



**BSR/ASHRAE Addendum h
to ANSI/ASHRAE Standard 62.1-2022**

Public Review Draft

Proposed Addendum h to Standard 62.1-2022, Ventilation and Acceptable Indoor Air Quality

**Second Public Review (August 2024)
(Draft shows Proposed Changes to Current Standard)**

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FOREWORD

Section 8 of ASHRAE 62.1 addresses Operations and Maintenance of Ventilation Systems and related components. Ventilation systems that are not operated per design or maintained in good working order are subject to degraded performance of maintaining acceptable IAQ and potentially impacting energy use.

ASHRAE/ACCA Standard 180 provides maintenance tasks for HVAC systems. Table 8-1 has previously duplicated or modified maintenance tasks from this standard. A first public review of this addendum set to eliminate the majority of this table and referred to Standard 180 for maintenance. Based on public comments received, a new review of this section and table was initiated. It was decided that a new table, separate from Standard 180, that is based on the requirements of 62.1, could provide facility users with a list of inspection tasks that are important to maintaining acceptable IAQ.

It is important to emphasize that this new table is based on inspection and not maintenance. The results of the inspection task may have an impact on the preventive maintenance plan, or could elevate the need for service, or professional support. The goal is to be IAQ focused and to identify issues that may otherwise go undetected and to keep the ventilation system performing as intended.

[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~striking through~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]

Addendum h to 62.1-2022

Modify Section 8

8. OPERATIONS AND MAINTENANCE

8.1 General

8.1.1 Application. The requirements of this section apply to buildings and their ventilation systems and their components ~~constructed or renovated after the adoption date of this section~~ after placed into service.

8.1.2 Building Alterations or Change of Use. ~~When~~Where buildings are altered or ~~when~~where changes in building use, occupant category, significant change in occupant density, or other changes inconsistent with system design assumptions are made, the ventilation system design, operation, and maintenance shall be reevaluated and the O&M manual updated as necessary.

8.2 O&M Manual. An O&M manual, either written or electronic, shall be developed and maintained on site or in a centrally accessible location for the working life of the applicable ventilation system equipment or components. This manual shall be updated as necessary. The manual shall include the O&M procedures, ventilation system operating schedules and any changes made thereto, final design drawings, maintenance

schedules based on manufacturer’s instructions, and the inspection and maintenance requirements and frequencies provided in Table 8-1 and in ANSI/ASHRAE/ACCA Standard 180.

Informative Note: ANSI/ASHRAE/ACCA Standard 180, Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems, provide requirements for the development of a comprehensive maintenance plan for commercial HVAC systems.

8.3 Ventilation System Operation. Mechanical and natural ventilation systems shall be operated in a manner consistent with the O&M manual. Systems shall be operated such that spaces are ventilated in accordance with Section 6 during periods of expected occupancy.

8.4 Ventilation System Maintenance. The building ventilation system components shall be maintained in accordance with the O&M manual.

8.5 Ventilation System Inspection, Verification, Validation. The building ventilation system and components shall be inspected and verified to continue to meet requirements as designed in accordance with this standard. The inspection and verification shall be performed per minimum frequencies provided in Table 8-1.

Informative Note: Tasks may need to be increased in frequency when operating in a mode that is beyond normal operation. Tasks may result in changes to the O&M manual or identification of ventilation system deficiencies that require corrective action. Failure to perform tasks, make repairs, or correct deficiencies may result in less than acceptable IAQ.

Table 8-1 Minimum Maintenance Inspection, Verification, and Validation Activity and Frequency for Ventilation Systems Equipment and Associated Components

Inspection/Maintenance Task	Frequency^a
a. Investigate system for water intrusion or accumulation. Rectify as necessary.	As necessary
b. Verify that the space provided for routine maintenance and inspection of open cooling tower water systems, closed cooling tower water systems, and evaporative condensers is unobstructed.	Monthly
c. Open cooling tower water systems, closed cooling tower water systems, and evaporative condensers shall be treated to limit the growth of microbiological contaminants, including <i>legionella sp.</i>	Monthly
d. Verify that the space provided for routine maintenance and inspection of equipment and components is unobstructed.	Quarterly
e. Check pressure drop and scheduled replacement date of filters and air cleaning devices. Clean or replace as necessary to ensure proper operation.	Quarterly
f. Check ultraviolet lamp. Clean or replace as needed to ensure proper operation.	Quarterly
g. Visually inspect dehumidification and humidification devices. Clean and maintain to limit fouling and microbial growth. Measure relative humidity and adjust system controls as necessary.	Quarterly
h. Maintain floor drains and trap primer located in air plenums or rooms that serve as air plenums to prevent transport of contaminants from the floor drain to the plenum.	Semiannually
i. Check ventilation and IAQ related control systems and devices for proper operation. Clean, lubricate, repair, adjust, or replace as needed to ensure proper operation.	Semiannually
j. Check P traps in floor drains located in plenums or rooms that serve as air plenums. Prime as needed to ensure proper operation.	Semiannually
k. Check fan belt tension. Check for belt wear and replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment or evidence of wear and correct as needed.	Semiannually
l. Check variable frequency drive for proper operation. Correct as needed.	Semiannually
m. Check for proper operation of cooling or heating coil for damage or evidence of leaks. Clean, restore, or replace as required.	Semiannually

