

- Subject:** Recirculation of Process Ventilation Exhaust Air - Minnesota Rules 5205.0110
- Purpose:** To clarify the requirements for obtaining permission from the Minnesota Occupational Safety and Health Division (MNOSHA) to recirculate process ventilation system exhaust air. To identify contaminants in exhaust air that may not be recirculated.
- Scope:** This instruction applies to all exhaust ventilation systems which recirculate process air, with the exception of those systems required to comply with paragraph (e)(5)(ii) of the 1910.1025 lead standard .
- Reference:** Minnesota Rules 5205.0110, Subpart 4: "Air from any exhaust system handling materials listed in Title 29, part 1910, Subpart Z, shall not be recirculated without written permission from the Department of Labor and Industry."
- Minnesota Rules 5205.0110, Subpart 1, Providing outside air to indoor workrooms
- Industrial Ventilation Manual, ACGIH, 27th edition
- ANSI Z9.2 – 2006 Fundamentals Governing the Design and Operation of Local Exhaust Systems.
- ANSI Z9.7- 2007 Recirculation of Air from Industrial Process Exhaust Systems
- NFPA 654- 2006 Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids.
- NFPA 664 –2007 Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities.
- "A Strategy for Assessing and Managing Occupational Exposures", AIHA Press, Second Edition, 1998
- Cancellation:** Supersedes existing MNOSHA Instruction STD 5-1.1 dated January 25, 2011.
- Background:** Since the last update to this directive, ANSI, in conjunction with AIHA, has adopted a new consensus standard addressing recirculated air (see reference above). It describes the need for a continuous monitoring device (CMD), or some alternative means to continually measure performance (ventilation pressure, for example). While also requiring exhaust concentrations not to exceed 10% of acceptable levels (determined by each jurisdiction), ANSI does not specify the method(s) to conduct tests to measure the exhaust, short of inserting monitors within the ductwork, a practice uncommonly done. Therefore, with the 2005 update, MNOSHA changed the requirement for annual monitoring of the exhaust concentration to measuring the employee exposure(s) on an annual basis when highly toxic materials (carcinogenic, mutagenic or teratogenic materials) are being recirculated.
- This revision includes cross-references to existing OSHA, NFPA or ANSI standards and requires compliance with the vertical OSHA standard or appropriate ANSI or NFPA standard.
- Definitions:** Definitions as used in this instruction are:
- A. "Air cleaning device" means an engineered component of an exhaust ventilation system which utilizes mechanical, chemical, or electrical forces, or any combination thereof, to remove dust, mists, gases, fumes, vapors, or other contaminants from an air stream.
 - B. "Carcinogen" means any substance that is either regulated by OSHA as a carcinogen; categorized by the ACGIH as either a "confirmed human carcinogen" or "suspected human carcinogen"; evaluated by the International Agency for Research on Cancer

June 30, 2015

(IARC) and found to be "carcinogenic" or "probably carcinogenic" to humans; or listed in the National Toxicology Program (NTP) Annual Report on Carcinogens.

- C. "Mutagenic substance" means any substance that induces genetic changes (mutations) in the DNA of chromosomes and is so designated on the material safety data sheet.
- D. "AL" means Action Level and refers to the action levels for each substance as defined in 29 CFR 1910.1017 through 1910.1052.
- E. "PEL" means Permissible Exposure Limit and refers to the eight hour time-weighted average, ceiling, peak, and short term exposure limits for air contaminants listed in 29 CFR 1910, Subpart Z-1-A.
- F. "Process ventilation" means an industrial ventilation system whose objective is to control any airborne contaminant which may be produced by an industrial process or operation. The process ventilation referred to in this instruction relates to local exhaust ventilation systems used to capture dusts, mists, gases, fumes, or vapors at their source.
- G. "Recirculation" means the direct or indirect return into any workplace of air from an air cleaning device installed on a local exhaust ventilation system.
- H. "Return air" means the air discharged directly from the air cleaning system to the occupied space. The concentration of the contaminants in the return air must be no more than ten percent of the PEL for the air contaminant for which permission is being granted.
- I. "Teratogenic substance" means any substance that causes physical defects in a developing embryo and is so designated on the material safety data sheet.
- J. "TLV®" means Threshold Limit Values adopted by the American Conference of Governmental Industrial Hygienists, current edition.

