AHRI Standard 1060 (I-P)

2018 Standard for

Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment

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IMPORTANT

SAFETY DISCLAIMER

AHRI does not set safety standards and does not certify or guarantee the safety of any products, components or systems designed, tested, rated, installed or operated in accordance with this standard/guideline. It is strongly recommended that products be designed, constructed, assembled, installed and operated in accordance with nationally recognized safety standards and code requirements appropriate for products covered by this standard/guideline.

AHRI uses its best efforts to develop standards/guidelines employing state-of-the-art and accepted industry practices. AHRI does not certify or guarantee that any tests conducted under its standards/guidelines will be non-hazardous or free from risk.

Note:
This standard supersedes ANSI/AHRI Standard 1060 (I-P)-2014.
For SI ratings, see AHRI Standard 1061 (SI)-2018.

AHRI CERTIFICATION PROGRAM PROVISIONS

Scope of the Certification Program

The certification program includes performance ratings of Air-to-Air Exchangers for use in Air-to-Air Energy Recovery Ventilation Equipment (AAERVE), with supply and exhaust airflows at or above 50 scfm but below or equal to 5,000 scfm at AHRI Standard Rating Conditions. In addition, Air-to-Air Exchangers for use in Air-to-Air Energy Recovery Ventilation Equipment rated above 5,000 scfm are included if the participant's basic model group(s) for those models include at least one model rated at or above 50 scfm but below or equal to 5,000 scfm.

This certification program does not include heat exchangers joined by circulated heat transfer medium (run-around loop).

Certified Ratings

The following certification program ratings are verified by test:

1. Sensible Effectiveness, %
2. Latent Effectiveness, %
3. Supply and Exhaust Pressure Drop, in H_2O
4. Exhaust Air Transfer Ratio (EATR)
5. Outdoor Air Correction Factor (OACF)

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U.S.A.

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PERFORMANCE RATING OF AIR-TO-AIR EXCHANGERS FOR ENERGY RECOVERY VENTILATION EQUIPMENT

Section 1. Purpose

1.1 *Purpose*. The purpose of this standard is to establish for Air-to-Air Exchangers intended for use in Air-to-Air Energy Recovery Ventilation Equipment (AAERVE): definitions; test requirements; rating requirements; minimum data requirements for Published Ratings; marking and nameplate data; and conformance conditions.

1.1.1 *Intent*. This standard is intended for the guidance of the industry, including manufacturers, designers, installers, contractors and users.

1.1.2 *Review and Amendment*. This standard is subject to review and amendment as technology advances.

Section 2. Scope

2.1 *Scope*. This standard applies to factory-made Air-to-Air Exchangers for use in Air-to-Air Energy Recovery Ventilation Equipment (AAERVE) as defined in Section 3.

2.2 *Exclusions*. This standard does not apply to the rating and testing of heat exchangers joined by circulated heat transfer medium (run-around loop). A run-around loop employs liquid-containing coils connected in a closed loop and placed in each of two or more airstreams.

Section 3. Definitions

All terms in this document will follow the standard industry definitions in the *ASHRAE Terminology* website (https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology) unless otherwise defined in this section.

3.1 *Air-to-Air Energy Recovery Ventilation Equipment (AAERVE)*. Energy recovery components and packaged energy recovery ventilation units which employ Air-to-Air Exchangers to recover energy from exhaust air for the purpose of pre-conditioning outdoor air prior to supplying the conditioned air to the space, either directly or as part of an air-conditioning (to include air heating, air cooling, air circulating, air cleaning, humidifying and dehumidifying) system.

3.2 *Air-to-Air Exchanger (Exchanger)*. A device that transfers heat/energy between an exhaust airstream and a separated supply airstream. Exchangers are also referred to as energy recovery components.

3.2.1 *Heat Pipe Heat Exchanger*. A device employing tubes charged with a fluid for the purpose of transferring sensible energy from one airstream to another. Heat transfer takes place through the vaporization of the fluid exposed to the warmer airstream and condensation of the fluid in the cooler airstream.

3.2.2 *Plate Heat Exchanger*. A device for the purpose of transferring energy (sensible or total) from one airstream to another without moving parts. The design may incorporate parallel, cross or counter flow construction or a combination of these to achieve the energy transfer.

