's supplemental checklist (if available). (AHRI shall approve)
12. Verify the refrigerant line length between Outdoor and Indoor Units against the manufacturer's published installation instructions.
13. Verify airflow rates of Indoor Units.

F2 *Additional Procedures and Checks Following a Failure:*

1. For high stage and low stage compressor operation:
   a. Indoor (ID) airflow;
   b. ID watts;
   c. ID static;
   d. Outdoor (OD) airflow if OD air is the secondary check or refrigerant mass flow;
   e. OD watts on fan motor;
   f. Compressor watts;
   g. Sub-cooling and superheat; and
   h. Liquid temperature.
2. Record the temperatures leaving the circuits.
3. Photos of test setup.
4. ID airflow speed tap. List all speed tap changes.
5. Time between defrost.
6. Report any error messages or abnormally flashing lights.
7. Last date that the evaluation of air-conditioning and heating equipment test stands was conducted.

F3 *Laboratory Procedures for Testing Variable Speed ICM Matched Systems:*

1. The ICM coil and expansion device or Coil-Blower assembly shall be acquired by the laboratory AHRI selection process.
2. OEM system components shall be acquired by the Laboratory from the AHRI selection process.
3. The Laboratory shall notify the OEM in advance that the System and controller will be utilized for ICM testing.
4. OEM matched system shall be tested.
5. OEM system test setup may be witnessed by the OEM if they have elected to do so.
6. OEM system must pass all metrics.
7. The ICM test will be performed by the Laboratory following the OEM test.
8. If onsite, the OEM participant shall not witness the ICM testing.
9. The laboratory may contact the ICM as required to resolve indoor setup issues.
10. ICM tests shall be executed in the same manner as the OEM system test.
    a. Airflow settings shall be provided by the ICM.
    b. Compressor Speed setting must match.
    c. ICM may provide specific charging instructions if required in advance.
11. Rough check data may be provided for ICM Coil-Blower tests only.
12. Any OEM related setup issues shall be communicated only to AHRI staff.
13. The laboratory shall complete the ICM testing and issue preliminary results to AHRI only.
14. AHRI will review preliminary test failures in detail and will invalidate the test if testing errors are found and the lab will be instructed to repeat the test.
15. AHRI will review and approve the preliminary results and authorize the laboratory to issue the final test report to the participant as described in NDA.
16. No provision for private testing will be allowed for ICM variable speed tests.
17. When requested, immediately upon a confirmed first sample failure the lab will setup and test the ICM second sample as described above steps 7 – 16.

APPENDIX G: COIL GEOMETRY SCREENING

G1 Information regarding the mixed Indoor Unit may be verified by the matched System Manufacturer.

G2 *Single-Speed & Single-Stage Mixed Coil Requirements*

G2.1 ICM ratings shall be subject to the flowchart shown in Figure G1, G2 and G3.

G2.2 If the sample's ratings pass the criteria of the flowchart, the ratings are subject to the coil geometry screening program. The program shall generate a rating based on submitted data from the ICM. This rating is then compared with the System Manufacturer's inputted data. The ratings of the mixed coil shall not exceed 6% of the output rating generated by the coil geometry screening program.

