

HVI Publication 920©
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HVI® PRODUCT PERFORMANCE CERTIFICATION PROCEDURE INCLUDING VERIFICATION AND CHALLENGE©



This publication describes
the requirements and procedures for the
certified performance ratings program
for residential ventilation products
administered by The Home Ventilating Institute®

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HOME VENTILATING INSTITUTE®
PRODUCT PERFORMANCE CERTIFICATION PROCEDURE
INCLUDING VERIFICATION AND CHALLENGE

The History of HVI®

The Home Ventilating Institute (HVI) was incorporated as a trade association in 1955. From the first, it has focused on residential ventilating products information for Members and consumers.

The History of HVI's Product Certification Program

HVI began to certify residential ventilation products' 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 independently procured from the marketplace. HVI's certification programs are continuously being refined. This edition of *HVI Publication 920* represents HVI's latest progress.

Disclaimer

Final recourse for consumers, competitors, Members and any other entity seeking any remedy for product certification and/or performance disputes is with the involved parties, not with HVI.

Units of Measure

Units of measure used herein are the inch-pound (IP) system because of present residential preferences. Values in IP units may be converted to the International System of Units (SI) units using conversions found in the *ASHRAE Handbook of Fundamentals, chapter on Units and Conversions*.

Related HVI 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*©

Forms and Instructions

Forms and instructions required for the HVI Certification process are made available to authorized companies.

TABLE OF CONTENTS

Section 1. Introduction, Basis, Purpose, Overview and HVI Label	3
Section 2. Scope of This Publication	5
Section 3. Definitions	5
Section 4. General Certification Requirements	11
Section 5. Procedure for Certifying Base Models	15
Section 6. Certifying Derived Models – Requirements and Procedures	17
Section 7. Presenting HVI-Certified Ratings – Form and Format	19
Section 8. Record Keeping and Maintenance of HVI Certification Records	24
Section 9. HVI Verification – Requirements and Procedures	26
Section 10. HVI Challenge – Requirements and Procedures	31
Section 11. Lab Reports	35
Section 12. File Reviews.....	36
Section 13. Verification of Products Not Certified by HVI	36
Section 14. Maintenance of <i>HVI Publication 920</i>	38
Appendix I. Product Categories, Tolerances, Requirements	40
Appendix II. Special Requirements – Exhaust Products.....	43
Appendix III. Special Requirements – HRVs, ERVs, and CATUs.....	47
Appendix IV. Special Requirements – Combination Rating	51
Appendix V. Special Requirements – Static and Passive Vents.....	53
Appendix VI. Special Requirements – Integrated Supply and Exhaust Ventilators	54
Appendix VII. Special Requirements – Duct Termination Fittings	59
Appendix VIII. Special Requirements – Range Hood Capture Efficiency	60

HVI PRODUCT PERFORMANCE CERTIFICATION PROCEDURE INCLUDING VERIFICATION AND CHALLENGE

1. Introduction, Basis, Purpose, Overview, and HVI Label

- 1.1. **Introduction.** HVI Certification of product performance is a voluntary, cooperative, competitively policed program for obtaining, maintaining, and verifying performance ratings of residential ventilation products, and for presenting those ratings, administered by the Home Ventilating Institute.
- 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 certifying Member.
 - 1.2.1. All product testing for HVI Certification is done in accordance with American National Standards Institute (ANSI), Standards Council of Canada (SCC), and ISO/IEC consensus standards.
 - 1.2.1.1. HVI prescribes specific procedures for product testing within the ANSI and SCC standards.
 - 1.2.2. Testing for certification must be done in an HVI-designated third party laboratory or an HVI-approved first party laboratory. Tests from unauthorized laboratories are not eligible for consideration as part of the HVI Certification process.
 - 1.2.2.1. Since the list of HVI-designated third party labs may change over time, HVI will accept lab reports from those third party labs which were HVI-designated on the date shown on each lab report, provided the reports contain all the required information to qualify for certification on the date of the certification request. (See Section 6.1.1.1. for additional clarification.)
 - 1.2.3. Members apply to HVI for certification based on appropriate test reports. HVI reviews the application materials and grants certification if they are judged to be in accordance with HVI's prescriptive requirements, resulting in uniform and comparable ratings.
 - 1.2.4. The vigilance and quality control of every HVI Member enables them to be confident their products in the field will achieve their certified ratings.
 - 1.2.5. HVI's annual Verification Program enhances and strengthens the integrity of HVI Certification.
 - 1.2.6. The vigilance of every HVI Member, especially using the HVI Challenge procedure, ensures products will continue to perform as expected.

1.3. Purposes of HVI Product Certification.

- 1.3.1. To provide uniform, comparable, and impartial HVI-Certified performance ratings, in accordance with HVI procedures for testing, labeling and cataloging Member's products.
- 1.3.2. To enable designers, builders, consumers, code officials, and manufacturers, as well as Members, to confirm and compare ratings.
- 1.3.3. To ensure users that HVI-Certified products deliver the performance claimed.
- 1.3.4. To ensure fair competition.
- 1.3.5. To provide a readily available source of comparative data on residential ventilation products.

1.4. Overview of HVI Product Performance Certification. The program has four essential elements: Certification, Verification, Challenge, and Presentation of product performance ratings in the marketplace. Following are introductory overview descriptions of selected elements of HVI Certification, details of which are found in this and other HVI publications.

- 1.4.1. Certification is issued by HVI after a Member makes proper application, accompanied by a valid and complete test report from an HVI-designated third party laboratory or HVI-approved first party laboratory, all as prescribed herein.
- 1.4.2. The annual HVI Verification process requires random marketplace procurement by HVI of HVI-Certified products, with no participation by the Member. (Exception: refer to Section 9.1.3.2.) HVI provides the product to an HVI-designated third party laboratory for testing to verify that HVI-Certified products are continuing to deliver the expected performance. Procedures for resolution of any problems are described in this document.
- 1.4.3. The HVI Challenge process enables one Member to question, with a basis, the published performance of another Member's HVI-Certified product. HVI procures on the open market and tests the product (similar to Verification). Procedures for resolution are described in this document and the loser pays HVI the costs of the Challenge.
- 1.4.4. Presentation of HVI-Certified product performance ratings in the marketplace is regulated to provide realistic and comparable ratings in HVI Members' collateral materials.

- 1.4.4.1. Misrepresentation of product performance is prohibited. (Refer to Sections 3.11., 4.8., 4.24., and 4.25.)
- 1.4.5. *HVI Publication 911: HVI-Certified Home Ventilating Products Directory*© enables easy product comparisons. Procedures and requirements for presentation of ratings are described herein.
- 1.5. The HVI Certification Label is required to be affixed to HVI-Certified products in conjunction with the HVI-Certified ratings, and in accordance with rules governing its use. See *HVI Publication 925*.

2. Scope of This Publication

- 2.1. This procedure covers certification of products used in and/or suited for residential and/or light commercial building construction applications for which HVI has adopted a certification program. Refer to Sections 3.15., and 3.26. for building construction application definitions.
- 2.2. This procedure covers those product performance parameters (including, but not limited to airflow, sound level, and energy performance) for which HVI has adopted a certification program.
 - 2.2.1. Not all parameters are certified for all products. Products for which HVI has adopted a certification program, and the specific parameters and requirements for those products, are listed in the Appendices.
- 2.3. The elements of HVI product certification are described in this publication to ensure consistent, fair and equitable administration of the program.
- 2.4. This document describes the HVI Certification program requirements. It is arranged in an explanatory manner to assist HVI Members participating in the programs, and for the information of those who depend on the ratings.
- 2.5. This procedure refers to product testing in general language. For specific test methods and requirements, refer to the applicable HVI publications and their related test procedures. Information more specific to product categories adopted by HVI can be found in the Appendices of this publication.

3. Definitions

- 3.1. Airflow rating - Quantity of airflow a product will produce at the specified rating point static pressure, measured in cubic feet per minute (cfm).
- 3.2. Base model - The model initially certified from which certification for other models may be derived. (See also Derived model.)

3.2.1. A base model which is tested for purposes of establishing performance data from which other products will be derived but which itself is not manufactured, marketed, or sold will be designated as a “non-production base model”. Certification of derived models may be based on qualifying non-production base models. Performance ratings for non-production base models approved by HVI will not be published in the HVI-Certified Home Ventilating Products Directory but will nevertheless be considered certified by HVI.

3.3. Blending ventilator – Ventilator that mixes two or more airflows for distribution throughout the house. (See also Integrated Supply and Exhaust Ventilator.)

3.4. Cfm – Cubic feet of air per minute, ft^3/min , at 0.075 lb./ ft^3 , HVI’s “standard” density. The unit of measure for airflow ratings.

3.5. Delist – Process whereby a model loses its HVI certification and is removed from the HVI-Certified Home Ventilating Products Directory.

3.6. Derived model – A model whose certification is derived from another (base) model. (See also Base model.)

3.7. Direct discharge fans – Exhausters that mount in an exterior wall, discharging air directly to the outdoors without ductwork.

3.8. Ducted products – Ventilating products that utilize ductwork to move air between the indoors and outdoors.

3.9. Family of products – 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 Base model, and Derived model.)

3.10. HVI-Certified Home Ventilating Products Directory – Official publication of HVI-Certified product ratings. Often referred to as “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 HVI Member is confident its HVI-Certified product will achieve if picked up in the field and tested in accordance with verification procedures at an HVI-designated laboratory.

3.12. HVI Member (or Member) – An organization (business) that has met all requirements for HVI membership and has been accepted into the membership (see HVI Bylaws). For HVI product performance certification, there is a provision for non-Member participation (see Section 4.23).

- 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. Light commercial – HVI certifies products which are used in and/or suited for residential or light commercial building construction applications. The term “residential” is defined below. The term “light commercial” as used herein describes building construction in which a product within HVI’s scope is installed and used in a similar manner as in a residential ventilation installation. Examples include gas stations, motels, college dormitories, restaurants, and small offices.
- 3.16. Net free area, tested – Net free area of a static ventilating device based on an actual airflow test of the product in accordance with the HVI procedure listed in Appendix V.
- 3.17. Nominal duct system – A hypothetical duct system that is deemed to be representative of a kitchen range hood’s typical installation. See Appendix II, Kitchen Range Hoods – Particular Requirements for details.
- 3.18. Nominal installed airflow (NIA) – A normalized airflow rate calculated by applying the normalized airflow curve ratio to the airflow determined by the intersection of a kitchen range hood’s test report airflow curve and the nominal duct system curve. See Appendix II, Kitchen Range Hoods – Particular Requirements for details.
- 3.19. Normalized airflow curve – An airflow curve that precisely represents a product’s airflow performance relative to the basic static pressure rating point. A normalized airflow curve is used for ratings in addition to the basic rating point. It is developed by applying the normalized airflow curve ratio to the HVI 916 airflow test report data points. See Appendix I for details. (See also 3.20. and 7.2.5.).
- 3.20. Normalized airflow curve ratio (NCR) - The ratio between the airflow performance rating and the tested airflow performance, both at the basic static pressure rating point, used to develop the data points for a normalized airflow curve. The NCR is always less than or equal to unity.
- 3.21. 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.

3.22. 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.

3.23. 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 (see Appendices).

3.24. Probationary model or product (probationary ratings) – A model that originally had HVI-Certified ratings, but failed an HVI verification or challenge test. Provisions regulating probationary models are described in other sections of this procedure.

3.25. Product categories – The standard 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:

- 3.25.1. Bathroom exhaust fan – A fan primarily intended for exhausting air from a bathroom.
- 3.25.2. Bathroom combination unit – A bathroom exhaust fan that includes other function(s), such as lighting and/or heating.
- 3.25.3. 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.
- 3.25.4. Downdraft kitchen exhauster – A ducted exhauster located adjacent to the cooking function at or near countertop level, sometimes integral with the range. A downdraft kitchen exhauster has an air inlet for removing and exhausting cooking contaminants. A downdraft kitchen exhauster utilizes a relatively high volume of air to capture contaminants by velocity. Includes non-powered downdraft kitchen ventilator.
- 3.25.5. Duct termination fitting – A ducted fitting mounted at the end of a duct. This includes indoor duct inlets and outlets and outdoor duct inlets and outlets.
- 3.25.6. Energy recovery ventilator (ERV) – A mechanically powered ventilating device with separate intake and exhaust air streams and a heat exchanger to transfer a portion of the total energy (heat and moisture) from one air stream to the other.

