Portland State University

Indoor Air Quality Management Plan

Introduction

Protecting indoor environments is essential for maintaining healthful living and working spaces for tenant and building occupants. Portland State University (PSU) has adopted the following plan with the understanding that one of the most effective ways to protect building occupants from health problems is to enhance indoor air quality (IAQ).

Scope

This plan applies to all PSU owned and managed properties seeking LEED for Existing Buildings: Operations & Maintenance (LEED- O+M) certification. The purpose of this program is to enhance IAQ by optimizing practices to prevent the development of indoor air quality problems in the building, correcting indoor air quality problems when they occur and maintaining the well-being of the occupants.

This plan is based on the EPA publication IAQ Building Education and Assessment Model (I-BEAM) available at http://www.epa.gov/iaq/largebldgs/i-beam/. The EPA publication is a very comprehensive and valuable resource and should be referred to often.

Responsible Party

IAQ management is a team process involving PSU Facilities and Property Management (FPM) and Environmental Health and Safety (EHS). FPM is responsible for building maintenance as well as performing the IAQ profiles and necessary follow up repairs, to ensure good IAQ in PSU buildings. EHS is responsible for fielding building occupant complaints and performing IAQ testing if needed.

Both departments should be familiar with the principles contained in IAQ Building Education and Assessment Model (I-BEAM).

IAQ Profile

The appropriate PSU FPM manager will conduct a visual inspection and document review to develop an IAQ profile of any PSU building pursuing LEED O+M certification, based on I-BEAM protocols and practices, to record the status of all IAQ parameters identified in this plan (see appendix A). The final reports are kept by FPM on the designated shared server.

The IAQ profile profile focuses on:

- Identifying and reviewing records, such as “as built” blueprints, up-to-date list of control system set points, information on space usage, information on relative room pressure relationships, schedules and procedures for facility operations and maintenance, maintenance records for HVAC equipment, MSDS’s for products used in the building and amount of outside air entering the building under all modes of HVAC operation;
- Conducting a walkthrough inspection, based on I-BEAM procedures, and using the appropriate team members expertise to document information on pollutant/source inventory, IAQ problem indicators (odors,

dirty or unsanitary conditions, mold or mildew, moisture, unusual noises, uneven temperatures, wind tunnels, poorly designed OSA and exhaust openings), building envelop and HVAC conditions and operations.

The IAQ visual inspection ("profile") will be performed periodically but not less than every 5 years in any building seeking certification or re-certification under LEED O+M.

Address existing and potential IAQ problems

The periodic inspection program must be based on I-BEAM procedures. From the IAQ profile information, FPM can identify current practices or conditions that affect indoor air quality. Diagnosing IAQ problems is as much an art as science so this is where the team's previous experience (or outside assistance) will help the IAQ process.

General strategies to correct IAQ problems include:

- Identifying sources, then removing or reducing the source, sealing or covering the source, or modifying the environment;
- Improving ventilation to provide outside air to occupants and to dilute and/or exhaust pollutants;
- Improving air filtration to clean air from outside and inside the building; and
- Controlling occupant exposure through administrative approaches such as scheduling contaminant-producing activities during unoccupied periods.
- FPM to conduct visual inspections, based on I-BEAM procedures, of the facility to specifically address potential IAQ problems such as water stained ceilings; quantity and concentration of indoor plants; types of paints, sealants, and cleaning products used by in-house staff and vendors; or any other potential IAQ problems.
- Problems identified during periodic inspections, based on I-BEAM procedures, or preventive maintenance cycles will be corrected immediately if possible. To address problems which are more difficult to resolve, a scope of corrective measures and timeline will be developed by FPM. Information regarding the status of these problems will be shared with the affected building occupants as appropriate.

Discrepancies identified and recorded in the IAQ profile that are considered low or no cost repairs should be resolved and completed within 90 days. For those discrepancies or potential issues that require capital level expenses to address, a plan to further investigate, quantify, and develop a scope and budget to resolve will be established.

Develop and implement a plan for facility operations and maintenance

The HVAC operation is a key component to good IAQ in a building. The HVAC equipment first needs to be in proper working order, clean (internally) to deliver quality supply air and finally an operations schedule that accurately reflects the building use. The HVAC systems are designed to provide proper room relative pressures and deliver the ventilation air that is required for good IAQ. In general, ventilate the building with the maximum volume of outside air (OSA) that is practical. The OSA will dilute indoor pollutants and the fan system will evacuate the pollutants out of the spaces.

PSU has incorporated a standard practice of performing an unoccupied time purge cycle. This cycle utilizes 100% OSA for supply air and can be used to pre-cool a building before occupancy during the cooling season. This purge cycle dilutes and evacuates indoor pollutants accumulated during occupied periods.