3.2.3 *Rotary Heat Exchanger*. A device incorporating a rotating cylinder or wheel for the purpose of transferring energy (sensible or total) from one airstream to the other. It incorporates heat transfer material, a drive mechanism, a casing or frame, and includes any seals which are provided to retard the bypassing and leakage of air from one airstream to the other.

3.3 *Airflow*.

3.3.1 *Entering Exhaust Airflow*. The exhaust airstream (indoor air) before passing through the Exchanger, indicated in Figure 1 as Station 3, expressed in scfm. Also referred to as return air (RA).

3.3.2 *Entering Supply Airflow*. The supply airstream (outdoor air) before passing through the Exchanger, indicated

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in Figure 1 as Station 1, expressed in scfm. Also referred to as outdoor air (OA).

3.3.3 *Leaving Exhaust Airflow*. The exhaust airstream (indoor air) after passing through the Exchanger, indicated in Figure 1 as Station 4, expressed in scfm. Also referred to as exhaust air (EA).

3.3.4 *Leaving Supply Airflow*. The supply airstream (outdoor air) after passing through the Exchanger, indicated in Figure 1 as Station 2, expressed in scfm. Also referred to as supply air (SA).

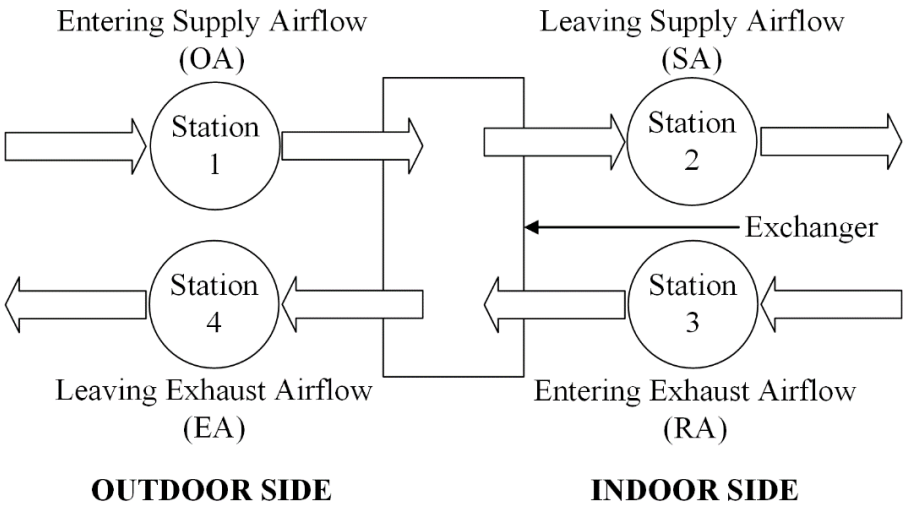


Figure 1. Scheme of Airflows for Exchangers

3.4 *Capacity Rate.* The quantity of energy an airstream at a specific mass flow rate is able to absorb or release per unit time per unit change in temperature, humidity content, or enthalpy content.

3.5 *Effectiveness.* A ratio of the actual energy transfer (sensible, latent, or total) to the product of the minimum energy capacity rate and the maximum difference in temperature, humidity ratio, or enthalpy.

Effectiveness is not adjusted to account for that portion of the psychrometric change in the Leaving Supply Airflow that is the result of leakage of Entering Exhaust Airflow rather than exchange of heat or moisture between the airstreams.

3.5.1 *Latent Effectiveness.* The Effectiveness determined using only measured humidity ratios, heat of vaporization values, and mass airflow rates. The equation for determining Latent Effectiveness is Equation C1 in Appendix C.

3.5.2 *Sensible Effectiveness.* The Effectiveness determined using only measured dry bulb temperature differences, specific heat capacities, and mass airflow rates. The equation for determining Sensible Effectiveness is Equation C1 in Appendix C.

3.5.3 *Total Effectiveness.* The Effectiveness determined using only measured dry bulb temperature differences, specific heat capacities, measured humidity ratios, heat of vaporization values, and mass airflow rates. The equation for determining Total Effectiveness is Equation C2 in Appendix C.

