U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SUBJECT: Air Traffic Organization Indoor Air Quality Program Implementation Requirements (ATO IAQ PIR)

1. These requirements establish responsibilities, procedures, and standards for managing the Air Traffic Organization (ATO) Indoor Air Quality (IAQ) program.
2. This requirement document replaces the ATO's *Indoor Air Quality Implementation Guidance* and the *Guidance for the Management of Mold in FAA Facilities* documents released in September 2006. The revised document reflects the current organizational structure, assigns roles and responsibilities, and incorporates best practices.
3. The purpose of this document is to provide standardized ATO IAQ program implementation requirements that contribute to a safe and healthful work environment for ATO employees and building occupants.
4. All current collective bargaining agreements regarding IAQ and mold must be followed.
5. This requirement document must be annually reviewed and updated as appropriate with documented changes.

ATO IAQ PIR Addendum Record

Version	Date Issued	Description of Changes
Initial issuance	7/1/15	New document

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Chapter 1—General Information

1. Purpose of ATO IAQ PIR

These requirements establish the Air Traffic Organization (ATO) Indoor Air Quality (IAQ) program and delineate roles and responsibilities, procedures, and standards for managing the program. This document replaces the ATO's *Indoor Air Quality Implementation Guidance* and *the Guidance for the Management of Mold in FAA Facilities* documents both dated September 30, 2006. Revisions were necessary to reflect the current organizational structure, assign roles and responsibilities, and incorporate best practices. The purpose of this document is to provide standardized ATO IAQ program implementation requirements that contribute to a safe and healthful work environment in all ATO-owned, -leased, or -maintained facilities. IAQ issues may result from nuisance odors, vapors, or particulates from construction or from outdoor air infiltration generated by equipment. IAQ issues may also result from biological contamination such as bacteria or mold growth, which usually result from a moisture event in the facility. Moisture events could include excessive humidity; interior condensation; roof leaks; pipe ruptures; condensate overflow from heating, ventilation, and air conditioning (HVAC) equipment; and flooding from outdoor sources.

2. Who Is the Audience?

This document applies to all ATO employees.

3. Where Can I Find This Document?

You can find an electronic copy of this document at the FAA directives management systems' uniform resource locator (URL): https://employees.faa.gov/tools_resources/orders_notices/.

4. What Does This Document Cancel?

This document cancels ATO's Indoor Air Quality Implementation Guidance and the Guidance for the Management of Mold in FAA Facilities documents dated September 30, 2006.

5. Who Has the Authority to Modify the ATO IAQ PIR?

The Environmental and Occupational Safety and Health (EOSH) Services Group, AJW-23, is the Office of Primary Responsibility (OPR) for the IAQ requirements and is authorized to modify the ATO IAQ PIR when necessary. The OPR resides under the Director of Air Traffic Control (ATC) Facilities (AJW-2). Annually, the OPR will review the ATO IAQ PIR and provide updates as appropriate.

Chapter 2—Roles and Responsibilities

This document defines and delineates the following responsibilities for ATO employees involved in the IAQ program:

1. Vice President, Technical Operations

The Vice President, Technical Operations, AJW-0, implements and incorporates the requirements of this document into programs and activities managed by the AJW-O organization, particularly those involving deployment of new systems and modernization projects that could impact IAQ.

2. Director, Air Traffic Control Facilities

The Director of Air Traffic Control (ATC) Facilities must provide resources for the overall management of the ATO IAQ Program.

3. ATO EOSH Services Group

- **a.** Provide technical guidance and requirements to all ATO organizations for the implementation of the ATO IAQ program.
- **b.** Coordinate with and provide technical assistance to the Office of Safety and Technical Training (AJI) on IAQ awareness training requirements for ATO employees.
- **c.** Develop, implement, and revise IAQ program documents as necessary to supplement this document.
- **d.** Assist service areas (SAs) in the implementation of the requirements of this document.
- **e.** Designate an ATO IAQ program administrator.
- **f.** Serve as the OPR to revise this ATO IAQ requirement document.

4. Service Area Directors

Service Area (SA) Directors must

- **a.** Implement the requirements of this document within their respective organizations.
- **b.** Ensure that managers complete the required ATO Manager's IAQ and Mold Awareness Training in the electronic learning management system (eLMS) as specified in the training needs assessment tool (TNAT).

5. Service Center Planning and Requirements Group

The Service Center Planning and Requirements Group (SC PRG) must

- **a.** Provide the oversight of the service area's (SA) IAQ program.
- **b.** Ensure the development and implementation of the written SA IAQ program based upon the requirements of this document.

c. Identify SA IAQ program resources, requirements, and funding needed and submit to the service units.

d. Designate the SA IAQ program administrator in writing to manage the implementation of the SA IAQ program.

e. Ensure that the SA IAQ program administrator completes the Mold Inspection and Assessment and the Mold Remediation Supervisor courses.

f. Provide implementation guidance for known construction, renovation, demolition, installation, commissioning, and other modification projects when requested.

g. Ensure that the SC Occupational Safety and Health (OSH) program implementation manager (PIM) completes required IAQ Awareness Training for ATO EOSH Technical Operations (TechOps) Personnel in the eLMS as specified in the TNAT.

6. District Managers, Technical Operations

District Managers must

a. Ensure the implementation of the SA IAQ program throughout the district.

b. Incorporate the SA IAQ program implementation requirements and implement appropriate engineering controls into all construction, renovation, demolition, installation, commissioning, and other modification projects managed by the district.

c. Ensure the use of applicable work permits and the latest revision of JO Order 3900.57A, Environmental and Occupational Safety and Health (EOSH) Requirements in the Planning and Execution of Construction and Maintenance Activities at National Airspace System (NAS) Facilities.

d. Ensure that district employees receive IAQ awareness training as outlined in this document.

e. Ensure timely evaluation of IAQ concerns and implement necessary response actions.

f. Report all identified IAQ concerns and activities to the SA IAQ program administrator.

g. Complete the required IAQ awareness training in the eLMS as specified in the TNAT.

7. Safety and Environmental Compliance Managers and Environmental Protection Specialists

The safety and environmental compliance managers (SECMs) and environmental protection specialists (EPSs) must:

a. Serve as the district IAQ technical point of contact.

b. Complete the required IAQ Awareness Training for ATO EOSH TechOps Personnel in the eLMS as specified in the TNAT.

c. Review plans and specifications for all known projects in staffed facilities that may influence IAQ.

8. System Support Center Managers

System support center (SSC) managers must

- **a.** Implement the SA IAQ program in the SSC with the assistance of the SECM.
- **b.** Ensure the use of applicable work permits and the latest revision of JO Order 3900.57A, Environmental and Occupational Safety and Health (EOSH) Requirements in the Planning and Execution of Construction and Maintenance Activities at NAS Facilities.
- **c.** Maintain records of incidents, reports, and corrective actions and keep the SECM and SA IAQ program administrator informed of incidents and their statuses. Ensure appropriate notification to unions.
- **d.** Ensure appropriate notification to unions of any projects potentially affecting IAQ.
- **e.** Coordinate the implementation of corrective actions in accordance with FAA policy.
- **f.** Complete the required ATO Manager's IAQ and Mold Awareness Training in the eLMS as specified in the TNAT.

