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920

PRODUCT PERFORMANCE CERTIFICATION AND SURVEILLANCE PROCEDURE

Home Ventilating Institute®
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HVI PUBLICATIONS

The Home Ventilating Institute, Inc., (HVI), incorporated in 1955, began to certify residential ventilation product performance in the 1960s in response to a need for consistent and reliable information. Since the 1970s, HVI has verified the performance of certified products through marketplace procurement. HVI's certification programs are continuously being refined.

Authority

This version of HVI Publication 920©, including Appendices I through VIII, was approved by the membership of the Home Ventilating Institute, Inc. on September 15, 2023. The revisions, which are substantial, required time for staff analysis and administrative implementation, consequently, this version of the publication was officially authorized by the HVI Board of Directors for use effective April 22, 2024.

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Production of this publication has spanned multiple decades, concepts, and iterations. Listed here are those who helped with the most recent revision.

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Related Publications

HVI Publication 903: First-Party Laboratory Testing Procedure®
HVI Publication 911: HVI-Certified Home Ventilating Products Directory®
HVI Publication 915: HVI Loudness Testing and Rating Procedure®
HVI Publication 916: HVI Airflow Test Procedure®
HVI Publication 917: Range Hood Capture Efficiency Testing and Rating Procedure®
HVI Publication 925: HVI Label and Logos Requirements®
HVI Publication 966: HVI Consumer Alert Database®

HOME VENTILATING INSTITUTE®
PRODUCT PERFORMANCE CERTIFICATION AND SURVEILLANCE PROCEDURE

TABLE OF CONTENTS

HOME VENTILATING INSTITUTE®
PRODUCT PERFORMANCE CERTIFICATION AND SURVEILLANCE PROCEDURE

1 Introduction, Basis, Purpose, and Overview

1.1 **Introduction**. HVI Certification of product performance is a voluntary, cooperative, competitively policed program administered by the Home Ventilating Institute for obtaining, maintaining, presenting, and verifying performance ratings of ventilation products generally suited for residential applications.

Informative note: Ventilation products that are generally suited for residential applications may also be used in some commercial and industrial applications.

1.2 **Basis**. HVI Certification is based on strictly specified product testing. It is maintained by the vigilance and quality control of HVI and each *party responsible for certification*.

1.2.1 **Standards**. All product testing for HVI Certification shall be in accordance with referenced American National Standards Institute (ANSI), Standards Council of Canada (SCC), American Society for Testing Materials (ASTM), and ISO/IEC consensus standards. Where necessary, HVI prescribes specific procedures for product testing designed to be used in conjunction with referenced standards.

1.2.2 **Laboratories**. Testing for certification shall be done in an HVI-approved laboratory. Tests from unapproved laboratories are not eligible for consideration as part of the HVI Certification process.

1.2.2.1 **Qualifying Date**. Since the list of HVI-approved laboratories may change over time, HVI shall accept test reports from those laboratories which were HVI-approved on the date shown on each test report, provided the reports contain all the required information to qualify for certification on the date of the certification request.

1.2.3 **Test Reports**. *Parties responsible for certification* apply to HVI for certification based on qualifying test reports. HVI reviews the application materials and grants certification if they are judged to be in accordance with HVI's prescriptive requirements.

1.2.4 **Vigilance**. The vigilance and quality control of every *party responsible for certification* enables them to be confident their products will achieve their certified ratings, under laboratory test conditions.

1.2.5 **Verification**. HVI's annual verification program enhances and strengthens the integrity of HVI Certification.

1.2.6 **Challenge**. The vigilance of every *party responsible for certification*, especially using the HVI challenge procedure, ensures products shall continue to perform as expected.

1.3 **Purposes of HVI Product Performance Certification**.

1.3.1 Provide uniform, comparable, and impartial HVI-Certified performance ratings, in accordance with HVI procedures for testing, labeling and cataloging ventilation products.

1.3.2 Enable designers, builders, consumers, code officials, manufacturers, and *parties responsible for certification*, to readily confirm and compare ratings of ventilation products.

Informative note: HVI Certification at a single rating point may be insufficient information for designers who plan to incorporate a certified product into a complex system.

1.3.3 Validate that HVI-Certified products meet the requirements of HVI's certification program.

1.3.4 Support fair competition.

1.4 **Overview of HVI Product Performance Certification**. The program has three essential elements: certification, surveillance, and presentation of product performance ratings. Following are introductory descriptions of these elements, details of which are found in this and other HVI publications.

1.4.1 **Certification**. Certification is issued by HVI after a *party responsible for certification* makes proper application, accompanied by a valid and complete test report from an HVI-approved laboratory (see Sections 5 and 6).

1.4.2 **Surveillance**. HVI performs annual surveillance of certified products as described in Section 9. The primary components of surveillance are verification, challenge, compliance with *HVI Publication 966*, *literature* review, and declarations.

1.4.3 **Presentation**. Section 7 contains requirements for the development and presentation of *HVI-Certified ratings*. Misrepresentation of product performance is prohibited. *HVI-Certified ratings* are listed in the *HVI-Certified Products Directory*. The *HVI Certification Label* is affixed to HVI-Certified products in conjunction with the *HVI-Certified ratings* required by Section 7 and in accordance with *HVI Publication 925*.

2 Scope

2.1 **Scope**. This procedure contains rules for certifying products for which HVI has adopted a certification program, including rules for certifying applicable

product performance parameters such as airflow, sound performance, and energy performance. Also included in this procedure are rules for presenting and surveilling certified ratings.

3 Definitions

Informative Note: Terms defined in Section 3 appear in italics throughout the publication.

3.1 ***airflow rating*** – the HVI-Certified quantity of airflow a product will produce at the specified rating point *static pressure*, developed from test results that are measured in cubic feet per minute (*cfm*), rounded, and in some cases, conservatively reduced.

3.2 ***balanced ventilation system*** – a ventilation system that simultaneously supplies outdoor air to and exhausts air from a space, where the mechanical supply airflow rate and the mechanical exhaust airflow rate are each within 10% of the average of the two airflow rates.

3.3 ***cfm*** – cubic feet of air per minute, ft^3/min, at 0.075 lb/ft^3, HVI's "standard" density. The I-P unit of measure for *airflow ratings*.

3.4 ***delisted*** – severed from HVI Certification and removed from the *HVI-Certified Products Directory*.

3.5 ***derated*** – derived from a test report and conservatively modified for the purpose of certification.

3.6 ***direct discharge*** – an installation configuration for exhausters that mount in an exterior wall, discharging air directly to the outdoors without ductwork.

3.7 ***dryer exhaust duct power ventilator (DEDPV)*** – an *inline fan* or *remote exterior mounted ventilator* that is utilized to supplement the acceptable length of a single residential clothes dryer exhaust duct.

3.8 ***general exhaust fan*** – a ceiling or wall mounted, ducted or *direct discharge fan* for conveying air from the indoors to the outdoors. *Product categories* in *general exhaust fan* include *bathroom exhaust fan*, *kitchen exhaust fan*, and *other room exhaust fan*.

3.9 ***HVI Certification Label*** – the official HVI label, complying with *HVI Publication 925*, affixed to a product to designate HVI certification of the product.

3.10 ***HVI-Certified Products Directory*** – official publication of *HVI-Certified ratings*. Also referred to as "*HVI Publication 911*," "the *HVI Directory*," "*HVI CPD*," or "*CPD*".

3.11 ***HVI-Certified ratings*** – performance ratings based on prescribed and controlled testing of certified products which the *party responsible for certification* is confident its HVI-Certified product will achieve if subjected to verification testing at an *HVI-approved third-party laboratory*.

3.12 ***HVI Member*** – a business, as referenced in HVI Bylaws, that has met all requirements for HVI membership and has been accepted into the membership (see HVI Bylaws).

3.13 ***indoor duct inlet*** – a *duct termination fitting* mounted inside the building structure which is used to remove air from a room or other space.

3.14 ***indoor duct outlet*** – a *duct termination fitting* mounted inside the building structure which is used to introduce air into a room or other space.

3.15 ***laboratory, first-party, HVI-approved*** – a manufacturer's laboratory that has been authorized by HVI to perform product testing for certification only.

3.16 ***laboratory, third-party, HVI-approved*** – an independent, third-party laboratory that has been authorized by HVI to perform product testing for certification, verification, and challenge.

Informative note: A list of HVI-approved laboratories and the *product categories* and procedures for which they are authorized to conduct HVI testing is available on the HVI website or by contacting HVI headquarters.

3.17 ***literature*** – digital and/or printed materials presenting *HVI-Certified ratings*, including, but not limited to, product specification sheets, sell sheets, submittal sheets, catalogs, brochures, and website content.

3.18 ***model, base*** – a tested model from which certification for other models may be derived (see also *model, derived* and *model, base, non-production*).

3.19 ***model, base, non-production*** – a *base model* that is certified for purposes of establishing performance data from which other products will be derived but which itself is not manufactured, marketed, sold, nor listed in the *HVI CPD*.

3.20 ***model, derived*** – a model whose application for certification is derived from a referenced *base model* (see also *model, base*).

3.21 ***net free area*** – the effective available area of a *static vent* or a *fresh air inlet* determined in accordance with *HVI Publication 916*.

3.22 ***nominal duct system*** – a hypothetical duct system that is deemed to represent a *kitchen range hood's* or *downdraft kitchen ventilator's* typical installation.

3.23 ***nominal installed airflow (NIA)*** – an *airflow rating* determined from the working point, which is the intersection of a *kitchen range hood*'s or *downdraft kitchen ventilator*'s test report airflow curve and the *nominal duct system* curve at the same duct dimension.

3.24 ***outdoor duct inlet*** – a *duct termination fitting*, intended to be mounted on the exterior of the building structure, that is used for the introduction of outside air into the building.

3.25 ***outdoor duct outlet*** – a *duct termination fitting*, intended to be mounted on the exterior of the building structure, that is used to exhaust air to the outside. Included are wall caps, roof caps, and eave caps.

3.26 ***party responsible for certification*** – a business, as referenced in HVI Bylaws, that submits products to HVI under its own or another brand name for certification and is responsible for maintaining the certification (the applicant).

3.27 ***pressure, static (P_s)*** – the air pressure that a fan must overcome in order to produce an associated airflow. The *static pressure* rating point (or points) is the nominal amount of *static pressure* adopted by HVI for rating the airflow of a given *product category*.

3.28 ***product categories*** – the HVI names for product types or product-line groups used for the *HVI CPD*, product comparisons, and certification requirements. For further information on *product categories*, see Appendix I. *Product categories* are defined as follows:

3.28.1 ***bathroom exhaust fan*** – a ceiling or wall mounted, ducted or *direct discharge fan* for conveying air from the indoors to the outdoors, primarily intended for exhausting air from a bathroom.

3.28.2 ***compact air treatment unit (CATU)*** – a packaged *HRV* or *ERV* that uses a refrigeration cycle or circulating fluid to transfer heat between two isolated air streams.

3.28.3 ***downdraft kitchen ventilator*** – a ducted exhauster located adjacent to the cooking appliance at or near countertop level, sometimes integral with the range, with an air inlet and an integrated or directly connected air-moving device for removing and exhausting cooking contaminants.

Informative note. HVI does not provide ratings for *downdraft kitchen ventilators* combined with *inline fans* or *remote exterior mounted ventilators*.

3.28.4 ***duct termination fitting (DTF)*** – a ducted fitting mounted at the end of a duct. This includes *indoor duct inlets*, *indoor duct outlets*, *outdoor duct inlets*, and *outdoor duct outlets*.

Informative note: *DTFs* may not have a duct fitting but are normally

understood to accept a duct to direct air from an indoor space to the outdoor, outdoor to an indoor space, and/or between two indoor spaces.

3.28.5 ***energy recovery ventilator (ERV)*** – a mechanically powered ventilating device, generally installed as a *balanced ventilation system*, with separate intake and exhaust air streams and a heat exchanger to transfer heat and moisture from one air stream to the other.

3.28.6 ***fresh air inlet*** – a passive opening to the exterior of a structure that is used for the introduction of outside air into the living space.

3.28.7 ***heat recovery ventilator (HRV)*** – a mechanically powered ventilating device, generally installed as a *balanced ventilation system*, with separate intake and exhaust air streams and a heat exchanger to transfer heat from one air stream to the other.

3.28.8 ***inline fan*** – a fan that supplies outdoor air or exhausts indoor air, with ductwork on both intake and exhaust, designed to be located within the building.

3.28.9 ***integrated supply and exhaust ventilator (ISEV)*** – a mechanically powered ventilating device with factory-assembled exhaust and supply systems that mixes outdoor air with return air prior to delivery.

Informative note: *ISEVs* are sometimes referred to as blending ventilators. They may include heat or energy recovery.

3.28.10 ***kitchen exhaust fan*** – a ceiling or wall mounted, ducted or *direct discharge*, fan for conveying air from the indoors to the outdoors, determined by the manufacturer to be suitable for use in a cooking area in accordance with UL 507, CSA C22.2 No. 60335-2-31, or CSA 22.2 No. 113.

3.28.11 ***kitchen range hood*** – a ducted exhauster composed of a hood with an integrated or directly connected air-moving device, such as an insert, for use over cooking equipment, that captures contaminants and exhausts them to the outdoors.

Informative note: *Kitchen range hoods* also include multi-function appliances incorporating, for example, microwave and/or clock functions. HVI does not provide ratings for *kitchen range hoods* combined with *inline fans* or *remote exterior mounted ventilators*.