- 3.25.7. 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.
- 3.25.8. Heat recovery ventilator (HRV) – A mechanically powered ventilating device with separate intake and exhaust air streams and a heat exchanger to transfer a portion of the sensible energy (heat) from one air stream to the other.
- 3.25.9. Inline fan – A fan designed to be located within the building structure with ductwork on both intake and exhaust.
- 3.25.10. Integrated supply and exhaust ventilator (ISEV) – A ventilating device with both exhaust and supply systems that mixes the fresh air with a certain amount of recycled air. Sometimes called a balanced ventilator.
- 3.25.11. Kitchen fan – A ceiling or wall mounted, ducted or direct discharge, exhaust fan for exhausting contaminants from a kitchen.
- 3.25.12. Kitchen range hood – A ducted exhauster for use over cooking equipment that captures contaminants by buoyancy and exhausts them. May be a dual-function appliance incorporating microwave and/or clock function, for example. Includes non-powered kitchen range hoods. Ductless range hoods are excluded.
- 3.25.13. Other room exhaust fan – An exhaust fan for mounting in the ceiling or wall of any room. The fan may or may not be suitable for use in a kitchen.
- 3.25.14. Non-powered kitchen ventilator – A kitchen ventilator without an air-moving device, intended for use with a separate power unit. Included are standard (catalogued) range hoods, specialty range hoods, and downdraft kitchen ventilators. The non-powered kitchen ventilator and separate power unit may or may not be offered by the same manufacturer.
- 3.25.15. Powered attic ventilator (PAV) – An exhaust fan intended to remove air from an unoccupied attic.
- 3.25.16. Range hood power unit – An interior power unit offered separately for use with a non-powered kitchen ventilator.
- 3.25.17. 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 range hood shell, or a grille.

3.25.17.1. "Type B" remote exterior mounted ventilator – An exhaust fan which is used as a year-round low velocity whole house ventilation system. The fan is usually mounted on the roof and is ducted to an air intake grille at the ceiling. For purposes of distinguishing this product from other remote exterior mounted ventilators, HVI refers to this product as a "Type B" remote exterior mounted ventilator throughout its procedural publications including *HVI Publication 915*, *HVI Publication 916* and *HVI Publication 920*. No product distinction is made in the HVI CPD.

3.25.18. Separate interior power unit – An air-moving device offered for kitchen ventilation in connection with a non-powered kitchen ventilator. The standard HVI name for this category is range hood power unit.

3.25.19. Separate power unit for kitchen ventilation – A power unit offered separately for use with non-powered kitchen ventilators. The power unit may be a remote exterior mounted ventilator, range hood power unit, or inline fan, any of which may be offered for kitchen ventilation. The separate power unit and non-powered kitchen ventilator may or may not be offered by the same manufacturer. The definition does not include separate power units that are not offered for use in kitchen ventilation applications, even though they may be similar.

3.25.20. Static vent – A non-powered ventilating device intended to allow or provide airflow for attic, crawl space and other building structural spaces.

3.25.21. 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.

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

3.26. Residential (home) ventilation – Mechanical ventilation serving residential dwelling units (homes), as opposed to commercial, industrial, or institutional buildings. Residential ventilation, with few exceptions, serves a single dwelling unit whether it is in a single family or low- or high-rise building.

3.27. Sone – A unit for rating sound level that is linear and weighted to represent the response of the average human auditory system.

3.28. Testing laboratory, HVI-designated – An independent third-party laboratory that has been authorized by HVI to perform product testing for certification, verification and challenge. A list of HVI-designated 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.

4. General Certification Requirements

- 4.1. All parties seeking HVI certification must execute the HVI Certified Ratings Program Participation Agreement.
- 4.2. HVI product performance certification begins with standardized testing in accordance with HVI procedures using the most precise and repeatable methods available for the type of products involved. Testing is based on methods described in consensus-based testing Standards and carried out under narrowly prescribed testing procedures at an HVI-designated third party laboratory or authorized first-party laboratory. For details, refer to other HVI Publications and the standards on which they are based.
 - 4.2.1. When a model number 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 is permitted.
- 4.3. Members may apply for HVI-Certified performance ratings when confident the product will pass HVI verification testing. (See Section 9.) This requirement is fundamental and applies to all aspects of the program, including base model certification, derived model certification, product modifications and presentation of product performance ratings.
- 4.4. HVI Certification is appropriate for standard, commercially available, residential and light commercial ventilation products with brand names and model numbers. HVI-Certified products are usually produced in volume and are offered in printed literature under a specific brand name and model number.
- 4.5. HVI Certification relies primarily on simplified single number ratings that may be insufficient information for designers who plan to incorporate a certified product into a complex non-residential system.
- 4.6. HVI Certification is not appropriate for custom-made, one-of-a-kind, or commercial / industrial products. Other organizations administer programs for this class of products.

- 4.7. Both HVI-Certified ratings and licensed ratings from other certifying organizations may be presented on the same page, sheet or publication, as long as it is clear which ratings are certified by HVI.
- 4.8. Misrepresentations and/or deceptive use of the HVI certification program requirements for any model can subject the violating party to the suspension and/or revocation of certification(s) for other model(s), as well as administrative fines and public notification as set forth in HVI policy and other publications. This extends to statements, representations, published information by the Manufacturer/Member and its agents, dealers and distributors (“Contributory Misrepresentation”.)
- 4.9. Product certification is voluntary and can be selectively elected for models within a product category. Certifications are non-transferable between products. (Refer to Section 4.21.1.)
- 4.10. Specific requirements for product categories are found in the applicable Appendices of this publication.
- 4.11. Whenever an HVI Member decides to apply for a new certification for a product using the same model number as a previously certified product, the Member shall explain in writing to HVI how to differentiate between obsolete and current stock, so HVI is able to procure the latest version. This requirement applies for any such situation whether it is the result of verification, challenge or a product design change.
- 4.12. Modification of a model, including any change or substitution (e.g., of components or configuration) that will adversely affect the HVI-Certified performance, requires that the product be re-tested and re-certified. It is the Member's responsibility to evaluate and control changes that affect the Member's confidence in every HVI-Certified performance parameter.
- 4.13. A Member may make application for certification of a “derived” model, basing the request on the test and ratings of a certified base model. (See Section 6 for requirements and procedures.)
 - 4.13.1. Each model submitted for certification must meet all applicable requirements in effect at the time of the submission.
- 4.14. Safety Listing. HVI-Certified products shall be listed or certified for safety with a recognized laboratory if an applicable program exists for the category.
- 4.15. HVI Label and Ratings Markings. The HVI-Certified Label shall be affixed to all HVI-Certified products, and the HVI-Certified ratings shall appear in conjunction with it. See *HVI Publication 925* for details regarding the HVI-Certified Label and its use.

- 4.15.1. All HVI-Certified products shall be permanently labeled with sufficient detail enabling consumers to determine the brand, model, or manufacturer as necessary to ensure identification for warranty or replacement purposes. These markings must be in a location which remains reasonably accessible to the consumer during routine maintenance of the installed product.
- 4.16. HVI-Certified ratings shall be shown in a manner consistent with HVI requirements wherever presented, including catalogs, website and literature. Catalog approval by HVI is not required before printing, but HVI welcomes requests for assistance in meeting HVI's ratings presentation requirements.
 - 4.16.1. HVI shall enforce presentation of HVI-Certified ratings in catalogs and literature. Enforcement shall be of a helpful nature, but if results are not forthcoming, and/or if the Member is not responsive, HVI shall protect its certified ratings program through increasingly rigorous measures.
- 4.17. If a Member misrepresents a product's certified ratings in its literature or abuses HVI Certification through its marketing or sales collateral, website or promotions, HVI can require the Member to cease distribution of such literature and information, and/or require the Member to correct such misrepresentation. Additionally, HVI can implement other measures to protect the marketplace and HVI's Certification Program. See Section 4.8.
- 4.18. Every HVI-Certified product shall have a production date code. The date code is usually the same one as safety listing organizations already require on every product. HVI shall verify compliance with this provision and remind and/or enforce it at appropriate opportunities including verification and challenge.
 - 4.18.1. If there is a question of when a product was produced, such as in connection with a Verification or Challenge, the date code on the product shall be used to determine date of manufacture by HVI and by competing Members.
 - 4.18.2. If the Member's date code is in a cryptic style that would defeat the intent of this requirement, the translation of the code shall be provided to HVI for the product and period in question.
- 4.19. The HVI CPD is HVI's instrument for publishing all current HVI-Certified product ratings. HVI shall publish updates to current ratings at least monthly and post each new version on the HVI website.

- 4.19.1. When a model is delisted, the manufacturer must:
 - 4.19.1.1. Immediately cease shipment of delisted units displaying the HVI-Certified label;
 - 4.19.1.2. Immediately cease labeling delisted units as HVI-Certified;
 - 4.19.1.3. Remove HVI references from all marketing materials, spec sheets, website, et al within thirty days;
 - 4.19.1.4. Before shipping delisted products within the manufacturer's control, cover or remove HVI-Certified labels and references.
- 4.20. 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 Member or downstream supplier, except as described as a normal part of the program.
- 4.21. HVI shall publish all certified ratings as soon as practical after issuance, but not before the date requested by the Member. A product becomes certified when HVI publishes its ratings. If queried, HVI shall provide certified ratings, and whether they are current, valid, and in good standing. HVI shall not release any other information about any product's certification without the Member's consent.
 - 4.21.1. Derived models may not be considered HVI-Certified solely on the basis that another model in the same product family is HVI-Certified. Each unique model number must be listed in the HVI CPD in order to be considered HVI-Certified. A model number that does not appear in the HVI CPD is not HVI-Certified. (Exception: See Section 3.2.1.)
- 4.22. In the event there is a disagreement related to any aspect of the HVI product certification program, the Appeals Process described in the HVI Quality Manual is the means for resolution.
- 4.23. This procedure is not intended to exclude non-Members from participating in HVI product performance certification. To participate, a non-Member is required to meet certain appropriate participation criteria intended to protect and preserve the value and integrity of the HVI Certification program and to enable HVI enforcement for those reasons.
 - 4.23.1. The applicant, whether a Member or non-Member, must demonstrate that it meets relevant HVI membership criteria as defined in the HVI Bylaws.

- 4.23.2. An applicant which qualifies for participation in the HVI-Certified Ratings Program as an Original Equipment Manufacturer (OEM) may apply for certification of its products following a vote of approval by the HVI Board, execution of the HVI Certified Ratings Program Participation Agreement, and payment of an initial fee.
- 4.23.3. An applicant which qualifies for participation in the HVI-Certified Ratings Program as a Private Labeler may apply for certification of its products following execution of the HVI Certified Ratings Program Participation Agreement.
 - 4.23.3.1. Note that product listings for non-Member Private Labelers are managed by the affiliated Original Equipment Manufacturer.

- 4.24. Authorized companies shall meet all certification requirements including ratings presentation.
- 4.25. HVI shall enforce certification requirements consistently and fairly for authorized non-Member companies as well as HVI Members.

5. Procedure for Certifying Base Models

- 5.1. Testing. The Member shall arrange for testing as described below.
 - 5.1.1. Preparation. Preparation of a product for testing may include certain mountings, etc., as described in the HVI test procedures. The product shall not be specially prepared or tuned because ratings represent performance of production products.
 - 5.1.2. Submittal. HVI Members shall submit the product to an HVI-designated third party testing laboratory or authorized first party laboratory for HVI product certification testing. The HVI Member shall designate the desired tests and the ratings that the Member expects to certify.
 - 5.1.2.1. Required forms can be obtained directly from each HVI-designated laboratory.
 - 5.1.3. Laboratory testing. The HVI-designated third party laboratory or authorized first party laboratory shall test in accordance with the current HVI test procedure publications and their foundational standards.
 - 5.1.4. Test Report. The laboratory shall furnish the Member a copy of a test report that includes the model number of the product tested, performance data, sufficient photographs to document the test set-ups, and any other item appropriate to the product and test.

- 5.1.5. Fees for testing. Fees for product certification testing at HVI-designated third party labs are to be paid directly to the testing laboratory by the Member requesting the testing. Laboratory testing fee schedules are negotiated by HVI from time to time and a copy of the current fee schedule is available from each testing laboratory.
- 5.2. Application for certification. The Member who submitted the product for testing will ensure submission of the following items to HVI in application for certification.
 - 5.2.1. A copy of the complete test report, including sufficiently clear copies of the photographs to document the test setup, shall be requested from the testing laboratory to be sent directly to HVI. HVI will not accept lab reports which are not provided directly from an authorized laboratory.
 - 5.2.2. A completed Product Certification Request. The online form is available to authorized companies.
 - 5.2.2.1. Information required includes, but is not limited to, the name of the company requesting certification, the brand name of the product, the model number of the product, the test report identification number and date, the specific performance certification ratings requested for all applicable parameters, and the earliest date the Member wishes HVI to communicate the ratings. See the Appendices for product- and parameter-specific requirements.
 - 5.2.3. Sales literature, or product specification sheet, describing the product tested must be submitted to HVI within thirty days of the date of the certification request. Upon review of the materials by HVI, the Member will have an additional thirty days to make any revisions necessary in order to comply with program requirements. If the materials are not in compliance with program requirements within ninety days of the date of the certification request, the affected models will be delisted.
 - 5.2.4. Evidence of listing by a safety agency (such as Underwriters Laboratories).
 - 5.2.4.1. Because of sequence, safety listing may not be available at the time HVI certification is requested. HVI is not required to withhold initial certification for failure to provide proof of safety listing. However, HVI shall verify safety certification whenever a product is picked up in the field for verification or challenge. HVI may verify safety listing or certification by calling the safety agency for confirmation at any time.