9. Engineering Services Managers

Engineering Services (ES) managers must

- **a.** Incorporate SA IAQ program implementation requirements and appropriate engineering controls into all construction, renovation, demolition, installation, commissioning, and other modification projects managed by Engineering Services (ES);
- **b.** Coordinate project planning with the facility or SSC manager, SECM, and SA IAQ program administrator.
- **c.** Review all project specifications and plans to identify activities that may influence IAQ. Ensure implementation of IAQ requirement in all ES projects.
- **d.** Notify the SECM of all engineering packages associated with staffed facilities and provide the engineering package if requested.
- **e.** Ensure that IAQ compliance costs associated with project-specific abatement, mitigation, or engineering-control requirements are included in all ES cost estimates.
- **f.** Maintain records of incidents, reports, and corrective actions and provide them to the SA IAQ program administrator.
- **g.** Ensure the use of applicable work permits and the latest revision of JO Order 3900.57A, Environmental and Occupational Safety and Health (EOSH) Requirements in the Planning and Execution of Construction and Maintenance Activities at NAS Facilities.
- **h.** Apply High-Performance Sustainable Building (HPSB) guiding principles as required by the FAA in Leadership in Energy and Environmental Designs (LEED).
- **i.** Complete the required ATO Manager's IAQ and Mold Awareness Training in the eLMS as specified in the TNAT.

10. Field Maintenance Party Specialists, ES Resident Engineers, ES EOSH Coordinators, and ES Installation Personnel

Field Maintenance Party (FMP) specialists, ES resident engineers (RE), ES EOSH coordinators, and ES installation personnel must

- **a.** Notify the SECM of all engineering packages associated with staffed facilities and provide the engineering package if requested.
- **b.** Complete the required IAQ Awareness Training for ATO TechOps Personnel in the eLMS as specified in the TNAT.
- **c.** Maintain records of incidents, reports, and corrective actions and keep the SECM and SA IAQ program administrator informed of all incidents and their statuses. Ensure appropriate notification to all parties following the appropriate collective bargaining agreements.

11. Employees

Employees must

- **a.** Prevent IAQ problems from arising in work operations and notify shift or task supervisors or SECM of IAQ concerns about water leaks or wet building materials in their respective work area(s).
- **b.** Not alter or hinder the operation of HVAC systems, unless otherwise authorized to, or introduce contaminants to the building environment.
- **c.** Coordinate any on-site IAQ evaluations with the SA IAQ program administrator.

Chapter 3—ATO Service Area IAQ Program

1. SA IAQ Program Implementation Plan

a. Each SA must implement a written IAQ Program.

b. The SA ATO IAQ Program Administrator coordinates the review of the written SA IAQ Program with the headquarters ATO IAQ Program Administrator.

2. SA IAQ Program Outline

The outline must include the following:

a. Delineation of roles and responsibilities

b. Requirements for IAQ assessments or investigations to address occupant concerns and incident-driven evaluations

c. Strategies for mitigation of IAQ concerns once identified

d. Procedures for measuring and validating program effectiveness

e. Measures to prevent future IAQ concerns (proactive)

f. Administrative functions to address the following:

(1) Training requirements

(2) Communication requirements in accordance with established communication processes

(3) Recordkeeping requirements in accordance with established recordkeeping processes

Chapter 4—Managing the Building IAQ Program

Pollutants in the indoor environment can adversely affect IAQ and can increase the risk of illness. Pollutants and odors can originate from outdoor and indoor sources, including building maintenance activities, pest control, housekeeping, renovation or remodeling, and new furnishings and finishes. Pollutants can also be introduced by building occupants and frequently include air fresheners and fragrances, mold from improperly maintained houseplants, cooking odors and food items improperly stored or disposed of, and the excessive use of personal hygiene products and perfumes. Maintaining acceptable IAQ is a shared responsibility between building management and all of the individuals who work in the building.

1. IAQ Investigations—Initial, Reactive, Concern and Incident-Driven Evaluations

a. Initial site investigation. Initiate a site investigation when IAQ-related concerns are reported. This initial investigation is limited in scope and includes a discussion with affected employees, a walkthrough inspection to identify obvious causes of reported problems, and an assessment of equipment and systems operating in the area. Initiate a detailed investigation by the SECM or his or her qualified designee if the initial IAQ assessment indicates that an additional investigation is necessary.

b. Initial screening criteria. Initial screening criteria should include identifying visible mold growth or the presence of moisture intrusion on building materials, odors generated from internal or external activities, and the presence of new furnishings or building materials.

c. Initial IAQ investigation air sampling parameters. The following tables present generally acceptable target values of commonly identified and sampled parameters in IAQ investigations. Further investigation will be required if the measured values exceed the target values.

Table 1. Initial IAQ Investigation Air Sampling Parameters

IAQ Parameter	Target Value[1]
Carbon dioxide (CO_2)	700 ppm above outdoor air
Carbon monoxide (CO)	ND[2] (< 5 ppm)[3]
Relative humidity	20% to 60%; Humidity ratio of <0.0124 [4]
Temperature	68-82° F [5]

Table 2. Humidity Ratio Levels

IAQ Parameter	Target Values														
Temperature	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
Target maximum relative humidity at 1.1% humidity ratio [6]	75	72	70	67	65	63	61	59	57	55	53	52	50	48	47

2. IAQ Investigations—Detailed Evaluations

a. Detailed scope of work. If initial assessment results require additional site investigation, the SECM or his or her qualified designee must perform a more detailed evaluation in collaboration with the PRG and the SA IAQ program administrator. The investigation will progress in steps to include the background information review, a building evaluation, an HVAC system evaluation, and sampling, as appropriate. The complexity of the situation will dictate the scope and determine if additional expertise from SA Technical Operations (i.e., Districts, Engineering Services, and Technical Services) is required. When developing the scope of work for the detailed evaluation, include the following:

(1) A history of the concern

(2) Sample collection objectives

(3) Sample locations and frequency

(4) Sample collection equipment, methods, and procedures

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[1] Target values are subject to change based on future revisions of standards and regulations.

[2] ND = Not detected (use the value if the analytical instrument can detect to this level).

[3] ppm = parts per million of air.

[4] Humidity ratio is the amount of water vapor relative to dry air. The range of 20–60% is provided for initial guidance. In some cases, 60% of relative humidity may be required for the reduction of static charges on NAS equipment. However, sustained levels above 70% can lead to fungal growth. Reference: American National Standards Institute (ANSI); American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE); Standard 55-2010, Thermal Environmental Conditions for Human Occupancy.

[5] Temperature range is dependent on season, weather conditions, and time of day.

[6] Temperature and relative humidity levels have a maximum target value of 1.1% humidity ratio level. Exceeding the target value may cause fungal growth from air moisture alone. When accessing IAQ parameters, evaluate conditions using information from this table.

(5) Sample handling, transporting, and analytical testing methods and certification, e.g., an identification of the American Industrial Hygiene Association (AIHA) accredited laboratory used for the analysis

(6) Inspection procedures for relevant components of the HVAC system (including building air intakes for entrainment of building, bathroom, or generator exhaust or other contamination sources)

(7) An explanation of the comparison of sample results to applicable standards and criteria

(8) A written report of findings and recommendations for corrective actions

b. Detailed IAQ investigation air sampling parameters. Measure additional parameters based on site-specific concerns and at the discretion of the investigator. Potential sampling parameters are listed in the table below; however, this list is not comprehensive. Sample known or suspected contaminants. Further investigation will be required if the measured values exceed the target values.

Table 3. Detailed IAQ Investigation Air Sampling Parameters

IAQ Parameter	Target Value[1]
Formaldehyde (CH_2O)	<27 ppb [2]
Hydrogen sulfide (H_2S)	ND (<0.2 ppm) [2]
Nitrogen dioxide (NO_2)	ND (<100 µg/m^3) [2, 3, 6]
Ozone (O_3)	ND (<50 ppb) [2, 4, 6]
Particulates (PM 2.5) [5]	(<15 µg/m^3) [2, 3, 7]
Particulates (PM 10) [5]	(<50 µg/m^3) [2, 3, 7]
Sulfur dioxide (SO_2)	ND (<80 µg/m^3) [2, 3, 6]
Total volatile organic compounds (VOC analytical)	<0.8 ppm [6]

3. Develop Strategies for Mitigation of IAQ Concerns

a. Qualified individuals will determine the proper control strategies once the investigation process identifies the source of the IAQ problem(s). Control strategies can be characterized as:

(1) **Source control**. Identify, control, and remove the pollutant sources where feasible, e.g., vehicle exhaust, environmental tobacco smoke (ETS).