3.28.12 ***other room exhaust fan*** – a ceiling or wall mounted, ducted or *direct discharge* fan for use in other than a kitchen, for conveying air from the indoors to the outdoors.

3.28.13 ***powered attic ventilator (PAV)*** – an exhaust fan intended to remove air from an unoccupied attic.

3.28.14 ***remote exterior mounted ventilator (REMV)*** – An exhaust fan intended for mounting in an exterior location, usually connected by ducts to an interior device such as a downdraft intake, a *kitchen range hood* shell, or a grille.

3.28.15 ***static vent*** – a non-powered and non-ducted ventilating device intended to allow or provide airflow for attic, crawl space, and other building structural spaces.

3.28.16 ***whole house comfort ventilator (WHCV)*** – a ceiling mounted exhauster that moves relatively large volumes of air into the attic, drawing intake air through open window(s) to provide increased comfort through velocity cooling.

3.29 ***product family*** – a group of products that include one basic product (the *base model*) and one or more *derived models* that all depend on a common certification test (see also *model, base*, and *model, derived*).

3.30 ***sone*** – a unit for rating sound performance that is linear and weighted to represent the response of the average human auditory system.

3.31 ***verification cycle*** – a process involving the selection, procurement, testing, assessment of conformity, notification of results, and, where applicable, resolution of failures for HVI-Certified products.

3.32 ***working speed*** – the lowest speed of a kitchen exhaust device that produces not less than 100 *cfm*, or not less than 90 *cfm* for two-speed models, when working on the same duct system as the maximum speed test.

Informative note: See Section 7.9.1.4 *product categories* that are eligible for a *working speed* rating.

4 General HVI Certification Requirements and Procedures

4.1 **Applicability**. Models submitted for HVI Certification shall belong to a *product category* that is eligible for testing in accordance with HVI publications in an HVI-approved laboratory. The model shall be intended for distribution in volume, with a brand name and model number. Each model submitted for certification shall meet all applicable requirements in effect at the time of the submission, including any addenda to this procedure.

Informative note: Specific requirements for certification of *product categories* are found in the applicable Appendices of this publication.

4.2 **Participation**. To be eligible for HVI Certification, the *party responsible for certification* shall meet the following criteria.

4.2.1 **Agreement**. The *party responsible for certification* shall complete, submit, and maintain compliance with the *HVI-Certified Ratings* Program Participation Agreement and shall submit payment of any required fees.

4.2.2 **Confidence**. The *party responsible for certification* shall apply for *HVI-Certified ratings* only when confident the product will pass HVI verification testing (see Section 9.1). This requirement shall apply to all aspects of the program, including *base model* certification, *derived model* certification, product modifications, and presentation of product performance ratings.

4.3 **Testing**. HVI product performance certification shall be based on testing conducted at an *HVI-approved third-party laboratory* or *HVI-approved first-party laboratory* in accordance with the standardized test methods referenced by HVI procedures.

4.3.1 **Single Sample**. When a model is to be HVI-Certified for more than one parameter such as air and sound, a single product sample shall be used for all certification testing, and no alterations between tests are permitted.

Exception to 4.3.1. Where in the process of certification testing, a product sample is damaged during transit between HVI-approved laboratories, a second product sample shall be permitted to be used for the remaining certification testing to be completed at the receiving laboratory.

4.3.2 **Multiple Installation Configurations**. Models supplied with multiple installation configurations shall be tested for the most restrictive combination of configurations in compliance with Section 7.2.1.1.

4.4 **Application for Certification**. The *party responsible for certification* shall ensure submission of the following items to HVI.

4.4.1 **Test Report**. A copy of the complete test report for the model under consideration for certification shall be sent directly to HVI from the *HVI-approved third-party laboratory* or the *HVI-approved first-party laboratory*. The test report shall comply with the requirements of Section 10.

Exception to 4.4.1. Where applying for certification of a *derived model*, the applicable *base model's* or *non-production base model's* test report shall be referenced by HVI.

4.4.2 **Product Certification Request**. A completed HVI Form 101A: Product Certification Request. This online form is available to authorized companies.

4.4.2.1 **Derived Model Description**. Where a *party responsible for certification* submits HVI Form 101A: Product Certification Request for a *derived model*, the applicant shall include a description of the differences between the *derived model* and the *base model*, all in confidence.

4.5 **Re-Application for Certification**. At any time, a *party responsible for certification* shall be permitted to correct and resubmit any request for product certification that was previously rejected by HVI.

4.6 **Issuance of Certification**. HVI shall issue a statement of conformity, based on a decision following review of the submitted materials, that fulfillment of specified requirements has been demonstrated.

4.6.1 **Publication**. After approving certification, and after the earliest date of publication requested by the *party responsible for certification*, HVI shall publish the ratings in the subsequent edition of the *HVI CPD*. HVI shall publish updates to current ratings at least monthly.

4.6.2 **Certification Evidence**. Each unique combination of brand, model number, and associated ratings completes the certification process only after HVI publishes the associated ratings in the *HVI CPD*, HVI's instrument for publishing all current *HVI-Certified ratings*. A brand, model number, and associated ratings that are *delisted* or are not listed in the *HVI CPD* are not HVI-Certified. To continue to be recognized as HVI-Certified, each unique combination of brand, model number, and associated ratings shall maintain its listing in the *HVI CPD*.

Exception to 4.6.2. HVI-Certified *non-production base models* do not appear in the *HVI CPD* but are nonetheless HVI-Certified, provided they are not *delisted*.

4.7 **Literature**. No later than thirty days following the issuance of certification, the *party responsible for certification* shall submit a *literature* sample to HVI containing the model's certified performance and reference to HVI certification. The *literature* sample shall be reviewed by HVI in accordance with Section 9.4.

4.8 **Voluntary and Non-Transferable**. Product performance certification is voluntary, and certification shall not be transferable between models.

4.8.1 **Reuse of an Existing Model Number**. Wherever a *party responsible for certification* applies for a new certification for a model using the same model number as a previously certified model, the *party responsible for certification* shall explain in writing to HVI how to differentiate between obsolete and current stock, so HVI is able to procure the latest version.

Informative note: This requirement applies for any such situation

whether it is the result of verification, challenge, or a model design change.

4.8.2 **Modification of Models Triggering Re-Certification**. Modification of a model that adversely affects the HVI-Certified performance, including any change or substitution (e.g., of components or configuration), requires that the model be re-tested and re-certified. It is the *party responsible for certification*'s responsibility to evaluate and control changes that affect their confidence in every *HVI-Certified rating*.

4.9 **HVI Certification Label, Brand and Model Markings, Date Codes, and Presentation of Ratings**. Use and presentation of the *HVI Certification Label*, *HVI-Certified ratings*, brand and model markings, and date codes shall comply with Section 7 of this publication.

4.10 **Confidentiality**. Confidentiality shall not be breached by any participant in any HVI Certification activity in any manner that would create a market advantage or disadvantage for any participant or downstream supplier, except as described as a normal part of the program. If queried, HVI shall provide certified ratings. HVI shall not release any other information about any model's certification without the consent of the *party responsible for certification*.

4.11 **Delisted Models**. When a model is *delisted*, the manufacturer shall:

4.11.1 Immediately cease shipment of *delisted* models displaying the *HVI Certification Label*; any *HVI Certification Labels* and references on *delisted* units within the manufacturer's control shall be covered or removed before shipment;

4.11.2 Immediately cease labeling *delisted* models as HVI-Certified; and

4.11.3 Within thirty days, remove the *HVI Certification Label* and HVI references from all *literature* associated with the *delisted* model.

4.12 **Enforcement**. HVI shall enforce certification requirements consistently and fairly for authorized non-member companies as well as *HVI Members*.

4.13 **Appeals Process**. In the event there is a disagreement related to any aspect of the HVI product performance certification program, the Appeals Process described in the HVI Quality Manual shall be the means for resolution.

5 Base Model Certification

5.1 **Applicability**. The certification process for *base models* shall comply with Section 4, Section 5, and any specific requirements for the *product category* in the Appendices.

5.2 **Testing**. The *party responsible for certification* shall arrange for testing as follows.

5.2.1 **Preparation**. Preparation of a model for testing shall include any mountings, etc., as described in the HVI test procedures. The performance of pre-production prototypes used for certification testing shall be representative of the performance of production models, as ultimately determined through verification and challenge testing.

Informative note: The model should not be specially prepared or tuned, because ratings represent performance of production models.

5.2.2 **Submittal**. The *party responsible for certification* shall submit the model to an *HVI-approved third-party laboratory* or *HVI-approved first-party laboratory* for HVI product performance certification testing. The *party responsible for certification* shall designate the desired tests, rating metrics, and test conditions, where applicable, at which the *party responsible for certification* expects to certify.

Informative note: HVI shall only accept test reports from *HVI-approved first-party laboratories* for models where the *HVI Member* operating the *HVI-approved first-party laboratory* is the *party responsible for certification*.

5.2.2.1 **Forms**. Required forms for submitting models for testing shall be obtained directly from the HVI-approved laboratory used for testing.

5.2.3 **Laboratory Testing**. The *HVI-approved third-party laboratory* or *HVI-approved first-party laboratory* shall test in accordance with the current HVI test procedure publications and their foundational standards.

5.2.4 **Test Report**. The laboratory shall furnish the *party responsible for certification* a copy of a test report complying with Section 10.

5.2.5 **Fees for Testing**. Fees for product performance certification testing at an *HVI-approved third-party laboratory* shall be paid directly to the laboratory by the *party responsible for certification* requesting the testing. A copy of the current fee schedule is available from each laboratory.

6 Derived Model Certification

6.1 **Applicability**. The certification process for *derived models* shall comply with Section 4, Section 6, and any specific requirements for the *product category* in the Appendices.

6.2 **Model Eligibility**. To be eligible for certification, a *derived model* shall be in the same *product family* as an HVI-Certified *base model* and shall be essentially equivalent to the *base model* in design and construction. The

derived model shall only differ from the associated *base model* in aspects which do not adversely affect the product's HVI-Certified performance ratings, such as color, finish, name plate, or other similar variances, as asserted by the *party responsible for certification* and confirmed by HVI.

Informative note: To confirm that the *derived model* meets this requirement, HVI may require a *party responsible for certification* to provide inspection models, test data for the *derived model*, or other HVI-approved proof of compliance.

6.3 **Applicant Eligibility.** Application for certification of a *derived model* shall only be available to the *party responsible for certification* of the associated *product family's base model*. The *party responsible for certification* shall be responsible for enforcement of HVI procedures related to all models in the *product family*.

6.4 **Failures or Violations within a Product Family**. Where there is a violation or failure of one model in a *product family* identified through surveillance, all other models in the *product family* shall be subjected to resolution as required.

Informative note: The test of the *base model* is the basis of an entire *product family's* certification.

7 Development and Presentation of HVI-Certified Ratings

7.1 **Applicability**. Section 7 and the Appendices shall establish the minimum requirements for the presentation of *HVI-Certified ratings* on products, packaging, and any associated *literature*. Where there is a conflict between the requirements of this section and those in the relevant *product category*'s Appendix, the Appendix shall take precedence.

7.2 Development of Ratings

7.2.1 **Basic Ratings**. Basic ratings shall be developed for each certified model in compliance with Section 7 and the applicable Appendices for the model's *product category*.

7.2.1.1 **Multiple Installation Configurations**. Where a model has selectable discharge configurations (e.g., vertical and horizontal) and/or has multiple duct size adapters supplied with the model, it shall be tested and rated for the most restrictive combination of these features. The duct size adapter with the smallest cross-sectional area shall be deemed to be the most restrictive. Test data from an HVI-approved laboratory shall be used to determine which discharge configuration is the most restrictive.

Informative note: This requirement does not prohibit parties responsible for certification from pursuing ratings at other

configurations.

7.2.1.2 **Multiple Speeds**. Multiple speed models' basic ratings shall be at maximum speed; ratings at other speeds are optional (see also specific requirements and exceptions in the Appendices).

7.2.2 **Rounding**. "Rounding to the nearest" shall follow conventional practice, i.e., 5 or more rounds up. Thus, when rounding to the nearest half *sone*, 2.74 rounds down to 2.5, and 2.75 rounds up to 3.0 *sones*.

7.2.3 **Derated Values**. HVI shall permit applications for performance ratings that are more conservative than that shown on the test report submitted with the application for certification. Rounding rules shall still apply to *derated* ratings.

7.2.3.1 **Lower Values**. Where *derated* values are used, the following certification ratings shall be less than the value from the test report: *airflow ratings*, *static pressure*, energy recovery ratings, fan efficacy ratings, and *net free area* ratings.

7.2.3.2 **Higher Values**. Where *derated* values are used, the following certification ratings shall be more than the value from the test report: sound ratings and fan input power ratings.

7.2.3.3 **Derating Derived Models**. The *party responsible for certification* shall not be required to derate *derived models* and their associated *base models* equally.

7.3 Presentation and Marking

7.3.1 **Units of Measure**. Ratings shall be presented in inch-pound (I-P) units, as follows, except where otherwise noted:

7.3.1.1 **Airflow:** cubic feet per minute (*cfm*)

7.3.1.2 **Pressure**: inches of water gauge (in. w.g.)

7.3.1.3 **Loudness:** *sones*

7.3.1.4 **Fan input power**: watts (W)

7.3.1.5 **Fan efficacy:** *cfm*/W

7.3.1.6 **Distance** (e.g., for duct diameter): inches (in.)