Action: Minnesota OSHA will consider all written applications from employers requesting permission to recirculate process air. A letter granting permission or explaining denial will be drafted by the Health OMT. A copy of this letter and the original application will be placed in the Recirculated Air file in the St. Paul office. Decisions for granting permission to recirculate process ventilation system exhaust air will be based on the following criteria:

- A. CONTAMINANTS WHICH MAY NOT BE RECIRCULATED: Recirculation of air will not be permitted from systems containing one or more of the following contaminants:
 - 1. A radioactive substance (as listed in 10 CFR 20.1001-.2401, Appendix B, table I, Column 3).
 - 2. A carcinogen for which there is no permissible exposure limit.
 - 3. A mutagen for which there is no permissible exposure limit.
 - 4. A teratogen for which there is no permissible exposure limit.
- B. CONTAMINANTS WHICH REQUIRE PERMISSION FOR RECIRCULATION: Air containing contaminants with PELs or TLVs® (for those substances where a PEL exists) below 500 ppm or 5 mg/m³ (collected as total dust) may be recirculated with the prior approval of MNOSHA. In order to be considered for approval, the written application submitted by the employer must include the following information:

1. The identification of the plant or facility (department, building, section, etc.) where the system is located.
2. A description of the processes and/or operations being ventilated by the system or systems for which recirculation approval is being requested. Each system must be separately identified.
3. The identification of all the process contaminants in the air being handled by the exhaust ventilation system.
4. The identification of the volume of air to be recirculated, the total rate of air exchange in the affected space, and the occupancy of the affected space.
5. A description of the air cleaning device (make, model, type, etc.) to be utilized for the air recirculation.
6. Evidence that the system will reduce the contaminant concentration in the exhaust stream to less than 10% of the PEL.
NOTE: Any consideration for variance from this requirement must be documented as being consistent with Chapter 7, "Conservation Approaches" subsection, of the Industrial Ventilation Manual published by the American Conference of Governmental Industrial Hygienists (ACGIH).
7. A description of alternate air discharge arrangements or other means of providing equivalent health and fire protection in the event of an air cleaning device malfunction. An alternate air duct to exhaust air to the out-of-doors is normally required on all recirculation systems to protect worker health. The requirement for an alternate duct discharge to the out-of-doors may be waived where equivalent health protection can be provided by means of a monitoring system incorporated into the primary air cleaning device. This monitoring system must be capable of activating a warning device to alert personnel of system malfunction. Once the warning is activated, the employer must have provisions to either:
 - a. activate a by-pass to a secondary or standby means of air cleaning at least as effective as the primary air cleaning device; or
 - b. terminate immediately the release of process contaminants to the occupied space.

The monitoring system(s) referred to above may be operated on the principles of changes in pressure, airflow, contaminant concentrations, temperature, or other reliable means.
8. Supplementary information relevant to system performance, testing and monitoring, including test methods.
9. A commitment that measurements which demonstrate the effectiveness of the system in controlling exposure, such as capture velocity, face velocity, duct velocity or static pressure will be made at least every three months.
10. Prior to any changes in the process or controls which might result in an increase in employee exposures to the contaminant, evidence shall be compiled showing that the contaminant concentration in the exhaust stream will remain less than 10% of the PEL.

11. Records of all monitoring tests shall be maintained for thirty (30) years.

C. ADDITIONAL REQUIREMENTS FOR CARCINOGENIC, MUTAGENIC, AND TERATOGENIC SUBSTANCES: In addition to the requirements above, the following shall be required for carcinogens, mutagens and teratogens which have OSHA permissible exposure limits.

