

**INTERPRETATION IC 62.1-2010-1 OF  
ANSI/ASHRAE STANDARD 62.1-2010  
VENTILATION FOR ACCEPTABLE INDOOR AIR QUALITY**

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**Reference:** This request for interpretation refers to the requirements presented in ANSI/ASHRAE Standard 62.1-2010, Section 5.16.3.4 (Section 5.17.3.4 of 62.1-2007), Class 4 Air, regarding the recirculation or transfer of air from chemical storage room and laboratory fume hood exhaust systems.

**Background:** Section 5.16.3.4 (Section 5.17.3.4 of 62.1-2007), Class 4 Air, states that “Class 4 air shall not be recirculated or transferred to any space nor recirculated within the space of origin.” This request is specific to the application of this requirement to chemical storage room and laboratory fume hood exhaust systems both of which are classified as Class 4 air in the standard(s).

While it is implied in Section 5.16.3 (Section 5.17.3 of 62.1-2007) “Recirculation Limitations” that some recirculation of higher class (more dirty) air may be acceptable, Sub-section 5.16.3.4 (Section 5.17.3.4 of 62.1-2007) as written indicates that no recirculation of Class 4 air is allowed. Sections 5.16.3.2.2 & 5.16.3.3.2 (Section 5.17.2.2 in 62.1-2007) further clarifies by example that “recirculation air” includes air that passes from exhaust to supply through energy recovery devices. If interpreted to mean that absolutely no cross airflow is allowed, this requirement appears to specifically preclude the use of total energy recovery devices serving fume hoods or chemical storage type spaces since total energy recovery wheels will have a small amount of cross airflow even when applied with an enthalpy wheel manufacturer transfer purge option.

Although this section of ASHRAE 62.1 indicates no recirculation is allowed, it is noted that other ASHRAE and industry references include guidelines for establishing a maximum allowable limit for recirculation (or re-entrainment) from fume hood and chemical storage room exhaust stack discharge into air intakes or operable windows. Note that to comply with these other guidelines, it is required that a project specific and very limited allowance for recirculation of Class 4 air be defined for both normal and emergency (spill) conditions.

These other laboratory specific guidelines therefore acknowledge that the goal for absolute separation while desirable is unlikely to be met under all conditions due to complex wind patterns, building geometry and associated limited separation distances between the exhaust discharge stacks and air intakes. It should be noted that these other standards and guidelines are specific to assessing recirculation of Class 4 air from laboratory fume hoods and chemical storage room exhaust and not to all Class 4 air applications. The following is a listing of the requirements in these other standards and guidelines:

**Reference 1: 2007 ASHRAE Applications - Stack Heights and Air Intakes:** “Laboratory exhaust stacks should release effluent to the atmosphere without producing undesirable high concentrations at fresh air intakes, operable doors and windows, and locations on or near the building where access is uncontrolled.”

**Reference 2: 2007 ASHRAE Applications - Stack Heights and Air Intakes:** Stack Height: “Chapter 15 of the 1997 *ASHRAE Handbook—Fundamentals* describes a geometric method to determine the stack discharge height high enough above the turbulent zone around the building that little or no effluent gas impinges on air intakes of the emitting building.”

**Reference 3: 2007 ASHRAE Applications - Stack Heights and Air Intakes:** Criteria for Suitable Dilution: “An example criterion based on Halitsky (1988) is that the release of 15 cfm of pure gas through any stack in a moderate wind (3 to 18 mph) from any direction with a near-neutral atmospheric stability (Pasquill Gifford Class C or D) must not produce concentrations exceeding 3 ppm at any air intake. This criterion is meant to simulate an accidental release such as would occur in a spill of an evaporating liquid or after the fracture of the neck of a small lecture bottle of gas in a fume hood. The intent of this criterion is to limit the concentration of exhausted gases at the air intake locations to levels below the odor thresholds of gases released in fume hoods, excluding highly odorous gases such as mercaptans. Laboratories that use extremely hazardous substances should conduct a chemical-specific analysis based on published health limits. The above criterion is preferred over a simple dilution standard because a defined release scenario (15 cfm) is related to a defined intake concentration (3 ppm) based on odor thresholds or health limits.”

**Reference 4: AIHA/ANSI Standard Z9.5-2003 Laboratory Ventilation:** 5.3.4 Discharge of Contaminated Air: The discharge of potentially contaminated air that contains a concentration more than the allowable breathing air concentration shall be “Discharged in a manner and location to avoid reentry into the laboratory building or adjacent buildings at concentrations above 20% of allowable concentrations inside the laboratory for routine emissions or 100% of allowable concentrations for emergency emissions under, wind conditions up to the 1%-wind speed for the site.”

As can be seen in the above excerpts, while quite stringent these references clearly indicate a non-zero based limitation for recirculation of fume hood exhaust air into air intakes or operable windows. As stated above, it is required in these references that a project specific value for acceptable recirculation be established when assessing recirculation (re-entrainment) from exhaust stacks. While the above referenced guidelines have been accepted and used in the industry, they are in conflict with the interpretation that recirculation of Class 4 fume hood and chemical storage room exhaust air into air intakes must be absolutely eliminated.