(2) **Ventilation**. Minimize the accumulations of contaminants, modify the ventilation system to increase the quantity of outdoor air, or improve the air

[1] Target values are subject to change based on future revisions of standards and regulations.
[2] Identified as "concentrations of interest" in ANSI/ASHRAE Standard 62.1-2013.
[3] µg/m^3 = microgram per cubic meter of air
[4] ppb = parts per billion of air
[5] PM = particulate matter
[6] If outdoor concentrations are higher, use these as the target value.
[7] Indoor particulate levels can be measured using a laser particle counter (set at a detection of 0.3 microns and greater). Mean indoor particle levels should be less than mean outdoor levels.

distribution. Outdoor air supply cannot exceed an HVAC system's ability to remove moisture (latent load). When increasing the amount of outdoor air, exercise caution to ensure the HVAC system can maintain appropriate humidity levels.

(3) **Filtration**. Modify the ventilation system to remove specific pollutants from entering the building-supplied air ventilation, enhance or incorporate specialized filtration, or modify the ventilation system.

(4) **Decontamination and mitigation**. Clean the HVAC system components or other source of contaminants.

(5) **Administrative control**. Minimize the use of chemicals and other materials that could affect IAQ. It may be necessary to relocate employees away from the area where the materials are used. Consider using these materials when the building is least occupied.

b. Implement control measures for contaminants during construction, renovation, demolition, installation, commissioning, and other modification projects.

c. Ensure corrective measures do not adversely affect the facility IAQ.

d. Validate and document the effectiveness of the corrective measures.

4. Preventive Measures

a. Proper and effective preventive maintenance will have a positive impact on facility IAQ and reduce incidents. Preventive measures require the facility to

(1) Maintain building equipment and HVAC systems as specified in FAA orders, maintenance technical handbooks (MTHB), and manufacturers' recommendations.

(2) Manage processes to eliminate or minimize the release of the pollutant from potential significant pollutant sources in the indoor environment.

b. Proper and effective management of construction, renovation, demolition, installation, commissioning, and other modification projects will have a positive impact on facility IAQ and reduce incidents.

(1) Review all construction processes and building operations prior to project initiation to identify potential impact.

(2) Identify and implement control measures for all activities generating dusts and odors in order to prevent contaminants from migrating into occupied areas of the building.

(3) Adhere strictly to Federal, State and local regulations and FAA directives such as JO Order 3900.57A, Environmental and Occupational Safety and Health (EOSH) Requirements in the Planning and Execution of Construction and Maintenance Activities at NAS (National Airspace System) Facilities, and reduce potential IAQ issues.

(4) The FAA must review and approve all contractors' safety data sheets (SDS) for materials and chemicals prior to their use on site.

(5) Disruption of the mechanical systems during construction can adversely affect a facility's IAQ. During construction activities, auxiliary heating and cooling may be required. During work activities, protect the HVAC systems from nuisance dust and contaminants.

(6) Potential air contaminants commonly identified on construction projects can include the following:

(a) Nuisance dusts and other aerosols
(b) Regulated materials such as asbestos and lead, which require stringent work practices identified in FAA directives and compliance programs
(c) Odors and other contaminants produced by chemicals and construction activities, which can adversely affect IAQ
(d) Newly installed products that may adversely affect IAQ by releasing off-gas pollutants
(e) Smoke, odors, and particulates generated by hot work and welding operations. These operations require work permits as specified in other FAA documentation and additional control measures, such as installing local exhaust and isolating the work area.
(f) Water infiltration and mold growth caused by temporary openings in the building envelope
(g) Condensation due to temperature differences in facilities without proper insulation

(7) Appropriate housekeeping practices are important to maintaining facility IAQ. They involve cleaning methods and the use of products that minimize the introduction of pollutants into the environment.

(8) ATO provides spring and summer seasonal maintenance alerts to assist in mold prevention and facility IAQ enhancement. Facility managers are to ensure that technicians review these seasonal alerts and use them as a basis for facility reviews. The TechNet URL: http://technet.faa.gov/ links to a wide array of published Technical Operations data, tools, and resources, including facility listings, orders, references, and maintenance-related resources.

Chapter 5—Mold

1. Initial Response Measures Following a Water-Intrusion Event

a. Following a water-intrusion event, focus on identifying the water source and immediately implement water-extraction and -drying efforts. Usually, rapid response efforts will prevent microbial growth.

b. Once the water source is identified, take action to prevent additional water damage. Ensure that permanent fixes are in place prior to build-back and restoring building materials.

c. Water sources are categorized by the Institute of Inspection, Cleaning and Restoration Certification (IICRC) S500 Standard and Reference Guide for Professional Water Damage Restoration as follows:

(1) **Category 1 Water Source**: Clean water from a sanitary source, e.g., water supply lines, rainwater, and snowmelt from rooftops.

(2) **Category 2 Water Source**: Gray water from an unsanitary source that contains some degree of contamination that could cause sickness or discomfort if consumed by humans, e.g., washing machine overflows, toilet overflows, and non-feces waters.

(3) **Category 3 Water Source**: Black water containing pathogenic agents that could cause disease or death if consumed by humans, e.g., sewage backups and overflows from beyond toilet traps, feces, floodwaters and groundwater intrusion.

(4) Categories of water can quickly degrade into higher categories due to contamination. Conduct sampling and respond with response actions appropriate to the site-specific conditions.

d. Within 24–48 hours of water damage from clean water sources, dry all building materials to a moisture level that will not support mold growth. Certain water leaks may occur over a long time and may not be identified when the water intrusion initially occurred.

e. Remove and discard all porous materials contaminated with sewage or other Category 2 or 3 water sources. Clean and disinfect contaminated non-porous material. Due to the potential for human illness associated with sewage-contaminated materials, additional PPE and work procedures will be required. Removal and cleaning shall be conducted using the methods in this chapter. Some States have licensing requirements for remediation contractors. Coordinate the FAA-required protocols with the licensed individuals to reach an agreed-upon protocol.

f. If building materials are not sufficiently dried within 48 hours, they must be evaluated for the presence of mold. Contact a SECM or his or her qualified designee on responses after 48 hours since these may require a mold remediation evaluation to determine the level of engineering controls and mold remediation procedures. Monitor all water-damaged building materials until they are thoroughly dry, or

remove and discard as ordinary construction debris following the appropriate engineering controls and mold-remediation procedures. Remove and discard porous materials if visible mold growth is present. Non-porous materials with visible mold or contaminated water must be cleaned and thoroughly dried. Removal and cleaning must be conducted using the methods in this chapter.

g. Review asbestos-containing material and lead-based paint survey reports to ensure these and any other regulated materials present are handled appropriately.

h. The Environmental Protection Agency (EPA) does not recommend biocide use as a routine practice during mold remediation, although there may be instances where professional judgment may require biocides.