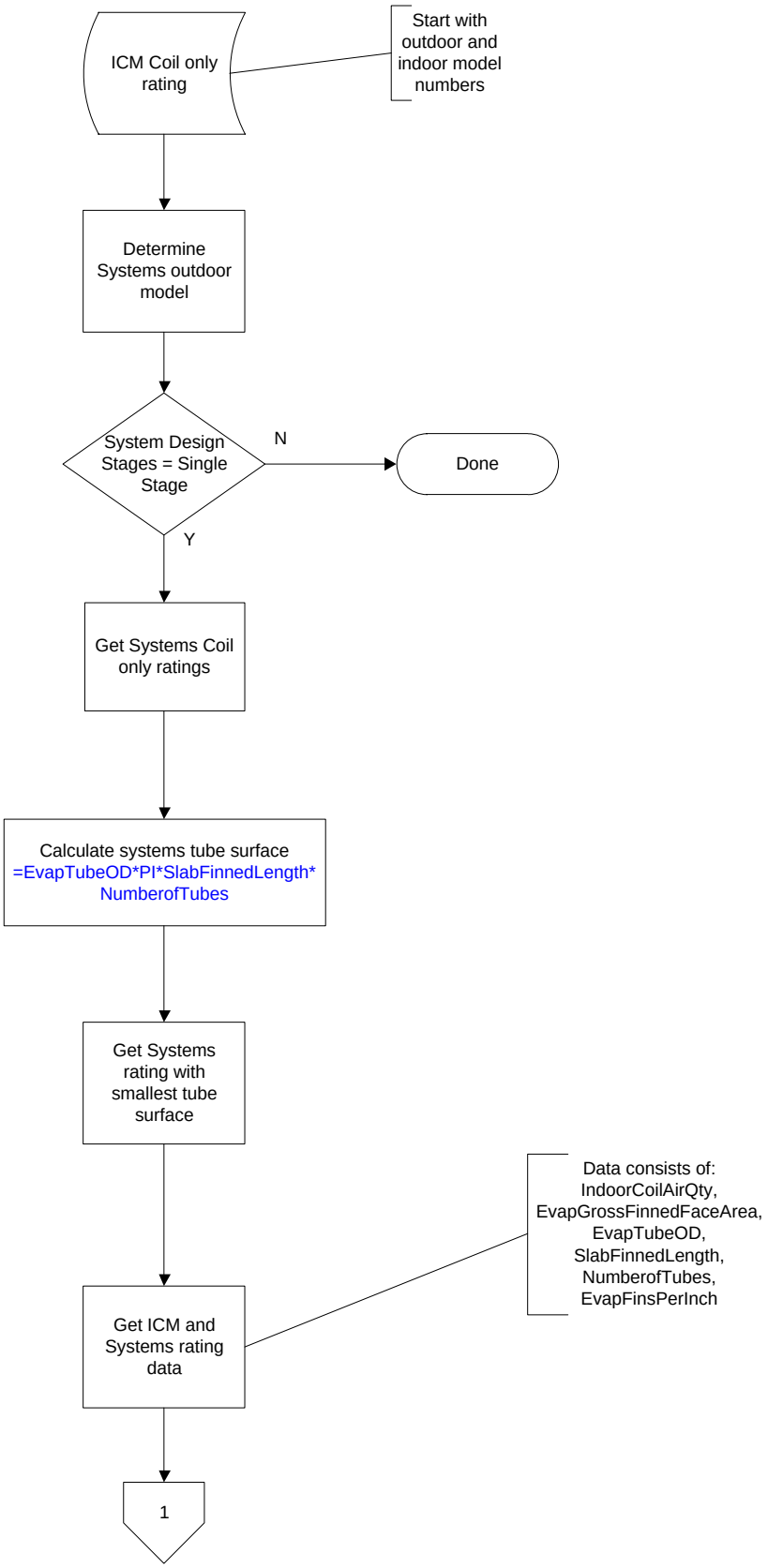
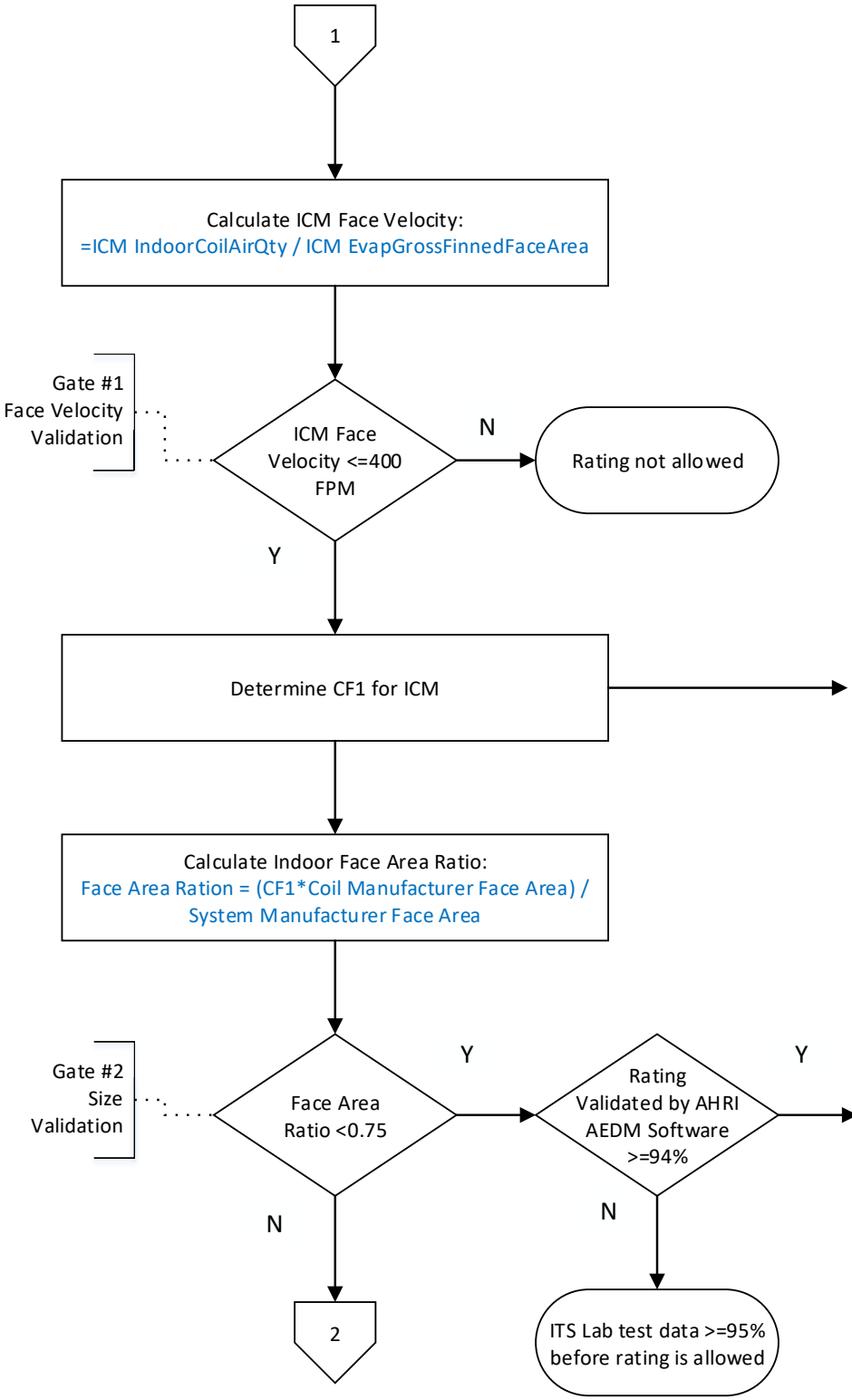
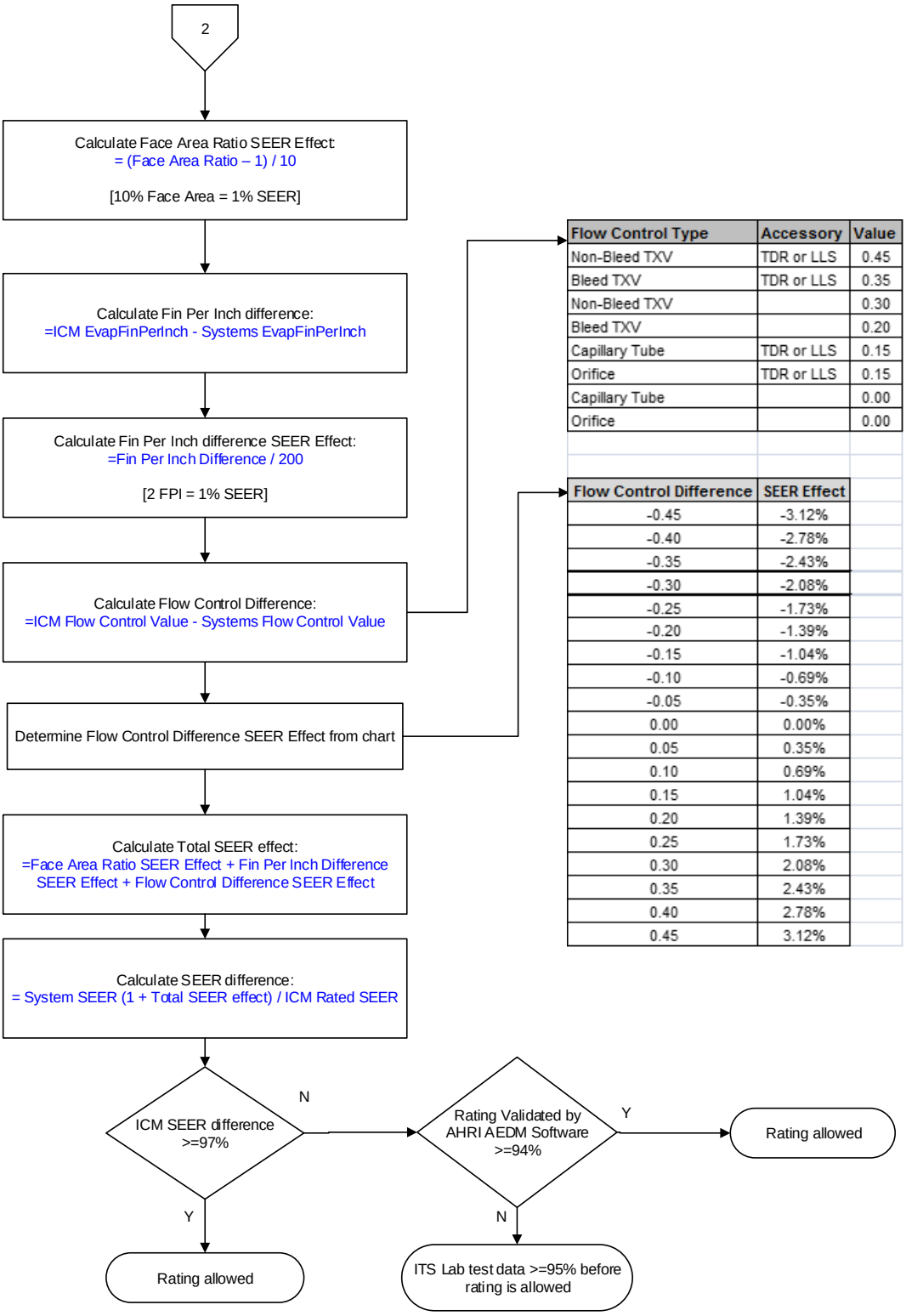