7.3.1.7 **Temperature**: degrees Fahrenheit (°F)

7.3.2 **Conversions**. Where the *HVI CPD* does not display a certified rating in SI units, the *party responsible for certification* is permitted to present the rating in SI units by converting in accordance with the ASHRAE

Handbook of Fundamentals, chapter on Units and Conversions, or with the following:

Informative note: See Appendix III for unit conversion rules related to *HRVs* and *ERVs*.

7.3.2.1 **Static Pressure**: For values not exceeding 1 in. w.g., assume 250 Pascals (Pa) per 1 in. w.g.

7.3.2.2 **Airflow**: For values not exceeding 1,000 *cfm*, assume 0.47 liters per second (L/s) per 1 *cfm*.

7.3.3 **Publication of Certified Ratings**. All *HVI-Certified ratings* shall be published in the *HVI CPD*.

Exception to 7.3.3. *HVI-Certified ratings* for *non-production base models* are not required to be published in the *HVI CPD*.

7.3.4 **Display of the HVI Certification Label and Basic Ratings**. The *HVI Certification Label* shall be affixed to all HVI-Certified models, in compliance with *HVI Publication 925*. Basic ratings shall be published in conjunction with the *HVI Certification Label* on the certified model, in accordance with *HVI Publication 925*.

Exception to 7.3.4: Publication of ratings in conjunction with the *HVI Certification Label* on the model shall not be required where the model provides a direct link to the *HVI CPD* for certified ratings.

Informative note: This provision does not prohibit the display of optional *HVI-Certified ratings* or the *HVI Certification Label* on the model, on the carton, or in *literature*. HVI encourages the use of the *HVI Certification Label* on the carton and within *literature*.

7.3.5 **Proximity to Other Performance Data**. Where *HVI-Certified ratings* are presented in proximity to performance data not certified by HVI, the material shall clearly delineate which ratings are certified by HVI.

7.3.6 **Brand and Model Markings**. All HVI-Certified models shall be permanently labeled with sufficient detail enabling consumers to determine the brand and model. These markings shall be in a location which remains accessible to the consumer during routine maintenance of the installed model.

7.3.7 **Date Code**. Every HVI-Certified model shall have a production date code that HVI shall reference when it is necessary to determine the date of manufacture. The date code required by a safety listing organization shall satisfy this requirement. Where a date code is cryptic, the manufacturer shall provide the translation of the code to HVI, when requested, for the model and period in question.

7.4 Airflow Ratings

7.4.1 **Basic Airflow Ratings**. Models shall be rated for airflow at a *static pressure* that is not less than the basic rating point, for each rated speed setting, as prescribed in the Appendices for each *product category*.

7.4.2 **Optional Airflow Ratings.** Optional *airflow ratings* that are in addition to the basic *airflow ratings* shall be permitted when certified at other *static pressures*.

7.4.3 **Airflow Rounding**. Basic *airflow ratings* and, where provided, optional *airflow ratings* shall be developed from the laboratory test report and rounded down to the nearest whole *cfm*, or *derated* further. See the Appendices for exceptions.

7.4.4 **Static Pressure Associated with Airflow Ratings**. Where a model has more than one HVI-Certified *airflow rating* point, each *airflow rating* point shall be identified by expressing its certified *static pressure* (P_s) in inches of water gauge ("in. w.g."), which shall be rounded from the test report data to the nearest 0.01 in. w.g., or *derated* further. Products with a single *airflow rating* point shall not be required to list the *static pressure* along with the *airflow rating* (see Section 7.3.2 for SI units).

7.5 Sound (Loudness) Ratings

7.5.1 **Basic Sound Ratings**. Models shall be rated for sound performance at the basic rating point identified in the Appendices, for each rated speed, unless no HVI sound certification procedure exists for the *product category*. For a *product category's* particular requirements, see the Appendices to this procedure.

7.5.2 **Optional Sound Ratings.** Any additional, optional sound ratings provided for models in *product categories* for which an HVI sound certification procedure exists shall be HVI-Certified in conjunction with an *airflow rating*.

7.5.3 **Sound Rounding**. Sound ratings shall be developed from the laboratory test report and rounded using the following rules. These rules shall not prohibit the *party responsible for certification* from further derating the sound performance.

7.5.3.1 Greater than 1.5 *sones* shall be rounded to the nearest 0.5 *sones*.

7.5.3.2 From 0.3 *sones* to and including 1.5 *sones* shall be rounded to the nearest 0.1 *sones*.

7.5.3.3 Less than 0.3 *sones* shall be rated < 0.3 *sones*, because sound testing resolution is inadequate to differentiate more finely at lower

levels.

7.6 Fan Input Power and Fan Efficacy Ratings

7.6.1 **Applicability**. At the discretion of the *party responsible for certification*, electrically operated HVI-Certified products shall be certified for fan input power and fan efficacy. The fan input power and fan efficacy shall be that resulting from operation of the product's fan(s) at the speed setting, airflow, and *static pressure* of the rating point. Power used for lights, sensors, heaters, timers, or night lights shall not be included in the determination of power consumption. For any given rating, fan efficacy shall only be rated where fan input power and airflow are also rated.

7.6.2 **Rounding**

7.6.2.1 **Fan Input Power**. Fan input power ratings shall be developed from the laboratory test report and expressed using three significant digits (e.g., 21.3 watts, 213 watts), rounded up to the third digit, or *derated* further. No corrections shall be made to the fan input power to account for standard density of air.

Exception to 7.6.2.1. Ratings under 10 watts shall be expressed with two significant digits.

7.6.2.2 **Fan Efficacy**. Fan efficacy ratings shall be developed by dividing rated airflow by rated fan input power. Fan efficacy, where reported in units of *cfm*/W, shall be rounded down to the nearest one decimal place (tenth). Where reported in units of L/s/watt, fan efficacy shall be rounded down to the nearest two decimal places (hundredth).

7.7 **Energy Recovery Performance Ratings**. See Appendix III for specific requirements that apply to energy recovery ratings.

7.8 **Net Free Area Ratings**. See Appendix V for specific requirements that apply to *net free area* ratings.

7.9 Speed Ratings

7.9.1 **Nomenclature**. For models with more than one HVI-Certified speed rating, speed settings shall be identified for each rating point using the prescribed nomenclature as follows:

7.9.1.1 HS – highest continuous speed

7.9.1.2 MS – medium speed

7.9.1.3 LS – lowest speed

7.9.1.4 WS – *working speed* (applicable to *kitchen range hoods* only; see Appendix II, Section AII.3.4.1)

7.9.1.5 BS – boost speed: an additional, non-continuous speed available to provide more airflow or *static pressure* when temporarily required by field conditions.

7.9.2 **Variable Speed**. For models with infinitely variable speed controls, or with more than three discrete speed settings, and with *HVI-Certified ratings* at more than one speed, speed settings shall be identified by the HVI-Certified airflow at the basic rating point for that speed setting (e.g., 80 *cfm*, 90 *cfm*, 100 *cfm*), unless the *party responsible for certification* elects to certify three or fewer speeds using the nomenclature in Section 7.9.1 in which case, the medium speed is understood to be in the middle between the highest and lowest speed settings. In cases where a model has an even number of discrete speed settings, medium speed is understood to be the lower of the two middle speed settings.

8 Certification Records

8.1 **HVI Records**. HVI shall maintain records on each model it certifies. The records shall contain all items related to the model's certification, including a copy of the test report, the completed HVI Form 101A: Product Certification Request, with attachments, and information documenting the history of all verification and challenge activity related to the specific brand and model number.

8.2 **Participant Record**. Each *party responsible for certification* shall maintain a similar record on its premises.

8.3 **Collaboration and Record Maintenance**. HVI and the *party responsible for certification* shall be forthcoming with information needed to assist the other in maintaining records, furnish missing copies, etc.

8.4 **Deficiency**. Where a deficiency in the record is identified (e.g., missing test reports), HVI shall provide ninety days for the *party responsible for certification* to resolve the deficiency before the affected models are *delisted*.

8.5 **Complaints**. Each *party responsible for certification* shall keep a record of all consumer/marketplace complaints made known to the party relating to a model's compliance with the relevant product performance certification requirements. Each party shall take appropriate action with respect to such complaints and any deficiencies found in models that affect compliance with the relevant product performance requirements for certification. Actions taken shall be documented. Each *party responsible for certification* shall make these records available to HVI when requested.

9 Surveillance

Surveillance of HVI-Certified products, including verification, challenge, identification of noncompliance with HVI policies and procedures through *HVI Publication 966*, *literature* review, and declarations shall be conducted in accordance with this section.

9.1 HVI Verification – Requirements and Procedures

9.1.1 Verification Requirements

9.1.1.1 **Purpose**. Verification of *HVI-Certified ratings* is required by HVI to assure and demonstrate the continuing validity of HVI Certification.

Informative note: Verification does not replace challenge; the two procedures are complementary in support of HVI Certification.

9.1.1.2 **Verification of Certified Ratings**. Where an HVI-Certified model is selected for verification, all certified ratings shall be subject to verification at HVI's discretion (refer to Section 9.1.2.3.4).

Exceptions to 9.1.1.2: Appendix I Section AI.3.4, Appendix III Sections AIII.5.9.1, AIII.5.9.2, AIII.5.9.3, and Appendix VII Section AVII.4.2.

9.1.1.3 **Frequency**. HVI shall initiate at least one *verification cycle* each year. The *verification cycle* shall continue until completed. HVI shall initiate additional verification where HVI deems it necessary to demonstrate the continuing validity of HVI Certification, or to uphold or enforce the HVI Certification programs.

Informative note: Additional verification is generally focused on an area where there is reason for concern (e.g., a *product category*, one or more parties responsible for HVI Certification, and/or models that have undergone significant changes).

9.1.1.4 **Applicable Version of HVI Publication 920**. Verification testing shall be conducted according to the most current version of *HVI Publication 920,* including any addenda, errata, and clarifications that are in effect at the time each testing cycle begins.

9.1.2 **Procedure for Annual HVI Verification**. The following procedure shall be followed annually.

9.1.2.1 **Selection**. HVI staff shall randomly select the models to be tested from the current *HVI CPD*. Every *party responsible for certification* shall have not less than 3% of its *product families* selected for verification on an annual basis, for each product group in which the *party responsible for certification* maintains *HVI-Certified ratings*.

Wherever 3% results in a fraction, normal rounding rules shall apply, with a minimum of one. Any *product family* that is tested within ENERGY STAR's verification cycle during the same year shall count towards these requirements. Where the party responsible for certification has *product families* within a *product category* that are not ENERGY STAR certified, not less than one *product family* that is not ENERGY STAR certified shall be selected for verification (see Appendix I for a complete list of *product categories* and for *product category* groups used in verification).

Exception to 9.1.2.1. Where a *product family* passes verification, it shall not be subjected to verification testing in the following year, provided it is not recertified in the interim.

9.1.2.2 **Unit Procurement**. HVI shall procure representative unit(s) of the selected model(s) from one or more of the outlets as named by the *party responsible for certification* within HVI Form 101A: Product Certification Request, or, at HVI's discretion, from another location. HVI shall pay for all models procured and then bill the expenses to the *party responsible for certification*.

Exception to 9.1.2.2. Where, after reasonable efforts have been made, HVI determines that a given model is not readily available for procurement through sources independent from the original equipment manufacturer (OEM) and/or brand owner, HVI shall request three (3) sample units of the given model directly from the OEM or brand owner's sales office or warehouse facility. Where such units are not shipped within sixty days of HVI's notification to the *party responsible for certification*, the model shall be *delisted*, and HVI shall select an alternate model for verification.

9.1.2.2.1 **Unit Delivery**. HVI shall arrange for direct delivery of the test units to the *HVI-approved third-party laboratory*.

9.1.2.2.1.1 **Receiving Inspection**: When each verification test unit arrives at the *HVI-approved third-party laboratory*, the laboratory shall inspect the unit for damage, missing components, and manufacturing defects. The *HVI-approved third-party laboratory* shall notify HVI if any of those problems are detected. Except in the case of obvious shipping damage, units shall be tested in the condition in which they arrive at the lab. Where there is obvious shipping damage, the lab shall reject the sample, and HVI shall return it to the vendor or discard it, and a new sample shall be procured.

9.1.2.3 **Laboratory Testing**. The *HVI-approved third-party laboratory* shall test all units submitted, completing a test report for each one. Test

procedures and reporting requirements shall be the same as for initial certification (including accessories, test points, and set-up) except as follows:

9.1.2.3.1 **Witness**. Test witnessing by the *party responsible for certification*, or other affiliated personnel, shall not be permitted.

Exception to 9.1.2.3.1. Witness of the verification testing set-up by the *party responsible for certification*, or other affiliated personnel, of the test unit for the model being verified shall be permitted. In such a case, the verification testing laboratory shall notify the *party responsible for certification* at least 5 business days ahead of time that a unit is to be tested on a specific date. The *party responsible for certification* shall have 2 business days to indicate whether they wish to witness the verification test set-up. The *party responsible for certification* shall not change the time or date of the verification test set-up or test.

9.1.2.3.2 **Documentation**. A sufficient number of photographs shall be taken to demonstrate test set-ups, model packaging, labeling, installation manuals, model specifications, and condition of the unit(s) tested.

9.1.2.3.3 **Multiple Samples**. In cases where three samples are procured (refer to the Exception to Section 9.1.2.2), lab representatives shall randomly select two of the samples for testing.

9.1.2.3.4 **Multiple Configurations and Speed Settings**. HVI shall designate the configuration and speed setting to be used for verification.

Exception to 9.1.2.3.4. HVI shall test additional discharge configurations and speed settings where requested by the *party responsible for certification* in advance of a *verification cycle*. All tested configurations shall be subject to the same pass/fail criteria.