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n. Visually inspect outdoor air intake louvers, bird screens, mist eliminators, and adjacent areas for cleanliness and integrity; clean as needed; remove all visible debris or visible biological material observed and repair physical damage to louvers, screens, or mist eliminators if such damage impairs the item from providing the required outdoor air entry.	Semiannually
o. Visually inspect natural ventilation openings and adjacent areas for cleanliness and integrity; clean as needed. Remove all visible debris or visible biological material observed and repair physical damage to louvers, and screens if such damage impairs the item from providing the required outdoor air entry. Manual and/or automatic opening apparatus shall be physically tested for proper operation and repaired or replaced as necessary.	Semiannually
p. Verify the operation of the outdoor air ventilation system and any dynamic minimum outdoor air controls.	Annually
q. Check air filter fit and housing seal integrity. Correct as needed.	Annually
r. Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
s. Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
t. Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
u. Check integrity of all panels on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
v. Assess field serviceable bearings. Lubricate if necessary.	Annually
w. Check drain pans, drain lines, and coils for biological growth. Check adjacent areas for evidence of unintended wetting. Repair and clean as needed.	Annually
x. Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
y. Inspect unit for evidence of moisture carryover from cooling coils beyond the drain pan. Make corrections or repairs as necessary.	Annually
z. Check for proper damper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
aa. Visually inspect areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Annually
ab. Check condensate pump. Clean or replace as needed.	Annually
ae. Visually inspect exposed ductwork and external piping for insulation and vapor barrier for integrity. Correct as needed.	Annually
ad. Verify the accuracy of permanently mounted sensors whose primary function is outdoor air delivery monitoring, outdoor air delivery verification, or dynamic minimum outdoor air control, such as flow stations at an air handler and those used for demand control ventilation, including CO ₂ sensors. A sensor failing to meet the accuracy specified in the O&M manual shall be recalibrated or replaced. Performance verification shall include output comparison to a measurement reference standard consistent with those specified for similar devices in ASHRAE Standard 41.2 or ASHRAE Standard 111.	5 years
ae. Verify the total quantity of outdoor air delivered by air handlers set to minimum outdoor air mode. If measured minimum airflow rates are less than the design minimum rate documented in the O&M manual, ± a 10% balancing tolerance, (1) confirm the measured rate does not conform with the provisions of this standard and (2) adjust or modify the air handler components to correct the airflow deficiency. Ventilation systems shall be balanced in accordance with ASHRAE Standard 111 or its equivalent, at least to the extent necessary to verify conformance with the total outdoor airflow and space supply airflow requirements of this standard. Exception: Units under 2000 cfm (1000 L/s) of supply air are exempt from this requirement.	5 years

a. Minimum frequencies may be increased or decreased if indicated in the O&M manual.

Task #	Relative Section	Inspection, Verification, Validation Task	Frequency
1a	4.1 6.1.4	Verify that the building is not designated as a nonattainment area. Address per <u>section 6.1.4.</u>	Annually
2a	5.1.2	Inspect piping and ductwork insulation system for integrity and signs of <u>moisture or biological growth and repair as needed.</u>	Annually
3a	5.4.1	Verify that no modifications to the HVAC system or the facility have been <u>made that impact separation distances.</u> <u>Deficiencies require corrective action.</u>	Annually