Figure G1: Part 1 of the ORNL Flowchart



Rows System Manufacturer	Rows Coil Manufacturer	CF1
1	1	1
1	2	1.9
1	3	2.85
1	4	3.25
1	5	3.55
2	1	0.5
2	2	1
2	3	1.25
2	4	1.5
2	5	1.56
3	1	0.37
3	2	0.75
3	3	1
3	4	1.25
3	5	1.4
4	1	0.3
4	2	0.425
4	3	0.8
4	4	1
4	5	1.34

Figure G2: Part 2 of the ORNL Flowchart



Flow Control Type	Accessory	Value
Non-Bleed TXV	TDR or LLS	0.45
Bleed TXV	TDR or LLS	0.35
Non-Bleed TXV		0.30
Bleed TXV		0.20
Capillary Tube	TDR or LLS	0.15
Orifice	TDR or LLS	0.15
Capillary Tube		0.00
Orifice		0.00

Flow Control Difference	SEER Effect
-0.45	-3.12%
-0.40	-2.78%
-0.35	-2.43%
-0.30	-2.08%
-0.25	-1.73%
-0.20	-1.39%
-0.15	-1.04%
-0.10	-0.69%
-0.05	-0.35%
0.00	0.00%
0.05	0.35%
0.10	0.69%
0.15	1.04%
0.20	1.39%
0.25	1.73%
0.30	2.08%
0.35	2.43%
0.40	2.78%
0.45	3.12%

Figure G3: Part 3 of the ORNL Flowchart

APPENDIX H: CERTIFICATION OF MODELS RATED WITH INTERNATIONAL RATING CONDITIONS

Certification of models rated with International Rating Conditions shall be certified using the USE OM and the GOM, with the following exceptions:

H1 *Basic Model Groups (BMGs)*. See Section 1.5.

H1.1 *BMG Division.* A participant may choose to either list products at domestic rating conditions, international rating conditions, or both using the following options:

- *Domestic and International Rating Conditions*. The product shall share one BMG at both Domestic and International Rating Conditions.
- *Domestic Rating Conditions.* The product shall have one BMG at Domestic Rating Conditions.
- *International Rating Conditions.* The product shall have one BMG at International Rating Conditions.

H2. *Annual Testing Requirements.*

H2.1 *System Manufacturers and ICM.* 20% of a Participant's BMGs certified to International Rating Conditions shall be tested annually, with a minimum of one (1) model. Fractional numbers shall be rounded up to the nearest whole number..

H2.3 *BMG Models with AHRI Standard Ratings and International Ratings*. BMGs that have certified ratings at both the AHRI Standard Rating Conditions and International Rating Conditions shall be counted only once, under BMGs with AHRI Standard Rating Conditions.

H3 *Certified Data at International Rating Conditions*. The participant shall certify the performance rating at one or more of the international rating conditions, as specified in Table 14 of AHRI Standard 210/240-2017 with Addendum 1, Table 11 of AHRI Standard 210/240-2024, and/or AHRI Standard 211/241-0B/1B-2021 (SI). The participant may further choose to certify additional operating conditions specified in Table H1. Certification tests shall be conducted at all conditions at which the participant certifies the equipment.

H3.1 *Unitary Small Air-Conditioners (Systems and Mixed-Match Coils), Under 65,000 Btu/h [19,000 W]*

- Cooling Capacity at T1, T2, T3, and/or T4, Btu/h; as applicable;
- Energy Efficiency Ratio (EER_{T1}, EER_{T2}, EER_{T3}, EER_{T4}) and Energy Efficiency Ratio 2 ($EER2_{T1}$, $EER2_{T2}$, $EER2_{T3}$, $EER2_{T4}$) T1, T2, T3, and/or T4, Btu/W·h, and Coefficient of Performance (COP_{T1}, COP_{T2}, COP_{T3}, COP_{T4}) at T1, T2, T3 and/or T4, W/W; as applicable; and
- Extra High Temperature Operating Requirement, as applicable.

H3.2 *Unitary Small Air-Source Heat Pumps (Systems and Mixed-Match Coils), Air-Cooled under 65,000 Btu/h [19,000 W].*

- Cooling Capacity at T1, T2, T3, and/or T4, Btu/h; as applicable;
- Energy Efficiency Ratio and Energy Efficiency Ratio 2 (T1, T2, T3, and/or T4, Btu/W·h, and Coefficient of Performance (COP_{T1}, COP_{T2}, COP_{T3}, COP_{T4}) at T1, T2, T3, and/or T4, W/W; as applicable;
- Heating Capacity at H1, H2, and/or H3, Btu/h; as applicable;
- Coefficient of Performance (COP_{H1}, COP_{H2}, COP_{H3}) at H1, H2, and/or H3; as applicable; and
- Extra High Temperature Operating Requirement, as applicable.

H4 *Optional Operating Requirements.* Participant may choose to optionally certify equipment to the conditions for the operating tests specified in Table H1. The requirements of the optional operating condition tests are specified below.

H4.1 *Extra High Temperature Operating Requirement*. Unitary Air Cooled Air-Conditioners and Heat Pump Equipment shall pass the following extra high temperature operating condition test with an indoor-coil at the T3 condition airflow rate.