2. Mold Assessment

a. Water-damaged building materials not thoroughly dried within 48 hours have an increased likelihood to support microbial growth and must be assessed to determine if mold is present. The assessment must be conducted by the SECM or his or her qualified designee and must include the following:

(1) Classification of the water source

(2) Determination of the likely duration of water intrusion (days, weeks, months, or years)

(3) Determination of the extent of wet or damaged building materials

(4) Extent of visible mold present

(5) Recommendation of interim measures until remediation and restoration operations can be initiated

(6) Evaluation of potential project disruptions to the NAS, fire life safety, and other critical FAA operations as well as the health and safety of the building occupants

b. Once mold is identified or suspected, take preventive measures to minimize disturbance of affected materials causing mold spores to become airborne and negatively affect indoor air quality. Determine and implement corrective actions based upon the amount of mold present and other site-specific factors as described in this chapter. Provide a response action plan to all parties following the appropriate collective bargaining agreements.

c. Some investigative and initial corrective activities, e.g., assessing potential mold and moisture sources inside wall cavities or emergency corrective activity to stop moisture flow, must require control measures such as restricting access, and particulate and dust control. The SECM, SA IAQ program administrator, or his or her qualified designee will determine the appropriate control measures based on the site-conditions and activities required.

3. Sampling and Analysis

a. Mold-remediation efforts are the same regardless of the type(s) of mold present. Therefore, sampling is not necessary to characterize mold. Sampling may be necessary to provide information to medical personnel treating an individual diagnosed with adverse health effects potentially associated with occupational mold exposure.

(1) A certified industrial hygienist (CIH) or other qualified individual must develop a written sampling plan providing sound justification for performing mold sampling. An industrial hygienist (IH) or other qualified individual under the direction of the CIH may collect samples and conduct visual post-remediation evaluations. The FAA must provide sample results and reports to all parties following the appropriate collective bargaining agreements.

(2) The written sampling plan must include the sampling methodology, the Laboratory's AIHA accreditation certificate, and the laboratory's address and phone number. Submit all samples for analysis to accredited AIHA Environmental Microbiology Laboratory Accreditation Program (EMLAP) laboratories.

(3) A CIH or other qualified individual with experience in mold investigations must interpret the laboratory sample results.

b. The following sampling techniques are not recommended at this time:

(1) Mycotoxin sampling

(2) Interstitial wall sampling, e.g., Wall Check®

(3) Settling plates

(4) Total mold volatile organic compounds (TMVOCs)

4. Routine Maintenance and Cleaning Activities

Removing a few ceiling tiles, replacing air-handling unit filters, and routine cleaning of HVAC components are not considered mold-remediation activities because they can be accomplished using minimal engineering controls and do not typically result in significant mold-spore disturbance if conducted properly. If visible mold growth is identified during maintenance activities, contact a SECM or his or her qualified designee to determine appropriate engineering controls or need for mold-remediation procedures.

5. Minor Mold-Remediation Projects

a. Projects with less than 10 square feet of visible mold growth are considered minor remediation projects. However, some minor projects may have significant potential to release mold spores because of their location, type of material affected, airflow patterns, or other specific site conditions and may warrant additional controls. The total amount of mold present should not be divided into separate smaller areas to reduce the engineering controls, PPE, or need for post remediation criteria to

remediate conditions. These projects must be evaluated by a SECM or SA IAQ program administrator to determine the appropriate response methods.

b. Work procedures for minor mold remediation projects include the following:

(1) Moisture identification and temporary repair. Identify and implement temporary repairs of moisture-intrusion sources if possible to prevent continued water damage.

(2) Limited engineering controls to minimize dust. A containment may not be necessary to control mold-spore migration on minor projects if mold-affected building materials can be removed without disturbing mold. Limited engineering controls include the use of wet methods, vacuums equipped with High-Efficiency Particulate Air (HEPA) filters, disposable polyethylene drop cloths, and the prompt cleanup and disposal of moldy materials.

(3) Use appropriate PPE. Minor mold-remediation projects are not anticipated to generate significant mold aerosols. Utilize respiratory protection consisting of an N95 disposable respirator. Use goggles with no side vents or appropriate eye protection, and wear gloves to prevent skin contact.

(4) Removal of affected porous materials. Remove intact materials to minimize mold spore aerosolization. Place affected materials into disposal containers immediately after removal.

(5) Cleaning of non-porous materials. Clean the remaining substrates and any other non-porous materials using HEPA vacuums and a detergent-and-water solution. Allow materials to dry thoroughly.

(6) Instituting proper waste disposal. Place contaminated materials into airtight containers at the removal site. Prior to sealing the containers, evacuate excess air using a HEPA vacuum. HEPA vacuum or wet-wipe the outside of waste containers immediately before transporting. Containers should be disposed of as ordinary construction debris if no regulated contaminants are present.

(7) Conducting a post-remediation evaluation. Conduct a visual evaluation when the contaminated materials have been removed and the remaining materials have been cleaned and dried to ensure no visible mold growth remains. Particle counting may then be used as part of the post-remediation evaluation as outlined in Section 9 of this chapter.

(8) Implementing permanent correction of the moisture source. The source of the moisture that contributed to the mold growth must be identified and corrective actions taken to prevent additional water intrusion to limit future mold growth.

(9) Build-back restoration. Conduct build-back of materials after all steps above have been completed, including the permanent repair of the moisture intrusion source.

6. Major Mold-Remediation Projects (Non-HVAC)

a. Major mold-remediation projects have a high probability of releasing significant mold spores into the air and include one or more of the following conditions:

(1) Greater than 10 square feet of visible mold growth

(2) Suspected mold growth of an unknown quantity, e.g., water saturated gypsum wallboard or an internal water leak where the full extent of the impacted area is not visible

(3) Mold growth or water damage resulting from a sewage-contaminated or other unclean water source

(4) Mold growth underneath wallpaper or other impervious coverings like fiber-reinforced plastic (FRP)

b. Work procedures for major mold remediation projects (non-HVAC) include the following:

(1) Designing the project. A CIH must design the project using an FAA-approved scope of work. The FAA must approve all contractor remediation specifications and submittals prior to the start of the project.

(2) Engineering controls to prevent mold spore migration must include the following:

(a) Deactivation and isolation of the air-handling system. Isolate the air-handling system from the containment area with critical barriers.

(b) Constructing work area enclosure. Construct a work area enclosure with a decontamination chamber consisting of a minimum of two stages for all entrances and exits of people, equipment, and waste. The decontamination chamber must contain an air-lock system to maintain negative pressure. The preferred air lock contains three-chambers with four overlapping flap doors. However, if there is inadequate floor space, a two-chamber air lock may be used. Isolation barriers must be constructed using fire-retardant polyethylene sheeting or other appropriate materials.

(c) Implementing negative air pressured enclosure. Establish negative air pressure within the containment using HEPA filtration equipment, discharging exhaust to the outdoors whenever possible. The number of negative air machines must be sufficient to create a negative pressure inside the containment enclosure in relation to the area outside the containment enclosure, taking into account conditions that could affect pressure relationships (e.g., elevators, exhaust fans, or other exhaust appliances).

(3) Using appropriate PPE. Use appropriate PPE during all major mold-remediation projects anticipated to generate significant mold aerosols. PPE appropriate for these jobs must include the following at a minimum:

(a) Respiratory protection consisting of a negative pressure air-purifying half-facepiece respirator equipped with P-100 HEPA filters
(b) Goggles with no side vents, or other appropriate eye protection
(c) Disposable full-body coverall with head and foot coverings
(d) Gloves to prevent skin contact with mold during the removal process
(e) Adequate fall protection PPE and procedures as needed

(f) Any other PPE deemed appropriate for the hazards present in the workplace

(4) Removing affected porous materials. Remove intact materials to minimize mold spore aerosols. Place affected materials into disposal containers immediately after removal.

(5) Cleaning non-porous materials. Clean the remaining substrates and any other non-porous materials using HEPA vacuums and a detergent-and-water solution. Allow materials to dry thoroughly.

(6) Instituting proper waste disposal. Place contaminated materials into airtight containers. Prior to sealing the containers, evacuate excess air using a HEPA vacuum. HEPA vacuum or wet-wipe the outside of waste containers immediately before transporting. Containers should be disposed of as ordinary construction debris if no regulated contaminants are present.