- The design of the system must be approved by a licensed Professional Engineer or a Certified Industrial Hygienist.
- Personal monitoring results which demonstrate that employees affected by the ventilation system are exposed below the AL, or below the PEL when no AL exists, shall be submitted with this application. Where the application is made for a new process, conditional approval may be granted provided that monitoring results are submitted within 30 days of startup.
- When the monitoring results submitted with the application show that any employees are exposed to levels greater than 10% of the AL (or PEL when no AL exists) personal monitoring to verify that employee exposures to the substance remains below the AL, (or PEL when no AL exists) must be performed at least annually thereafter. Monitoring may cease when at least six consecutive results show all employee exposures are below the AL, or PEL when no AL exists.
- Personal monitoring of those affected by the ventilation system must also be performed within five days following any change in process or controls that may result in increased exposure.

D. INTERACTION WITH OTHER STANDARDS: Notwithstanding any of the above, employer's operations must be in compliance with existing standards prior to granting permission. If identified during an inspection, the vertical standard shall be cited. These include:

- a) 1910.107(d)(3) and (d)(9) prohibit recirculation of flammable liquids. Letters of interpretation explain that recirculation is allowed if compliance with appropriate NFPA & ANSI codes is done.
- b) 1910.124(c) General Requirements for Dipping and Coating Operations, prohibits recirculation from dipping if levels exceed 25% of the LFL or pose a health hazard. The air must be free of any solid material that poses a health or safety hazard for employees; be monitored by approved equipment. The employer must have a system that sounds an alarm and automatically shuts down the operation when the vapor concentration for any substance in the exhaust airstream exceeds 25 percent of its LFL.
- c) 1910.1025, Lead, A federal OSHA letter of interpretation states that if the ventilation was not installed to control an overexposure (or to prevent one), the Lead Standard paragraph dealing with mechanical ventilation does not apply, 1910.1025(e)(4)(ii).
- d) 1910.1027, Cadmium, requires HEPA filters & be monitored to assure effectiveness;
- e) 1910.1003, 13 regulated carcinogens, prohibited;

f) Other carcinogens: ANSI Z9.7-2007 Paragraph 4.2.1 requires special precautions for carcinogens or other highly toxic substances with acute toxicity. Recirculation is prohibited unless there is an effective air cleaning method capable of removing contaminants to 10% of the acceptable level. Further, highly toxic substances as defined in 1910.1200 shall not be recirculated unless there is a functioning continuous monitoring device system (CMD) capable of detecting at least as low as 10% the acceptable level in the discharge ductwork; and the CMD shall be calibrated and maintained in accordance with the manufacturer's specifications. Also, there must be the ability to direct the exhaust outlet to the outside or to a back-up cleaning device in the event the cleaner fails (or shut down); and an air cleaning device failure will not result in an employee exposure above the acceptable level. An alternative to CMD is described in ANSI Z9.7 as well.

g) Other Combustible materials, such as magnesium, aluminum and Wood Dust: NFPA 664, requires spark detectors when exhausting wood dust; this is to prevent fires. Employers must show that their ventilation system meets NFPA 664 (and also NFPA 69 which is referenced in 664) before permission is granted. NFPA 654.6.1.3 Recycling of Air-Material Separator Exhaust: "Recycling of air-material separator exhaust to buildings shall be permitted if the system is designed to prevent both return of dust with an efficiency of 99.9% at 10 micrometer and transmission of energy from a fire or explosion to the building. Some woods are category A1, A2 carcinogens (per ACGIH). Those with PELs can be given permission to recirculate. Those without specific PELs, or not included in Subpart Z, are not covered by this rule and do not need permission.