- 5.3. Issuance of certification. HVI will review the materials submitted and if all requirements have been met, and if everything is in order, will issue certification.
 - 5.3.1. Communication and publication of certified ratings. After issuing certification, and after the Member-requested earliest date of publication, HVI is free to communicate the certified ratings and will publish the ratings in the next edition of the HVI CPD. (Not Listed = Not Certified.)
- 5.4. Re-application. Any request for product certification which is rejected by HVI may be corrected and resubmitted immediately.
 - 5.4.1. Any product which has been subject to any adversarial action as a result of any misrepresentation or false statements is ineligible to be resubmitted for certification until one hundred and eighty days after the final disposition of the violation resolution procedure.

6. Certifying Derived Models – Requirements and Procedures

- 6.1. Requirements
 - 6.1.1. A Member may make application for certification of a "derived" model, basing the request on the lab report(s) of a certified base model for which the Member already holds HVI Certification, provided the reports contain all the required information to qualify for certification on the date of the certification request.
 - 6.1.1.1. Exception to 6.1.1. If, during the review of a certification request for a derived model, a lab report is found to be deficient in some way which is the result of a non-performance-based requirement rather than a performance-based requirement (e.g., due to changes in program requirements which occurred after certification of the base model), the certification request may be approved provided all other program requirements are met.
 - 6.1.2. The derived model may be certified if it only differs from the 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 with all certification, the Member's confidence in the model's performance is required.
 - 6.1.3. Derived model certification shall not be used to avoid testing products that differ significantly from the base model.

- 6.1.4. Performance, test, and rating representation issues with one model number in a family of model numbers shall result in the appropriate effect for the entire family because one test is the basis of the entire family's certification. (i.e., references to a model number within this procedure, including verification and challenge, apply to its entire family.)
 - 6.1.4.1. In the specific case of a failed verification or challenge test resulting in withdrawal or re-certification of the failed model number or its ratings, the entire family shall be withdrawn or must be re-certified.
 - 6.1.4.1.1. Exception: If a de-rated derived model passes verification or challenge tests, but test results would not be passing for other models in the family that are not de-rated, those other models may be subject to a verification test.
- 6.1.5. An HVI Member may make application for certification of a derived model for another HVI Member based on the first Member's base model. (Private label certification is permitted.)
- 6.1.6. An HVI Member may make application for certification of a derived model for a non-Member based on the Member's base model. The Member then assumes responsibility for any problems and enforcement. Non-Member private label certification is permitted under the Member's control.
- 6.1.7. Application for private label certification is the responsibility of the Member responsible for the base model.
- 6.1.8. Before HVI can approve any requests for derived private label product certification, the Member or non-Member desiring the derived private label certification shall be required to demonstrate it meets the qualifications for Regular membership as described in the HVI Bylaws and execute the required legal documentation including, but not limited to, the HVI Certified Ratings Program Participation Agreement (see Section 4.1).

6.2. Procedure

- 6.2.1. Certifying a derived model follows a procedure similar to certifying a base model, with variations described in this Section. A Member shall submit a Request for Product Certification to HVI as described in Section 5, Procedure for Certifying Base Models.

- 6.2.1.1. All certification information about the base model is required including, but not limited to, brand name, model number, test report date and model number.
- 6.2.1.2. The Member shall describe in writing to HVI the difference between the derived model number and the base model number, all in confidence.
- 6.2.2. HVI shall review the request and its attachments and evaluate the described differences between the base and derived models.
 - 6.2.2.1. If HVI's review finds that the base model and the derived model have no inappropriate differences, the base model is in good standing, and all submittal materials have been received, they shall issue certification for the derived model.
 - 6.2.2.2. If the evaluation of the described differences between the base model and the derived model causes HVI to be concerned that the difference may have a negative effect on performance, HVI shall request appropriate action from the Member before issuing HVI Certification. The requested action may include furnishing HVI with inspection models or a proof test of the derived model.
- 6.2.3. HVI shall issue product certification for the derived model in the same way it issues it for base models, after everything is in order.

7. Presenting HVI-Certified Ratings – Form and Format

7.1. General Requirements

- 7.1.1. HVI-Certified Ratings shall be presented as prescribed below wherever the ratings are presented including on products, packaging and associated literature. (See Section 1.5.)
- 7.1.2. "Rounding to the nearest" follows 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.
- 7.1.3. This section describes general requirements. Particular requirements for each product category are found in the applicable Appendices. Appendix I contains a guide to the proper Appendix for each product category.

- 7.1.4. Consistency of HVI ratings between categories is a primary objective; therefore, differences between product categories must be logical and explainable. Nevertheless, functional differences exist between categories. If there is a conflict between this section's requirements and those in the category's Appendix, the Appendix shall take precedence.
- 7.1.5. See Appendix I for conversion of units of measure between IP and SI units.
- 7.1.6. Products with selectable discharge configurations (e.g., vertical and horizontal) and/or duct sizes shall be rated for every discharge possibility and duct size supplied with the product.
- 7.1.7. Multiple speed products' basic ratings shall be at maximum speed; ratings at other speeds are optional. (See also specific requirements and exceptions in the Appendices.)

7.2. Airflow ratings

- 7.2.1. Shall be expressed in cfm, in whole numbers. See Appendix I for SI units.
- 7.2.2. Shall be rounded down to the nearest 10 cfm. (Varies for certain categories; see the Appendices.)
- 7.2.3. In case more than one rating is to be certified by HVI, the basic rating is always required for each configuration and rated speed setting and shall be rounded down to the nearest 10 cfm as indicated. Additional rating points shall be derived from a normalized airflow curve to the nearest whole number. (See "normalized airflow curve" below, and Appendix I.)
 - 7.2.3.1. Exception: Duct termination fitting rating points shall be derived from the test airflow curve, rounded down to the nearest whole number.
- 7.2.4. Presenting ratings. For those products with more than one HVI-Certified airflow rating point, each rating point shall be identified by expressing its static pressure (P_s) in inches of water ("w.g."). Products with a single rating point may list the static pressure along with the airflow rating. (See Appendix I for SI units.)
- 7.2.5. The HVI normalized airflow curve is a standard method of representing an HVI-Certified product's airflow performance at static pressures in addition to the standard static pressure rating point for the category.

Due to HVI-prescribed rounding, the test report airflow curve must be normalized for it to agree with the HVI-Certified rating(s). For a description of the procedure for development of an HVI-acceptable normalized airflow curve, see Appendix I. The normalized airflow curve has several purposes including those described below.

- 7.2.5.1. First, when a product has more than one HVI-Certified airflow rating point, either required or optional, the first (basic) rating point may generally be used to create a normalized airflow curve, and it becomes the source of additional ratings. (See the Appendices for product categories that permit or prescribe more than one rating point, and those that require testing rather than the normalized airflow curve.)
- 7.2.5.2. Second, a Member may wish to publish an airflow curve based on the certification test, in addition to the HVI prescribed single number rating(s). The resulting normalized airflow curve is not HVI-Certified, but is constructed in accordance with HVI procedures, and is in agreement with the HVI-Certified Rating(s).
- 7.2.5.3. Third, special rating points may be required for unique jurisdictions that require rating at other than the prescribed HVI static pressure. For those, HVI Members may obtain HVI Certification and present unique ratings in addition to those prescribed herein by following the normalized airflow curve procedure in Appendix I.
- 7.2.5.4. It is optional but not required that such unique ratings be displayed in conjunction with the label, on the product, in the literature, or on the carton. Members may issue published supplement(s) presenting unique HVI-Certified ratings.
- 7.2.5.5. Such ratings may appear in the HVI CPD, at the Member's request, and are subject to HVI Verification and Challenge.

7.3. Sound (loudness) ratings

- 7.3.1. Shall be expressed in sones according to the rounding rules below.
 - 7.3.1.1. Greater than 1.5 sones shall be rounded to the nearest 0.5 sones.
 - 7.3.1.2. From 0.3 sones to and including 1.5 sones shall be rounded to the nearest 0.1 sones.
 - 7.3.1.3. Less than 0.3 sones will be rated <0.3 sones, because sound testing resolution is inadequate to differentiate more finely at lower levels.

7.3.2. HVI-Certified products shall be certified for sound performance, unless no sound certification procedure presently exists for that product category.

7.3.3. HVI-Certified products rated at more than one static pressure point shall be HVI-Certified for sound performance at each point if sound certification is available for the product category. For particular requirements for specific product categories, see the Appendices to this procedure.

7.3.3.1. Exception: When additional airflow ratings are based on the HVI normalized airflow curve procedure, HVI sound certification is not required for the additional airflow ratings. If included, additional sound ratings shall be HVI-Certified.

7.4. Energy ratings (for Energy-to-run-fan – for energy recovery products see Appendix III.)

7.4.1. At the Member's option, electrically operated HVI-Certified products may also be certified for energy required to operate them (designated as Energy-to-run-fan); requirements are described herein. Energy used for lights, sensors, heaters, timers, or night lights is not included in the determination of power consumption. This is not to be confused with energy recovery products for which energy certification is mandatory.

7.4.2. Shall be expressed in watts using three significant digits (e.g., 21.3 watts, 213 watts). Watts ratings under 10 shall be expressed with two significant digits instead of three.

7.4.3. Shall be rounded up to the third digit.

7.4.4. Energy-to-run-fan (watts) for specific products must be certified and published in the HVI CPD. The published value for watts shall be no less than the as-tested value corresponding to the speed setting, airflow, and static pressure of the rating point. Use of the correction factor based on air density has been abandoned.

7.4.5. Fan efficacy (cfm/watt) may also be expressed in Members' literature, provided it is based on a direct calculation of as-tested watts and whole cfm, using data from the airflow test report at the rating point. Fan efficacy (cfm/watt) is not an HVI-Certified parameter, but the HVI standard procedure for presenting fan efficacy is to round down to the nearest one decimal place (tenth). Members may optionally list fan efficacy at a lower value.

7.5. Energy recovery ratings

7.5.1. See Appendix III.

7.6. Net free area ratings

7.6.1. See Appendix V.

7.7. Speed ratings

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

- HS – highest continuous speed
- MS – medium speed
- LS – lowest speed
- WS – working speed (applicable to range hoods only; See Appendix II, Kitchen Range Hoods – Particular Requirements)
- BS – an additional speed available to provide more airflow or static pressure when required by field conditions. The boost may be:
 - Temporary (non-continuous speed boost, selectable by consumer as needed for various conditions)
 - Permanent (continuous speed boost, selectable upon installation which cannot be changed by consumer and which, by default, becomes the new highest speed)

7.7.2. For products 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 Member elects to certify three or fewer speeds using the nomenclature in Section 7.7.1. 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.

7.8. De-rating. Any Member company may apply for a lesser performance rating than is shown on the test submitted with the application for certification. The Member is required to have confidence the product will meet the ratings.

7.8.1. HVI airflow certification ratings may be less than the maximum allowed based on the test report. Airflow ratings shall still be in 10's of cfm as noted in Section 7.2.2. (Varies for certain categories; see Appendices.)

- 7.8.2. HVI sound certification ratings may be more than the minimum allowed based on the test report.
- 7.8.3. HVI Energy-to-run-fan(s) certification ratings may be more than the minimum allowed based on the test report.
- 7.8.4. HVI Energy Recovery certification ratings may be less than the maximum allowed based on the test report.
- 7.8.5. HVI Net Free Area certification ratings may be less than shown on the test report.
- 7.8.6. HVI-Certified performance ratings of derived models may be de-rated from the HVI-Certified performance ratings of the base model, or a base model may be de-rated while a derived model is not.
 - 7.8.6.1. Base and derived models must be equivalent in design and construction as described in Section 6.
- 7.8.7. De-rating shall not be used to avoid testing derived models that are not the same as described in Section 6.
- 7.8.8. HVI Certification is based on “single number” ratings for most products. A full fan performance curve based on HVI Certification testing may be presented in a Member’s literature and/or website. The curve is not HVI-Certified. (See also Section 7.25.)
 - 7.8.8.1. HVI has no routine procedure for enforcing the accuracy of these curves. Nonetheless, HVI may become involved as per Section 4.22. if it receives an inquiry about possible inconsistency. HVI shall not permit misrepresentation of data related to HVI Certification and shall protect its certified ratings program.