4a	<p><u>5.4.3</u> <u>5.4.4</u> <u>5.4.5</u></p>	<p><u>Inspect outdoor air intakes and exhaust openings, bird screens, louvers, dampers, and other attached components and ducting for rain intrusion, snow entrainment, pest intrusion, and physical condition.</u></p> <ul style="list-style-type: none"> • <u>Indication of biological growth</u> • <u>Indication of corrosion</u> • <u>Buildup of dirt and debris</u> • <u>Indication or presence of birds, insects, or other animals</u> • <u>Integrity</u> <p>Clean and repair as needed; Determine root cause and corrective actions.</p>	<p><u>Semi-annually</u></p>
5a	<p><u>5.5</u> <u>5.9</u></p>	<p><u>Verify air filtration fit, function, and performance</u></p> <ul style="list-style-type: none"> • <u>Verify efficiency and particulate matter rating is at least minimum requirements.</u> • <u>Verify filters are correct thickness, fit, and size for housing assembly.</u> • <u>Verify seal integrity so that airflow cannot bypass the filter(s).</u> • <u>Verify filter scheduled replacement frequency.</u> • <u>Confirm that pressure drop readings do not exceed the maximum pressure drop of the filter or the maximum allowable for the fan based on the static pressure calculations.</u> • <u>Verify electronic air cleaning devices are operating in accordance with manufacturer’s instructions.</u> <p><u>Repair, replace, or clean filters or assembly components as necessary to for intended operation.</u></p>	<p><u>Quarterly, or at scheduled replacement if sooner</u></p>
6a	<p><u>5.7.1</u> <u>5.7.2</u> <u>5.7.3</u> <u>5.7.4</u> <u>7.2.3</u></p>	<p><u>Inspect drain pans, seals, traps, pumping systems, drains and drain piping within air handling equipment, ducting, and plenums.</u></p> <ul style="list-style-type: none"> • <u>Verify drain pan is sized and positioned under water producing devices.</u> • <u>Verify drain pan slope is in direction of drain outlet.</u> • <u>Inspect for biological growth, corrosion, or other debris that would prevent intended drain operation.</u> • <u>Verify water drains freely out of pan and through attached drain piping.</u> • <u>Verify traps, seals, and priming devices are wet and operational.</u> • <u>Verify pumps are operational.</u> • <u>Inspect for signs of overflow or water carryover.</u> • <u>Validate shut off devices or alarms function as intended.</u> <p>Clean and repair as needed; Determine root cause and make corrective actions</p>	<p><u>Semi- annually</u></p>
7a	<p><u>5.8</u></p>	<p><u>Inspect humidifiers and dehumidifiers</u></p> <ul style="list-style-type: none"> • <u>Verify drain components function intended.</u> • <u>Verify water feed components function as intended.</u> • <u>Inspect for biological growth, corrosion, or other debris on units or associated ducting as an indication improper operation.</u> • <u>Verify humidity, dew point, or other moisture measurements are within designed ranges and associated sensors function as intended.</u> • <u>Verify operation on desiccant dehumidifiers per manufacturers instructions</u> <p>Clean and repair as needed; Determine root cause and make corrective actions</p>	<p><u>Semi- annually</u></p>
7b	<p><u>5.8</u></p>	<ul style="list-style-type: none"> • <u>Validate humidity, dew point, or other moisture measurements associated sensors are calibrated and function as intended.</u> 	<p><u>Every 3 years</u></p>
8a	<p><u>5.9.1</u> <u>5.9.2</u></p>	<p><u>Verify operation and condition of air-cleaning devices and ultraviolet devices</u></p> <ul style="list-style-type: none"> • <u>Verify operation of air cleaning devices per manufactures instructions</u> • <u>Inspect for indication of lamp malfunction or ineffectiveness and determine root cause and corrective action.</u> • <u>Clean lamps in accordance with manufacturer’s instructions.</u> • <u>Replace lamps per manufacturers schedule or upon lamp failure.</u> 	<p><u>Quarterly</u></p>
9a	<p><u>5.10.1.1</u> <u>5.19.1</u></p>	<p><u>Verify that space and access is provided and is maintained unobstructed for:</u></p>	<p><u>Semi- annually</u></p>