(7) Conducting a post-remediation evaluation. Once the contaminated porous materials are removed and the remaining non-porous materials are cleaned and dried; the post-remediation evaluation must be conducted prior to the release of the work area. The evaluation criteria are presented in Section 9 of this chapter.

(8) Implementing permanent correction of a moisture source. The source of the moisture that contributed to the mold growth must be identified and corrective actions taken to prevent additional water intrusion to limit future mold growth.

7. Work Procedures for Fungal Remediation Projects in HVAC Systems

a. Any amount of visible mold growth on permanent components of HVAC systems or in air plenums is significant and considered a major project. Mold remediation projects in HVAC systems or air plenums have a high probability of releasing mold spores into the air and can spread airborne mold spores to other areas of the building.

b. Work procedures for major mold remediation projects include the following:

(1) Project design. A CIH experienced in mold must design mold remediation projects in HVAC systems or air plenums following the National Air Duct Cleaning Association (NADCA) guidelines because they require additional specialized control measures. The FAA must approve all contractor remediation specifications and submittals prior to the start of the project.

(2) Engineering controls to prevent mold spore migration. The interior components of the HVAC system including ductwork extending to other areas of the building must be isolated through the construction of critical barriers. The preferred air lock contains three chambers with four overlapping flap doors. However, if there is inadequate floor space, a two-chamber air-lock system may be used. Construct isolation barriers using fire-retardant polyethylene sheeting or other appropriate materials. A containment around the HVAC equipment is generally not required because the interior confines of the system define the work area. Engineering controls to prevent mold spore migration must include the following:

(a) Deactivation of the air-handling system.
(b) Creation of negative air pressure within the work area with negative air machines equipped with HEPA filtration and discharge of the exhaust outdoors whenever possible. Negative air machines should be oriented to draw air toward the entrance to the work area away from unaffected portions of the building.

(3) Use of personal protective equipment. Use appropriate PPE during all major mold remediation projects anticipated to generate significant mold aerosols. PPE appropriate for these jobs must include the following at a minimum:

(a) Respiratory protection consisting of a negative pressure air-purifying half-facepiece respirator equipped with P-100 HEPA filters
(b) Goggles with no side vents, or other appropriate eye protection
(c) Disposable full-body coverall with head and foot coverings
(d) Gloves to prevent skin contact with mold during the removal process
(e) Adequate fall protection PPE and procedures as needed
(f) Any other PPE deemed appropriate for the hazards present in the workplace

(4) Removal of affected porous materials. Remove intact material to minimize mold spore aerosols. Place affected materials into disposal containers immediately after removal.

(5) Cleaning non-porous materials. Clean the remaining substrates and any other non-porous materials using HEPA vacuums and a detergent-and-water solution. Allow materials to dry thoroughly.

(6) Instituting proper waste disposal. Place contaminated materials into airtight containers at the removal site. Prior to sealing the containers, evacuate excess air using a HEPA vacuum. HEPA vacuum or wet-wipe the outside of waste containers immediately before transporting. Containers should be disposed of as ordinary construction debris if no regulated contaminants are present.

(7) Biocides. The EPA regulates the use of biocides in HVAC systems. Biocides must not be used in mold-remediation projects in HVAC systems or air plenums unless specifically directed by the CIH in the project design documentation. The CIH must pre-approve the use of EPA-approved biocides in air-conveyance systems. The application of a biocide must be conducted while the work area is under negative pressure. Operate the negative air machines until no detectable odors are present following biocide application. Provide details of the proposed use of biocides to all parties following the appropriate collective bargaining agreements.

(8) Conducting a post-remediation evaluation. A visual inspection must be completed to ensure all mold contamination has been effectively abated. Following a successful visual inspection, complete a post-remediation sampling as specified by the CIH.

8. Anti-Microbial Coatings

The application of anti-microbial coatings should not be for biocide purposes but rather as a preventive measure on porous materials not removed due to project limitations. Apply the anti-microbial coatings after a thorough cleaning of materials' surfaces.

9. Post-Remediation Evaluation Criteria

a. Properly address the moisture source prior to the installation of new finishing materials.

b. Ensure satisfactory completion of all aspects of the mold-remediation scope of work.

c. Ensure removal of all debris and waste generated during the project.

d. Ensure the containment enclosure is free of visible mold growth and mold odors, and remaining materials are dry relative to known dry materials.

e. Perform spore trap sampling criteria for major remediation procedures. Spore-trap air sampling for major remediation procedures must use the following criteria:

(1) Inside containment. Collect a minimum of three samples, with additional samples for larger containments based on the CIH recommendation.

(2) Outside the building control. Collect a minimum of three samples.

(3) Inside building and outside containment control. Collect a minimum of three samples inside the building at least fifty-feet from the containment area.

(4) Active air movement. Collect all containment samples while there is active air movement created by one of the following methods:

(a) Negative air machines drawing air into the containment and exhausting outside the containment.
(b) HEPA filtration machines re-circulating air in the containment.

(5) Release criteria. Mold remediation is complete when all of the following conditions are met:

(a) Total mold concentrations of each sample collected inside the containment are less than the highest control sample collected.
(b) Concentrations of all individual mold types and species except Aspergillus / Penicillum / (ASP/PEN) inside the containment area must not be greater than the highest control sample collected. Use the highest individual control sample result for comparison purposes to inside-containment samples. A difference of 40 spores per cubic meter (sp/m^3) of air (comparisons of total or individual species) or less must be considered negligible and not be grounds for a post-remediation evaluation failure. If these conditions are not met, the mold remediation is incomplete, and the cleaning procedures must be repeated.
(c) The concentration of ASP/PEN types inside the containment area should also be equal to or less than the highest control sample. A difference of 40 sp/m^3 of air (comparisons of total or individual species) or less must be considered negligible and not be grounds for a post-remediation

evaluation failure. ASP/PEN will also be subject to absolute criteria. Inside the containment area, concentrations of 200 sp/m^3 or less will not be grounds for clearance failure regardless of control concentrations. Inside the containment area, concentrations of ASP/PEN of 400 sp/m^3 or greater will be grounds for clearance failure regardless of control sample results.

(6) Laboratory analysis. Submit all samples to any accredited AIHA EMLAP laboratories for analysis.

(7) Reporting. Provide sample results to all parties following the appropriate collective bargaining agreements.

10. Particle-Counter Monitoring for Dust Control

a. Particle counters in conjunction with visual observations can be a useful tool to validate the effectiveness of engineering controls during mold-remediation projects. Negative pressure enclosures are designed to prevent the migration of airborne particulates to areas outside the work area. If particle-count trends outside the work area increase during abatement operations, it may be an indication that engineering controls are not effective and require corrective action. When interpreting the measurement results, consider construction-related or dust-generating activities outside the containment that may affect particle counts.

b. Particle counters may be used to validate the effectiveness of minor mold-remediation projects. Many particle counters can measure particulates in several size ranges and can display the results in particle counts (a numerical count of the particles) or as a mass-concentration usually reported in mg/m^3 (milligrams of particulate per cubic meter of air). The following criteria must be utilized:

(1) Conduct a visual evaluation and ensure the work area is free of visible mold growth, particulate, and debris prior to the collection of particle counts to validate mold-remediation projects.

(2) Collect multiple measurements within the affected work area, outside the work area, and in an unaffected area of the building to increase confidence in the data. Regardless of the comparison method, the measurements within the work area should be similar to or below those measured outside the work area and in unaffected areas of the building.