8. Record Keeping and Maintenance of HVI Certification Records

- 8.1. HVI shall maintain a file on each product it certifies. The file shall contain all items related to the product’s certification, including a copy of the test report (except for derived models), the Request for HVI Certification of a Product with attachments, and information documenting the history of all verification and challenge activity related to the specific model number.
- 8.2. Each Member shall maintain a similar file on its premises.
- 8.3. Either HVI or the Member may call upon the other to help maintain records, furnish missing copies, etc.

- 8.4. If a deficiency in the records is identified (e.g., missing lab reports), HVI shall allow the Member ninety days to resolve the deficiency before delisting the affected models.
- 8.5. Each Member that has derived or private label models shall furnish HVI information showing product ratings, identification data, test identification and the relationship between Base and Derived models.
- 8.6. Each Member shall keep a record of all consumer/marketplace complaints made known to the Member relating to a product's compliance with the relevant product performance certification requirements. Each Member must take appropriate action with respect to such complaints and any deficiencies found in products that affect compliance with the relevant product performance requirements for certification. Actions taken must be documented.
 - 8.6.1. Each Member must make these records available to HVI when requested.
 - 8.6.2. HVI shall compare information with the Member from time to time to verify consistency of record keeping.
- 8.7. Upon request from a Member competing in the same category, HVI shall make a certifying Member's product family information available to the competing Member.
 - 8.7.1. Sharing base and derived family information shall be limited to situations where it is not possible to identify clearly which family a certain product belongs to, and/or to identify all models within the family.
 - 8.7.2. Sharing base-and-derived family information shall be limited to one product family per request.
- 8.8. When a file is no longer active because a Member dropped a product, stopped doing business, etc., such files shall be retained by HVI a minimum of three years.
 - 8.8.1. Exception: When the product is a base model that other models derive their certification from, the file shall be retained by HVI a minimum of three years after all models in the family have been dropped.
- 8.9. Each Member is required to inform HVI, without delay, of changes which may affect its ability to conform to the certification requirements. Examples of changes include, but are not limited to, the following:
 - The legal, commercial, organizational status or ownership;
 - Organization and management (e.g., key managerial, decision-making or technical staff);

- Modifications to the product or the production method;
- Contact address and production sites (components manufacturing as well as final assembly sites);
- Major changes to the quality management system.

9. HVI Verification – Requirements and Procedures

9.1. Verification Requirements

- 9.1.1. Verification is required by HVI to assure and demonstrate the continuing validity of HVI Certification. Verification does not replace Challenge; the two procedures are complimentary in support of HVI Certification.
- 9.1.2. When an HVI-Certified product is selected for verification, all certified ratings shall be verified. (Exceptions: Sections 9.2.5.3. and 9.2.5.5. and Appendix III.)
- 9.1.3. HVI shall conduct at least one verification cycle each year. See Appendix I for the proper verification year for each category.
 - 9.1.3.1. Every Member shall have 10% of its product families tested each year from each product category in which the Member maintains HVI-Certified listings. Whenever 10% results in a fraction, normal rounding rules shall apply, with a minimum of one. Any product family containing models actively certified by ENERGY STAR will be excluded from HVI verification cycle selection. (See Appendix I for complete list of categories and for category groupings.)
 - 9.1.3.2. When, after reasonable efforts have been made, it is determined by HVI staff that a given model is not available for procurement through sources independent from the original equipment manufacturer (OEM) and/or brand owner, HVI may procure for testing three (3) samples of the given model directly from the OEM or brand owner's sales office or warehouse facility.
- 9.1.4. In addition to annual verification, HVI shall conduct special verification when HVI deems it necessary to demonstrate the continuing validity of HVI Certification, or to uphold or enforce the HVI Certification programs. Such verification will usually, but not necessarily, be focused on an area where there is reason to be concerned (e.g., a certain product category, a certain Member or Members, and/or products that have undergone certain changes) and requires the approval of the HVI Risk Assessment Committee (RAC).

9.1.5. Verification testing is conducted according to the most current version of *HVI Publication 920* in effect at the time each testing cycle is begun.

9.2. Procedure and schedule for normal HVI verification. The following procedure is to be followed annually.

9.2.1. HVI requests from each certifying Member the names and locations of at least three of its outlets where each of its certified products may be procured. (It may be necessary for a Member to provide more than three outlets in total, identifying the products or categories available in each.)

9.2.2. Each Member responds, in confidence, to the request.

9.2.3. HVI staff randomly selects the models to be tested from the current HVI CPD.

9.2.4. HVI procures the selected model(s) from one or more of the outlets, or other location it may choose. HVI pays for all products procured and then bills the expenses to the appropriate Member.

9.2.4.1. HVI has the test products delivered directly to the HVI-designated test laboratory.

9.2.4.1.1. Shipment of Test Unit: When ordering, HVI shall instruct the source to ship the selected unit either on skids or properly crated to the HVI-designated verification test laboratory.

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

9.2.5. The HVI-designated laboratory tests all units submitted, completing a test report for each one. Test procedures are the same as for initial certification (including accessories, test points, and set-up) except as follows:

9.2.5.1. Test witnessing by the Member shall not be permitted.

- 9.2.5.1.1. Verification testing set-up may be witnessed by the manufacturer of the product being verified. HVI will submit to the testing lab a list of the manufacturers desiring to witness set-up at the time verification product selections are submitted to the testing lab. The verification testing laboratory will notify the relevant manufacturers at least 5 business days ahead of time that a product is to be tested on a specific date. The manufacturer has 2 business days to indicate whether or not they wish to witness the verification test set-up. The manufacturer may not change the time or date of the verification test set-up or test.
- 9.2.5.2. A sufficient number of photographs shall be taken to demonstrate test set-ups, product packaging, labeling, installation manuals, product specifications, and condition of the unit(s) tested.
- 9.2.5.3. Range hoods and other products with optional (e.g., vertical or horizontal) discharges will be tested using the one designated by HVI.
 - 9.2.5.3.1. Exception to 9.2.5.3. HVI will test all discharges based on a Member's preference as specified in advance of a verification cycle. All tested configurations are subject to the same pass/fail criteria.
- 9.2.5.4. Sound tests will require careful test laboratory set-up because the Member will not be mounting the product on the test ceiling panel.
- 9.2.5.5. Products with more than three certified speeds will have one half of all certified speeds tested. The highest certified speed and the lowest certified speed (or working speed, if applicable) will always be tested. The remaining speeds are to be designated by HVI at the time of testing. In the case of an odd number of certified speeds, the number tested will be rounded up to the nearest integer, e.g., a nine-speed fan will have five speeds tested.
 - 9.2.5.5.1. Exception to 9.2.5.5. HVI will test all speeds based on a Member's preference as specified in advance of a verification cycle. All tested speeds are subject to the same pass/fail criteria.
- 9.2.6. HVI will analyze the test reports for pass/fail, in accordance with tolerances listed in the Appendices. The basis for analysis is the certified rating, not the initial test report. HVI will notify the Member, enclosing a copy of the test report.

- 9.2.6.1. If the product passes, no further action is required.

 - 9.2.6.1.1. In cases where three samples are procured (refer to Section 9.1.3.2.), lab representatives will randomly select two of the samples for testing. Both tested samples must meet or exceed all requirements for the product to be considered as having passed.
 - 9.2.6.2. If the product fails, all of its ratings are classed "probationary" and they must be resolved. If the failed model number is part of a product family, all models in the family are probationary.
 - 9.2.6.2.1. Even though probationary, for ninety days HVI shall answer inquiries with the regular ratings and not publicly reveal their probationary status, nor change the HVI CPD. The period of time is consistent with the ninety days the Member is given to describe corrective action (below).

- 9.2.7. Resolving failures in normal verification. Within thirty days of receiving notice of a test failure, the Member shall respond describing to HVI the corrective action selected. Options available to the Member include the following:
 - 9.2.7.1. Option 1: Request that HVI procure and test another unit.
 - 9.2.7.2. Option 2: The Member may submit a new Request for HVI Certification of a Product, with a new test report and all other attachments, requesting a new certification for the probationary model. In addition, the Member is required to inform HVI how to tell the difference between old and new products on the outside of the carton so that new products may be procured.
 - 9.2.7.2.1. HVI may decide to conduct immediately a special verification of the newly re-certified model.
 - 9.2.7.3. Option 3: The Member may immediately accept the verification test data and submit a new certification request for each model in the product family to be certified using the verification results.
 - 9.2.7.4. Option 4: The Member may immediately withdraw the model from the market.

9.2.7.5. Option 5: In cases where the verification failure is not performance-related, the Member may submit to HVI a "plan of action" for correcting the problem. The Plan shall describe the actions the Member will take to get the product into compliance within no more than sixty days.

9.2.7.5.1. The plan of action shall be reviewed by HVI to determine that it can be reasonably expected to correct the problem. If so, HVI shall notify the Member that the plan is acceptable.

9.2.7.5.2. A notice of completion shall be provided to HVI. Along with the notice of completion, the Member shall inform HVI how to tell the difference between old and new products on the outside of the carton so they may be procured.

9.2.7.5.3. HVI, at its discretion, may procure and test a unit after receiving the notice of completion, following procedures similar to the Verification procedures described above, and using Member information to be sure revised product is being tested. Administrative fees and costs incurred for this testing will be billed back to the Member for reimbursement to HVI.

9.2.7.6. Whenever a manufacturer fails to meet the deadlines for verification resolution, the failed model(s) within a product family will be automatically delisted from the HVI CPD.

9.2.8. HVI CPD. HVI will publish appropriate changes to certified ratings at its next issuance.

9.2.9. Costs of Verification. HVI will bill each Member, in advance and/or afterward, for all verification costs, including purchase, shipping and testing. HVI will add a standard fee for its administrative costs associated with verification.

9.2.10. Repeated verification tests. The preceding describes situations that indicate a need to procure a new unit and/or repeat a verification test. Among those reasons are: unit damaged in transit, unit is defective, and/or possible lab error during the test. The need for repeat testing may be determined by HVI and/or the Member. The Member shall be responsible for associated costs of the repeat testing except in cases where HVI determines lab error has occurred.

9.2.11. Verification review. As a normal part of the verification cycle each year, HVI will report the results of the verification as a whole at the next meeting of the general membership. HVI will identify the percent of each certified rating achieved in each test. The report will be divided by

product category showing the number tested in each. The purpose of the report is to enable Members to assess the overall condition of the HVI verification program.

- 9.2.11.1. Proprietary information will not be disclosed (if less than three Members are in any category, it will be reported as “all other”).

10. HVI Challenge – Requirements and Procedures

10.1. Requirements of HVI Challenge

- 10.1.1. The purpose of the HVI Challenge is to strengthen the HVI-Certified ratings program and to provide for resolving a documented dispute between HVI Members regarding HVI-Certified Ratings. The dispute may involve certified ratings and/or performance, or the presentation of ratings to the marketplace.
- 10.1.2. The procedure for HVI Challenge contains several deadlines. If a challenged Member misses those deadlines or chooses to ignore the challenge process, HVI may summarily withdraw the HVI Certification of a model number, notifying both challenger and challenged Member. In such cases, the model number shall be removed from the HVI CPD and HVI shall answer inquiries by stating that the model is not HVI-Certified.
- 10.1.3. The challenge process is carried out confidentially unless a model number fails a challenge, in which case results may become known as described below.
 - 10.1.3.1. During the normal course of a challenge, neither the challenger nor the challengee shall disseminate publicly nor within its distribution chain information about it or about its existence.
 - 10.1.3.2. In the event a product fails a challenge, that fact may be disseminated upon receipt of the report.
- 10.1.4. Where this section requires that a Member’s literature (catalog) be changed, the Member’s website shall also be changed. The time allotted for changing the website shall be not more than thirty days.
- 10.1.5. In Procedure for HVI Challenge, below, there are points where HVI may determine it is necessary to conduct a verification test in order to enforce and/or uphold the HVI Certification process. HVI shall identify such points and conduct verification whenever HVI considers it appropriate.