h) Rosin core solder pyrolysis products - PEL (as formaldehyde) is 0.1 mg/m³ which was added to the PEL list in 1989 based on an ACGIH TLV[©] which was removed in 1994 (in favor of language that says to keep exposure to lowest amount feasible). There is no current federal PEL. This PEL entry is still on the MNOSHA list, therefore it is covered by this rule. However, analysis should be based on formaldehyde measurements. The PEL for formaldehyde is 0.75 ppm

E. CONTAMINANTS WHICH MAY BE RECIRCULATED WITHOUT PERMISSION: Air recirculation may be utilized without prior approval of MNOSHA, if:

1. The air to be recirculated contains process contaminants whose PELs and TLVs[®] are equal to or exceed 500 ppm and 5 mg/m³ total or respirable particulate; and
2. The work area is provided with outside air at the rate of 15 cubic feet per minute per person as required by Minnesota Rules 5205.0110, subpart 1.
3. The air cleaning device is capable of reducing the concentration of process contaminants in the return air to ten (10) percent or less of their PELs. If the air cleaning device has no alarm to indicate higher levels, periodic performance checks must be made to ensure proper operation.

F. REVIEW OF REQUEST.

The OMT Director/Supervisor reviews the request for compliance with Minn. Rule 5205.0110 and this directive. In some cases, OSHIs may also be asked for their review, especially if the request is in connection with an inspection. If the request is compliant, a letter shall be sent to the requesting party granting the permission (Appendix A). The Director/Supervisor shall sign the letter. Reviews should be completed within three weeks of their receipt.

If the request is not compliant with 5210.0110 and this directive, the requesting party shall be contacted and informed of the reason the request is not compliant and/or

requesting additional information. If the request is not granted, a letter shall be sent explaining to the employer providing the reason why permission cannot be granted and/or requesting additional information. The Director/Supervisor shall sign the cover letter.

- G. DURATION OF PERMISSION: When granted, permission to recirculate process air shall be for a period of five years for carcinogenic, mutagenic and teratogenic substances, and ten years for all other substances, provided the requirements of this section are met. The OMT Director/Supervisor shall sign the letter.

James Krueger, Director MNOSHA Compliance

Distribution: OSHA Compliance and WSC Director

Note: Minnesota Occupational Safety and Health Division instructions are used exclusively by OSHA personnel to assist in the proper interpretation and application of occupational safety and health statutes, regulations and standards. They are not legally binding declarations and they are subject to revision or deletion at any time without notice.

APPENDIX A: SAMPLE LETTER - APPROVAL TO RECIRCULATE PROCESS AIR

DATE

RE: Request to Recirculate Process Exhaust Air

Dear Mr/Ms _____ :

This is in response to your request for approval for recirculation of process air in the _____ operations of your facility at (address) _____. Permission is hereby granted to recirculate process air as described in the application. Approval is continuing for five years for carcinogenic, teratogenic and mutagenic substances, and ten years for all other substances, and as long as the conditions in MNOSHA instruction STD 5-1.1 (enclosed) are met. In particular:

1. The system is maintained, as designed, so that process air contaminant concentrations in the return air do not exceed 10% of PELs, and;
2. Prior to any change in process or controls that may result in increased exposure, you compile evidence showing that concentrations in the return air will not exceed 10% of the PELs, and;
3. Standby means of air cleaning and/or procedures to terminate immediately the release of process contaminant(s) are in place, and;
4. For any recirculated carcinogenic, mutagenic or teratogenic substances, if the personal monitoring submitted with your application show that any employee is exposed to greater than 10% of the AL (or PEL where no AL exists), you perform personal air monitoring at least annually, or until at least six consecutive monitoring results show employee exposures are below the AL (or PEL where no AL exists). In addition, you perform personal monitoring of those affected by the ventilation system within five days following any change in process or controls that may result in increased exposure.

Sincerely,

Alden L. Hoffman, P.E., CIH, Director
OSHA Management Team
Occupational Safety and Health Division

ALH

Enclosure [include if needed]