Chapter 6—Reporting and Recordkeeping

1. IAQ Reports

a. At the completion of an IAQ investigation, generate a report of findings with any recommended corrective measures. The following persons must receive a copy of the IAQ investigation report:

(1) Appropriate facility manager (Technical Operations, Air Traffic Operations North and South)

(2) SECM

(3) Others responsible for implementing corrective actions

(4) Facility bargaining representatives, following applicable collective bargaining agreements

b. The facility manager will coordinate with the responsible individual or organization for the implementation of corrective actions provided in the investigation report in accordance with FAA policy.

c. The type of report generated depends on the complexity of the IAQ investigation and issues. When preparing the report, consider these factors:

(1) Provide an executive summary identifying the reason for the evaluation. Include any health concerns noted by building occupants. It should also describe significant findings and provide a summary of recommendations.

(2) Describe the sampling methodology, equipment used, and the sampling strategy. Include the limitations of sampling protocols and limits of detection for particular contaminants based upon the sampling method used.

(3) Provide a discussion of site observations, survey findings, and an interpretation of data. Clearly reference the regulatory, consensus, or FAA standards used to interpret the data.

(a) Include all measurements obtained by direct-reading instrumentation in a format that allows for identification of the measurement locations, times, and results.

(b) Include laboratory analytical data in a format that allows identification of sampling locations, sample parameters, and the laboratory analysis results. Include laboratory accreditations.

(c) Include photographic documentation, if applicable, with descriptions of the photograph location and a narrative. Include the date and time for the photographs to assist in determining pre- and post-remediation conditions and provide scale if possible.

(4) Provide detailed recommendations for corrective actions of any deficiencies identified in the survey. Describe interim corrective measures implemented during the investigation to address the investigation's findings.

(5) Append any supporting documentation to the report. The supporting documentation must include chain-of-custody forms, laboratory analytical reports, direct-read instruments calibration certificates, field calibration documentation, and sample collection data. Documentation of equipment calibrations must follow the National Institute of Standards and Technology (NIST) primary reference standards. Supporting documentation may include photographs.

(6) Provide a typed list of the names, roles, accreditation, licenses, company addresses, and phone numbers of the CIH, IH, or other qualified individuals that participated in the project and those that collected the samples.

(7) Document all quality control procedures conducted regarding project sampling.

2. Recordkeeping

a. The recordkeeping requirements should follow applicable FAA standards. Maintain the records in accordance with FAA orders and regulations including 29 CFR 1910.1020 (Code of Federal Regulations) for employee occupational exposure records and employee access requirements. Retain these records in a manner that meets privacy and security requirements per FAA Order 1280.IB, Protecting Personally Identifiable Information. URL: http://www.faa.gov/documentLibrary/media/Order/1280.1B.pdf

Chapter 7—Training

ATO employees must receive a level of IAQ awareness training consistent with their duties associated with the IAQ program. The courses must meet applicable Federal, State, and local regulations and FAA standards, whichever is more stringent.

1. ATO Manager's IAQ and Mold Awareness Training

a. Managers will receive IAQ and mold awareness training. This will be less detailed than the training necessary for SECM, other EOSH professional, and facility maintenance personnel. The IAQ awareness training provides managers with basic IAQ knowledge to make timely correction of minor IAQ concerns raised by building occupants.

b. Training topics

(1) What is acceptable IAQ?

(2) Indoor air contaminants and control strategies

(3) Water intrusion and mold growth inside buildings

(4) Temperature, humidity, and importance of proper HVAC maintenance

(5) Health effects

(6) Preventing IAQ concerns

(7) Identifying moisture intrusion and mold

(8) Reporting IAQ concerns and employees responsibilities

(9) The ATO IAQ PIR (this document)

2. IAQ Awareness Training for ATO TechOps Personnel

a. Engineers, FMP, ES RE, ES EOSH coordinators, and ES installation personnel, who design, construct or oversee facilities, and facility maintenance personnel must understand the intended design parameters of HVAC systems. Their input is essential when it comes to preventive maintenance and operations of HVAC systems and to timely address observed IAQ concerns. This IAQ awareness training will focus on the mechanical systems and reporting and response actions of facility personnel.

b. Training topics

(1) Acceptable IAQ

(2) Indoor air contaminants and control strategies

(3) Health effects

(4) Prevention of IAQ problems

(5) HVAC hygiene and general maintenance

(6) Water intrusion and mold

(7) Reporting IAQ concerns and employees' responsibilities

(8) Minor cleanup methods and equipment

(9) Engineering controls and personal protective equipment (PPE)

(10) The ATO IAQ PIR (this document)

(11) Project closeout (sampling, post-remediation evaluation criteria, and documentation)

3. IAQ Awareness Training for ATO EOSH TechOps Personnel

a. EOSH technical personnel and SECMs provide critical information and assistance in addressing IAQ issues. The EOSH first response often is the SECM who provides technical guidance and advice to facility management and interfaces regularly with ATO employees. This IAQ awareness training will include identification of IAQ issues and IAQ sampling techniques.

b. Training topics:

(1) Acceptable IAQ

(2) Indoor air contaminants, mold, and control strategies

(3) Temperature, humidity, and importance of proper HVAC maintenance

(4) Health effects

(5) Prevent IAQ problems

(6) HVAC hygiene and general maintenance

(7) Assessment techniques, investigations, and sampling/testing equipment

(8) Identifying moisture intrusion and mold

(9) Scope of work, qualifications of contractors, and use of subject matter experts (SMEs)

(10) Mold remediation project management

(11) Major and minor mold-cleanup methods, remediation techniques, instruments, and equipment

(12) Engineering and administrative controls

(13) Personal Protection Equipment (PPE)

(14) The ATO IAQ PIR (this document)

(15) Project closeout (sampling, post-remediation evaluation criteria, and documentation)

4. Mold Remediation Supervisor Training

a. This two-day instructor-led course provides practical instruction on assessing water intrusion and mold in the workspace and provides industrial hygiene solutions for mold remediation.

b. SA IAQ program administrator, EOSH technical personnel, and SECMs provide critical information and assistance in addressing mold concerns. The EOSH first

response often is the SECM who provides technical guidance and advice to facility management and interfaces regularly with ATO employees. EOSH professionals can grandfather out of the requirement to complete this course if they can demonstrate course knowledge through expertise, training, or certification.

c. Training topics

(1) Understanding building construction and systems

(2) Interpretation of data and laboratory results

(3) Evaluation (source of moisture or water leak, standing water, and bioaerosol sampling)

(4) Finding mold (IAQ monitoring, temperature, relative humidity, dew point, psychrometrics, sampling equipment, and procedures)

(5) Hands-on case study (flooding a room, water extraction, use of equipment, drying techniques, IAQ monitoring and interpretation, remediation, and final clean-up)

(6) Mold basics (health concerns due to occupational exposure and prevention)

(7) Mold growth (source, moisture, ventilation, and structural integrity)

(8) Remediation techniques (drying techniques, testing, and inspection procedures)

(9) Planning the mold-remediation project

(10) Isolation and control of the containment

(11) Cleaning methods for mold contaminated materials

(12) HVAC mold remediation

(13) Project monitoring and quality control

(14) Personal protective equipment and worker training

(15) Regulation and guidelines

5. Mold Inspection and Assessment Training

a. This two-day instructor-led course provides practical instruction on assessing water intrusion and mold in the workspace and on conducting sampling. It also provides interpretation of results leading to recommend industrial hygiene solutions.

b. The SA IAQ program administrator, EOSH technical personnel, and SECMs provide critical information and assistance in addressing IAQ issues. The EOSH first response often is the SECM who provides technical guidance and advice to facility management and interfaces regularly with ATO employees. EOSH professionals can grandfather out of the requirement to complete this course if they can demonstrate course knowledge through expertise, training, or certification.

c. Training topics

(1) Evaluation (source of moisture or water leak, standing water, and bioaerosol sampling)

(2) Finding mold (sampling equipment and procedures)

(3) Hands-on case study (assessment, inspection protocol, and sample collection)

(4) Laboratory procedures, interpretation of results, handling samples, chain of custody, and analysis

(5) Mold basics (health effects and biocides)

(6) Mold growth (moisture, ventilation, and structural integrity)

Appendix A—Applicable and Approved Consensus Standards

There are no Federal regulatory requirements for IAQ. Several State Governments are currently addressing legislative activity to include licensing, certification, and means and methods of compliance.

a. Federal Agencies

(1) The Occupational Safety and Health Administration (OSHA) established occupational exposure limits. OSHA issues and enforces industrial workplace standards. While lacking specific IAQ standards for office environments, OSHA would likely defer to the General Duty Clause to address building IAQ issues.