- 10.1.6. The cost of a challenge shall include the procurement costs, transportation costs, laboratory testing fees and HVI administration costs. All of HVI's costs associated with a challenge must be covered.
- 10.1.7. Informal challenges shall be received by HVI, especially with respect to possible misrepresentation of a certified product's performance in literature and/or website. HVI may receive such a challenge in the form of a formal letter from any source. HVI shall investigate and take action to protect its certification program.
 - 10.1.7.1. Depending on the scope of the allegations, informal challenges may not be required to follow steps of the challenge procedure described in this section.
- 10.1.8. Challenge testing is conducted according to the most current version of *HVI Publication 920* in effect at the time each challenge is initiated.

10.2. Procedure for HVI Challenge

- 10.2.1. When an HVI Member has reason to believe another Member's model number is not meeting its HVI-Certified ratings, or the ratings are being misrepresented, the first Member may initiate an HVI challenge.
- 10.2.2. The HVI Representative of the Member company considering a challenge shall contact HVI to verify the certified rating(s) of the model number in question and to get an estimate of the cost of the challenge.
 - 10.2.2.1. At the time of the pre-challenge inquiry the inquiring Member should ask HVI whether the model number is part of a family of models, and if so, request that HVI provide full base and derived information.
 - 10.2.2.2. If the model number that is the subject of the inquiry is already being challenged by another Member, HVI shall explain the challenge in detail to the inquiring Member's representative, who will be guided by the information, but will not publicize it.
- 10.2.3. After verifying ratings, the representative of the inquiring Member may initiate the challenge by writing a letter to HVI. A challenge is considered to be initiated only when all of the following items are received by HVI:
 - 10.2.3.1. Identification of the challenged model number.
 - 10.2.3.2. Identification of the challenged parameter(s) and the basis for challenging them.

- 10.2.3.3. Payment deposited with HVI for the estimated cost of the challenge.
- 10.2.4. Within one week after receiving a challenge letter, HVI shall notify the challenged Member (challengee) and provide them a copy of the challenger's correspondence.
- 10.2.5. Within three weeks after HVI notification of the challenge, the challengee shall respond to HVI in writing, providing the names of at least six outlets where the product may be procured, and choosing one of the following alternatives. (This is the first decision the challengee is required to make.)
 - 10.2.5.1. Accept the challenge.
 - 10.2.5.1.1. HVI will proceed with Challenge Testing, described below.
 - 10.2.5.2. Apply for a rating that is sufficiently adjusted to satisfy the challenger.
 - 10.2.5.2.1. HVI shall act as mediator to arrive at a mutually acceptable rating. If not successful in one week, HVI will proceed with Challenge Testing as described below.
 - 10.2.5.3. Delist the model.
 - 10.2.5.4. Submit a "plan of corrective action" that recognizes the deficiency and corrects the model number's performance so it meets requirements as soon as possible, but in no more than sixty days.
 - 10.2.5.4.1. The challengee shall immediately cease producing the model number and inform HVI of the schedule and of how to differentiate between old and new product on the outside of the carton.
 - 10.2.5.4.2. Within one week, HVI will forward a copy of the challengee's plan of corrective action to the challenger.
 - 10.2.5.4.3. Within one week, the challenger will notify HVI whether or not the response from the challengee is acceptable. If the challenger is satisfied with the corrected rating or the plan of action, and if both the challengee and HVI agree, the challenge may be dropped and the unused portion of the challenger's deposit will be returned. If not, the challenge proceeds.

10.2.6. Challenge Testing. Within three weeks, HVI shall procure the product, and have it tested at the HVI-designated laboratory in accordance with HVI Verification Test procedures. HVI shall notify both parties of results within two days of the test. HVI shall retain a copy of the test report in the product's file and send a copy of the test report and a pass/fail notice to both the challenger and challengee. The test report is confidential and shall not be disseminated by the challenger in any way. (The pass/fail analysis shall be based on the certified rating, not the initial test report.)

10.2.6.1. Pass. If the product is determined to have passed the challenge test, the ratings have been confirmed and are in good standing.

10.2.6.2. Fail. If the challenged product has failed, the model number's ratings, and all products in the family are classed "probationary" and they must be resolved. See: Resolution of Challenge Test Failure, described below.

10.2.6.2.1. Even though probationary, for ninety days HVI shall answer inquiries with the regular ratings and not publicly reveal their probationary status, nor change the HVI CPD. The period of time is consistent with the ninety days the Member is given to describe corrective action (below).

10.2.6.2.2. In the event the challenged Member disputes a test failure based on a laboratory set-up or process, they may ask HVI to order a re-test at that Member's expense.

10.2.6.2.2.1. The challenged Member may request 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.

10.2.7. Resolution of Challenge Test Failure. Within one week, the challengee shall choose one of the following actions. (This is the second decision the challengee may be required to make.)

10.2.7.1. Immediately accept the ratings from the challenge test, mark the product with the new ratings, and change all literature at the next printing.

10.2.7.1.1. The challenge test report then becomes the test report for the model and its family of models. A new certification request must be submitted for each model.

- 10.2.7.2. Immediately delist the model.
- 10.2.7.3. Immediately obtain a new certification from HVI, satisfying all requirements, including a new test report and information on how to differentiate between old and new product on the outside of the carton.
 - 10.2.7.3.1. If this option is chosen, HVI may, at its discretion, promptly verify performance of the new product through marketplace pickup.
- 10.2.8. HVI shall immediately notify the challenger of the challengee's choice, including the means of differentiating between old and new product, if applicable.
- 10.2.9. Costs. If the product passes the challenge, an invoice of actual costs less initial deposit will be sent to the challenger. If the product fails the challenge test, and/or if repeated tests are considered necessary, the challengee is responsible for costs. A final invoice of actual costs will be sent to the challengee and the challenger's initial deposit will be refunded.

11. Lab Reports

- 11.1. Lab report contents. Through the natural evolution of the program and the standards on which the program is based, the required contents in lab reports may change. Whenever possible, HVI will strive to collect this new data via mechanisms which will eliminate the need for actively certified models to undergo new certification testing in order to remain HVI-Certified. Additionally, distinctions between types of content is provided as a guide to further minimize widespread disruption of the program:
 - 11.1.1. Performance-based content: Data included in a lab 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 delisting. Every effort will be made to provide Members with as much advance notice as possible.
 - 11.1.2. Non-performance-based content: Data included in a lab report which is 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 delisting; however, special circumstances may arise which would require retesting. In those cases, every effort will be made to provide Members with as much advance notice as possible.

12. File Reviews

- 12.1. In accordance with ISO/IEC 17065, to which the HVI Certified Ratings Program is accredited, all HVI-Certified products must continue to fulfill program requirements throughout the life of the certification.
- 12.2. HVI staff will conduct regular file reviews of all HVI-Certified product listings within three months of a base model's fifth year of certification and more frequently as needed to ensure the integrity of the listings.
 - 12.2.1. File reviews may reveal noncompliance with performance-based or non-performance-based program requirements.
 - 12.2.1.1. HVI seeks to avoid major disruptions to the program which may arise when file reviews reveal nonconformities related to non-performance-based program requirements. When revealed, HVI staff will discuss the nonconformities with the Risk Assessment Committee which, at its discretion, may defer demonstration of compliance with non-performance-based requirements for a period of time to allow Members adequate opportunity to resolve the nonconformity.

13. Verification of Products Not Certified by HVI

- 13.1. Purposes of HVI Performance Verification Procedure for Products Not Certified by HVI.
 - 13.1.1. To provide uniform and impartial product performance testing, in accordance with internationally recognized and readily available procedures for testing and confirmation of the ratings of non-HVI-Certified products.
 - 13.1.2. To protect the safety and interests of the general public, designers, builders, consumers, code officials, HVI members, and non-HVI member manufacturers.
 - 13.1.3. To promote fair competition among all which manufacture products within the scope of the HVI-Certified Ratings Program.
- 13.2. Process for Verification of Products Not Certified by HVI.
 - 13.2.1. Assertion. The issuance of a statement to HVI Staff, by an HVI member, the HVI Certification Committee, or any other HVI-served party/stakeholder that the published ratings of a product not certified by HVI are substantially incorrect and that, as such, the interests of the general public and other stakeholders are compromised. An assertion

statement shall clearly and specifically describe the reasons HVI should initiate product testing and shall be accompanied by sufficient supporting data, e.g., current catalogs, brochures, website content, etc. to validate the assertion.

- 13.2.1.1. Where applicable, HVI Staff will provide a proforma invoice to the asserting stakeholder which includes the estimated cost of procurement, testing, and staff time associated with the verification testing of the product. The asserting stakeholder is required to provide a deposit to cover the estimated costs. A final statement will be provided upon conclusion of the testing process reflecting actual costs. Overages are required to be paid by the asserting stakeholder, regardless of the outcome of the testing. If actual costs are less than the deposit paid, the balance will be refunded by HVI to the asserting stakeholder.
- 13.2.2. Verification Testing. Upon receipt of the required deposit, HVI Staff will randomly procure via the marketplace two (2) samples of the product to be tested and ship them to the HVI-designated third-party laboratory and provide testing parameters as appropriate. The resulting lab reports will be provided, in confidence, to the HVI Staff.
- 13.2.3. Evaluation of Results. The HVI Staff will provide sanitized test results to a task group, members of which are appointed by the HVI Risk Assessment Committee (RAC), for evaluation. The RAC is responsible for ensuring the impartiality of the task group throughout the process. Task group members will be required to sign confidentiality agreements as appropriate. The task group will advise the RAC of its findings and recommendations.
- 13.2.4. Notification. Upon acceptance by the RAC of the task group's findings and recommendations, HVI Staff will notify, in confidence, the manufacturer of the tested product. If the findings indicate the advertised ratings do not match the test data, the manufacturer will be afforded due process to resolve the discrepancies prior to any public dissemination of the findings.
 - 13.2.4.1. Public release of findings shall be done in accordance with HVI Publication 925.

14. Maintenance of *HVI Publication 920*

- 14.1. *HVI Publication 920* is the basis for participation in and control of HVI's Certification program, one of its most valuable core processes. Therefore, it is vitally important that it be maintained with painstaking accuracy. On the other hand, it is important to enable constructive changes without unnecessary difficulty.
- 14.2. HVI shall offer the current version of *HVI Publication 920* on the HVI website for download in a non-editable (protected) form.
 - 14.2.1. The cover sheet of the publication shall indicate the Edition (year) and Version (date). The version date will relate to the date of publication.
 - 14.2.2. For best service to Members, customers, and consumers, the updated *HVI Publication 920* must be available on the website promptly, consistent with the drafting and review(s) required to ensure impeccable accuracy.
- 14.3. Maintenance of this document, and the HVI Certification process, is the responsibility of the Certification Committee.
 - 14.3.1. The Certification Committee and its Chair shall be responsible for managing and enforcing the appropriate drafting, editing and review structure for each change.
 - 14.3.2. The Certification Committee shall submit all substantive changes to the general membership for adoption at a regular meeting, or by letter ballot if deemed necessary.
 - 14.3.3. The magnitude and impact of a proposal to change *HVI Publication 920* shall be the basis for determining the appropriate structure for drafting, adopting, and incorporating such change. The appropriate process should be decided as part of considering the change.
 - 14.3.3.1. Substantive changes, especially those that cause significant change in the HVI Certification process, shall be processed and communicated carefully. Such changes may require approval by one or more groups, shall be approved by the HVI Certification Committee, and shall be finally adopted by the general membership.
 - 14.3.3.2. Very small changes or editorial explanations, as examples, may appropriately go through a simpler process and be incorporated into *HVI Publication 920* more promptly.

- 14.4. Presentation of proposals for changes to *HVI Publication 920* may be by any HVI Member, by any group of HVI Members, and by any committee of HVI.
 - 14.4.1. A change may be proposed in more than one way. For expeditious adoption, proposals should be as complete as possible in both substance and format. However, a proposal may be presented to HVI staff, who shall direct it appropriately. Alternatively, the Member may request an agenda item to present a proposal. In any case, the proposal must be presented with sufficient specificity for consideration.
 - 14.4.2. In response to a legitimate request, HVI will provide *HVI Publication 920* in an editable format for developing a proposal(s).
 - 14.4.3. When it is not practical to provide a proposal in complete format, the other methods may be used.
 - 14.4.3.1. A proposal may be written with thoroughness, but not in format, and adopted as presented or with minor amendment.
 - 14.4.3.2. If a proposal not written in *HVI Publication 920* format, or not thorough, is adopted, the Certification Committee Chair shall direct the drafting, approval, and incorporation of the final language into *HVI Publication 920*.
 - 14.4.3.3. When appropriate and convenient, a thoroughly drafted proposal may be provided along with *HVI Publication 920* as a temporary supplement until it is drafted into the sections and paragraphs of *HVI Publication 920*.
- 14.5. Periodically the Certification Committee may decide that a new edition of *HVI Publication 920* is in order. A new edition offers the opportunity for general revision and editing without changing the substance of the provisions in the publication.
- 14.6. Additional HVI Certification programs may be developed and added to this procedure upon adoption by the product group, the Certification Committee, and the general membership.
- 14.7. The Appendices to this procedure are considered to be part of the procedure and revisions of Appendices shall be administered the same as revisions of the body of the procedure.
- 14.8. Each new edition of *HVI Publication 920* will be registered for US copyright.