It should also be noted that versions of the above laboratory standards and guidelines are also specifically referenced in ASHRAE Standard 62.1-2010 (62.1-2007). Below are the specific references to these standards as listed in 62.1-2007 and 62.1-2010:

**Reference 1: ASHRAE Standard 62.1-2007 Section F2 - Exhaust outlets and outdoor air intakes or other openings shall be separated in accordance with the following. Exception: Laboratory fume hood exhaust air outlets shall be in compliance with NFPA 45-1991 and ANSI/AIHA Z9.5-1992.**

**Reference 2: ASHRAE Standard 62.1-2007 TABLE 5-1 Air Intake Minimum Separation Distance - Note 2: Laboratory fume hood exhaust air outlets shall be in compliance with NFPA 45-1991 and ANSI/AIHA Z9.5-1992. Note 3: Noxious or dangerous exhaust is exhaust air with highly objectionable fumes or gases and/or exhaust air with potentially dangerous particles, bioaerosols, or gases at concentrations high enough to be considered harmful. Information on separation criteria for industrial environments can be found in the ACGIH Industrial Ventilation Manual and in the ASHRAE Handbook—HVAC Applications (2007).**

**Reference 3: ASHRAE Standard 62.1-2010 Section F2 - Exhaust outlets and outdoor air intakes or other openings shall be separated in accordance with the following. Exception: Laboratory fume hood exhaust air outlets shall be in compliance with NFPA 45-2004 and ANSI/AIHA Z9.5-2003.**

**Reference 4: ASHRAE Standard 62.1-2010 TABLE 5-1 Air Intake Minimum Separation Distance - Note 2: Minimum distance listed does not apply to laboratory fume hood exhaust air outlets. Separation criteria for fume hood exhaust shall be in compliance with NFPA 45 and ANSI/AIHA Z9.5. Information on separation criteria for industrial environments can be found in the ACGIH Industrial Ventilation Manual and in the ASHRAE Handbook—HVAC Applications (2007).**

From review of the referenced standards and guides as well as ASHRAE 62.1-2010 (62.1-2007), it appears that while a stringent non-zero based recirculation limitation will meet established industry guidelines for limited recirculation (re-entrainment) of fume hood exhaust air due to stack discharge arrangement, it MAY NOT MEET the specific requirement of Section 5.16.3.4 (Section 5.17.3.4 in 62.1-

2007), Class 4 Air, for no recirculation if it is interpreted that this section requires an absolute zero level of cross airflow.

From a U. S Green Building Council Leadership in Energy & Environmental Design (LEED) perspective the most stringent interpretation of no recirculation would also mean a laboratory facility where the exhaust stack design meets the requirements of industry accepted guidelines such as the 2007 ASHRAE Applications Handbook and AIHA/ANSI Standard Z9.5-2003, may fail to meet a mandatory requirement of Standard 62.1-2007 and therefore cannot be LEED certified. In order to clarify the intent of this section of ASHRAE 62.1-2010 (62.1-2007), this interpretation request is being submitted for consideration.

**Interpretation No. 1:** A laboratory and chemical storage room ventilation system and exhaust stack design that meets a project identified limit for exhaust stack recirculation (re-entrainment) in compliance with recommendations in the 2007 ASHRAE Applications Handbook and AIHA/ANSI Standard Z9.5-2003 meets the intent of Section 5.16.3.4 (Section 5.17.3.4 of 62.1-2007), Class 4 Air, for no recirculation.

**Question No. 1:** Is this interpretation correct?

**Answer No. 1:** No

**Comments on No. 1:** Section 5.16.3.4 (Section 5.17.3.4 of 62.1-2007), Class 4 Air, does not apply to the separation of exhaust outlets from outdoor air intakes. Such separation is covered in Section 5.5.1 and Appendix F.

**Interpretation No. 2:** A laboratory and chemical storage room ventilation system and exhaust stack design that includes a total energy recovery wheel and associated cross airflow while meeting a project identified limit for exhaust stack recirculation (re-entrainment) in compliance with recommendations in the 2007 ASHRAE Applications Handbook and AIHA/ANSI Standard Z9.5-2003 meets the intent of Section 5.16.3.4 (Section 5.17.3.4 of 62.1-2007), Class 4 Air, for no recirculation.

**Question No. 2:** Is this interpretation correct?

**Answer No. 2:** No

**Comments on No. 2:** Section 5.16.3.4 does not allow for recirculation of any amount of Class 4 air nor does it allow the use of heat recovery equipment which will result in recirculation of Class 4 air via leakage, carryover or transfer from the exhaust side of the system. It is possible to install heat recovery equipment, such as run-around loops, heat pipes or impermeable, plate-type heat exchangers, which will allow heat recovery from the Class 4 exhaust airstream while preventing cross-contaminated flow.

**Interpretation No. 3:** This interpretation also applies to ANSI/ASHRAE Standard 62.1-2007.

**Question No. 3:** Is this interpretation correct?

**Answer No. 3:** Yes

**Comments on No. 3:** These interpretation answers of “No” for Questions 1 & 2 apply to Standard 62.1-2007, with adjustments for changes in section numbering between the two versions of the Standard.