H4.1.1 *Temperature Conditions*. Temperature conditions shall be maintained as shown in Table H1 ± 1.0°F [0.6°C].

H4.1.2 *Voltages*. Tests shall be run at the unit's rated voltage ± 2%.

H4.1.3 *Procedure*. Unitary Air Cooled Air-Conditioners and Heat Pump Equipment shall operate continuously at full capacity for 2 hours at the temperature conditions and voltage(s) specified above.

H4.1.4 *Requirements*. During the test, the equipment shall operate without failure of any of its components.

Table H1. Conditions for Operating Requirement Tests for Air-cooled Equipment

TEST	INDOOR SECTION		OUTDOOR SECTION	
	Air Entering Temperature			
	Dry-Bulb °F [°C]	Wet-Bulb °F [°C]	Dry-Bulb °F [°C]	Wet-Bulb °F [°C]
Extra High Temperature Operating Conditions	80.6 [27.0]	66.2 [19.0]	125.6 [52.0]	87.8[1] [31.0]

Note:
1. The wet-bulb temperature condition is not required when testing air-cooled condensers which do not evaporate condensate.

H5 *Publication of Ratings at International Rating Conditions in Certified Directory*. The following information pertaining to each model certified shall be published in the Directory:

- AHRI Certified Reference Number;
- Model Status;
- Brand Name;
- Series Name;
- Model Number(s) or Designation(s);
- AHRI Type;
- Refrigerant;
- Standard Rating Cooling Capacity at T1 ($CoolingCapacity_{T1}$), Btu/h (W)[1];
- Standard Rating Cooling Capacity at T2 ($CoolingCapacity_{T2}$), Btu/h (W)[1];
- Standard Rating Cooling Capacity at T3 ($CoolingCapacity_{T3}$), Btu/h (W)[1];
- Standard Rating Cooling Capacity at T4 ($CoolingCapacity_{T4}$), Btu/h (W)[1];
- Energy Efficiency Ratio at T1 (EER_{T1}), Btu/W·h[1];
- Energy Efficiency Ratio at T2 (EER_{T2}), Btu/W·h[1];
- Energy Efficiency Ratio at T3 (EER_{T3}), Btu/W·h[1];
- Energy Efficiency Ratio at T4 (EER_{T4}), Btu/W·h[1];
- Energy Efficiency Ratio 2 at T1 ($EER2_{T1}$)[1];
- Energy Efficiency Ratio 2 at T2 ($EER2_{T2}$)[1];

- Energy Efficiency Ratio 2 at T3 ($EER2_{T3}$)[1];
- Energy Efficiency Ratio 2 at T4 ($EER2_{T4}$)[1];
- Co-efficient of Performance at T1 (COP_{T1})[1];
- Co-efficient of Performance at T2 (COP_{T2})[1];
- Co-efficient of Performance at T3 (COP_{T3})[1];
- Co-efficient of Performance at T4 (COP_{T4})[1];
- Standard Rating Heating Capacity at H1 ($HeatingCapacity_{H1}$), Btu/h (W)[1];
- Standard Rating Heating Capacity at H2 ($HeatingCapacity_{H2}$), Btu/h (W)[1];
- Standard Rating Heating Capacity at H3 ($HeatingCapacity_{H3}$), Btu/h (W)[1];
- Coefficient of Performance (COP_{H1}) at H1[1];
- Coefficient of Performance (COP_{H2}) at H2[1];
- Coefficient of Performance (COP_{H3}) at H3[1];
- Extra High Temperature Operating Requirement[1];
- Rated Full Load Indoor Coil Air Quantity at T1, SCFM[1];
- Rated Full Load Indoor Coil Air Quantity at T2, SCFM[1];
- Rated Full Load Indoor Coil Air Quantity at T3, SCFM[1];
- Rated Full Load Indoor Coil Air Quantity at T4, SCFM[1] ;
- Rated Full Load Indoor Coil Air Quantity at H1, SCFM[1];
- Rated Full Load Indoor Coil Air Quantity at H2, SCFM[1] ;
- Rated Full Load Indoor Coil Air Quantity at H3, SCFM[1]; and
- Frequency (Hertz)

Notes
1. If rated

H6 *Options Following First Sample Certified Rating Test Failure*. Failure options shall follow Section 3.18 for failing rating conditions (domestic, international, or both).

H6.1 *Options Following International Rating Condition Optional Operating Requirement Test Failure*. If the Participant's model does not comply with an Optional Operating Requirement test, the model shall no longer be listed as compliant to the Optional Operating Requirement on the AHRI Directory and AHRI Certificate. The options below are only followed if a model does not fail other rating points.

Failure of Optional Operating Requirement test shall not result in a Penalty Test.

H6.1.1 *Options Following 1st Sample Failure*

- Accept non-compliance, the model shall no longer be listed as compliant to the Optional Operating Requirement on the AHRI Directory and AHRI Certificate; or
- Test second sample of the same model (sample must be available within the timeframe and procedure allotted in Section 3.18 following notification of decision); or
- Obsolete the model, which also obsoletes all models within the corresponding BMG. This option also accepts non-compliance.

H6.1.1 *Options Following 2nd Sample Failure*

- Accept non-compliance, the model shall no longer be listed as compliant to the Optional Operating Requirement on the AHRI Directory and AHRI Certificate; or
- Obsolete the model, which also obsoletes all models within the corresponding BMG. This option also accepts non-compliance.

APPENDIX I: ICM DEFINED TEST REPORT DATA

For each test, ICMs shall only receive the following data:

Coil Replacement Test Reports

Data Category	Notes
System Details	Intended Use
Indoor Model No.	Test Record
Outdoor Model No	Test Record
Indoor Serial No.	Test Record
Outdoor Serial No	Test Record

Each Steady State Test Point	Intended Use
Barometer (in. Hg.)	Air/Refrigerant Properties
ID Inlet DB (Deg F)	Confirm Conditions
ID Inlet WB (Deg F)	Confirm Conditions
ID Outlet DB (Deg F)	Results
ID Outlet WB (Deg F)	Results
OD Inlet DB (Deg F)	Confirm Conditions
OD Inlet WB (Deg F)	Confirm Conditions
SubCooling (Deg F)	Coil Properties
Superheat (Deg F)	Coil Properties
SubCooling (Deg F)	Outdoor Service Valve
Superheat (Deg F)	Outdoor Service Valve
Refrigerant Capacity (Btu/hr)	Results
Airflow	Confirm Conditions
External Static Pressure (in H20)	Confirm Conditions
Total Capacity (Btu/hr)	Results
Sensible Capacity (Btu/hr)	Results
Latent Capacity (Btu/hr)	Results
Total Power (Watts)	Results
EER (Btu/Watt)	Results
EER2 (Btu/Watt)	Results