9.1.2.4 **Outcome and Actions**. HVI shall analyze the test unit's *HVI Certification Label*, model markings, display of ratings, and test reports for pass/fail. Test report results shall be within the tolerances listed in the Appendices. The basis for analysis shall be the *HVI-Certified rating*, not the initial test report. HVI shall notify the *party responsible for certification*, enclosing a copy of the test report.

9.1.2.4.1 **Multiple Samples**. In cases where three samples are procured (refer to the Exception to Section 9.1.2.2), the two samples that are randomly selected for testing in accordance with Section 9.1.2.3.3 shall meet or exceed all requirements for the model to be considered as passing.

9.1.2.4.2 **Passing Models**. Where the representative unit(s) passes, the verification process is terminated, and the *product family* shall be exempted from verification testing for the following year.

Exception to 9.1.2.4.2. Where a representative unit for a *derated derived model* passes, but other models in the *product family* would not pass with the same test results, the *party responsible for certification* shall resolve the other models' ratings in accordance with Section 9.1.2.5. At its discretion, HVI shall subject the other models to verification testing.

9.1.2.4.3 **Failing Models**. Where the model fails, the model, and any models in its *product family*, shall be subject to failure resolution in accordance with Section 9.1.2.5.

9.1.2.4.3.1 **Disclosure**. HVI shall not disclose model failures until the failure has been resolved in accordance with Section 9.1.2.5.

9.1.2.5 **Failure Resolution**. The measures for failure resolution contained in this section shall apply to resolution of failures in normal verification. Within thirty days of receiving notice of a test failure, the *party responsible for certification* shall identify to HVI the corrective action selected from the options below. Unless otherwise noted in the following subsections, failures shall be resolved within ninety days of failure notification.

9.1.2.5.1 **Option 1**. Request that HVI procure and test another unit. The verification process shall resume at Section 9.1.2.2. Where multiple sample units were procured from the OEM or the brand owner in accordance with the Exception to Section 9.1.2.2, this option shall only be available where one unit passed, one unit failed, and the third sample is used for testing.

9.1.2.5.2 **Option 2**. Submit a new HVI Form 101A: Product Certification Request, with a new test report and all other attachments, requesting a new certification for each model in the *product family*. In addition, inform HVI how to differentiate between old and new models on the outside of the carton, to assist in procurement of the new models. This terminates the verification process for the model and each model in the

product family.

Exception to 9.1.2.5.2. At its discretion, HVI shall conduct additional verification testing of the newly re-certified model.

9.1.2.5.3 **Option 3**. Accept the verification test data and simultaneously submit a new HVI Form 101A: Product Certification Request for each model in the *product family* to be certified using the verification results. This terminates the verification process for the model and each model in the *product family*.

9.1.2.5.4 **Option 4**. *Delist* all models in the *product family* in accordance with Section 4.11. This terminates the verification process for the model and each model in the *product family*.

9.1.2.5.5 **Option 5**. Where the verification failure is limited to the misrepresentation of the model's certified performance and issues that are not performance-related, submit to HVI a "plan of action" for correcting the problem.

9.1.2.5.5.1 **Plan Review**. The plan of action shall be reviewed by HVI to determine that it can be reasonably expected to correct the failure. If so, HVI shall notify the *party responsible for certification* that the plan is acceptable.

9.1.2.5.5.2 **Notice of Completion**. Once the plan of action is completed, a notice of completion shall be provided to HVI. Along with the notice of completion, the *party responsible for certification* shall inform HVI how to tell the difference between old and new models on the outside of the carton so they may be procured. This terminates the verification process for the model and each model in the *product family*.

9.1.2.6 **Delinquency**. Whenever a *party responsible for certification* fails to meet the deadlines for verification resolution, the failed model(s) and each model within a *product family* shall be *delisted* and subjected to any consequences within *HVI Publication 966* associated with unresolved violations.

Exception to 9.1.2.6. At its discretion, HVI shall extend deadlines to accommodate extenuating circumstances.

9.1.2.7 **HVI CPD Maintenance**. HVI shall publish any resultant changes to certified ratings at the next issuance of the *HVI CPD*.

9.1.2.8 **Costs of Verification**. HVI shall bill each *party responsible for certification*, in advance and/or afterward, for all verification costs, including purchase, shipping, testing, an administrative fee, and

where applicable, a fee for unsuccessful procurements.

9.1.2.9 **Repeated or Additional Verification Tests**. Eligible reasons for repeating a verification test shall include: unit damaged in transit, unit is defective, and/or possible lab error during the test. The need for repeat or additional testing shall be determined by HVI and/or the *party responsible for certification*. The *party responsible for certification* shall be responsible for associated costs of the repeat or additional testing except in cases where HVI determines lab error has occurred.

9.2 HVI Challenge – Requirements and Procedures

9.2.1 Challenge Requirements

9.2.1.1 **Purpose**. The purpose of the HVI challenge is to strengthen the *HVI-Certified ratings* program and to provide for resolving a documented dispute between a challenger, which shall be an *HVI Member*, and a challengee, which shall be a *party responsible for certification*, regarding *HVI-Certified ratings*. The dispute shall involve certified ratings and/or performance, or the presentation of ratings to the marketplace.

9.2.1.2 **Delinquency**. Where a challengee misses a deadline within the challenge process or chooses to ignore the challenge process, HVI, at its discretion, shall summarily withdraw the HVI Certification of the model and its *product family*, notifying both challenger and challengee. In such cases, the affected models shall be removed from the *HVI CPD*, and HVI shall answer model inquiries by stating that the model is not *HVI-Certified*.

9.2.1.3 **Confidentiality**. The challenge process shall be carried out confidentially. During the normal course of a challenge, neither the challenger, HVI, nor the challengee shall disseminate publicly, nor within the challenger's distribution chain, information about it or about its existence.

Exception to 9.2.1.3. The requirement for confidentiality expires when a model is *delisted* or when a model that fails a challenge completes the failure resolution as described in Section 9.2.2.6.

9.2.1.4 **Cost**. The cost of a challenge shall include the procurement costs, transportation costs, laboratory testing fees, and HVI administration costs. All HVI's costs associated with a challenge shall be covered.

9.2.1.5 **Applicable Version of HVI Publication 920**. Challenge testing shall be conducted according to the most current version of *HVI Publication 920*, including any addenda, that is in effect at the time each challenge is initiated.

9.2.2 **Procedure for HVI Challenge**

9.2.2.1 **Pre-Challenge Initiation**. When a prospective challenger has reason to believe another party's HVI-Certified model is not meeting its *HVI-Certified ratings*, or the ratings are being misrepresented, the prospective challenger shall, at its discretion, initiate an HVI challenge.

9.2.2.1.1 **Pre-Challenge Inquiry**. The prospective challenger shall contact HVI to verify the certified rating(s) of the model in question and to get an estimate of the cost of the challenge.

9.2.2.1.2 **Association**. At the time of the pre-challenge inquiry, the prospective challenger shall ask HVI whether the model number is part of a *product family*, and if so, request that HVI provide full *base model* and *derived model* information.

9.2.2.1.3 **Pre-Existing Challenge**. Where the model that is the subject of the inquiry is already being challenged by another challenger, HVI shall explain the challenge in detail to the prospective challenger, who shall not publicize it.

9.2.2.2 **Full Challenge Initiation**. After verifying ratings, the representative of the prospective challenger shall, at its discretion, initiate the challenge by writing a letter to HVI. A challenge shall be considered as initiated only when HVI receives all the following items.

9.2.2.2.1 **Model Identification**. Identification of the challenged model number.

9.2.2.2.2 **Parameters and Basis**. Identification of the challenged parameter(s) and the basis for challenging them.

9.2.2.2.3 **Payment**. Payment deposited with HVI for the estimated cost of the challenge.

9.2.2.3 **Service of Notice**. Within one week after receiving a challenge letter, HVI shall notify the challengee and provide them a copy of the challenger's correspondence.

9.2.2.4 **Challengee Response**. Within two weeks after HVI notification of the challenge, the challengee shall respond to HVI in writing, providing the names of at least three outlets where the model may be procured, and shall choose one of the following options.

Informative note: This is the first decision the challengee is required to make.

9.2.2.4.1 **Option 1.** Accept the challenge.

9.2.2.4.1.1 **Testing**. HVI shall proceed with challenge testing in accordance with Section 9.2.2.5.

9.2.2.4.2 **Option 2.** *Delist* all models in the *product family* in accordance with Section 4.11. This terminates the challenge process for the model and each model in the *product family*.

9.2.2.4.3 **Option 3.** Where the challenged parameters are limited to the misrepresentation of the challenged model's certified performance and issues that are not performance-related, submit a "plan of corrective action" to correct the challenged parameters for the model, and each model in the *product family*, so it meets requirements as soon as possible, but in no more than sixty days.

9.2.2.4.3.1 **Acceptability**. Where HVI determines that the plan of corrective action requires modifications, the challengee shall accept HVI's modifications, or the challenge shall proceed using Option 1 or Option 2, per the selection of the challengee. Where HVI accepts the plan of corrective action without modification or the challengee accepts HVI's modifications to the plan of corrective action, the challenge shall be terminated, and the unused portion of the challenger's deposit shall be returned.

9.2.2.5 **Challenge Testing**. HVI shall expeditiously procure the model and have it tested at the *HVI-approved third-party laboratory* in accordance with HVI verification test procedures. HVI shall determine pass/fail using the same criteria for verification. HVI shall notify both parties of pass/fail results. HVI shall retain a copy of the test report in the model's record and send a copy of the test report to the challengee. Where the model passes, HVI shall also send a copy of the test report to the challenger. The test report shall be confidential and shall not be disseminated by the challenger in any way.

9.2.2.5.1 **Passing Models**. Where, based on the challenge test, the ratings are confirmed and are in good standing, the model passes. The challenge process is terminated, costs shall be assessed in accordance with Section 9.2.2.9, and no further action is required.

Exception to 9.2.2.5.1. Where a *derated derived model* passes, but other models in the *product family* would not pass with the same test results, HVI shall determine whether to subject those other *product family* models to testing.

9.2.2.5.2 **Failing Models**. Where the model fails, the model, and any models in its *product family*, shall be subject to failure resolution in accordance with Section 9.2.2.6.

9.2.2.5.2.1 **Disclosure**. HVI and the challenger shall not disclose model failures until the failure has been resolved in accordance with Section 9.2.2.6.

9.2.2.5.2.2 **Retest**. In the event the challengee disputes a test failure based on a laboratory set-up or process, they are permitted to request that HVI order a re-test at the challengee's expense.

9.2.2.5.2.2.1 **Witness**. Where the challengee requests permission to witness the re-test, HVI shall permit such witnessing, coordinate the test timing with the laboratory, and present the challenger the opportunity to witness the re-test with the challengee.

9.2.2.6 **Failure Resolution**. Within thirty days of receiving notice of the test failure, the challengee shall identify to HVI the corrective action selected from the following options. Unless otherwise noted in the following subsections, failures shall be resolved within ninety days of failure notification.

Informative note: This is the second decision the challengee may be required to make.

9.2.2.6.1 **Option 1**. Accept the challenge test data and simultaneously submit a new HVI Form 101A: Product Certification Request for each model in the *product family* to be certified using the challenge test results.

9.2.2.6.2 **Option 2**. *Delist* all models in the *product family* in accordance with Section 4.11.

9.2.2.6.3 **Option 3**. Submit a new HVI Form 101A: Product Certification Request, with a new test report and all other attachments, requesting a new certification for each model in the *product family*. In addition, inform HVI how to differentiate between old and new models on the outside of the carton, to assist in procurement of the new models.

Exception to 9.2.2.6.3. At its discretion, HVI shall conduct additional verification of the newly re-certified model.

9.2.2.7 **Notification of Selection**. HVI shall immediately notify the challenger of the challengee's failure resolution choice, including the means of differentiating between the old and new model(s),

where applicable.

9.2.2.8 **Delinquency**. Whenever a challengee fails to meet the deadlines for failure resolution, the failed model(s) and each model within a *product family* shall be *delisted* and subjected to any consequences within *HVI Publication 966* associated with unresolved violations.

Exception to 9.2.2.8. At its discretion, HVI shall extend deadlines to accommodate extenuating circumstances.

9.2.2.9 **Costs**. Where the model passes the challenge, an invoice of actual costs less initial deposit shall be sent to the challenger. Where the model fails the challenge test, and/or if repeated tests are considered necessary, the challengee shall be responsible for costs. A final invoice of actual costs shall be sent to the challengee, and the challenger's initial deposit shall be refunded. Recovery of costs terminates the challenge process for the model and each model in the *product family*.

9.3 **HVI Publication 966, Consumer Alert Database.** *HVI Publication 966* establishes a process for identifying noncompliance with HVI policies and procedures, especially as related to illegal or unauthorized use of HVI's trademarks, failure to abide by HVI certification program requirements, and misrepresentation of product performance for both HVI-Certified products and products that are not HVI-Certified.

9.4 **Literature Review**. In association with a model's certification, and at HVI's discretion, HVI shall review a *literature* sample for the model under consideration. HVI shall review the *literature* sample's references to certified performance and to HVI certification for compliance with Section 7 and *HVI Publication 925*. Where HVI determines that the *literature* sample is not compliant, the *party responsible for certification* shall have forty-five days following HVI's notification to make any revisions necessary to comply, or the model shall be *delisted* and subjected to any consequences within *HVI Publication 966* associated with unresolved violations.

Exception to 9.4. At its discretion, HVI shall extend deadlines to accommodate extenuating circumstances.