APPENDIX I. PRODUCT CATEGORIES, TOLERANCES, REQUIREMENTS

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 categories. If requirements for specified items such as testing, ratings, and tolerances in a category's Appendix differ from the general requirements in this Appendix, the requirements of the category Appendix shall take precedence.

Standard HVI Product Categories

The following are the standard product categories for the HVI CPD and for certification requirements. Members may occasionally, with HVI permission and if there is good reason, use additional descriptions as subsets to the main product categories.

To the right of the product categories listing shown below are the appendices which describe specific requirements for each product category.

<u>HVI Product Category</u>	<u>Appendices</u>
Bathroom Exhaust Fans including Combination Units	II
Compact Air Treatment Units	III
Downdraft Kitchen Exhauster (incl. non-powered ¹)	II
Duct Termination Fittings	VII
Energy Recovery Ventilators	III
Heat Recovery Ventilators	III
Integrated Supply and Exhaust Ventilators	VI
Inline Fans	II
Kitchen Fans	II
Kitchen Range Hoods (including non-powered ¹)	II and VIII
Other Room Exhaust Fans	II
Powered Attic Ventilators	II
Range Hood Power Units ²	II
Remote Exterior Mounted Ventilators	II
Static Vents, Fresh Air Inlets	V
Whole House Comfort Ventilators	II
Dryer Exhaust Duct Power Ventilators	II

¹*Non-powered kitchen ventilators are to be tested for Combination Rating. See HVI Publication 915 and HVI Publication 916 for testing, and Appendix IV of this publication for rating.*

²*HVI certifies range hood power units only in conjunction with a non-powered kitchen ventilator.*

Verification Grouping

Certain product categories may be grouped by HVI before randomly selecting the verification models. After grouping, HVI may select from the group, rather than the category, following the procedure described in Section 9. Groups shall be as follows:

- Energy recovery ventilators, Heat recovery ventilators, Compact air treatment units
- Bathroom exhaust fans, Other room exhaust fans, Kitchen exhaust fans
- Static vents, Duct termination fittings, Fresh air inlets
- Inline fans, Dryer exhaust duct power ventilators
- Downdraft kitchen exhausters, Kitchen range hoods

Tolerances for Verification and Challenge

Airflow rating tolerance. All products shall achieve a minimum of 90% of their HVI-Certified airflow rating. Exceptions, if any, are found in the Appendix for the product category.

Sound rating tolerance. All products shall produce not more than 110% of sound rating plus 0.25 sones. Exceptions, if any, are found in the Appendix for the product category.

Energy rating tolerance. (Energy-to-run-fan.) All products shall operate at not more than 110% of their HVI-Certified energy-to-run-fan rating. A tolerance of plus 1 watt is to be applied for products with HVI-Certified energy ratings of 10 watts or less. Exceptions, if any, are found in the Appendix for the product category. (This is not the same as the energy factors for HRVs, ERVs, and CATUs described under Verification in Appendix III.)

Units of Measure

Units of measure in this procedure are the inch-pound (IP) system. Values in IP units may be converted to International Standard (SI) units using conversions found in the *ASHRAE Handbook of Fundamentals*, chapter on Units and Conversions. Members shall list HVI-Certified ratings in IP units as described herein. In addition, Members may list HVI-Certified ratings in SI units using the following “rule of thumb” conversions for the units listed below.

Rounding: Before IP ratings are converted to SI, they are already rounded and additional rounding is not required. Section 7 describes requirements for rounding HVI-Certified ratings for presentation.

Static pressure: 1" w.g. may be converted to 250 Pa for values of 1" w.g. or less.

Airflow: 1 cubic feet per minute airflow may be converted to 0.47 liters per second for values of 1,000 cfm or less.

Energy: Watts are used for both systems.

For testing and rating conducted under *HVI Publication 915* and *HVI Publication 916*, the primary units are IP and may be converted to SI as described. For testing and rating conducted under procedures based on CAN/CSA C439, the primary units are SI and may be converted to IP as described.

The Normalized Airflow Curve for Airflow Ratings

HVI-Certified airflow ratings are based on precise airflow testing, and each product category has an HVI specified basic rating point static pressure. For certain categories, there are additional optional or required rating points (see the applicable category Appendix). For the basic rating point, airflow is rounded down to the nearest 10 cfm, as described in Section 7. For additional airflow ratings, a normalized airflow curve is used. This abbreviated overview of the uses of a normalized airflow curve serves as a foundation for the following description of creating and using it. Other details related to the normalized airflow curve are described in other parts of this publication, including Section 7, and the Appendices for each category.

Constructing a normalized airflow curve begins with the normalized airflow curve ratio (NCR). The NCR is the three-decimal expression (less than, or equal to, one) of the ratio between the airflow rating and the test report airflow, both at the same basic static pressure rating point. The airflow at each test point is normalized when it is multiplied by the NCR, to create the normalized airflow curve data points. The normalized airflow curve for a fan will pass exactly through the rating point, and will pass through the same static pressure at zero airflow as the test curve.

The resulting curve is used for additional HVI-Certified rating points described in the Appendices. The curve may also be represented as being in accordance with HVI procedures for non-certified performance information.

Certification and Presentation of Energy-to-run-fan Ratings

An HVI Member, at their option, may apply for certification of Energy-to-run-fan. HVI shall issue certification of such rating if requirements are met. Also at the Member's option, such rating may be shown in the HVI CPD. Exception: Energy-to-run-fan (watts) must be certified and published in the HVI CPD to maintain eligibility for certain special jurisdictions. It is not required that Members certify all products in a category for Energy-to-run-fan.

If Members represent the energy to run their HVI-Certified products in conjunction with the HVI Label and/or Logo, and in conjunction with HVI-Certified performance ratings, that data shall be HVI-Certified Energy-to-run-fan ratings, and such ratings shall be presented in accordance with HVI requirements and procedures.

APPENDIX II. SPECIAL REQUIREMENTS – EXHAUST PRODUCTS

Product Categories Included

Product categories whose requirements are covered by this Appendix (II) are generally mechanical exhaust products and are listed in Appendix I. The first part of this Appendix describes requirements that apply broadly to the categories; following in the second part are particular requirements for some product categories.

Required Certification

Airflow. 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 is used where additional optional speed settings are to be certified, with some exceptions for kitchen range hoods, as noted below.

- Rating points for ducted products other than kitchen range hoods: For products with ducting on one side, e.g., bathroom exhaust fans, the basic rating point is 0.1" w.g. Inline fans shall have basic ratings at a fan static pressure of 0.2" w.g., to account for inlet and outlet ducts.
- Rating points for kitchen range hoods: The basic rating point is 0.1" w.g. The optional working speed basic rating point static pressure is calculated using the system curve of the unit tested at high speed. Where a nominal installed airflow is HVI-Certified, the associated static pressure shall be calculated from the intersection of the kitchen range hood's test report airflow curve and the nominal duct system curve. See the "Kitchen Range Hoods – Particular Requirements" section of this appendix for more information.
- Direct discharge (non-ducted) products rating points: Direct discharge products exhausted directly to the outside, without ductwork, shall be rated at 0.03" w.g. Exception: whole house comfort ventilators (WHCVs) – see below. Included are: powered attic ventilators (PAVs) (both roof-mounted and gable-mounted), direct discharge types of kitchen exhaust fans, other room exhaust fans, etc.

Sound. All Appendix II products shall be certified for sound level.

Exception: Sound is not required for the following products because no HVI sound certification program currently exists.

- Powered attic ventilators
- Remote exterior mounted ventilators
- Whole house comfort ventilators
- Inline fans
- Dryer exhaust duct power ventilators

Energy-to-run-fan. Optional for all products in Appendix II.

Particular Requirements for Certain Product Categories

Dryer Exhaust Duct Power Ventilators (DEDPVs) – Particular requirements

DEDPVs shall be rated at 0.2" w.g. in accordance with the product type – either Inline Fan or Remote Exterior Mounted Ventilator. In addition, the maximum static pressure at which the product maintains 1,200 fpm outlet velocity is listed as the maximum static pressure. The rating point is extracted directly from the fan curve, using 105 cfm for 4" diameter duct.

Inline Fans – Particular requirements

The required basic rating point is 0.2" w.g. At 0.2" w.g., round down to the nearest 10 cfm for the basic rating. Additional rating points, at static pressure greater than 0.2" w.g., may be certified at the Member's option. For those points, create a normalized airflow curve and round down to the nearest whole number. See also Section 7. When an inline fan is offered for use with non-powered kitchen ventilators, additional requirements are described in Appendix IV, Combination Rating.

Whole House Comfort Ventilators (WHCVs) – Particular requirements

The basic rating point is 0.1" w.g. because they are expected to overcome the resistance of attic outlet vents. They are tested and certified using the smallest shutter recommended by the Member, and at the minimum distance between fan and shutter recommended by the Member. Products supplied with duct shall be installed and tested with the supplied duct in accordance with the installation instructions. (See *HVI Publication 916*.)

Powered Attic Ventilators (PAVs) – Particular requirements

If a gable-mounted type powered attic ventilator is sold with a louver, it shall be tested and certified with that louver. If sold without a louver, it shall be tested and certified with the "standard HVI louver", described in the *HVI Publication 916*. For an additional rating, units may also be tested with a specific model of louver or shutter, and it shall be identified in the Member's literature. Powered attic ventilators are rated for airflow at 0.03" w.g.

Remote Exterior Mounted Ventilators (REMs) – Particular requirements

When a product in this category is offered for use with non-powered kitchen ventilators, additional requirements are described in Appendix IV, Combination Rating.

Kitchen Range Hoods – Particular requirements

In addition to the basic rating point certification, at least one Nominal Installed Airflow (NIA) and associated static pressure shall be certified. The NIA and associated static pressure shall be calculated from the airflow rate and static pressure associated with the intersection of the kitchen range hood's test report airflow curve and the nominal duct system curve. The NIA shall be normalized by applying the NCR and rounded down to the nearest whole number in cubic feet per minute, or derated further, and the associated static pressure shall be rounded to the nearest 0.01" w.g. The system curve for a nominal duct system shall be determined in accordance with Table All1, using

Equation AII2. Two additional rating points, at static pressure greater than 0.1" w.g., may be certified at the Member's option. For those points, create a normalized airflow curve and round down to the nearest whole number. See also Section 7.

Table AII1. Nominal Duct System Characteristics for Kitchen Range Hoods.

Nominal Duct System Parameter	Characteristics
Length	$L = 10$ where $L = \text{duct length, feet}$
Dimension	The duct dimensions shall be the same as the kitchen range hood's duct take-off for the listed configuration and speed.
Roughness coefficient	$e = 0.00024$ where $e = \text{roughness coefficient, feet}$
Elbows	There shall be two elbows, each with a loss coefficient as follows: $C_e = 0.42$ where $C_e = \text{elbow loss coefficient, dimensionless}$
Integrated Damper	Losses associated with any damper that is integrated with the kitchen range hood are accounted for in the kitchen range hood's normalized fan curve and are not addressed here.
External Duct Termination Fitting	When the kitchen range hood is not listed with an HVI-Certified external duct termination fitting, the external duct termination fitting's loss coefficient shall be calculated as a function of velocity, V : For $V < 540$: $C_t = 135036*V^{-1.628}$ For $V \geq 540$: $C_t = 114*V^{-0.502}$ where $C_t = \text{external duct termination loss coefficient, dimensionless}$ $V = \text{velocity, feet per minute}$ When the kitchen range hood is listed with an HVI-Certified external duct termination fitting, the loss coefficient shall be determined from interpolation of HVI 916 test data as a function of the velocity associated with the rated nominal installed airflow and the rated duct dimension.
Friction factor	Friction factor shall be calculated using the Haaland equation, Equation AII1, where $f = \text{friction factor, dimensionless}$ $e = \text{roughness coefficient, feet}$ $D_h = \text{hydraulic diameter, inches}$ Calculated in accordance with HVI Publication 916, inches $Re = \text{Reynolds number, dimensionless}$ <div style="text-align: right; margin-top: 20px;"> $f = \left\{ -1.8 \log \left[\left(\frac{3.24e}{D_h} \right)^{1.11} + \frac{6.9}{Re} \right] \right\}^2$ <p style="text-align: right;"><i>Equation AII1.</i></p> </div>

Airflow	<p>Airflow shall be calculated using the ASHRAE Handbook of Fundamentals' Darcy-Weisbach equation, Equation AII2,</p> <p>where</p> <p>D_h = hydraulic diameter, Calculated in accordance with HVI Publication 916, inches</p> <p>V = velocity, feet per minute</p> <p>ρ = standard air density, 0.075 lbm/ft³</p> <p>f = friction factor, dimensionless</p> <p>L = duct length, feet</p> <p>Δp = friction loss, in. w.g.</p> <p>C_e = elbow loss coefficient, dimensionless</p> <p>C_t = external duct termination loss coefficient, dimensionless</p>
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Separate range hood power packs for mounting in a hood shall be tested and certified using one of the Member's recommended hoods. If the manufacturer makes no hood for use with the power pack, a representative hood from another source, or a representative mock-up, may be used.