Final	Intended Use
SEER	Results
SEER2	Results
HSPF	Results
HSPF2	Results
HSPF2 Region V	Results
COP at 5°F	Results

Coil Blower Test Report

Data Category	Notes
System Details	Intended Use
Indoor Model No.	Test Record
Outdoor Model No	Test Record
Indoor Serial No.	Test Record
Outdoor Serial No	Test Record

Each Steady State Test Point	Intended Use
Barometer (in. Hg.)	Air/Refrigerant Properties
ID Inlet DB (Deg F)	Confirm Conditions
ID Inlet WB (Deg F)	Confirm Conditions
ID Outlet DB (Deg F)	Results
ID Outlet WB (Deg F)	Results
OD Inlet DB (Deg F)	Confirm Conditions
OD Inlet WB (Deg F)	Confirm Conditions
SubCooling (Deg F)	Coil Properties
Superheat (Deg F)	Coil Properties
SubCooling (Deg F)	Outdoor Service Valve
Superheat (Deg F)	Outdoor Service Valve
Refrigerant Capacity (Btu/hr)	Results
Airflow	Confirm Conditions
External Static Pressure (in H20)	Confirm Conditions
Total Capacity (Btu/hr)	Results
Sensible Capacity (Btu/hr)	Results
Latent Capacity (Btu/hr)	Results
Total Power (Watts)	Results
Indoor Power (Watts)	Results
EER (Btu/Watt)	Results
EER2 (Btu/Watt)	Results

Final	Intended Use
SEER	Results
SEER2	Results
HSPF	Results
HSPF2	Results
HSPF 2 Region V	Results
COP at 5°F	Results

APPENDIX J: ICM AHRI NON-DISCLOSURE AGREEMENT

AHRI NON-DISCLOSURE AGREEMENT

This Non-Disclosure Agreement ("the Agreement") is entered into as of_____, 20___ (the Effective Date), by and between the Air-Conditioning, Heating and Refrigeration Institute (AHRI), a non-profit organization incorporated in the state of Virginia with the principal business address of 2311 Wilson Boulevard, Arlington, VA 22201, [Participant in the Unitary Small Equipment Certification Program], with the principal address of _____ (hereafter, "the Participant"), and [Outdoor Unit Manufacturer], with a principal address of _____ (hereafter, "the OUM") (collectively "the Parties").

RECITALS

WHEREAS, AHRI is a certification body that hosts a testing and performance verification program for air conditioning and heat pump equipment ("the Unitary Small Equipment Certification Program"). The Unitary Small Equipment Certification Program tests and certifies the performance of matched systems, which include outdoor units and indoor coils or air handlers. Manufacturers, including the OUM, who design and manufacture variable speed outdoor units and their proprietary controls are herein referred to as "Outdoor Unit Manufacturers". Outdoor Unit Manufacturers participate in the Unitary Small Equipment Certification Program. Manufacturers, including the Participant, who design and manufacture coils and air handlers, also participate in the Unitary Small Equipment Certification program and are hereafter referred to as "Independent Coil Manufacturers".

WHEREAS, the Participant is an Independent Coil Manufacturer who seeks to participate in the AHRI Unitary Small Equipment Certification Program by testing its coils and air handlers with variable speed outdoor units produced by the OUM. In order for AHRI to test and verify the performance of an Independent Coil Manufacturer's equipment that is matched with the variable speed outdoor units, AHRI and its affiliates may require the use of software, data and information owned by the OUM.

WHEREAS, AHRI has certain data, information, controls, testing, results, reports, specifications or other information related to the performance of variable speed outdoor units, some of which is the OUM's Confidential Information, as defined below. This information may be used confidentially by AHRI or its affiliate laboratories to verify the performance of the Participant's equipment. Pursuant to the rules of the Unitary Small Equipment Certification Program Operations Manual, AHRI is permitted to disclose certain specific categories of the OUM's Confidential Information to the Participant. These categories of Confidential Information are delineated in Appendix I. For all other categories of the OUM's Confidential Information not specified in Appendix I, AHRI has implemented administrative controls to prevent the Participant from receiving such Confidential Information. However, in the event of the execution of the AHRI Unitary Small Equipment Certification Program, the Participant may gain access to Confidential Information of the OUM not specified in Appendix I.

WHEREAS, the Participants seeks to participate in the Unitary Small Equipment Certification Program and test with the variable speed equipment of the OUM;

WHEREAS, the Participant and the OUM each acknowledges and agrees that it does not have any rights to retain, collect, copy, extract, derive from or distribute the other party's Confidential Information or any information derived from such Confidential Information, and the Participant and the OUM each agrees to not disclose, use or reverse engineer any of the other Party's Confidential Information to which it may gain access in connection with the Unitary Small Equipment Certification Program.

NOW THEREFORE, in consideration of the mutual covenants and agreements contained herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Definition of Confidential Information. "Confidential Information" means any proprietary information of the Participant or the OUM relating to its applicable equipment or any applicable test reports, test results, technical or business information furnished, directly or indirectly, by AHRI (as the disclosing party) to the Participant or the OUM (as receiving party) in connection with the Unitary Small Equipment Certification

Program to be performed hereunder, regardless of whether such information is specifically designated as confidential and regardless of whether such information is in written, oral, electronic or other form. Confidential Information includes, without limitation, test reports, trade secrets, know-how, inventions, software technical data or specifications, testing methods, business or financial information, research and development activities, product and marketing plans, and Certification Program information that is not within the public domain.

2. Disclosures of Confidential Information Listed on Appendix I. The Parties acknowledge that testing and verifying the performance of the Participant's coils or air handlers that are matched with the OUM's equipment may require the use of software, data and information owned by the OUM that is included within the scope of the Confidential Information. The Parties agree that AHRI may disclose to the Participant categories of the Confidential Information of the OUM specified in Appendix I. Disclosure of information specified in Appendix I will be carried out in accordance with the rules and procedures of the Unitary Small Equipment Program Operations Manual. The ICM agrees not to disclose such Confidential Information to any third party, affiliate, related company, or to use such information for its business dealings, competitive advantage, in any manner whatsoever.

3. Disclosures of the OUM's Confidential Information Not Listed on Appendix I. If the Participant gains access to the OUM's Confidential Information that is not included in Appendix I, the Participant shall immediately notify AHRI and the OUM, and immediately return and destroy the Confidential Information and any and all information or materials derived from the Confidential Information. The Participant agrees that it shall not use or retain such Confidential Information or any materials derived from such Confidential Information, including all copies and extracts whether that information is disclosed by AHRI staff, testing laboratories that contract with AHRI, the OUM or another participant in the program who is also subject to the terms of a similar agreement. AHRI agrees that it will notify the owner of the Confidential Information that a disclosure has occurred.