(2) The American Conference of Governmental Industrial Hygienists (ACGIH) publishes threshold limit values (TLVs) being politically neutral, experimentally based, reasonably scientific, and comprehensive. TLVs are guidelines (not mandated) for occupational employee exposures. In 1970, OSHA's original permissible exposure limits (PEL) were actually adopted TLVs made into a standard. For that reason, numerous legal cases have successfully used TLVs as a compliance tool. However, TLVs are guidelines for industrial settings and not for office buildings. IAQ professionals often use one-tenth the TLV as a standard for office setting indoor air quality, but this "rule of thumb" is not appropriate for all air contaminants.

(3) The Environmental Protection Agency (EPA) publishes primary and secondary standards for common outdoor airborne contaminants. The national primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect the public from outside pollutants. The secondary standards are the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of an outdoor pollutant. The EPA ambient air quality standards are available for ozone, respirable particulate matter (PM-10), fine particulate matter (PM-2.5), carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. The EPA has issued mold remediation guidance in the document, Mold Remediation in Schools and Commercial Buildings, EPA Publication 402-K-01-001. The values in the EPA National Ambient Air Quality Standards used in the ANSI/ASHRAE ventilation standards are geographically determined to identify areas of the country where cleaning of outside air to be used for dilution ventilation would be necessary. They are not appropriate as comparison criteria for IAQ surveys, as many of them are determined by averaging the concentrations for long periods (one to three years in some cases).

b. State and Local Regulations

(1) Several States and local municipalities have regulations and guidance dealing with IAQ and mold. Per the Occupational Safety and Health Administration Act, in the absence of a specific Federal standard, State, and local regulations

would apply. Consequently, the FAA must comply with the most stringent State and local IAQ and mold regulatory requirements.

(2) Guidelines on Assessment and Remediation of Fungi in Indoor Environments, New York City Department of Health and Mental Hygiene. URL: http://www.nyc.gov/html/doh/downloads/pdf/epi/epi-mold-guidelines.pdf

c. Applicable National Consensus Standards

(1) These national consensus standard organizations are comprised of industry experts or other recognized professionals that have developed and issued guidance and non-binding standards of care for IAQ issues. In many instances, government agencies and private organizations have mandated and incorporated guidelines and standards into specifications during construction, renovation, or investigative activities.

(2) Generally, the most recent version of ANSI/ASHRAE Standard 62.1, Ventilation for Acceptable Indoor Air Quality, governs IAQ recommendations in buildings. ASHRAE Standard 55, Thermal Environmental Conditions for Human Occupancy, defines conditions "in which 80% or more of the occupants will find the environment thermally acceptable." The ASHRAE standards are national voluntary consensus standards. The standards are not federally mandated limits but are based on recommended practices from a professional society of heating and air conditioning personnel. State and local building codes often adopt ASHRAE standards. Industry and Federal agencies generally accept these standards as a basis for evaluating building ventilation and frequently reference the standards in IAQ documents.

(3) ACGIH's Bioaerosols: Assessment and Control, 1999

(4) AIHA's Field Guide for Determination of Biological Contaminants in Environmental Samples, 2005

(5) AIHA's Recognition, Evaluation, and Control of Indoor Mold, 2008

(6) ACCA 6 (Air Conditioning Contractors of America) Standard for Restoring the Cleanliness of HVAC Systems, 2007

(7) ANSI/IICRC S500 Standard and Reference Guide for Professional Water Damage Restoration, 2006

(8) ANSI / IICRC-S520 Standard and Reference Guide for Professional Mold Remediation, 2008

(9) EPA IAQ Building Education and Assessment Model (I-Beam), 2002 Technical, URL: http://www.epa.gov/iaq/largebldgs/i-beam/index.html

(10) An Office Building Occupant's Guide to Indoor Air Quality, EPA-402-K-97-003, Oct. 1997, URL: http://www.epa.gov/iaq/pdfs/occupants_guide.pdf

(11) ACR 2006: Assessment, Cleaning and Restoration of HVAC Systems, 2006 Standard URL: http://nadca.com/sites/default/files/userfiles/ACR%202006.pdf

(12) Sheet Metal and Air Conditioning Contractors' National Association (ANSI/SMACNA 008-2008) IAQ Guidelines for Occupied Buildings under Construction

d. FAA Policy

(1) The latest revision of FAA Order 3900.19, FAA Occupational Safety and Health Program, established the overall agency OSH policy. URL: https://employees.faa.gov/employee_services/emerg_safety/media/FINAL3900.pdf

(2) The latest revision of FAA JO Order 3900.57A, Environmental and Occupational Safety and Health (EOSH) Requirements in the Planning and Execution of Construction and Maintenance Activities at NAS Facilities. URL: https://employees.faa.gov/tools_resources/orders_notices/

e. FAA Collective Bargaining Agreements

(1) The ATO will adhere to the provisions outlined in current collective bargaining agreements concerning IAQ. URL: https://employees.faa.gov/org/staffoffices/ahr/emp_labor_management_relations/labor_relations/agreements/

Appendix B—Key Terms and Definitions

Term	Definition
Air sampling	The process of measuring the airborne concentration of a potential contaminant in a specific air volume in a stated period
Anti-microbial coating	A coating like a primer that offers lasting protection against mold growth
Assessment	An evaluation to determine if an adverse IAQ condition exists or how the facility has changed due to an IAQ, moisture intrusion, or mold event. It involves subject matter experts reviewing the site and, in some cases, specific areas versus the entire facility. It may include basic IAQ parameters.
Biocide	A substance, process, or chemical that limits the growth of or kills organisms like mold. A biocide must be used under the direct supervision of a qualified certified industrial hygienist.
Carbon dioxide (CO_2)	A colorless, odorless, and incombustible gas present in the atmosphere and formed during respiration and combustion. Carbon dioxide is an indicator used to measure the balance between mechanically introduced outside air and occupant levels.
Carbon monoxide (CO)	A colorless, odorless, and highly poisonous gas formed by the incomplete fuel combustion. This air pollutant can be harmful to health.
Category 1 Water	Clean water is from a sanitary source, e.g., water supply lines, rainwater, and snowmelt from rooftops.
Category 2 Water	Gray water is from an unsanitary source, e.g., washing machine overflow, toilet overflow, and non-feces. It contains some degree of contamination and could cause sickness or discomfort if consumed by humans.
Category 3 Water	Black water is from a highly contaminated water source, e.g., sewage backups and overflows from beyond toilet traps, feces, floodwaters, and groundwater intrusion. It contains pathogenic agents that could cause disease or death if consumed by humans.
Certified industrial hygienist (CIH)	One certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.
Commissioning	The process of verifying new subsystems and equipment meet project requirements as intended and designed.
Containment	Demarcated isolation enclosure and any adjoining area where debris and waste from such work accumulates. A system of airtight, impermeable, permanent, or temporary barriers around a known contaminant to prevent its release into the air.
Employee exposure	The exposure to a contaminant that would occur if the employee were not using respiratory protection.