9.5 **Declarations**. On an annual basis, *parties responsible for certification* shall submit a declaration form confirming that their HVI-Certified models remain in compliance with the applicable requirements.

10 Laboratory Test Reports

10.1 **Contents**. Test reports from an *HVI-approved third-party laboratory* shall comply with ISO 17025. Test reports from an *HVI-approved first-party laboratory* shall comply with *HVI Publication 903*. All test reports shall comply with relevant HVI procedures and their referenced standardized test methods,

and at a minimum, shall include the model number of the model tested, performance data, and sufficient photographs to document the test set-ups.

Exception to 10.1. An actively certified *base model's* test report lacking information on a non-performance-based requirement of Section 10 but complying with ISO 17025 (or *HVI Publication 903* where developed by an *HVI-approved first-party laboratory*) and complying with the standardized test methods referenced by HVI procedures, shall be eligible for use in certification of *derived models*.

Informative note: Through the natural evolution of the program and the standards on which the program is based, the required contents in test reports may change. Whenever possible, HVI shall strive to collect these new data via mechanisms which shall eliminate the need for actively certified models to undergo new certification testing in order to remain HVI-Certified. Additionally, distinction between types of content is provided below as a guide to further minimize widespread disruption of the program:

Performance-based content: Data included in a test report which can be reasonably expected to impact product performance. Deficiencies in performance-based content could potentially require retesting of actively certified models in order to prevent disqualification and to prevent the model from being *delisted*. Every effort shall be made to provide parties responsible for certification with as much advance notice as possible.

Non-performance-based content: Data included in a test report which are administrative and unlikely to impact product performance. Deficiencies in non-performance-based content are not anticipated to require retesting of actively certified models in order to prevent disqualification and to prevent the model from being *delisted*; however, special circumstances may arise which would require retesting, such as when referenced standards change their requirements. In those cases, every effort shall be made to provide parties responsible for certification with as much advance notice as possible.

APPENDIX I. PRODUCT CATEGORIES, TOLERANCES, REQUIREMENTS

Informative note: Requirements of a general nature are described in this Appendix. Particular requirements for specific *product categories* are described in the Appendices that apply to those *product categories*. Where requirements in a *product category's* Appendix differ from the general requirements in this Appendix, or the main body of this publication, the requirements of the *product category* Appendix shall take precedence.

AI.1 HVI Product Categories

The *product categories* that shall be used for the *HVI CPD* and for certification requirements are listed in Table AI.1, alongside their applicable Appendices containing additional requirements.

Table AI.1. HVI Product Categories and their Applicable Appendices.

HVI Product Category	Appendices
Bathroom Exhaust Fans	II
Compact Air Treatment Units	III
Downdraft Kitchen Ventilators	II
Duct Termination Fittings	VII
Energy Recovery Ventilators	III
Fresh Air Inlets	V
Heat Recovery Ventilators	III
Inline Fans	II
Integrated Supply and Exhaust Ventilators	VI
Kitchen Exhaust Fans	II
Kitchen Range Hoods	II and VIII
Other Room Exhaust Fans	II
Powered Attic Ventilators	II
Remote Exterior Mounted Ventilators	II
Static Vents	V
Whole House Comfort Ventilators	II

AI.2 Verification Grouping. For verification purposes, the following product groupings shall be used by HVI when randomly selecting the verification models in accordance with Section 9.1.2.1.

AI.2.1 *Energy recovery ventilators*, *heat recovery ventilators*, *compact air treatment units*, *integrated supply and exhaust ventilators*

AI.2.2 *General exhaust fans,* including *bathroom exhaust fans*, *other room exhaust fans*, *kitchen exhaust fans*

AI.2.3 *Static vents*, *duct termination fittings*, *fresh air inlets*

AI.2.4 *Inline fans*, *remote exterior mounted ventilators, powered attic ventilators, whole house comfort ventilators*

AI.2.5 *Downdraft kitchen ventilators*, *kitchen range hoods*

AI.3 Tolerances for Verification and Challenge

AI.3.1 **Airflow Rating Tolerance**. All products shall achieve a minimum of 90% of their HVI-Certified *airflow rating*. Exceptions, if any, shall be found in the Appendix for the *product category*.

AI.3.2 **Sound Rating Tolerance**. All products shall produce not more than 110% of their HVI-Certified sound rating plus 0.25 *sones*. Exceptions, if any, shall be found in the Appendix for the *product category*.

AI.3.3 **Fan Input Power Rating Tolerance**. All products shall operate at not more than 110% of their HVI-Certified fan input power rating. A tolerance of plus 1 watt shall be applied for products with *HVI-Certified ratings* of fan input power that are 10 watts or less. Exceptions, if any, shall be found in the Appendix for the *product category*.

Informative note: Fan input power is not the same as the energy recovery performance factors for *HRVs*, *ERVs*, and *CATUs* described under verification in Appendix III.

AI.3.4 **Fan Efficacy Rating Tolerance.** Because airflow and power ratings are already subject to verification and challenge, fan efficacy ratings shall not be subject to verification or challenge.

APPENDIX II. SPECIAL REQUIREMENTS – EXHAUST AND SUPPLY PRODUCTS

AII.1 Scope. This appendix contains requirements for relevant *product categories* that are listed in Table AI.1 of Appendix I, specifically: *downdraft kitchen ventilators*, *general exhaust fans* (*bathroom exhaust fans*, *kitchen exhaust fans*, and *other room exhaust fans*), *inline fans*, *kitchen range hoods*, *powered attic ventilators*, *remote exterior mounted ventilators*, and *whole house comfort ventilators*. The first part of this Appendix describes requirements that apply broadly to these *product categories*; following in the second part are particular requirements for some *product categories*. Where requirements in this Appendix differ from others in this publication, the requirements of this Appendix shall take precedence for relevant *product categories*.

AII.2 Required Certification

AII.2.1 ***Airflow Ratings***. All Appendix II products shall be certified for airflow at the prescribed basic fan *static pressure* at maximum speed. The same basic fan *static pressure* shall be used where additional, optional speed settings are certified, with some exceptions for *kitchen range hoods* and *downdraft kitchen ventilators*, as noted in Section AII.3.4.

AII.2.1.1 **Basic Rating Points**. Basic rating points for Appendix II products shall be determined in accordance with this section.

Exception 1 to AII.2.1.1. The basic rating point for *direct discharge whole house comfort ventilators* (*WHCVs*), shall be in accordance with Section AII.3.2.

Exception 2 to AII.2.1.1. The basic rating point for *powered attic ventilators* shall be determined in accordance with Section AII.3.3.

AII.2.1.1.1 ***Direct Discharge* (Non-Ducted)**. The basic rating point for Appendix II *direct discharge* products shall be 0.03 in. w.g.

Informative note: Appendix II *direct discharge* products include, but are not limited to, *powered attic ventilators* (*PAVs*), both roof-mounted and gable-mounted, and *direct discharge* types of *general exhaust fans*.

AII.2.1.1.2 **Products with Ducting on One Side.** The basic rating point for Appendix II products with ducting on one side (e.g., most *general exhaust fans, REMVs, kitchen range hoods*, *downdraft kitchen ventilators*, etc.) shall be 0.1 in. w.g.

AII.2.1.1.3 **Products with Ducting on Two Sides**. The basic rating point for *inline fans* and other Appendix II products with ducting on two sides shall be 0.2 in. w.g., to account for inlet and outlet ducts.

AII.2.2 **Sound Ratings**. All Appendix II products shall be certified for sound performance at the basic rating point.

Exception to AII.2.2. Sound ratings shall not be required for the following Appendix II *product categories* because no HVI sound certification program currently exists: *powered attic ventilators*, *remote exterior mounted ventilators*, *whole house comfort ventilators*, and *inline fans*.

AII.3 Particular Requirements for Certain Product Categories

AII.3.1 Inline Fans and Remote Exterior Mounted Ventilators

AII.3.1.1 **Dryer Exhaust Duct Power Ventilators (DEDPVs)** The basic rating point for a *DEDPV* shall be determined in accordance with Section AII.2.1.1, based on whether it is a product with ducting on one side (e.g., a *remote exterior mounted ventilator*) or a product with ducting on two sides (e.g., an *inline fan*). In addition, the maximum *static pressure* at which the *DEDPV* maintains 1,200 fpm outlet velocity shall be listed. The maximum *static pressure* shall be determined from the test report fan curve, or *derated* further, using 105 *cfm* for 4" diameter duct.

AII.3.2 **Whole House Comfort Ventilators (WHCVs)**. The basic rating point for *WHCVs* shall be 0.1 in. w.g. because they are expected to overcome the resistance of attic outlet vents. *WHCVs* shall be tested and certified using the smallest shutter recommended by the *party responsible for certification* and at the minimum distance between fan and shutter recommended by the *party responsible for certification*. Products supplied with duct shall be installed and tested with the supplied duct in accordance with the installation instructions (see *HVI Publication 916*).

AII.3.3 **Powered Attic Ventilators (PAVs).** The basic rating point for *PAVs* shall be 0.03 in. w.g. Where a gable-mounted type *PAV* is sold with a louver, it shall be tested and certified with that louver. Where sold without a louver, it shall be tested and certified with the "standard HVI louver", described in *HVI Publication 916*. Additional, optional ratings with a specific model of louver or shutter shall be permitted, where the louver or shutter is identified in the *literature* of the *party responsible for certification*.

AII.3.4 Kitchen Range Hoods and Downdraft Kitchen Ventilators

AII.3.4.1 **Optional Rating Points**. Additional, optional rating points shall be determined at a *static pressure* not less than 0.1 in. w.g.

Exception 1 to AII.3.4.1. *Working speed* rating points shall be provided for *kitchen range hoods* at the discretion of the *party responsible for certification*. The rated *static pressure* for a *kitchen range hood* at a *working speed* rating point shall be determined in accordance with *HVI Publication 916*. A model that is rated for airflow at *working speed* shall also be rated for sound at *working speed*. Tolerance for *working speed*

airflow shall be +/- 15% of rating. Tolerance for *working speed* sound shall be the same as other sound ratings.

Exception 2 to AII.3.4.1. *NIA* ratings shall be provided at the discretion of the *party responsible for certification*, shall be determined in accordance with Section AII.3.4.4, and shall comply with Section 7. No sound rating shall be required for NIA ratings.

AII.3.4.2 **Nominal Installed Airflow Ratings**. *NIA* ratings for *kitchen range hoods* and *downdraft kitchen ventilators* shall be provided at the discretion of the *party responsible for certification*.

AII.3.4.3 **Directly Connected Air-Moving Devices**. Separate blowers for mounting directly in a hood (e.g., an insert) or to a downdraft intake shall be tested with not less than one hood or downdraft intake model selected by the *party responsible for certification* as the most restrictive available for the blower being certified. Where listed within the *HVI CPD*, the model number of the blower shall be listed with the model number of the hood or downdraft intake, or, at the discretion of the *party responsible for certification*, the model number of the blower shall be listed with the phrase, "with a compatible hood" or, "with a compatible downdraft intake," as applicable.

AII.3.4.3.1 Verification testing of such blowers shall include a hood or downdraft intake that is identified within *literature* as being compatible with the blower. HVI shall randomly select the hood or downdraft intake to be used for the verification test. The hood or downdraft intake model and the blower may or may not be offered by the same manufacturer.

AII.3.4.4 **Nominal Installed Airflow (NIA)**. Where an *NIA* rating is provided, it shall be determined in accordance with this section. The only *product categories* that are eligible for an *NIA* rating are *kitchen range hoods* and *downdraft kitchen ventilators*.

AII.3.4.4.1 **Working Point**. The *NIA* and associated *static pressure* shall be determined from the working point. The working point shall be the intersection of the air-moving device's test report airflow curve (*static pressure*, in. w.g., corrected for standard air density, as a function of airflow, *cfm*, corrected for standard air density) and a *nominal duct system* curve.

AII.3.4.4.2 **Test Report Airflow Curve**. For the purposes of calculating the *NIA*, the test report airflow curve shall be approximated by a linear regression of the following two test data points:

Point A. The test data point with the highest airflow value that is less than the working point airflow value, and

Point B. The test data point with lowest airflow value that is greater than the working point airflow value.

Informative note: See Figure AII.1 for an example of determining the test data points to use when calculating the *NIA*.

AII.3.4.4.3 **Nominal Duct System Curve**. The *nominal duct system* curve shall be determined in accordance with Equation AII.1, except where the air-moving device is listed with a listed outdoor *duct termination fitting* (*DTF*), or where the air-moving device duct dimension is not provided in Table AII.1. For these cases, the *nominal duct system* curve shall be determined in accordance with Equation AII.2. See Figure AII.1 for an example of a working point.

AII.3.4.4.4 **Certification Requirements**. Where a *party responsible for certification* elects to certify an *NIA*, the working point *NIA* and *static pressure* shall be certified for each listed combination of duct diameter and discharge configuration (i.e., vertical or horizontal) at maximum speed, at a minimum. Where a manufacturer elects to certify an *NIA* at another speed setting, the *NIA* shall be certified for each listed combination of duct diameter and discharge configuration at the selected speed setting.

Equation AII.1

$$\Delta p = c2q^2 + c1q + c0$$

where
Δp = friction loss, in. w.g.
q = airflow, *cfm*
$c2, c1,$ and $c0$ are constants listed in Table AII.1

See Figures AII.2.1 and AII.2.2 for illustrations of the curves resulting from application of Equation AII.1.

Table AII.1 *Nominal duct system* curve coefficients for use with Equation AII.1.