3.6 *Enthalpy Recovery Ratio*. A ratio of the change in enthalpy of the Entering Supply Airflow (Station 1) and the Leaving Supply Airflow (Station 2) to the difference in enthalpy between the Entering Supply Airflow (Station 1) and the Entering Exhaust Airflow (Station 3), with no adjustment to account for that portion of the psychrometric change in the Leaving Supply Airflow (Station 2) that is the result of leakage of Entering Exhaust Airflow (Station 3) rather than exchange of heat or moisture between the airstreams. (See Figure 1 for stations.) The equation for determining Energy Recovery Ratio is Equation C8 in Appendix C.

3.7 *Exhaust Air Transfer Ratio (EATR).* The tracer gas concentration difference between the Leaving Supply Airflow and the Entering Supply Airflow divided by the tracer gas concentration difference between the Entering Exhaust Airflow and the Entering Supply Airflow at the 100% rated Airflows, expressed as a percentage. The equation for determining EATR is Equation C3 in Appendix C.

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3.8 *Exhaust Pressure Drop*. The difference in static pressure of the air at the Entering Exhaust Airflow inlet and the air at the Leaving Exhaust Airflow outlet.

3.9 *Net Effectiveness*. A ratio of the actual energy transfer (sensible, latent, or total) to the product of the minimum energy capacity rate and the maximum difference in temperature, humidity ratio, or enthalpy, adjusted to account for that portion of the psychrometric change in the Leaving Supply Airflow that is the result of leakage of Entering Exhaust Airflow rather than exchange of heat or moisture between the airstreams. The derivation of Net Effectiveness is given in Appendix C.

3.9.1 *Net Latent Effectiveness*. The Effectiveness determined using only measured humidity ratios, heat of vaporization values, mass airflow rates and Exhaust Air Transfer Ratio. The equation for determining Net Latent Effectiveness is Equation C4 in Appendix C.

3.9.2 *Net Sensible Effectiveness.* The Effectiveness determined using measured dry bulb temperature differences, specific heat capacities, mass airflow rates and Exhaust Air Transfer Ratio. The equation for determining Net Sensible Effectiveness is Equation C4 in Appendix C.

3.9.3 *Net Total Effectiveness*. The Effectiveness determined using only measured dry bulb temperature differences, specific heat capacities, measured humidity ratios, heat of vaporization values, mass airflow rates and Exhaust Air Transfer Ratio. The equation for determining Net Total Effectiveness is Equation C7 in Appendix C.

3.10 *Net Supply Airflow*. That portion of the Leaving Supply Airflow that originated as Entering Supply Airflow. The Net Supply Airflow is determined by subtracting air transferred from the exhaust side of the Exchanger from the gross Airflow measured at the Supply Airflow leaving the Exchanger and is given by Equation 1:

$$SA_{net} = SA \cdot (1 - EATR) \quad (1)$$

Where:

EATR = Exhaust Air Transfer Ratio, %
SA = Leaving Supply Airflow, scfm
SA_{net} = Net Supply Airflow, scfm

3.11 *Outdoor Air Correction Factor (OACF)*. The ratio of the Entering Supply Airflow to the measured (gross) Leaving Supply Airflow.

3.12 *Pressure Differential*. Static pressure at the Leaving Supply Airflow outlet minus the static pressure at the Entering Exhaust Airflow inlet.

3.13 *Published Rating*. A statement of the assigned values of those performance characteristics, under stated Rating Conditions, by which a unit may be chosen for its application. These values apply to all Exchangers for use in Energy Recovery Ventilation Equipment of like size and type (identification) produced by the same manufacturer. The term Published Rating includes the rating of all performance characteristics shown on the unit or published in specifications, performance rating software, advertising or other literature controlled by the manufacturer, at stated Rating Conditions.

3.13.1 *Application Rating*. A rating at conditions one or more of which are outside the range of conditions specified in Table 1.

3.13.2 *Standard Rating*. A rating at conditions that are within the range of conditions specified in Table 1.

3.14 *Rating Conditions*. Any set of operating conditions under which a single level of performance results, and which cause only that level of performance to occur.

3.15 *"Shall" or "Should."* "Shall" or "should" shall be interpreted as follows:

3.15.1 *Shall*. Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.

3.15.2 *Should.* "Should" is used to indicate provisions which are not mandatory but which are desirable as good practice.

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