4. Non-Disclosure Obligation. The Participant and OUM each agrees that if it should gain access to any of the other party's Confidential Information, it agrees to not disclose that Confidential Information or any and all information or materials derived from that Confidential Information to any third party, affiliate, related company, or to use such information for its business dealings, competitive advantage, in any manner whatsoever.

5. No Interest. Nothing contained in this Agreement will be construed as granting or conferring any rights by license or otherwise, express or implied, or otherwise for any patents, copyrights, trademarks, know-how or other proprietary rights of the Parties acquired prior to or after the date of this Agreement.

6. Survival. Regardless of the termination of any business relationship or negotiations between the Parties, this Agreement and the obligations of confidentiality and nondisclosure contained herein will remain in full force and effect during any business arrangement with AHRI and (a) thereafter with respect to trade secrets and (b) for seven (7) years thereafter for all other
Confidential Information.

7. Injunctive Relief. The Parties agree that any actual or threatened unauthorized use or disclosure of a Party's Confidential Information by the other Party to any third party, (including such Party's parent, affiliates, subsidiaries or joint ventures) shall constitute a breach under this Agreement. The Confidential Information protected by this Agreement is of a special character, such that money damages would not be sufficient to award or compensate for such breach. The Parties agree that injunctive and other equitable relief may be appropriate to prevent such a breach and may be pursued in addition to any other remedies available at law or in equity. Each of Participant and the OUM agrees to waive any requirement for the securing or posting of any bond in connection with such remedy. In addition to injunctive or other equitable relief, Participant agrees that any breach by Participant shall incur an immediate violation of AHRI's program rules and regulations and AHRI agrees that the OUM may elect, in its sole discretion, to cease providing the OUM's equipment for testing without any penalty or violation. In the event of litigation to enforce any provision hereof, the OUM will be entitled to recover all costs, including its reasonable attorneys' fees and costs, incurred in connection with the litigation from the Participant.

8. Indemnification. Participant agrees to fully indemnify, hold harmless and defend AHRI and the OUM and their directors, officers, employees, agents, stockholders and Affiliates from and against all claims, demands, actions, suits, damages, liabilities, losses, settlements, judgments, costs and expenses (including but not limited to reasonable attorney's fees and costs), whether or not involving a third party claim, which arise out of or relate to any act or omission related to the subject matter of this Agreement.

9. Law. Delaware law will govern the interpretation of this Agreement, without reference to its rules regarding conflicts of law.

10. No Waiver. No waiver of any term, provision or condition of this Agreement, whether by conduct or otherwise, will be deemed to be or be construed as a further or continuing waiver of any such term, provision or condition or as a waiver of any other term, provision or condition of this Agreement. Time is of the essence in this Agreement.

11. Severability. If any provision of this Agreement is determined by any court of competent jurisdiction to be invalid or unenforceable, such provision shall be interpreted to the maximum extent to which it is valid and enforceable, all as determined by such court in such action, and the remaining provisions of this Agreement will, nevertheless, continue in full force and effect without being impaired or invalidated in any way.

12. No Assignment; Amendment. This Agreement may not be assigned or amended except by a writing signed by the Parties. This Agreement shall be binding upon, inure to the benefit of, and be enforceable by the successors, assigns, heirs, executors, and administrators of the Parties.

13. Counterparts. This Agreement may be executed in any number of counterpart signature pages, each of which shall be deemed to be an original and all of which together shall constitute one and the same original instrument. Delivery of the executed Agreement may be by facsimile transmission with confirmation of received transmission or other electronic means that faithfully reproduces the original with same effect as if a manually signed original were personally delivered.

14. Authorization. Each of the Parties, by signing below, represents to the other Parties, that it, he or she has the authority to bind the named person or entity to this Agreement.

15. Notices. All notices or other communications required or permitted to be given hereunder shall be directed in writing to a Party at such Party's contact information provided below (which may be changed upon notice to the other Parties) by: (i) personal delivered to the Party, with delivery deemed given on the date of receipt; (ii) transmission by postage-prepaid, certified mail, return receipt requested, with delivery deemed given on the date of delivery on the return receipt, (iii) transmission via overnight carrier with delivery deemed given on the date of delivery on the
air waybill or copy thereof, or (iv) transmission by facsimile with confirmed delivery receipt, with delivery deemed given one (1) business day after such a transmission.

IN WITNESS THEREOF the Parties have caused this Agreement to be executed by their duly authorized representatives.

Company: [Participant]

