Acceptable Cross Leakage for Energy Recovery Ventilation According to ASHRAE Standard 62.1

Introduction

With ASHRAE Standard 62.1-2010 (Ventilation for Acceptable Indoor Air Quality), HVAC system designers have clear-cut parameters for allowable energy recovery ventilation (ERV) cross leakage/ cross contamination. This technical note is intended to provide a summary of the key elements of this standard as it applies to cross leakage.

A common question from specifying engineers on this topic is: "How much ERV cross leakage is acceptable when the exhaust air is from a rest room?" ASHRAE Standard 62.1-2010 provides a clear, unambiguous answer: 10%.

Air Classification

The standard classifies air with respect to contaminant and odor intensity. In doing so, ASHRAE defines four classes of air as follows:

Class 1: Air with low contaminant concentration and inoffensive odor and sensory-irritation intensity, suitable for recirculation or transfer to any space. *Examples: office spaces, classrooms, assembly rooms, churches, corridors.*

Class 2: Air with moderate contaminant concentration, mildly offensive odors or sensory-irritation intensity, suitable for recirculation or transfer to any space with Class 2 or Class 3 air that is utilized for the same or similar purpose and involves the same or similar pollutant sources. Class 2 air is not suitable for recirculation or transfer to spaces with Class 1 air, or dissimilar spaces with Class 2 or Class 3 air.

Examples: rest rooms, swimming pools, dining rooms, locker rooms, warehouses.

Class 3: Air with significant contaminant concentration or significant offensive odor or sensory -irritation intensity that is suitable for recirculation with the same space. Class 3 air is not suitable for recirculation or transfer to any other space.

Examples: kitchens, dry cleaners, beauty salons, laboratories, pet shops.

Class 4: Air with highly objectionable fumes or gases or potentially containing dangerous particles, bioaerosols, or gases at a concentration high enough to be considered harmful, not suitable for recirculation or transfer to any other space.

Examples: paint spray booths, laboratory fume exhaust, kitchen grease exhaust.

Energy Recovery Re-Designation

With this understanding of the air classification system, the standard addresses energy recovery, which states:

“Class 2 air may be re-designated as Class 1 air in the process of recovering energy when it is diluted with outdoor air such that no more than 10% of the resulting airstream is Class 2 air. Class 3 air may be re-designated as Class 1 air in the process of recovering energy when it is diluted with outdoor air such that no more than 5% of the resulting airstream is Class 3 air.”

This re-designation states that a design may recover energy from restroom exhaust air (Class 2) to pre-condition outdoor air for a Class 1 space (i.e., classroom or office space) as long as the energy recovery cross leakage is no greater than 10%. The same logic applies to recovering energy from Class 3 air, with the cross leakage limit reduced to 5%.

More Efficient HVAC Design

The language in ASHRAE 62.1-2010 enables specifying engineers to design higher efficiency systems incorporating energy recovery ventilation.

ASHRAE's official endorsement of recirculating small amounts of Class 2 and Class 3 air encourages the use of ERV to recover energy in applications that traditionally may have been ignored. For instance, enthalpy/total energy recovery wheels, with AHRI certified cross leakage ratings, should be specified with confidence to recover energy from rest room exhaust air. The standard helps engineers maximize energy efficiency while keeping code officials satisfied.

Another benefit of the ASHRAE standard is that energy wheel purge sections are not necessary for Class 2 air, and generally not necessary for Class 3 air. A wheel with a purge option typically increases the ERV horsepower by 50% to 75% significantly reducing energy savings. With good energy recovery wheel designs limiting cross leakage to less than 5% engineers can achieve acceptable cross leakage without a purge option, thereby maximizing ERV system efficiency.

AHRI Certification

Going hand-in-hand with Standard 62.1-2010 is the AHRI 1060 certification program for rating air-to-air heat exchangers for ERV equipment. In addition to rating thermal performance, AHRI 1060 also certifies cross leakage performance.

With respect to ASHRAE 62.1, the critical AHRI certified rating to observe is EATR - Exhaust Air Transfer Ratio. EATR identifies the percentage of exhaust air that is transferred to the outdoor air stream during energy recovery. When recovering energy from a rest room (or other Class 2 air stream), the EATR value shall not exceed 10%.

All AHRI certified data can be found at http://www.ahridirectory.org

Summary

ASHRAE 62.1-2010 provides clear guidance and clarification to air stream recirculation issues and defines air classification categories. With respect to recovering energy from exhaust air, the amount of acceptable exhaust air cross leakage is now quantified based on the contaminant concentrations of the exhaust air.

Consequently, specifying engineers may apply the benefits offered by the standard to increase the efficiency of HVAC systems. This efficiency will likely come in the form of broader application of total enthalpy ERVs - without the need for energy consuming purge sections.

To ensure compliance to ASHRAE Standard 62.1, specifications should include language requiring AHRI 1060 certification with EATR ratings below ASHRAE 62.1-2010 limits for the application.

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