AHRI Guideline W
(formerly ARI Guideline W)

2005 GUIDELINE for

SELECTING, SIZING, & SPECIFYING PACKAGED AIR-TO-AIR ENERGY RECOVERY VENTILATION EQUIPMENT

AHRI Air-Conditioning, Heating, and Refrigeration Institute

2111 Wilson Boulevard, Suite 500
Arlington, VA 22201, USA
www.ahrinet.org

PH 703.524.8800
FX 703.562.1942

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Note:

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Price $10.00 (M) $20.00 (NM)
Printed in U.S.A.

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SELECTING, SIZING, & SPECIFYING PACKAGED AIR-TO-AIR ENERGY RECOVERY VENTILATION EQUIPMENT

Section 1. Purpose

1.1 *Purpose.* The purpose of this guideline is to provide information to support the application of Air-to-Air Energy Recovery Ventilation Equipment (AAERVE). This Guideline supports AAERVE that is manufactured using Air-to-Air Heat Exchangers (energy recovery components) rated in accordance with ARI Standard 1060. These energy recovery components include Heat Pipe Heat Exchangers, Plate Heat Exchangers, and Rotary Heat Exchangers.

1.1.1 *Intent.* This guideline is intended for the guidance of the industry, including architects, engineers, contractors, manufacturers, and end users.

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

Section 2. Scope

2.1 *Scope.* This guideline applies only to AAERVE.

2.2 *Applications.* This guideline is intended to apply primarily to commercial and institutional applications.

2.3 *Exclusions.* This guideline does not apply to 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 follow the standard industry definitions in the current edition of *ASHRAE Terminology of Heating, Ventilation, Air Conditioning and Refrigeration* and ASHRAE Standard 84, 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 Heat 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 Heat Exchanger. A device that transfers heat from an exhaust airstream to a separated supply airstream. Air-to-Air Heat 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 with no moving parts. This exchanger 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 air stream to the other.

3.3 *Economizer.* A system of controls and dampers that introduces outside air to a space when the space requires cooling, and the heat of the outside air is lower than the heat of the space.

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3.3.1 *Sensible Only.* A system that utilizes an outdoor air sensor that measures outdoor dry-bulb temperature only. If the space has a cooling requirement, outside air will be used if the outdoor dry-bulb temperature is less than or equal to the control setpoint.

3.3.2 *Enthalpy.* A system that utilizes an outdoor sensor that measures the total heat (both the sensible and latent) of the outside air. If the space has a cooling requirement, outside air will be used to cool the space if the total heat of the outside air is less than or equal to the control setpoint.

3.4 *Effectiveness*. The measured energy recovery 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 *Entering Air Conditions.* The dry-bulb and wet-bulb temperature that is entering the space on a stand alone system, or entering the air-conditioning system on integrated, stand alone-coupled or unitized systems. These conditions typically replace the "outdoor air conditions" in most design load software programs. These are also referred to as the Tempered Outside Air conditions. On stand alone systems these are also referred to as Supply Airflow conditions.

3.6 *Exhaust Airflow*. Airflow leaving the conditioned space.

3.6.1 *Entering Exhaust Airflow (Return Air).* The exhaust airstream before passing through the heat exchanger. Shown as Station 3 in ASHRAE Standard 84.

3.6.2 *Leaving Exhaust Airflow (Exhaust Air to Outside).* The exhaust airstream after passing through the heat exchanger. Shown as Station 4 in ASHRAE Standard 84.

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.

3.8 *Net Building Load.* The total calculated space conditioning energy required for a building including the impact of energy recovery. This is the total building load less the total energy recovered from the exhaust air. The Net Building Load may be calculated for both heating and cooling design conditions.

3.8.1 *Example.* Total building cooling load is 200 tons including outside air without the AAERVE. The AAERVE reduced the outdoor air load by 75 tons. The Net Building Load is 125 tons (200 tons -75 tons).

3.9 *Net Effectiveness*. The measured energy recovery Effectiveness 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.

3.11 *Net Zone Load.* The total space conditioning energy required for a particular zone of a building including the impact of energy recovery. This is the Total Zone Load less the total energy recovered from the exhaust air for the Zone by the AAERVE. The Total Zone Load may be calculated for both cooling and heating design conditions.

3.11.1 *Example.* Total zone cooling load is 20 tons including outside air without the AAERVE. The AAERVE reduced the outdoor air load by 7.5 tons. The Net Zone Load is 12.5 tons (20 tons -7.5 tons).

3.12 *Outdoor Air Correction Factor (OACF).* The Entering Supply Airflow divided by the measured (gross) Leaving Supply Airflow.

3.13 *Published Rating*. A statement of the assigned values of those performance characteristics at stated Rating Conditions, by which a unit may be chosen for its application. These values apply to all AAERVE 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, advertising or other literature controlled by the manufacturer, at stated Rating Conditions.

3.13.1 *Application Rating*. A rating based on tests performed at application Rating Conditions (other than Standard Rating Conditions).

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