Air Moving Device's **Duct Dimension (in)**	**c2**	**c1**	**c0**
3.25 x 10	8.93E-07	9.60E-04	3.62E-02
5	3.43E-06	1.28E-03	5.18E-02
6	1.29E-06	9.63E-04	4.53E-02
7	5.20E-07	7.78E-04	3.81E-02
3.25 x 14	4.02E-07	7.00E-04	3.46E-02
8	3.74E-07	5.42E-04	4.36E-02
10	1.08E-07	3.81E-04	3.71E-02
4.5 x 18	1.16E-07	3.77E-04	3.62E-02
12	1.48E-08	3.03E-04	2.97E-02

Equation AII.2

$$\Delta p = \left(\frac{12fL}{D_h} + 2C_e + C_t\right)\rho\left(\frac{V}{1097}\right)^2$$

where
f = friction factor, dimensionless, determined using Equation AII.3
D_h = hydraulic diameter, inches, determined by applying Equation AII.4 to the air moving device's duct dimension
V = velocity, feet per minute
ρ = standard air density, 0.075 lbm/ft^3
L = *nominal duct system* duct length, 10 feet
Δp = friction loss, in. w.g.
C_e = elbow loss coefficient, 0.42, dimensionless
C_t = outdoor *DTF* loss coefficient, dimensionless, determined using Equation AII.6 where the air-moving device is not listed with a listed outdoor *DTF*, and determined using Equation AII.7 otherwise.

Equation AII.3

$$f = \left\{-1.8\log\left[\left(\frac{3.24e}{D_h}\right)^{1.11} + \frac{6.9}{Re}\right]\right\}^{-2}$$

where
f = friction factor, dimensionless
e = roughness coefficient, 0.00024 feet
D_h = hydraulic diameter, determined as the diameter for circular ducts and determined in accordance with Equation AII.4 for noncircular ducts, in
Re = Reynolds number, dimensionless, calculated in accordance with Equation AII.5

Equation AII.4

$$D_h = \frac{4A}{P}$$

where
A = duct cross-sectional area, in^2
P = duct perimeter, in

Equation AII.5

$$Re = \frac{D_h V}{720v}$$

where
D_h = hydraulic diameter, inches
V = velocity, feet per minute
v = kinematic viscosity of air, 1.62 x 10^{-4} ft^2/s

Equation AII.6

$$C_t = 49086V^{-1.388}$$

where
V= velocity, feet per minute
C_t= outdoor *DTF* loss coefficient, dimensionless

Informative note: Losses associated with any damper that is integrated with the *kitchen range hood* or *downdraft kitchen ventilator* are accounted for in the *kitchen range hood*'s or *downdraft kitchen ventilator*'s fan performance test data and are not addressed by the *nominal duct system* curve.

Equation AII.7

$$C_t = C_{t\_A} + (V - V_A)\left(\frac{C_{t\_B} - C_{t\_A}}{V_B - V_A}\right)$$

where
C_t= outdoor *DTF* loss coefficient, dimensionless
V= velocity, feet per minute
V_A = *DTF* velocity, feet per minute, determined from the *DTF*'s rated airflow at rating point A
V_B = *DTF* velocity, feet per minute, determined from the *DTF*'s rated airflow at rating point B
Δp_A = *DTF* rated *static pressure*, in. w.g., determined at rating point A
Δp_B = *DTF* rated *static pressure*, in. w.g., determined at rating point B
C_{t_A}= the loss coefficient of the *DTF* at the *DTF* rating point A, determined in accordance with Equation AII.7.1
C_{t_B}= the loss coefficient of the *DTF* at the *DTF* rating point B, determined in accordance with Equation AII.7.2

Equation AII.7.1

$$C_{t\_A} = \frac{\Delta p_A}{0.075(\frac{V_A}{1097})^2}$$

Equation AII.7.2

$$C_{t\_B} = \frac{\Delta p_B}{0.075(\frac{V_B}{1097})^2}$$

The *DTF* rating points referenced by Equation AII.7, AII.7.1, and AII.7.2 shall have the same duct dimension as that used for the air moving device's working point. The two *DTF* rating points shall be determined as follows:

- Point A: the *DTF* rating point with the highest velocity that is less than the air moving device's working point velocity, and
- Point B: the *DTF* rating point with the lowest velocity that is greater than the air moving device's working point velocity.

Informative Example for Using Equation AII.7:
Suppose a *DTF* is listed in the *HVI CPD* with the duct size, *static pressure*, and rated airflow values shown in Table AII.2. Velocity, *V*, is calculated for each *DTF* rating point as a function of the *DTF*'s rated airflow and duct dimension. For a hypothetical *kitchen range hood* with a working point *NIA* of 200 *cfm* in a 6" duct, suppose that the working point velocity is 1019 feet per minute. Therefore, Point A for the *DTF* is P2 (i.e., (C_{t_A}, V_A) = (5.9, 581)) and Point B for the *DTF* is P3 (i.e., (C_{t_B}, V_B) = (2.9, 1182)). The loss coefficient for Point A is calculated using Equation AII.7.1, and the loss coefficient for Point B is calculated using Equation AII.7.2. Plugging these values into Equation AII.7 yields the following equation: C_t = -0.005V + 8.8. At a velocity of 1019 feet per minute, the value of the *DTF* C_t to use at the *kitchen range hood* working point is 3.7.

Table AII.2. Example Illustrating Determination of the Loss Coefficient for a Listed DTF at an Air-Moving Device's Working Point.

HVI-Certified Rating				Calculated Values	
Rating Point Reference	Duct Size (In.)	*Static Pressure* (In. w.g.)	Rated Airflow (*cfm*)	Velocity, V, calculated from Rated Airflow and Duct Size (FPM)	Rating Point Loss Coefficient, calculated using Equation AII.7.1 (dimensionless)
P1	6	0.100	89	453	
P2	6	0.125	114	581	5.9
P3	6	0.250	232	1182	2.9
P4	6	0.375	302	1538	
P5	6	0.500	349	1777	
P6	6	0.625	396	2017	
P7	6	0.750	432	2200	
P8	6	0.875	468	2384	
P9	6	1.000	503	2562	
P10	6	1.100	527	2684	

Figure AII.1. Example Working Point of a Kitchen Range Hood in Extraction Mode.

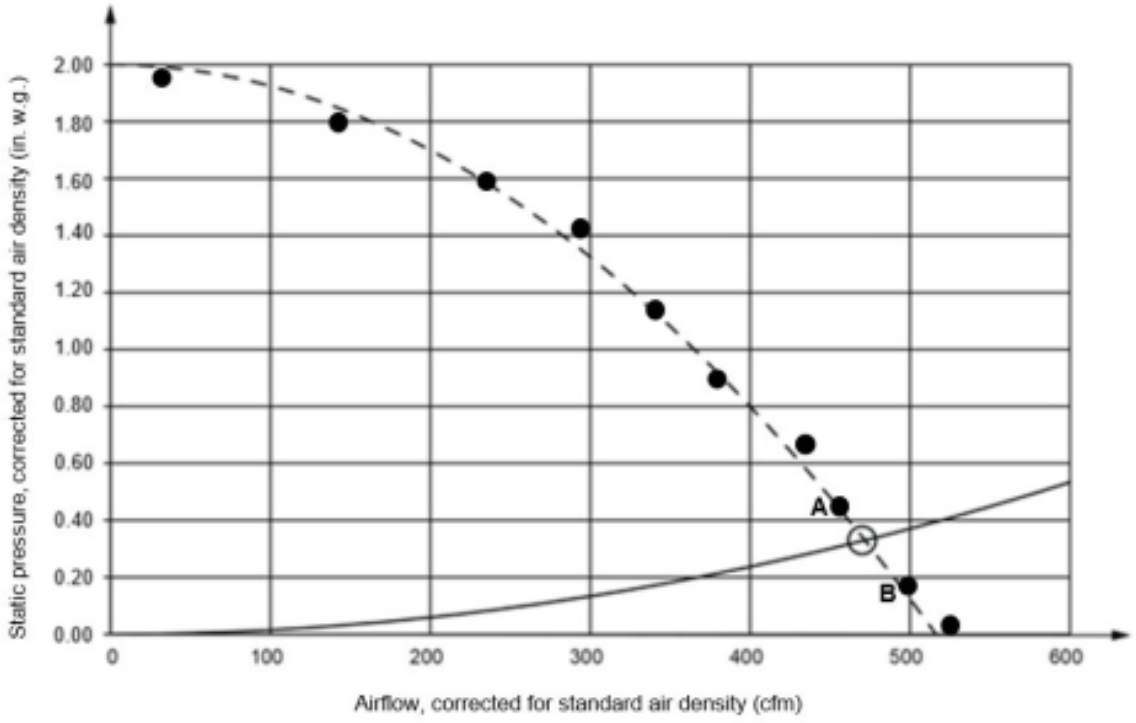


Figure AII.1 Key

——— Example *nominal duct system* curve

– – – – Example *kitchen range hood* test report airflow curve

○ Working point (intersection of the *nominal duct system* curve and the *kitchen range hood's* test report airflow curve)

● Test data point. In this example, Points A and B are the test data points used when calculating the *NIA*.

Figure AII.2.1 Nominal Duct System Curves Associated with Equation AII.1 for Airflows to 400 cfm.

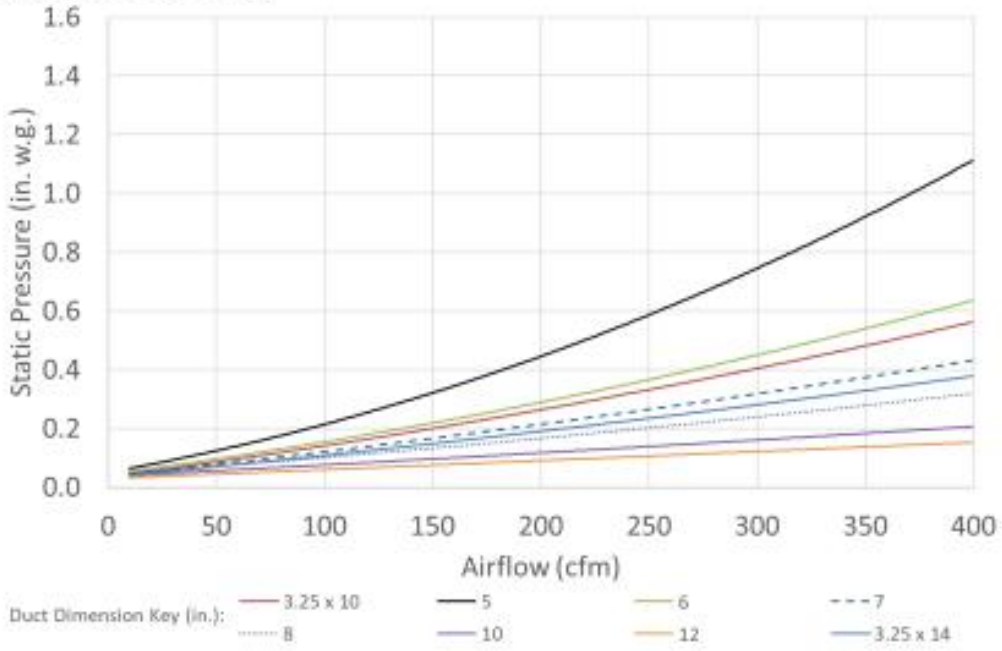
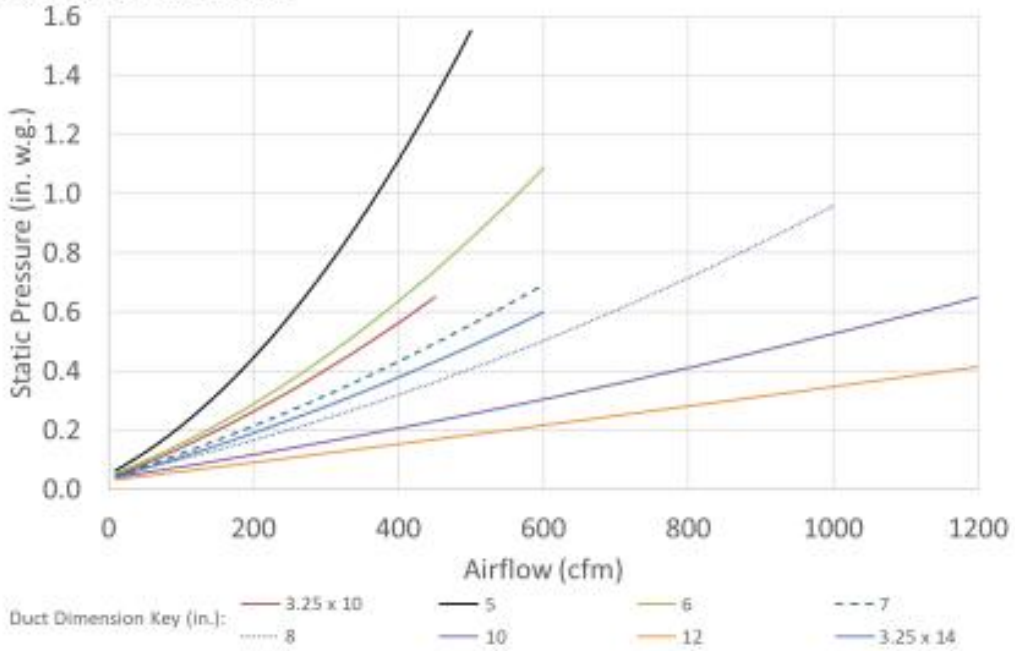


Figure AII.2.2 Nominal Duct System Curves Associated with Equation AII.1 for Airflows to 1200 cfm.



