

## DOCKETED

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## SECTION 140.9 – PRESCRIPTIVE REQUIREMENTS FOR COVERED PROCESSES

### (c) Prescriptive Requirements for Laboratory and Factory Exhaust Systems.

3. **Fan System Power Consumption.** All newly installed fan exhaust systems serving a laboratory or factory greater than 10,000 CFM, shall meet subsection A and either B, C, D or E. Fan systems shall also meet the acceptance testing requirements of subsection F:
  - A. System shall meet all discharge requirements in ANSI Z9.5-2012 Section 5.4 and Appendix 3; and
  - B. The allowable exhaust fan system power demand shall not exceed 0.6 watts per cfm of exhaust air. Exhaust fan system power demand equals the sum of the power demand of all fans in the exhaust system that are required to operate at normal occupied design conditions in order to exhaust air from the conditioned space to the outdoors. Exhaust air does not include entrained air, but does include all exhaust air from the fume hoods, hazardous exhaust flow or other manifolded exhaust streams: or
  - C. **Simple Turndown VAV Control.** The exhaust fan system shall be designed such the fan speed is varied to maintain the appropriate static pressure within the duct system under normal operating conditions, rather than the use of a by-pass damper.
    - i. The stack height and placement should be sufficient to minimize the maximum downwind concentrations of the exhaust associated with the worst-case emission scenario to less than the applicable health and odor limits for wind speeds conditions at or below the ASHRAE 1% design wind speed when the exhaust fan(s) is operation at the system minimum volume flow rate.
    - ii. Fan staging can be incorporated into the simple turndown VAV control strategy to allow the total exhaust system to operate above the minimum acceptable volume flow rates over the entire range of laboratory exhaust air flow loads.
    - iii. By-pass dampers can be utilized to maintain acceptable static pressure during non-standard conditions such as during fan start-up or shut-down, or during emergency modes when supply air flow requirements may be significantly reduced.
  - D. **Wind Responsive VAV Control.** The volume flow rate at the stack shall vary based on the measured 5-minute average wind speed and wind direction obtained from the calibrated local anemometer.
    - i. Location of the anemometer shall be installed in a location that experiences similar wind conditions to the free stream environment above the exhaust stacks and be at a height that is outside of the wake of nearby structures.
    - ii. Look-up tables shall be used to define the required exhaust volume flow rate, as a function of at least eight wind speeds and eight wind directions, to maintain downwind concentrations below health and odor limits for all detectable contaminants.
    - iii. Wind speed/direction sensors shall be certified by the manufacture to be accurate within plus or minus 40 fpm (0.2 m/s) and 5.0 degrees when measured at sea level and 25°C, factory calibrated, and certified by the manufacturer to require calibration no more frequently than once every 5 years.
    - iv. Upon detection of sensor and/or signal failure, the system shall reset the exhaust volume flow rate to the value needed to maintain downwind concentrations below health and odor limits for all detectable contaminants at worst-case wind conditions; or

- E. In-Situ Monitoring VAV Control.** The volume flow rate at the stack shall vary based on the measured contaminant concentration in the exhaust plenum from a calibrated contaminant sensor installed within each exhaust plenum. Air samples should be collected and analyzed within each exhaust plenum at a rate of at least once every 5 minutes.
- i. A contaminant-event threshold shall be established based on maintaining downwind concentrations below health and odor limits for all detectable chemicals at worst-case wind conditions.
  - ii. The emission rates for chemicals that can not be detected with the in-situ sensors shall be limited (controlled) to maintain downwind concentrations below acceptable health and odor limits when the exhaust system is operating at its minimum volume flow rate.
  - iii. Contaminant concentration sensors shall be Photo Ionization Detectors (PID) certified by the manufacturer to be accurate within plus or minus 5% when measured at sea level and 25°C, factor calibrated, and certified by the manufacturer to require calibration no more frequently than once every 6 months.
  - iv. Upon detection of the sensor and/or signal failure, the system shall reset the exhaust volume flow rate to the value needed to maintain downwind concentrations below the health and odor limits for all detectable contaminants at worst-case wind conditions.
- F. Fan System Power Consumption Acceptance.** Before an occupancy permit is granted for a laboratory or process facility subject to Section 140.9(c)3, the applicable equipment and systems shall be certified as meeting the Acceptance Requirement for Code Compliance, as specified by the Reference Nonresidential Appendix NA7.16. A Certificate of Acceptance shall be submitted to the enforcement agency that certifies that the equipment and systems meet the acceptance requirements specified in NA7.16.