	<u>5.19.2</u> <u>5.19.3</u>	<ul style="list-style-type: none"> • <u>All areas necessary for air balancing, verification, and measurement of ventilation by Section 7.2.2</u> • <u>All other areas that require routine maintenance and inspection by Section 8.2</u> • <u>All components and equipment that require verification by Section 8.5</u> • <u>All sensors, instruments, and ventilation system components, controls, and equipment</u> • <u>All access doors and panels.</u> <ul style="list-style-type: none"> ◦ <u>Verify access doors and panels are functional and correctly seal when not open for testing, inspection, or maintenance.</u> <p><u>Clean, repair, and provide access as needed.</u></p>	
10a	<u>5.10.2</u> <u>5.11.1</u>	<p><u>Inspect floor, ceiling, or mechanical room plenum systems and ductwork.</u></p> <ul style="list-style-type: none"> • <u>Verify that there is no biological growth, corrosion, or indication of insects or other animals.</u> • <u>Verify chemicals, cleaning products or equipment, or other materials are not kept in air handling spaces or plenums.</u> <p><u>Clean and remove foreign objects; Determine root cause and make corrective actions</u></p>	Annually
11a	<u>5.10.3</u> <u>7.2.2</u>	<p><u>Perform TAB air balance verification</u></p> <ul style="list-style-type: none"> • <u>Review design documents, most-recent TAB report, and current requirements</u> <ul style="list-style-type: none"> ◦ <u>Determine if airflows meet design intent.</u> ◦ <u>If occupancy or space utilization has changed determine if airflow rates meet this standard</u> • <u>Verify outdoor airflows meet design requirements of this standard.</u> • <u>In spaces that require exhaust by Table 6-2, verify exhaust airflow is greater than supply airflow.</u> • <u>Verify dynamic reset and outdoor airflow per Section 14 of this table.</u> <p><u>Verify CO2 sensor calibration and CO2 DCV setup.</u></p> <ul style="list-style-type: none"> • <u>Determine space type and design occupancy and verify maximum CO2 limit is correctly set.</u> • <u>Verify when the space is unoccupied that ventilation for the building component ventilation rate is provided or in occupancy standby.</u> 	Annually
11b	<u>5.10.3</u> <u>5.18</u> <u>6.2.5</u> <u>6.2.6</u> <u>6.2.6.1.3</u> <u>6.2.5</u> <u>6.2.6</u> <u>7.2.2</u>	<p><u>Perform TAB air balance validation</u></p> <ul style="list-style-type: none"> • <u>Measure outdoor airflows of all units and adjust as necessary.</u> <ul style="list-style-type: none"> ◦ <u>Spot check space level airflows at outlet/inlets at a minimum of 20% of all zones.</u> ◦ <u>Rebalance as necessary any discrepancies found to verify compliance with the design intent and this standard.</u> ◦ <u>Rebalance all zone and space level airflows if determined that occupancy or space utilization has changed, and airflows no longer meets design intent or this standard.</u> • <u>Rebalance exhaust airflows to maintain supply and exhaust relationship and pressurization requirements.</u> • <u>Validate CO2 sensor calibration in accordance with manufacturer’s instruction.</u> • <u>Validate, maintain, and calibrate ventilation sensors.</u> <ul style="list-style-type: none"> ◦ <u>Calibrate static and differential pressure transducers used control fan pressure, room pressure, VAV boxes, airflow, and filters.</u> ◦ <u>Validate airflow rates of airflow sensors.</u> ◦ <u>Clean airflow measuring stations per manufacturer’s instructions.</u> ◦ <u>Calibrate airflow measuring stations per manufacturer’s instructions.</u> 	Every 3 years
12a	<u>5.12</u>	<p><u>Verify cooling systems maintain indoor conditions below humidity limits.</u></p> <p><u>Determine root cause and make corrective actions</u></p>	Annually
13a	<u>5.13</u> <u>5.17</u> <u>6.5.1.2</u>	<p><u>Verify directional airflow and building pressurization.</u></p> <ul style="list-style-type: none"> • <u>Verify that air is transferred only from a lower-class air to a higher class air or within the same classification</u> 	Annually