APPENDIX III. SPECIAL REQUIREMENTS – HRVs, ERVs, AND CATUs

AIII.1 Scope. This appendix contains requirements for relevant *product categories* that are listed in Table AI.1 of Appendix I, specifically: ducted *heat recovery ventilators* (*HRVs*), ducted *energy recovery ventilators* (*ERVs*), and ducted *compact air treatment units* (*CATUs*). Where requirements in this Appendix differ from others in this publication, the requirements of this Appendix shall take precedence for relevant *product categories*. The scope includes ceiling/wall insert *HRV*, *ERV*, and *CATUs* that are tested in accordance with CAN/CSA C439 using pickup boxes on the grille openings.

Informative note: Ducted *HRVs* and *ERVs* include "two-duct" units as referenced in *HVI Publication 916* and "partially ducted" units as referenced in CAN/CSA C439. At the time of publication, there is no certification program for fixed-bed regenerator and non-ducted *HRV*, *ERV*, or *CATU* versions.

AIII.2 Test Method. HVI Certification of these products shall be based on testing in accordance with CAN/CSA C439-18, *Standard Laboratory Methods of Test for Rating the Performance of Heat/Energy-Recovery Ventilators*, herein referred to as CAN/CSA C439.

AIII.3 Test Report. Laboratory test reports shall comply with Section 10. All test conditions not prescribed, including the use of accessories, defrost connection, auxiliary controls, and additional, optional rating point(s) shall be reported with the test results.

AIII.4 Minimum Performance. HVI shall not establish a minimum performance requirement for *HRVs*, *ERVs*, or *CATUs*. HVI shall not enforce the minimum sensible heat-recovery efficiency requirement of 55% in Clause 9.3.3.1 of CAN/CSA C439.

AIII.5 Certified Ratings

AIII.5.1 **Unit Conversions.** Certified ratings in I-P units shall be developed by first converting the SI unit ratings to I-P units and then rounding to the nearest whole number.

AIII.5.2 **Basic Ratings**. All *HRV*, *ERV*, and *CATU* products shall be tested and certified for both energy recovery performance at nominal conditions and airflow performance at the maximum airflow (called the "maximum rated airflow" by CAN/CSA 439) specified by the *party responsible for certification*.

AIII.5.3 **Basic Airflow Performance Ratings.** *Airflow ratings* shall be test data, in units of L/s, rounded to the nearest whole number, or *derated* further. Following are the basic airflow metrics determined in accordance with CAN/CSA C439 that shall be rated for each certified model.

AIII.5.3.1 **Gross Exhaust Airflow**. The measured exhaust airflow rate, which may contain cross-leakage between the supply and exhaust airstreams.

Informative note: This value is used for duct design.

AIII.5.3.2 **Gross Supply Airflow**. The measured supply airflow rate, which may contain cross-leakage between the supply and exhaust airstreams.

Informative note: These values are used for duct design.

AIII.5.3.3 **Net Supply Airflow**. Defined in CAN/CSA C439.

Informative note: This is the actual amount of outdoor air delivered by the supply system of the unit. This value is used for sizing the equipment for the required ventilation rate.

AIII.5.3.4 **Exhaust Air Transfer Ratio (EATR)**. Defined in CAN/CSA C439.

AIII.5.4 **Optional Airflow Performance Ratings**. Following are the additional, optional airflow metrics determined in accordance with CAN/CSA C439 that shall be rated at the discretion of the *party responsible for certification*.

AIII.5.4.1 **Low Temperature Airflow Imbalance (LTAI).** Defined in CAN/CSA C439.

AIII.5.4.2 **Low Temperature Ventilation Reduction (LTVR).** Defined in CAN/CSA C439.

AIII.5.5 **Basic Input Power Performance Ratings**. Input power shall be rated for each certified model, expressed in watts, rounded to the nearest whole number, or *derated* further.

Informative note. Input power for *HRVs, ERVs, and CATUs* is collected for the entire unit in accordance with CAN/CSA C439, and includes the total coincidental power consumed by fan(s), electronics, compressors, pumps, electric resistance heating, etc.

AIII.5.6 **Optional Fan Efficacy Performance Ratings**. Where rated, fan efficacy shall be determined at a supply air temperature of 0°C, by dividing the rated net outdoor airflow by the rated total input power. Where reported in units of L/s/watt, fan efficacy shall be rounded down to the nearest two decimal places (hundredth). Where reported in *cfm*/W, fan efficacy shall be rounded down to the nearest one decimal place (tenth).

AIII.5.7 **Energy Recovery Performance Ratings.** *HRVs*, *ERVs*, and *CATUs* shall be rated for energy recovery performance with 0°C supply air at the maximum airflow (called the "maximum rated airflow" by CAN/CSA 439) specified by the *party responsible for certification*. At the discretion of the

party responsible for certification, additional, optional test conditions and airflows shall be certified.

Informative note: Common optional test points include but are not limited to -25°C (-13°F) and 35°C (95°F), and 30 L/s (64 *cfm*) and 55 L/s (117 *cfm*).

AIII.5.7.1 **Co-Rated Airflow**. Net outdoor airflow, as determined in accordance with CAN/CSA C439, shall be rated and published in conjunction with energy performance ratings.

Informative note: The verification test setup utilizes the same rated net outdoor airflow that is used within the certification test report for verification of each energy recovery performance rating.

AIII.5.7.2 **Rounding.** Energy recovery performance ratings shall be rounded down to the nearest whole percentage number, or *derated* further. Net outdoor airflow shall be test data, in units of L/s, rounded to the nearest whole number or *derated* further.

AIII.5.7.3 **Basic Energy Recovery Performance Ratings.** Following are the basic energy recovery performance metrics determined in accordance with CAN/CSA C439 that shall be rated for each certified model at a supply air temperature of 0°C, and at the maximum airflow (called the "maximum rated airflow" by CAN/CSA 439) specified by the *party responsible for certification*.

AIII.5.7.3.1 **Sensible Recovery Efficiency (SRE).** The net sensible energy recovered by the supply airstream as adjusted by any supply fan energy, energy consumption of other equipment transferring heat to/from the supply airstream, case heat loss or heat gain, air leakage, airflow mass imbalance between the two airstreams and the energy used for defrost (when running the low-temperature test), as a percent of the sum of the potential sensible energy that could be recovered from ambient conditions, the exhaust fan energy, and the energy consumption of any other equipment transferring heat to/from the exhaust airstream, determined in accordance with CAN/CSA C439 Clause 9.3.3.1.

Informative note: Referred to as "sensible heat recovery efficiency" by CSA C439. This value is used to predict and compare heating season performance of the *HRV*, *ERV*, or *CATU* unit.

AIII.5.7.3.2 **Adjusted Sensible Recovery Efficiency (ASRE).** Defined in CAN/CSA C439.

Informative note: This value should be used for energy modeling when fan input power is separately accounted for in

the energy model.

AIII.5.7.4 **Optional Energy Recovery Performance Ratings.** Following are additional, optional energy recovery performance metrics determined in accordance with CAN/CSA C439 that shall be rated at the discretion of the *party responsible for certification*.

AIII.5.7.4.1 **Total Recovery Efficiency (TRE).** The net total energy (sensible plus latent, also called enthalpy) recovered by the supply airstream as adjusted by supply fan energy, energy consumption of any other equipment transferring heat to/from the supply airstream, case heat loss or heat gain, air leakage, airflow mass imbalance between the two airstreams, and the energy used for defrost (when running the low-temperature test) as a percent of the sum of the potential total energy that could be recovered from ambient conditions, the exhaust fan energy, and the energy consumption of any other equipment transferring heat to/from the exhaust airstream, determined in accordance with CAN/CSA C439 Clause 9.3.3.2.

Informative note: This value is used to predict and compare cooling season performance for the *HRV, ERV, or CATU* model.

AIII.5.7.4.2 **Adjusted Total Recovery Efficiency (ATRE).** Defined in CAN/CSA C439.

Informative note: This value is used to predict and compare cooling season performance for the *HRV, ERV, or CATU* model. This value should be used for energy modeling when wattage for air movement is separately accounted for in the energy model.

AIII.5.7.4.3 **Net Moisture Transfer (NMT).** Moisture recovered divided by moisture exhausted and corrected for the effects of cross-leakage.

Informative note: NMT=0 indicates that moisture was not transferred (net of cross-leakage) from the exhaust airstream to the supply airstream. NMT=1 indicates complete transfer of moisture. NMT is provided as an indication of moisture handling characteristics and may be used to evaluate the moisture transfer ability of the equipment in order to assess the humidification or dehumidification performance of the product at the specified test condition.

AIII.5.8 **Sound Performance Ratings**. In addition to the testing and rating requirements associated with testing in accordance with CAN/CSA C439, two-duct ceiling/wall insert *HRVs*, *ERVs*, and *CATUs* shall be tested and rated for airflow and sound in accordance with *HVI Publication 916* and

HVI Publication 915.

Informative note: HVI has no sound certification program for other Appendix III products.

AIII.5.9 **Tolerances for Verification and Challenge**

AIII.5.9.1 **Airflow Performance Ratings**

AIII.5.9.1.1 Maximum Net Supply Airflow (at differential *static pressure* of 100 Pa): 85% minimum.

Informative note: Because maximum net supply airflow is already subject to verification and challenge, EATR shall not be subject to verification or challenge.

AIII.5.9.1.2 Maximum Gross Exhaust Airflow (at differential *static pressure* of 100 Pa): 85% minimum.

AIII.5.9.1.3 Airflows at other *static pressures* shall be permitted to be published for fan curve information only.

AIII.5.9.2 **Basic Energy Recovery Performance Ratings**

AIII.5.9.2.1 Net Outdoor Airflow: not to be verified or challenged

AIII.5.9.2.2 Energy Recovery Parameters: 90% minimum

AIII.5.9.2.3 Input Power: the greater of 115% and 3 watts

Informative note: Because TRE and ATRE are already subject to verification and challenge, NMT shall not be subject to verification or challenge.

AIII.5.9.3 **Optional Performance Ratings**. Because airflow and power ratings are already subject to verification and challenge, fan efficacy ratings shall not be subject to verification or challenge. Other published values such as low temperature airflow reductions and imbalance are published for information only and are not subject to verification, as the energy recovery calculations and thresholds already take into account any variation in these values.

AIII.6 Verification Test Failures. Where a model under test experiences a failure within the verification sequence, the *HVI-approved third-party laboratory* shall notify HVI before proceeding with the next test in the sequence. HVI shall instruct the laboratory to terminate testing if it is obvious that remaining tests will fail, but HVI shall normally instruct the laboratory to continue the test sequence.

APPENDIX IV. RESERVED

APPENDIX V. SPECIAL REQUIREMENTS – STATIC VENTS AND FRESH AIR INLETS

AV.1 Scope. This appendix contains requirements for relevant *product categories* that are listed in Table AI.1 of Appendix I, specifically: *static vents* and *fresh air inlets*. Additionally, the *party responsible for certification* shall be permitted to apply for certification for the following product types in accordance with the procedures and requirements of *HVI Publication 920*, including this appendix: room-to-room transfer registers, roof ventilators, gable end ventilators, under eave ventilators, sidewall ventilators, ridge ventilators, and foundation ventilators. Where requirements in this Appendix differ from others in this publication, the requirements of this Appendix shall take precedence for relevant *product categories*.

AV.2 Test Method. HVI Certification of these products shall be based on testing in accordance with *HVI Publication 916*.

AV.3 Certified Ratings. Products rated in accordance with this appendix shall be rated for *net free area*, determined from test data, and rounded down to the nearest 0.1 square inches, or *derated* further. Where *airflow ratings* are HVI-Certified, they shall be determined from test data, and rounded down to the nearest *cfm* at 0.04 in. w.g., or *derated* further. Sound ratings shall not be required for Appendix V products.

AV.4 Tolerances for Verification and Challenge. Airflow and *net free area* shall be a minimum of 90% of ratings.

APPENDIX VI. SPECIAL REQUIREMENTS – ISEVs

AVI.1 Scope. This appendix contains requirements for relevant *product categories* that are listed in Table AI.1 of Appendix I, specifically, *integrated supply and exhaust ventilators* (*ISEVs*). Where requirements in this Appendix differ from others in this publication, the requirements of this Appendix shall take precedence for relevant *product categories*. A device with heat or energy recovery is not eligible for certification as an *ISEV*.

AVI.2 Test Method. HVI Certification of *ISEVs* shall be based on testing in accordance with CAN/CSA C439-18, *Standard Laboratory Methods of Test for Rating the Performance of Heat/Energy-Recovery Ventilators*, herein referred to as CAN/CSA C439, as modified in accordance with Section AVI.5.

AVI.3 Test Report. Laboratory test reports shall comply with Section 10. Additionally, the test report shall include *static pressure* and airflow at all four ports for each test point along with the fan speed settings, mixing ratios, and the watts. Where the unit has more than four ports, the manufacturer shall provide the model modified so that it can be tested with four ports (added to Clause 8.1.1 of CAN/CSA C439).

AVI.4 Certified Ratings

AVI.4.1 **Airflow Performance**. *ISEVs* shall be certified for the following airflow metrics, determined from test data, and rounded to the nearest *cfm*, or *derated* further.

AVI.4.1.1 **Net Ventilation Airflow**. The net quantity of outside airflow supplied to the ventilation zone. The net ventilation airflow shall be the maximum of the net fresh air supply airflow and the net stale air exhaust airflow.