Name: _____

Title: _____
Date: _____

Company: AHRI

Name: _____

Title: _____

Date:_____

Company: _ _[OUM]_____

Name: _____

Title:_____
Date:_____

APPENDIX K: ICM 6% Flowcharts

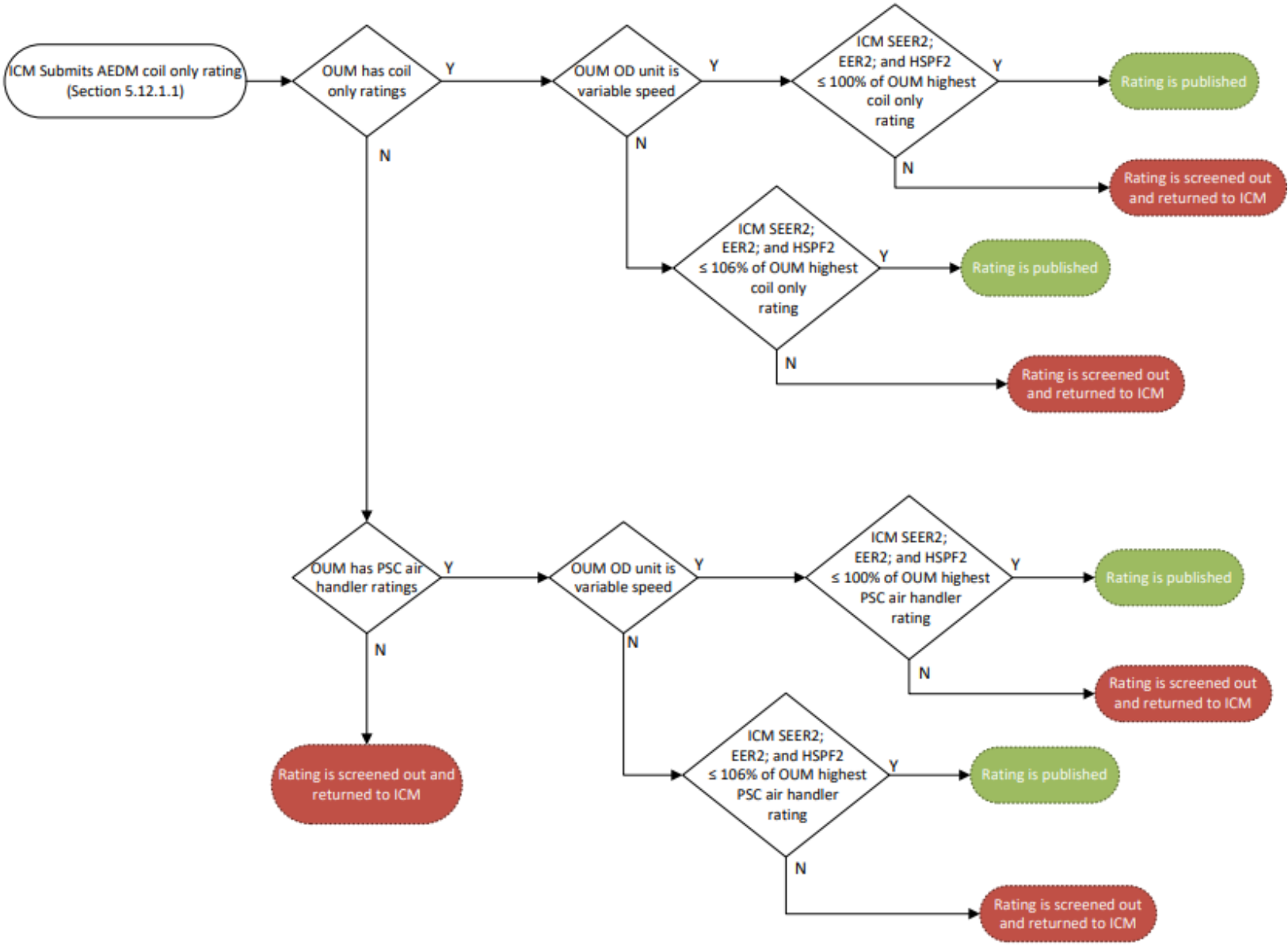


Figure K1: ICM AEDM Coil Only Rating