		<ul style="list-style-type: none"> • <u>Verify that zones are pressurized per design and flow moves toward the exhaust.</u> • <u>Verify any pressure indication or measurement sensors.</u> • <u>Validate through measurement that controls for ventilation and controls for exhaust track to maintain building at minimum neutral to positive pressure under all dynamic conditions</u> 	
14a	5.18 6.2.5 6.2.6	<p><u>Verify ventilation system, variable load and dynamic reset controls.</u></p> <ul style="list-style-type: none"> • <u>Inspect and test damper assemblies (adjust and repair as needed)</u> <ul style="list-style-type: none"> ○ <u>Verify seals are intact, linkages and dampers operate smoothly, dampers operate full range, actuators clamps are tight on shaft, dampers close tight, actuators modulate as intended and fail-safe on power loss.</u> • <u>Inspect fan assemblies (clean, lubricate, adjust, and repair as needed)</u> <ul style="list-style-type: none"> ○ <u>Belt tension and wear, sheave alignment, bearing operation.</u> ○ <u>Fan balance, tightness, and cleanliness</u> ○ <u>Electrical connections, motor controllers, variable frequency drives, and other speed modulating devices</u> • <u>Verify that zone level controls maintain no less than ventilation rates (Vbz) under all load and dynamic reset conditions.</u> <ul style="list-style-type: none"> ○ <u>Verify that zone air ventilation rates are maintained during supply fan turndown and other reduced load conditions.</u> ○ <u>Verify ventilation system and control provide no less than the minimum ventilation rates for the current occupancy.</u> • <u>Verify that occupancy controls shut off the zone ventilation when the space is either unoccupied or in occupied standby.</u> 	Every 2 years
15a	5.20	<u>Verify legionella plan is implemented and maintained</u>	Annually
16a	6.3.1 6.3.3.2 7.3	<p><u>For systems designed per the Indoor Air Quality Procedure (IAQP), Verify design compounds, Particulate Matter (PM), and occupant satisfaction.</u></p> <ul style="list-style-type: none"> • <u>Conduct subjective evaluation of occupants per section 7.3.2</u> <ul style="list-style-type: none"> ○ <u>Address concerns of occupants</u> • <u>Review design documents and any available test results per section 7.3.3:</u> <ul style="list-style-type: none"> ○ <u>Identify design compounds (DCs) and PM design intent, review post occupancy testing.</u> ○ <u>If occupancy or space utilization has changed determine if the initial tested DCs and DLs are still applicable to the space.</u> 	Every 2 years
16b	6.3.1 6.3.3.2 7.3	<p><u>Validate concentrations of DCs and PM2.5 remain less than the design limits (DLs) per section 7.3.1.</u></p> <ul style="list-style-type: none"> ○ <u>If occupancy or space utilization has changed identify new DCs.</u> <p><u>Perform objective evaluation per section 7.3.1 to verify DLs continue to be met.</u></p> <ul style="list-style-type: none"> ○ <u>If any limit is exceeded, perform root cause analysis to determine if flow rates need adjustment or air cleaning equipment needs repair or replacement.</u> 	Every 3 years
17a	6.4.3	<p><u>Verify natural ventilation controls and accessibility.</u></p> <ul style="list-style-type: none"> • <u>Verify that occupant operated natural ventilation openings are functional and accessible.</u> • <u>Verify control sequences and instrumentation that automate natural ventilation openings operate during occupied periods. Validate openings cannot be closed except during unoccupied periods or when mechanical ventilation system is active.</u> • <u>Verify controls and sequences for mechanical ventilation operate when conditions for natural ventilation are inadequate</u> 	Annually
18a	6.5	<p><u>Verify exhaust ventilation.</u></p> <ul style="list-style-type: none"> • <u>Review design documents and most-recent TAB report exhaust flow rates.</u> <ul style="list-style-type: none"> ○ <u>Determine if exhaust airflow rates are per table 6-2 and 6-3.</u> ○ <u>If occupancy or space utilization has changed identify new exhaust rates.</u> • <u>Review design documents, contaminants, and mixtures of concern.</u> 	Annually

		<ul style="list-style-type: none"> ○ <u>Verify that exhaust monitoring and control system are detecting and maintaining concentrations below limits and maintaining design airflow rates.</u> ○ <u>If occupancy or space utilization has changed identify new contaminants or mixtures of concern, concentration limits, and exhaust flow rates.</u> ● <u>If concentration levels, airflow rates, or pressurization requirements are not being maintained per design, perform the necessary actions described in section 11b of this table.</u> 	
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Table 8-1 Notes:

1. “a” type tasks are intended as verifications see Note 2; “b” type tasks are intended as validations, see Note 3
2. As used in this table, “verify” is intended to mean checking a condition through means such as visual inspection, review of documentation, reading gauges, using telltales, viewing local displays, or analyzing live or trend data in Building Automation System (BAS). These tasks are intended to be accomplished without special tools, specialized instrumentation, or by persons needing specialized training, knowledge, certifications, or licenses.
3. As used in this table, “Validate” is intended to mean taking action to perform a function that requires specific tools, calibrated instrumentation, adjustments, changes in operation, and by persons needing specialized training, knowledge, certifications, or licenses.
4. If the desired results of a task cannot be verified, as described in Note 2, then the task shall be validated as described in Note 3, regardless of listed minimum frequency.

Add the following reference to Section 9.

ANSI/ASHRAE/ACCA Standard 180 (2018) Standard Practice For Inspection And Maintenance Of Commercial Building HVAC Systems
Tables 5.1 – 5.25