AVI.4.1.2 ***Gross Recirculation Airflow***. The total amount of air distributed to the ventilation zone by the model under test. *Gross fresh air airflow* and *gross exhaust airflow* are not HVI-Certified but shall be listed with *HVI-Certified ratings* for design purposes.

AVI.4.2 **Sound Performance**. HVI currently has no sound certification program for *ISEVs*.

AVI.4.3 **Energy Recovery Performance**. HVI currently has no energy recovery certification program for this category.

AVI.4.4 **Fan Input Power**. All *ISEVs* shall be HVI-Certified for fan input power in accordance with requirements described in Section 7, and in *HVI Publication 916*.

AVI.4.5 **Fan Efficacy**. Fan efficacy shall be rated. Fan efficacy shall be determined by dividing the rated net outdoor airflow by the rated total input power. Where reported in *cfm*/W, fan efficacy shall be rounded

down to the nearest one decimal place (tenth). Where reported in units of L/s/watt, fan efficacy shall be rounded down to the nearest two decimal places (hundredth).

AVI.4.6 **Rating Points.** The primary rating point shall be 0.2 in. w.g. The second rating point shall be 0.4 in. w.g.

AVI.5 Modifications to CSA C439. This section contains exceptions to the test methods in CAN/CSA C439.

AVI.5.1 **Definitions**. The following terms and definitions shall be used within this Appendix.

AVI.5.1.1 *gross fresh air airflow*: airflow supplied from the outside; measured at station 1

AVI.5.1.2 *gross exhaust airflow*: airflow exhausted by the unit to the outside; measured at station 4

AVI.5.1.3 *gross recirculation airflow*: airflow supplied by the unit to the ventilation zone; measured at station 2

AVI.5.2 **Operating Point of the Unit.** Replace Clause 10.3.1 and 10.3.2 of CAN/CSA C439 with the following: The *party responsible for certification* shall provide the testing laboratory with targets of *static pressure* for each of the four ports. The airflow resistance of the test facility shall be adjusted so that the absolute value of the *static pressures* at station 1 is as close as possible to the value at station 4, and the absolute value of the *static pressure* at station 2 is as close as possible to the value at station 3. *Static pressure* at station 1 and 2 shall be specified by the *party responsible for certification*, but the difference between the *static pressure* at stations 1 and 2 shall be equal to at least 50 Pa for the first test and 100 Pa for the second test. The difference between *static pressure* at stations 3 and 4 shall be equal to at least 50 Pa for the first test and 100 Pa for the second test. Additional tests shall be permitted at an airflow lower than the maximum rated airflow (e.g., for a multi-speed unit). Pressures and airflows shall be recorded at the different intermediate speeds on the same system resistance curves used for the highest speed.

AVI.5.3 **Net Fresh Air Supply Airflow**. The net fresh air supply airflow, understood to be the real amount of fresh air in the *gross recirculation airflow*, shall be calculated using Equation AVI.1.

Equation AVI.1

Net Fresh Air Supply Airflow = $V_S \times F_2$

where

F_2 = airflow measured at station 2
V_S = supply ventilation reduction factor

AVI.5.4 **Supply Ventilation Reduction Factor**. The supply ventilation reduction factor, V_s, shall be the greater of the values determined in accordance with CAN/CSA C439 Equations 9 and 10.

Informative note: The supply ventilation reduction factor is a measure of the degree to which the *gross recirculation airflow* is a mix of the outside fresh air and the return air from the ventilation zone.

AVI.5.5 **Net Stale Air Exhaust Airflow**. The net stale air exhaust airflow, understood to be the real amount of stale air in the exhaust airflow to outside, shall be calculated using Equation AVI.3.

Equation AVI.3

Net Stale Air Exhaust Airflow = $V_E \times F_4$

where

F_4 = airflow measured at station 4
V_E = exhaust ventilation reduction factor

Informative note: The exhaust ventilation reduction factor is a measure of the degree to which the *gross exhaust airflow* is a mix of the stale air and fresh air.

AVI.5.6 **Exhaust Ventilation Reduction Factor**. The exhaust ventilation reduction factor, V_E, shall be the greater of the V_E' and V_E'' values determined from Equations AVI.4 and AVI.5.

Equation AVI.4

$$V_E' = \frac{B_4'}{B_3'}$$

Equation AVI.5

$$V_E'' = 1 - \frac{B_4''}{B_1''}$$

where

B_1''= measured concentration of tracer gas at station 1 in the test described in Clause 8.2.2 of CAN/CSA C439

B_3' = measured concentration of tracer gas at station 3 (measured in the same units as B_4') in the test described in Clause 8.2.1 of CAN/CSA C439

B_4' = measured concentration of tracer gas at station 4 (measured in the same units as B_3') in the test described in Clause 8.2.1 of CAN/CSA C439

B_4'' = measured concentration of tracer gas at station 4 (measured in the same units as B_1'') in the test described in Clause 8.2.2 of CAN/CSA C439

AVI.5.7 **Gross Airflows.** For each operating point of the model (50 Pa and 100 Pa) and for each port, gross airflows obtained from two different tests are available: first, when the tracer gas is injected at station 1 and again when the tracer gas is injected at station 3. As these airflows may be slightly different, the certified gross airflows at the specified operating point of the model shall be the average of the two test results, at each of the following stations: station 1 (for fresh air), station 4 (for exhaust air) and station 2 (for recirculation).

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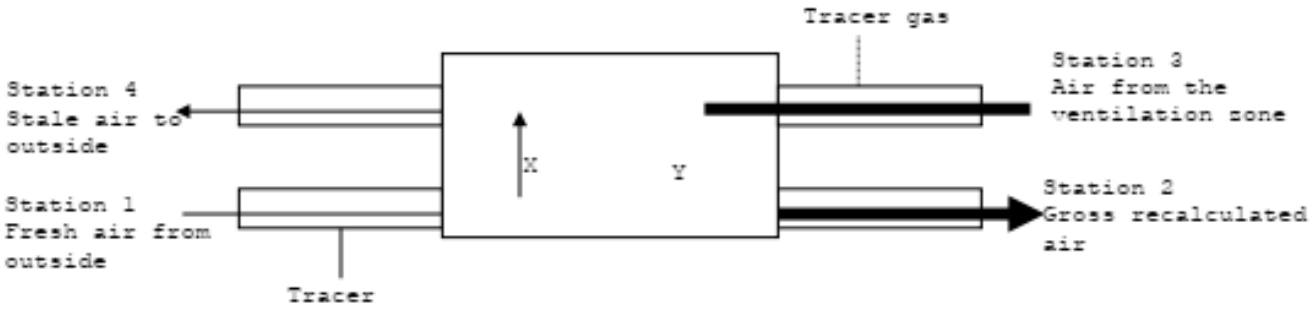
Informative Explanation of the Model and the Ventilation Reduction Factors

The following schematic and description are provided as an aid to understanding and communicating details related to this *product category*; they are not part of the certification requirements.



X and Y are the airflows exchanged between the exhaust and supply airstreams. The evaluation of the two ventilation reduction factors requires two steps. First, the tracer gas is injected into the airflow before station 1. Tracer gas concentrations are measured at station 1, $B"_1$, station 2, $B"_2$, and station 4, $B"_4$. Concentration at station 3 shall be null. Second, the tracer gas is injected before station 3. Tracer gas concentrations are measured at station 2, B'_2, station 3, B'_3, and station 4, B'4. Concentration at station 1 shall be null.

The supply ventilation reduction factor, V_S is determined in accordance with CAN/CSA C439 Equations 9 and 10.

The exhaust ventilation reduction factor, V_E, is calculated as the greater of the v'_E and v^*_E values determined from Equations AVI.4 and AVI.5.

AVI.6 Tolerances for Verification and Challenge.

AVI.6.1 **Airflow Performance Ratings.** Net ventilation airflow and *gross recirculation airflow* shall achieve a minimum of 85% of rating.

AVI.6.2 **Fan Input Power Ratings**. Fan input power shall not exceed 115% of rating.

AVI.7 Verification Test Failures. Where a model under test experiences a failure within the verification sequence, the *HVI-approved third-party laboratory* shall notify HVI before proceeding with the next test in the sequence. HVI shall instruct the laboratory to terminate testing if it is obvious that remaining tests will fail, but HVI shall normally instruct the laboratory to continue the test sequence.

APPENDIX VII. SPECIAL REQUIREMENTS – DUCT TERMINATION FITTINGS

AVII.1 Scope. This appendix contains requirements for relevant *product categories* that are listed in Table AI.1 of Appendix I, specifically, *duct termination fittings* (*DTFs*). *DTFs* included in the scope are *outdoor duct outlets* (e.g., roof caps, wall caps, eave caps, etc.) and *outdoor duct inlets*. *DTFs* excluded from the scope include *indoor duct inlets*, *indoor duct outlets*, and *DTFs* designed to transfer air from an interior space to an unconditioned space such as an attic or crawl space. Where requirements in this Appendix differ from others in this publication, the requirements of this Appendix shall take precedence for relevant *product categories*.

AVII.2 Test Methods. HVI Certification of these products shall be based on airflow testing in accordance with *HVI Publication 916*.

AVII.3 Required Certification.

AVII.3.1 **Airflow Ratings.** *DTFs* shall be certified for airflow. Where the DTF accommodates more than one duct size, the duct size having the smallest cross-sectional area shall be certified, at a minimum.

AVII.3.1.1 **Basic Rating Point.** All *DTFs* shall have basic HVI *airflow ratings* at a *static pressure* of 0.05 in. w.g. rounded down to the nearest whole number, or *derated* further. A minimum certified *airflow rating* of 10 *cfm* shall be required for certification. Where a model does not obtain at least 10 *cfm* at 0.05 in. w.g. during testing, it shall not be certified.

AVII.3.1.1.1 **Optional Airflow Ratings.** Additional, optional *airflow ratings* at *static pressures* greater than 0.05 in. w.g. shall be certified at the discretion of the *party responsible for certification*. For additional *airflow rating* points, two test points that are closely spaced around the intended *airflow rating* point shall be used to linearly interpolate the value of the airflow at the *airflow rating* point. The resulting *airflow rating* shall be rounded down to the nearest whole number, or *derated* further.

AVII.3.2 **Sound Ratings**. For *DTFs*, no HVI sound certification program currently exists; therefore, no sound rating shall be required.

AVII.4 Verification and Challenge.

AVII.4.1 **Tolerance**. The verification tolerance for all *airflow ratings* shall be a minimum of 90% of rating plus 1 *cfm*.

AVII.4.2 **Associated Ratings**. Verification of a *DTF* shall not require verification of associated *NIA* ratings or testing of associated *product categories*. If a *DTF* fails verification or challenge, any associated *NIA* ratings shall be subject to

the verification or challenge resolution requirements of Sections 9.1.2.5 and 9.2.2.6, respectively.

APPENDIX VIII. SPECIAL REQUIREMENTS – KITCHEN RANGE HOOD CAPTURE EFFICIENCY

AVIII.1 Scope. This appendix contains requirements for relevant *product categories* that are listed in Table AI.1 of Appendix I, specifically, *kitchen range hoods* within the scope of *HVI Publication 917*. This appendix shall only apply where a *party responsible for certification* elects to provide an optional *kitchen range hood* capture efficiency (RHCE) rating. Where requirements in this Appendix differ from others in this publication, the requirements of this Appendix shall take precedence for relevant *product categories*.

Informative note: The scope of *HVI Publication 917* is limited to "wall-mounted" *kitchen range hoods* (e.g., undercabinet, chimney, and microwave/hood combination units).

AVIII.2 Test Method. RHCE shall be tested and rated according to *HVI Publication 917 - HVI Domestic Range Hood Capture Efficiency Testing and Rating Procedure*©.

AVIII.3 Certified Ratings

AVIII.3.1 **Derivation**. RHCE shall be derived from calculated test values, rounded to the nearest whole number, or *derated* further, and represented as a percentage (e.g., 83%).

AVIII.3.2 **Presentation**. Where RHCE rating points are presented, the associated *airflow rating* point shall be clearly indicated.

AVIII.3.3 **Minimum Number of Rating Points**. Each model that the *party responsible for certification* elects to certify for RHCE shall be rated for RHCE at a minimum of one certified *airflow rating*.

AVIII.3.4 **Multiple Discharge Configurations and Duct Sizes**. Models with selectable discharge configurations (e.g., vertical and horizontal) and/or duct sizes shall be rated for RHCE at the lowest certified airflow across the available discharge configurations and duct sizes, at the speed setting selected by the *party responsible for certification*. RHCE shall be certified for other discharge configurations, duct sizes, and speed settings at the discretion of the *party responsible for certification*.

AVIII.3.5 **RHCE Curve.** Development of an RHCE curve shall be permitted where the same airflow rating points are used as were used to generate the model's certification airflow curve. A minimum of five airflow curve points shall be required for generation of an RHCE curve.

AVIII.3.6 **Sound Performance.** Sound ratings shall be required at each *airflow rating* point that the *party responsible for certification* elects to certify.

Exception 1 to AVIII.3.6. Where an NIA *airflow rating* point is used for the RHCE testing, a corresponding sound rating shall not be required for the rated RHCE.

Exception 2 to AVIII.3.6. Sound ratings shall not be required at every RHCE rating point used to generate the RHCE curve.

AVIII.4 Verification and Challenge of RHCE Ratings. All models certified for RHCE shall be subject to verification and/or challenge of RHCE ratings.

AVIII.4.1 **Tolerances for Verification and Challenge.** All products shall achieve no less than their certified RHCE rating minus 10 RHCE points.