Term	Definition
Environmental tobacco smoke (ETS)	Smoke from cigarettes, pipes, or cigars, the exhaled smoke from a smoker (second-hand smoke), and nicotine, chemicals, and the toxic mix of cancer-causing substances deposited on indoor surfaces by tobacco smoke (third-hand smoke).
Formaldehyde, (CH_2O)	A gas at room temperature, formaldehyde is colorless and has a characteristic pungent, irritating odor. It is an important precursor to many other chemical compounds, especially for polymers. Formaldehyde is used in many building materials and is present in most indoor environments. This air pollutant can be harmful to health.
Fungus	Classified as neither animal nor plant, fungus or fungi are single-celled or multinucleate organisms such as molds, yeasts, mushrooms, and puffballs.
High-efficiency particulate air (HEPA) filter	A filter with at least 99.97% efficiency in removing monodispersed particles of 0.3 micrometers in diameter.
Humidity ratio	The amount of water vapor relative to dry air.
Hydrogen sulfide (H_2S)	A colorless, very poisonous, and flammable gas with the characteristic foul odor of rotten eggs. It often results from the bacterial breakdown of organic matter in the absence of oxygen, such as in swamps and sewers. This air pollutant can be harmful to health.
Industrial hygienist (IH)	A professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards.
Interim measure	A method including selective removal, encapsulation, enclosure, or repair to allow the safe deferral of remediation efforts.
Investigation	An all-inclusive examination of a facility
Mold	There are thousands of mold species that grow indoors and outdoors. The terms fungal spores, fungi, microbial, and mold are often used interchangeably, but scientifically mold is a type of fungi. Fungal spores grow when there is moisture and an organic food source and reproduce by releasing microscopic spores.
Negative pressure	In a negative pressure containment, there is less air pressure inside the work area than the surrounding spaces, allowing a minor breach in the containment to have airflow into the negatively pressurized containment.
Nitrogen oxide (NO_X)	A reddish-brown toxic gas with a very strong odor. This air pollutant can be harmful to health.
Non-porous materials	Building materials that will not absorb water and can be affectively cleaned and disinfected as long as they are not structurally compromised.

Term	Definition
Ozone (O_3)	A pale blue gas with a characteristic odor found in atmospheric electrical discharges and formed in many industrial applications. This air pollutant can be harmful to health. Ozone-forming equipment is NOT allowed in ATO facilities.
P-95 particulate filtering facepiece respirator	It filters at least 95% of airborne particles and is strongly resistant to oil. It is approved by the National Institute for Occupational Safety and Health (NIOSH).
P-100 particulate filtering air purifying respirator	It filters at least 99.97% of airborne particles and is strongly resistant to oil. It is NIOSH approved.
Particulate	Microscopic to very small pieces of solid or liquid matter suspended in the air that can be synthetic or naturally occurring. PM 2.5 represents fine particles less than 2.5 micrometers in diameter and PM 10 are coarse particles between 2.5 and 10 micrometers.
Porous materials	Building materials that absorb water and cannot be effectively cleaned or decontaminated.
Post-remediation evaluation	The practice of verifying the acceptance of the contractor's work to demonstrate sufficient cleaning for re-occupancy. Also known as final air sampling and clearance air sampling.
Preventive maintenance	Regular and systematic inspection, cleaning, and replacement of worn parts, materials, and systems to maintain good working order.
Qualified individual	A person who, through education, training, and experience, can identify control strategies to mitigate IAQ concerns.
Remediation	The process of removing, enclosing, repairing, or encapsulating a contaminant.
Renovation	The modifying of any existing structure or portion thereof.
Staffed facility	A workplace where employees are assigned a duty or reporting station. It generally has personnel present on any given workday. Examples include air route traffic control center (ARTCC), air traffic control tower (ATCT), regional office, SSC office, and some air route surveillance radar (ARSR) facilities.
Sulfur dioxide (SO_2)	A toxic gas with a pungent smell formed in various industrial processes, in burning of sulfur-containing coal and petroleum, or released naturally by volcanoes. This air pollutant can be harmful to health.
Unstaffed facility	A workplace with no assigned personnel. It is visited only occasionally and is not intended as an employee workspace. Examples include Navigational Aid (NAVAID) and storage buildings.
Visible mold growth	Mold that has colonized a substrate, formed fungal mycelia, growth structures, and spores to the extent necessary to be visible to the naked eye and includes both active and dormant growth.

Term	Definition
Volatile organic compounds (VOC)	Organic chemicals with a high vapor pressure that evaporate at room temperature and enter the air. An example is formaldehyde. VOCs are ubiquitous in products and nature and are known for their odors. This air pollutant can be harmful to health.

Appendix C—Acronym List

Acronym	Meaning
µg/m^3	Microgram per cubic meter of air
ACCA	Air Conditioning Contractors of America
ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
ARSR	Air route surveillance radar
ARTCC	Air route traffic control center
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASP/PEN	Aspergillus/Penicillum
ATC	Air traffic control
ATCT	Air traffic control tower
ATO	Air Traffic Organization
CFR	Code of Federal Regulations
CH_2O	Formaldehyde
CIH	Certified industrial hygienist
CO	Carbon monoxide
CO_2	Carbon dioxide
eLMS	Electronic learning management system
EMLAP	Environmental Microbiology Laboratory Accreditation Program
EOSH	Environmental and occupational safety and health
EPA	Environmental Protection Agency
EPS	Environmental protection specialists
ES	Engineering Services
ETS	Environmental tobacco smoke
FAA	Federal Aviation Administration
FMP	Field Maintenance Party
FRP	Fiber-reinforced plastic
H_2S	Hydrogen sulfide
HEPA	High-efficiency particulate air
HPSB	High-performance sustainable building
HVAC	Heating, ventilation, and air conditioning
IAQ	Indoor air quality
I-BEAM	IAQ building education and assessment model
IH	Industrial hygienist
IICRC	Institute of Inspection, Cleaning and Restoration Certification
LEED	Leadership in Energy and Environmental Design
mg/m^3	Milligrams per cubic meter of air
MTHB	Maintenance technical handbooks
NADCA	National Air Duct Cleaning Association
NAS	National airspace system

Acronym	Meaning
NAVAID	Navigation Aid
ND	Not detected
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NO_X	Nitrogen oxides
O_3	Ozone
OPR	Office of primary responsibility
OSH	Occupational safety and health
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit (OSHA)
PIM	Program implementation manager
PM	Particulate matter
ppb	Parts per billion
PPE	Personal protective equipment
ppm	Parts per million
PRG	Planning and requirements group
RE	Resident engineer
SA	Service area
SC	Service center
SDS	Safety data sheet, formerly known as Material Safety Data Sheets (MSDS)
SECM	Safety and Environmental Compliance Manager
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SME	Subject matter expert
SO_2	Sulfur dioxide
sp/m^3	Spores per cubic meter
SSC	System support center
TechOps	Technical Operations
TLV	Threshold limit value (ACGIH)
TMVOC	Total mold volatile organic compounds
TNAT	Training needs assessment tool
URL	Uniform resource locator
VOC	Volatile organic compound

Appendix D—Document Feedback Information

Please submit all comments in written form, include recommendations for improving this document, suggestions for new related subjects, and errors. Send these via email to:

To: Document OPR: Jonathan Stutzman, AJW-235, Jonathan.Stutzman@FAA.Gov
Subject: ATO IAQ PIR Revision Request

Please provide as much information as possible to the OPR, for example:

a. An error, procedural, or typographical item in paragraph _____ on page _____ should be changed to _____ (attach separate sheet as necessary).

f. In future revisions of this document, please include coverage on the following subject _____ (describe the specific language you want to add, include references if applicable)

g. Include the following information for the OPR to respond appropriately:

(1) Submitted by: _____

(2) Submission date: _____

(3) Telephone: _____

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