Range hoods may optionally be tested and certified at "working speed" in addition to the maximum speed basic certification. In general, working speed is considered low speed for a two-speed hood, and for a multiple- or variable-speed hood, it is a low speed near 100 cfm. Additionally, manufacturers are permitted to rate range hood airflow at 0.03" w.g. if the working speed flow is 60% or less than the flow at high speed at 0.1" w.g. The specific procedure for working speed certification of a hood is found in the *HVI Publication 916*. Tolerance for working speed airflow is $\pm 15\%$ of rating. Tolerance for working speed sound is the same as other sound ratings.

APPENDIX III. SPECIAL REQUIREMENTS – HEAT RECOVERY VENTILATORS, ENERGY RECOVERY VENTILATORS, AND COMPACT AIR TREATMENT UNITS

All Appendix III products (as displayed in Section III of the HVI CPD) transfer heat (HRVs) or heat and humidity (ERVs) reclaiming energy otherwise wasted in an exhaust air stream and minimizing the cost associated with ventilation. A Compact Air Treatment Unit (CATU) is a packaged HRV or ERV that uses a refrigeration cycle or circulating fluid to transfer heat between two isolated airstreams.

HVI certifies several parameters for ducted HRVs, ERVs, and CATUs; there is currently no program for non-ducted versions. Ceiling/wall insert HRV and ERV products are tested for energy in accordance with these procedures.

HVI Certification of these products is based on testing both airflow and energy recovery performance in accordance with CAN/CSA C439 (-09), *Standard Laboratory Methods of Test for Rating the Performance of Heat/Energy-Recovery Ventilators*, herein referred to as CAN/CSA C439. This publication and this specific Appendix describe exceptions to CAN/CSA C439.

The HVI testing and rating program for Appendix III products is more prescriptive than CAN/CSA C439; however, there is no HVI testing document for the categories in this Appendix. Therefore, this Appendix records information and requirements that might normally be expected to be found in an HVI test procedure rather than this type of document.

All test conditions not prescribed, including the use of accessories, defrost connection, auxiliary controls, and additional rating point(s) shall be reported with the test results.

Performance Calculations

The performance calculations shall follow CAN/CSA C439 with the following exceptions:

1. Clause 12 of CAN/CSA C439 is not in application for the time being.
2. Very Low Temperature performance are rated over the last sixty hours of the 72-hour test, as required to maintain eligibility for certain special jurisdictions.

Certified Ratings

Members making application to HVI for certification of an HRV, ERV, or CATU shall submit to HVI the online product certification request form which is made available to authorized companies.

The entire HVI-Certified HRV/ERV/CATU Design Specification Sheet is considered HVI-Certified.

All HRV, ERV, and CATU products shall be tested and certified for both energy recovery performance at nominal conditions and airflow performance at maximum speed. Airflow and energy performance are separate tests from the same setup.

Maximum rated airflow for energy recovery performance testing as per section 10.3.1 of CAN/CSA C439 may be achieved by operating the unit's fan(s) at less than the maximum speed setting, if a speed control is supplied as part of the unit. This may be done to the Member's specifications by adjusting the airflow resistance of the test facility.

Ventilation Performance

Airflow ratings shall be either test data rounded to the nearest whole number, or shall be test data rounded down to tens, at the Member's option.

Gross Exhaust Airflow: The measured exhaust airflow rate, which may contain cross-leakage between the supply and exhaust airstreams. These values are used for duct design.

Gross Supply Airflow: The measured supply airflow rate, which may contain cross-leakage between the supply and exhaust airstreams. These values are used for duct design.

Net Supply Airflow: The gross supply airflow reduced by measured cross-leakage. This is the actual amount of outdoor air delivered by the supply system of the unit and is used for sizing the equipment for the required ventilation rate.

Exhaust Air Transfer (EAT): The percent of exhaust air found in the supply airstream at the specified external total static pressure. $\text{Gross Airflow} \times (1 - (\text{EAT}/100)) = \text{Net Airflow}$.

Energy Recovery Performance

HRVs, ERVs, and CATUs shall be rated for energy recovery performance with 0° C supply air at the maximum "rated airflow" specified by the Member. Additional test conditions may be tested and certified, at the Member's option. Common test points are at -13°F (-25°C) and 95°F (35°C), and 64 cfm and 117 cfm.

Energy performance ratings shall be rounded down to the nearest whole percentage number. "Rated airflow" is chosen for energy performance ratings, and shall be published in conjunction with the energy performance rating. Rated airflow is rounded to the nearest whole number from the test report or derated further. The verification test setup utilizes the same rated airflow for each energy recovery performance rating. Energy recovery parameters may be derated to less than shown on the test report.

Energy-to-run-fan shall be expressed in watts, rounded to the whole number or derated higher.

Sensible Recovery Efficiency (SRE): The net sensible energy recovered by the supply airstream as adjusted by electric consumption, case heat loss or heat gain, air leakage, airflow mass imbalance between the two airstreams and the energy used for defrost (when running the Very Low Temperature (VLT) test, as a percent of the potential sensible energy that could be recovered plus the exhaust fan energy. This value is used

to predict and compare Heating Season Performance of the HRV/ERV/CATU unit.

Adjusted Sensible Recovery Efficiency (ASRE): The net sensible energy recovered by the supply airstream as adjusted by case heat loss or heat gain, air leakage, airflow mass imbalance between the two airstreams and the energy used for defrost (when running the VLT test) as a percent of the potential sensible energy that could be recovered. This value should be used for energy modeling when wattage for air movement is separately accounted for in the energy model.

Total Recovery Efficiency (TRE): The net total energy (sensible plus latent, also called enthalpy) recovered by the supply airstream adjusted by electric consumption, case heat loss or heat gain, air leakage and airflow mass imbalance between the two airstreams, as a percent of the potential total energy that could be recovered plus the exhaust fan energy. This value is used to predict and compare Cooling Season Performance for the HRV/ERV/CATU unit.

Adjusted Total Recovery Efficiency (ATRE): The net total energy (sensible plus latent, also called enthalpy) recovered by the supply airstream adjusted by case heat loss or heat gain, air leakage and airflow mass imbalance between the two airstreams, as a percent of the potential total energy that could be recovered. This value is used to predict and compare Cooling Season Performance for the HRV/ERV/CATU unit. This value should be used for energy modeling when wattage for air movement is separately accounted for in the energy model.

Latent Recovery/Moisture Transfer (LRMT): Moisture recovered divided by moisture exhausted and corrected for the effects of cross-leakage. LRMT=0 indicates that moisture was not transferred (net of cross-leakage) from the exhaust airstream to the supply airstream. LRMT=1 indicates complete transfer of moisture. LRMT is provided for the Heating Season Performance and the VLT test 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.

Very Low Temperature Airflow Imbalance (VLTAI): The percent of airflow imbalance of the Supply System Airflow compared to Exhaust System Airflow over the last sixty hours of the 72-hour test.

HVI currently has no sound certification program for Appendix III products. Ceiling/wall insert HRV and ERV products are tested for energy in accordance with CAN/CSA C439 using pickup boxes on the grille openings. They are tested for airflow and sound in accordance with *HVI Publication 916* and *HVI Publication 915*.

Any HRV, ERV, or CATU in a family of products, for Verification and Challenge, must meet the highest certified rating for the entire family.

Tolerances for Verification and Challenge

Airflow Performance Ratings:

Maximum Net Supply Air Flow (at differential static pressure of 100 Pa):
85% minimum

Maximum Gross Exhaust Air Flow (at differential static pressure of 100 Pa):
85% minimum

Airflows at other static pressures may be published for fan curve information only.

Energy Recovery Performance Ratings:

Rated Air Flow:
Not to be verified or challenged

Energy recovery parameters:
90% minimum

Energy (electricity) to run fans:
115% maximum

Other published values such as Very Low Temperature (VLT) airflow reductions and imbalance are published for information only and not subject to verification, as the energy recovery calculations and thresholds already take into account any variation in these values.

Verification Test Failures: If a unit under test experiences a failure within the verification sequence, the HVI-designated testing 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 will normally instruct the laboratory to continue the test sequence.

APPENDIX IV. SPECIAL REQUIREMENTS – COMBINATION RATING

Combination testing for HVI-Certified ratings may be done for certain types of products that are incomplete by themselves and are offered with options. Examples include a non-powered model that may be used with more than one power unit model, or vice versa. Combination rating applies to kitchen ventilation products, although it may be possible to expand it to other types. Applicable product types are divided into the powered units and the non-powered units.

Powered units:

- Remote exterior mounted ventilators
- Inline fans
- Range hood power units

Non-powered units (kitchen ventilators):

- Non-powered catalogued range hoods
- Custom range hoods, including site-built hoods
- Non-powered downdraft kitchen exhausters

As an exception, requirements for range hood power units intended for non-powered range hoods are described in Appendix II, under Kitchen Range Hoods.

Inline fan requirements are found in Appendix II. Those requirements are not affected by this section. However, when those products are offered for kitchen ventilation applications, this section applies.

Remote exterior mounted ventilator requirements are found in Appendix II. Those requirements are not affected by this section. However, when those products are offered for kitchen ventilation applications, this section applies.

Airflow Testing

Laboratory requirements for combination airflow testing are described in *HVI Publication 916*. That publication describes airflow test plots at the same scale.

HVI-Certified Airflow Rating

The performance curves of the two airflow test reports should be drawn to the same scale, size, and zero, in response to a request of the Member arranging for the testing at an HVI-designated test laboratory.

Overlay one airflow test curve over the other. To allow for installed duct losses in the accepted HVI manner, the horizontal line representing the HVI static pressure rating point (0.1" w.g. or 0.2" w.g.) of the fan curve shall be laid over the line representing zero static pressure of the system curve. The test airflow is found where the fan performance curve crosses the system performance curve.

As with other products, the test airflow value is rounded down to the nearest 10 cfm for the HVI rating point. (An HVI normalized airflow curve may be produced from that number in the same manner as for other products.)

It is possible to apply for several HVI airflow ratings using combination rating. Testing powered units provides an airflow test curve for each; testing non-powered units provides a system curve for each. Using various combinations has the possibility to provide more ratings than the number of tests conducted. (e.g., three power unit tests and three non-powered unit tests can provide nine ratings.)

The Member shall make application to HVI for certification in the normal manner, and HVI shall verify that the curve overlay supports the requested airflow rating. When more than one combination of powered or non-powered products is derived from a set of tests, a note explaining which products were tested shall accompany the rating presented in the Member's catalog.

HVI-Certified Sound (Loudness) Rating

HVI requires that hoods be rated for sound. Combination testing cannot be used for sound.

Range hood power unit sound testing is described in Appendix II.

Other combinations may be sound tested individually, following *HVI Publication 915*.

When several airflow ratings result from combination testing, but the Member is confident sound performance does not vary greatly, the Member may test a representative combination for sound. Such a sound rating in the Member's catalog shall be accompanied by a note explaining which products were tested, and stating that other products may vary.

At the Member's option, a product or combination as described above may be sound rated based on test(s) with an acoustic muffler installed between the non-powered kitchen ventilator and the power unit or inline fan. Such a rating will be in addition to the normal sound rating.

APPENDIX V. SPECIAL REQUIREMENTS – STATIC AND PASSIVE VENTS

Requirements

The products in this category are HVI-Certified for Net Free Area in square inches. HVI-Certified Net Free Area Ratings are arrived at by airflow test, described in *HVI Publication 916*. Certification procedures and requirements in this document shall apply where possible.

There is no HVI sound certification program for these products.