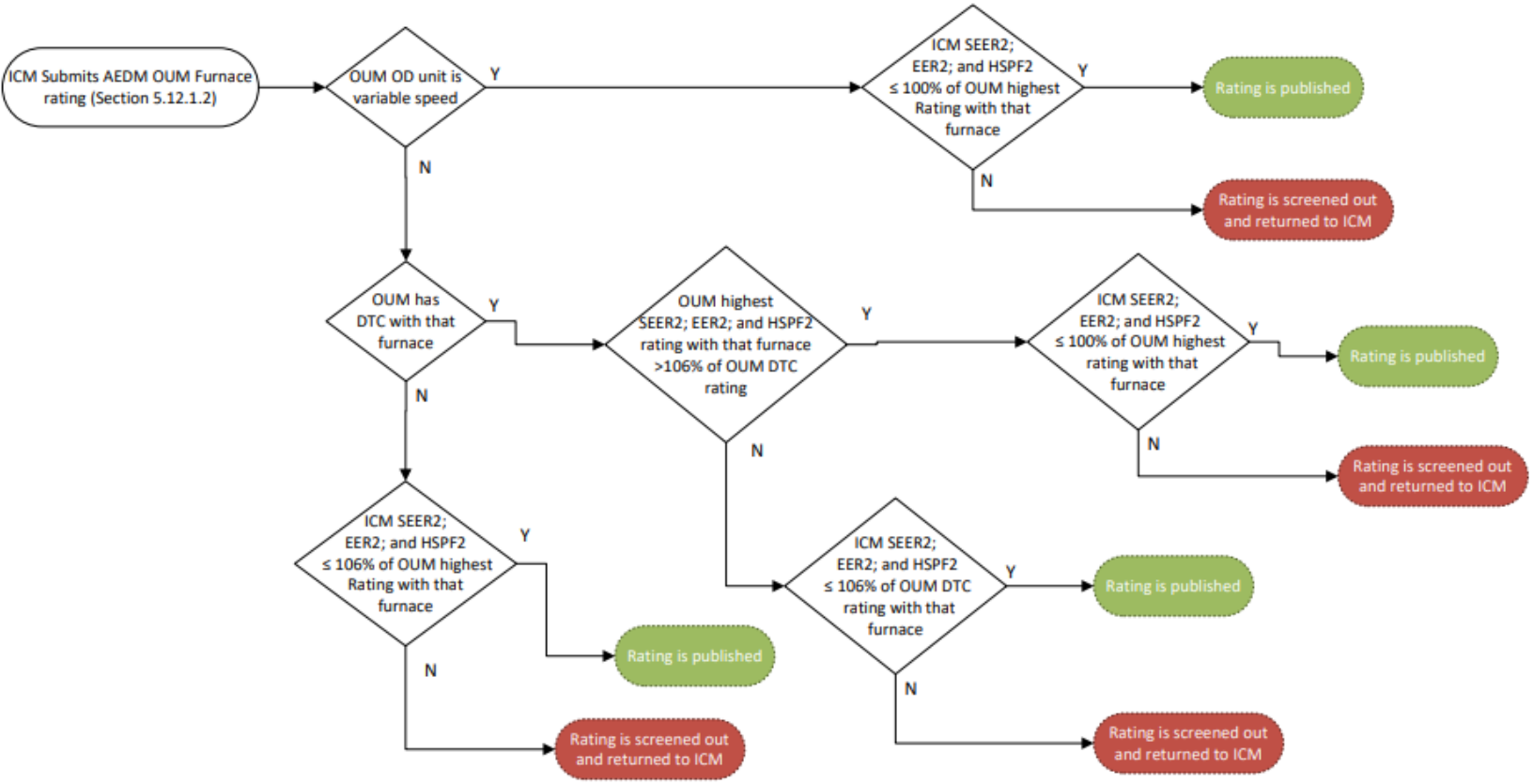


Figure K2: ICM AEDM OUM Furnace Rating

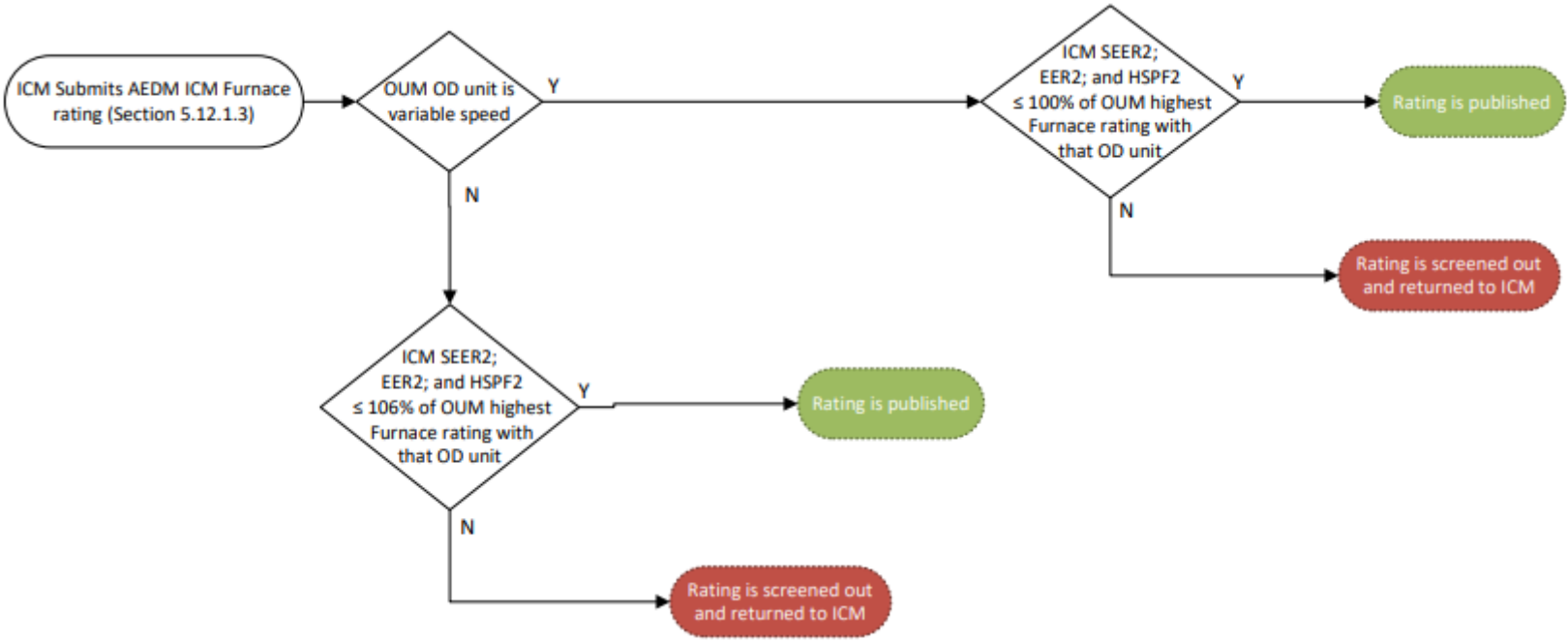


Figure K3: ICM AEDM ICM Furnace Rating

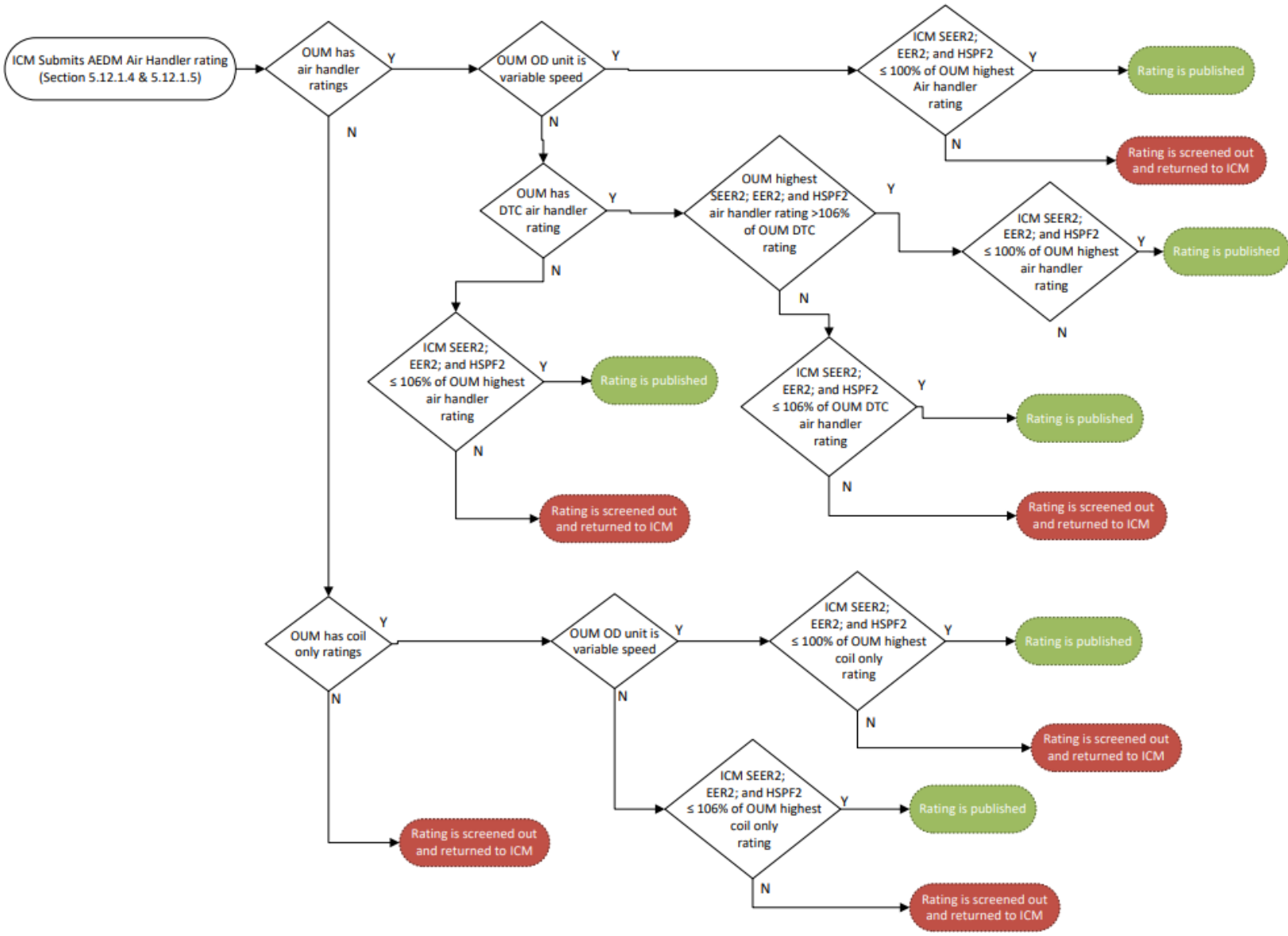


Figure K4: ICM AEDM Air Handler Rating