Products for which this method may be used:

Fresh Air Inlets (through wall, window, etc.)	Under Eave Ventilators
Room-to-room Transfer Registers	Sidewall Ventilators
Roof Ventilators	Ridge Ventilators
Gable End Ventilators	Foundation Ventilators

Testing

Airflow testing shall be in accordance with *HVI Publication 916*. As an overview of the procedure described in *HVI Publication 916*, the products covered in this Appendix are tested to determine the volume of airflow through the product as a result of static pressure applied across the product. Net Free Area is calculated from that test by representing the product as a single opening and calculating the area that corresponds to the tested airflow and static pressure.

Certified Ratings

Where airflow ratings are HVI-Certified, they shall be rounded down to the nearest cfm at 0.04" w.g.

Net free area shall be rounded down to the nearest 0.1 square inches.

Tolerances for Verification and Challenge

Airflow and Net Free Area shall be a minimum of 90% of ratings.

APPENDIX VI. SPECIAL REQUIREMENTS – INTEGRATED SUPPLY AND EXHAUST VENTILATORS

Product Categories Included

This Appendix describes the requirements for HVI Certification of product(s) named and described as follows:

Integrated Supply and Exhaust Ventilator: An air moving (ventilation) product comprised of factory-assembled elements including one or more fans, with or without heat recovery. The products are used in ducted supply and exhaust systems. A particular characteristic of an integrated supply and exhaust ventilator is that the fresh air supplied to the house is mixed with a certain amount of recycled air from the house. This product category does not include devices that only exhaust stale air or only take in outside air.

Required Certification

Airflow. All Appendix VI products shall be certified for airflow as follows:

Net ventilation airflow. The net quantity of outside airflow supplied to the house.

Gross re-circulation airflow. The total amount of air distributed to the house by the unit under test. Gross fresh airflow and gross exhaust airflow are not HVI-Certified, but shall be listed with HVI-Certified ratings for design purposes.

Sound. HVI currently has no Sound Certification program for Appendix VI products.

Energy Recovery Performance. Even if Appendix VI products include energy recovery capability, they shall not be HVI-Certified for energy performance. As the fresh air supplied to the house is mixed with a certain amount of recycled air from the house, HVI currently has no Energy Recovery Certification program for this category.

Fan(s) Energy Consumption. All Appendix VI products shall be HVI-Certified for fan energy consumption in accordance with requirements described in Section 7 of this publication, and in *HVI Publication 916*.

Rating Points

The primary rating point shall be 0.2" w.g.

The second rating point shall be 0.4" w.g.

Tolerances for Verification and Challenge

Net ventilation airflow shall achieve a minimum of 85% of rating.

Gross re-circulation airflow shall achieve a minimum of 85% of rating.

Watts and fan energy consumption shall achieve a maximum of 115% of rating.

Testing

Airflow. Airflow rates shall be measured in accordance with CAN/CSA C439, *Standard Laboratory Methods of Test for Rating the Performance of Heat/Energy-Recovery Ventilators*, hereinafter referred to as CAN/CSA C439. The following pages describe exceptions to some of the detail and methods in CAN/CSA C439.

Definitions:

- Gross Fresh Air Supply airflow: airflow supplied from the outside; measured at station 1
- Gross Exhaust airflow: airflow exhausted by the unit to the outside; measured at station 4
- Gross Recirculation airflow: airflow supplied by the unit to the house; measured at station 2

(For station numbering, see Figure 4 of CAN/CSA C439)

Operating point of the unit. Replace Clause 10.3.1 and 10.3.2 of CAN/CSA C439 with the following:

The submitter 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 equal to the value at Station 4, and the absolute value of the static pressure at Station 2 is as close as possible equal to the value at Station 3. Static pressure at station 1 and 2 will be specified by the submitter, but the difference between the static pressure at stations 1 and 2 must 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 must be equal to at least 50 Pa for the first test and 100 Pa for the second test.

Additional tests may be performed at airflow lower than the maximum rated airflow (e.g., for a multi-speed unit). Pressures and airflows will be recorded at the different intermediate speeds on the same system resistance curves used for the highest speed.

Special Test Conditions: Recirculation and Exhaust Air Composition

Supply Ventilation Reduction factor. 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 recycled air from the house. The real amount of fresh air in the Gross Recirculation airflow is:

$$\text{Net Fresh Air Supply Airflow} = V_s \times F_2$$

V_s = Supply Ventilation Reduction factor

F_2 = airflow measured at station 2

Set-up and measurements with the tracer gas shall be performed in accordance with CAN/CSA C439.

The Supply Ventilation Reduction factor is determined from the following equations:

$$\text{if } \frac{B_2''}{B_1''} < 0.9 \quad V_S = \frac{B_2''}{B_1''}$$

or

$$\text{if } \frac{B_2''}{B_1''} \geq 0.9 \quad V_S = 1 - \frac{B_2'}{B_3'}$$

V_S = ventilation reduction factor for fresh air

B_1'' = measured concentration of tracer gas at Station 1 in the test described in Clause 8.2.5 of CAN/CSA C439

B_2'' = measured concentration of tracer gas at Station 2 (measured in the same units as B_1'') in the test described in Clause 8.2.5 of CAN/CSA C439

B_2' = measured concentration of tracer gas at Station 2 (measured in the same units as B_3') in the test described in Clause 8.2.1 of CAN/CSA C439

B_3' = measured concentration of tracer gas at Station 4 (measured in the same units as B_2') in the test described in Clause 8.2.1 of CAN/CSA C439

Exhaust Ventilation Reduction Factor.

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. The real amount of stale air in the Exhaust airflow to outside is:

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

V_E = Exhaust Ventilation Reduction factor

F_4 = airflow measured at station 4

Set-up and measurements with the tracer gas shall be performed in accordance with CAN/CSA C439.

The Exhaust Ventilation Reduction factor is determined from the following equations:

$$\text{if } \frac{B'_4}{B'_3} < 0.9 \quad V_E = \frac{B'_4}{B'_3}$$

or

$$\text{if } \frac{B'_4}{B'_3} \geq 0.9 \quad V_E = 1 - \frac{B''_4}{B''_1}$$

V_E = ventilation reduction factor for exhaust air

B''_1 = measured concentration of tracer gas at Station 1 in the test described in Clause 8.2.5 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 8.2.5 of CAN/CSA C439

Maximum Net Ventilation Airflow

For certification requirements, the Net Ventilation Air flow is defined as the maximum of the Net Fresh Air Supply airflow or the Net Stale Air Exhaust airflow.

Gross Airflows

For each operating point of the unit (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 unit will 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).

Test Report

Testing agency shall report static pressure and airflow at all four ports for each test point along with the fan speed settings, mixing ratios, and the watts.

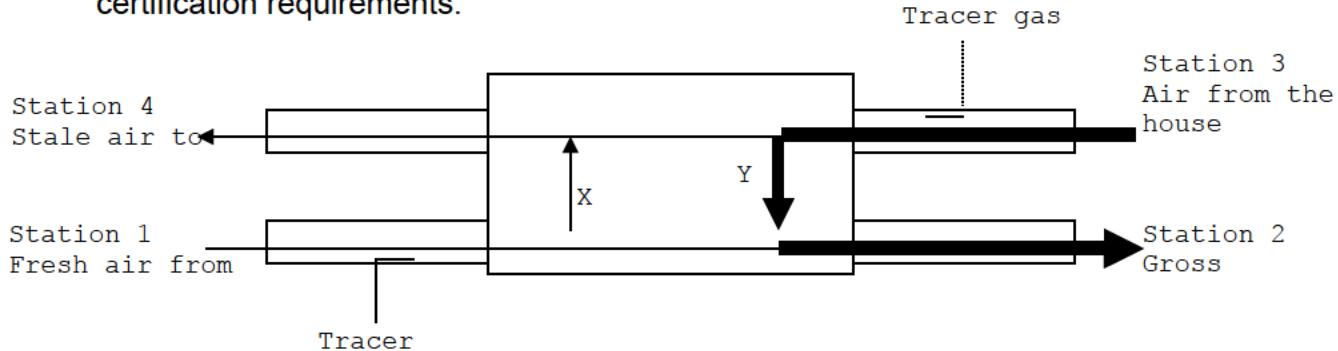
If the unit has more than four ports, the manufacturer has to provide the unit modified so that it can be tested with four ports (added to Clause 8.1.1 of CAN/CSA C439).

Certified Rating

Requested airflow ratings shall be rounded to the nearest whole integer.

Schematic of the Unit 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 needs two steps. First step, 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 must be null. At the second step, 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 must be null.

If $\frac{B''_2}{B''_1} < 0.9$, then the Supply Ventilation Reduction factor, V_S is equal to $\frac{B''_2}{B''_1}$. The two tracer gas concentrations are different enough to obtain a good accuracy for V_S . But if $\frac{B''_2}{B''_1} \geq 0.9$ (which means that the Y airflow is low) then $V_S = 1 - \frac{B'_2}{B'_3}$, using data from the second step (tracer gas injected before station 3).

In the same way, the Exhaust Ventilation Reduction factor, V_E , is calculated using these rules:

$$\text{if } \frac{B'_4}{B'_3} < 0.9 \quad V_E = \frac{B'_4}{B'_3} \text{ (Which means that the X airflow is high enough to use the data from the second step);}$$

$$\text{if } \frac{B'_4}{B'_3} \geq 0.9 \quad V_E = 1 - \frac{B''_4}{B''_1} \text{ (Which means that the X airflow is rather small, so we have to use data from the first step to have a good accuracy).}$$

Verification

For verification of this product category, use Appendix III, the section entitled Verification Requirements and Procedures.

APPENDIX VII. SPECIAL REQUIREMENTS – DUCT TERMINATION FITTINGS

Duct termination fittings are products that 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. Termination fittings covered under this program shall not allow air to be directed from an interior space to an unconditioned space such as an attic or crawl space.

Requirements

The products in this category are HVI-Certified for airflow. There is no HVI sound certification program for these products.

Products Covered

Outdoor Duct Outlets (roof caps, wall caps, eave caps)
Outdoor Duct Inlets

Products Not Covered (reserved for further development of certification program)

Indoor Duct Inlets
Indoor Duct Outlets

Required Certification

All outdoor duct outlets and inlets are to be certified for airflow. Required airflow testing shall be in accordance with *HVI Publication 916*. If the manufacturer recommends more than one duct size, all duct sizes must be certified.

Rating Points

All products shall have basic HVI airflow ratings at a static pressure of 0.05" w.g. rounded down to the nearest whole number. Ten test points approximately evenly spaced shall be measured from approximately 0.0" w.g. to 0.4" w.g. Two points, however, need to be closely spaced around the 0.05" w.g. rating point to allow for a mathematical (straight-line) interpolation of the rating point.

A minimum certified airflow rating of 10 cfm is required. If the product does not obtain at least 10 cfm at 0.05" w.g. during testing it cannot be certified.

Additional rating points at static pressures greater than 0.05" w.g. may be certified at the Member's option. For those points, two test points that are closely spaced around the intended rating point are used and mathematical (straight-line) interpolation may be used. The resulting rating point will be rounded down to the nearest whole number.

Tolerances for Verification and Challenge

The verification tolerance for all airflow rates shall be a minimum of 90% of rating plus 1 cfm.

APPENDIX VIII. SPECIAL REQUIREMENTS – RANGE HOOD CAPTURE EFFICIENCY

Requirements

Range hood capture efficiency (RHCE) is tested and rated according to HVI Publication 917 - *HVI Domestic Range Hood Capture Efficiency Testing and Rating Procedure*®.

Product Categories Included

Range hoods including undercabinet, inserts, chimney and microwave/hood combination units.

Presenting HVI Certified RHCE Ratings

RHCE is derived from calculated test values. Calculated test values will be rounded to the nearest whole number and represented as a percentage (e.g. 83%).

RHCE is an optional rating. Each range hood the Member chooses to certify for RHCE must be rated at a minimum of one certified airflow rating.

When RHCE rating points are used they must clearly indicate the airflow rating point.

If a range hood has multiple ducting options, the Member shall select the ducting configuration with the lowest certified airflow at the chosen speed setting. The Member may certify RHCE for other ducting configurations if desired.

Verification and Challenge of RHCE Ratings

RHCE is an optional performance parameter. All models certified for RHCE are subject to verification and/or challenge of RHCE ratings.

Tolerances for Verification and Challenge

All products shall achieve no less than their certified RHCE rating minus 10 RHCE points.

Derating Range Hood Capture Efficiency

RHCE certification ratings may be less than the maximum allowed based on the test report.

RHCE Curve

A RHCE curve may be developed if the same airflow rating points are used as were used to generate the product certification airflow curve. A minimum of five airflow curve points are required for generation of a RHCE curve.

Special Sound Exception for RHCE Curve

Sound ratings are not required at every RHCE rating point used to generate the RHCE curve. Sound ratings are required at each airflow rating point the Member wishes to certify.