The second component of good IAQ is the housekeeping. PSU has adopted a Green Cleaning Policy and all vendors agree to the terms of this document. Each building will be kept clean and staff and vendors are aware of the cleaning materials as they themselves may be sources of pollutants. The custodial contractors will buy and maintain cleaning products per the Green Cleaning Policy & Procedure. Cleaning products will be stored in a negative pressure area to prevent odors escaping the space. The custodial staff is trained on how their tasks and products can affect IAQ and reduce the pollutant sources within a building. The products and procedures used by custodians are documented to ensure proper compliance.

PSU has implemented a strong IAQ preventative maintenance plan. The plan includes monitoring, inspecting and cleaning HVAC equipment and components. The frequency of maintenance activities varies based on the needs of the equipment, function of the building and the environment around the building. All preventative maintenance activities are scheduled, assigned and tracked within the work order management system.

When prolonged deactivation or modification of HVAC equipment occurs (unscheduled maintenance), FPM and EHS will review the situation and make recommendations to minimize the effect on IAQ. FPM will also communicate with the building occupants to inform them how their air quality is being protected.

Manage processes with significant pollutant sources

Pollution sources with high potential to cause indoor air quality problems require that specific written protocols be established to manage those sources. These significant sources of pollution include:

- Construction (refer to PSU's Construction IAQ Plan)
- Painting (refer to PSU's Construction IAQ Plan)
- Pest Control (refer to PSU's Integrated Pest Management Plan)
- Shipping and Receiving
- Smoking (refer to PSU's Smoke & Tobacco Free Policy)
- Housekeeping (refer to PSU's Green Cleaning Policy & Procedure)

In-house staff, contractors or vendors that perform any of those services addressed above are required to comply with the associated plans referenced.

The following shipping and receiving protocol is intended to prevent vehicle contaminants from entering the building has been established and is enforced at the facility:

- Vehicles at the loading dock are not allowed to idle. Signage is posted.

- Delivery company supervisors have been notified of this protocol.

Education and Communication

FPM will develop a list of contractor personnel whose function could affect IAQ, such as pest control, cleaning services, general contractors, etc. Training and information for in-house personnel and contractors are provided on an annual basis or as-needed.

Open communication lines between FPM and tenants/occupants so the tenants and occupants can become partners in assuring good IAQ. Educate occupants that their activities can create indoor air quality problems and their cooperation is critical for maintaining good IAQ. A resource available to aid in training is an EPA publication titled "An Office Building Occupants' Guide to Indoor Air Quality" found at www.epa.gov/iaq/pubs/occupgd.html.

FPM and EHS maintain communication with building occupants to ensure that occupants know how to submit IAQ concerns. Occupants are directed to contact the FPM work control center (5-2FIX) for urgent issues, or entering an online customer request for non-urgent issues. Instructions for submitting IAQ concerns are here: https://www.pdx.edu/environmental-health-safety/indoor-air-quality.

The open communication line is a two direction process. FPM needs to inform the tenants/occupants about building conditions that may have a significant adverse IAQ impact—this will be done via the PSU Impact Notice System. Conversely, occupants should communicate to FPM or EHS when their activities may have significant adverse IAQ impacts. The management of good IAQ is a cooperative process.

Establish procedures for responding to IAQ complaints

Procedures have been established for responding to, documenting and resolving IAQ complaints. They include:

- Logging entries into the work order system
- EHS or FPM representative, depending on the nature of the concern, collects information from the complainant
- Identifying information regarding the source of complaints will be held confidential upon request to the degree possible
- EHS or FPM representative either resolves the problem or identifies appropriate outside source of assistance
- Feedback is provided to the complainant
- EHS or FPM representative later follows up to ensure that the remedial action has been effective and the work order is closed out

These procedures for responding to IAQ complaints have been shared with existing building occupants and are included in new tenant orientation documents.

Time Period

This Plan is effective July 1st 2017 and will be in effect for the duration of building operations and will be reviewed on an annual basis.

Relevant Definitions

IAQ	Indoor Air Quality	MSDS	Material Safety Data Sheet
CFM	Cubic Feet per Minute	GC	General contractor
CC	Controls contractor	MC	Mechanical contractor
HVAC	Heating Ventilation and Air Conditioning	MEP	Mechanical Electrical and Plumbing contractor
EPA	Environmental Protection Agency	OSA	Outside Air (ventilation)
EC	Electrical contractor	VOC	Volatile Organic Compound
		TAB	Test and balance contractor

Appendix A

Indoor Air Quality Profile

Prepared by:_____ Date: _____

The purpose of this form is to provide the designated IAQ Manager and any supporting staff a checklist of items to inspect when completing a whole building Indoor Air Quality (IAQ) profile and to document the status of all IAQ parameters identified in the building IAQ Management plan and consistent with the EPA's I-BEAM program. The IAQ profile focuses on occupied spaces, mechanical systems and building exterior. Any IAQ related discrepancies identified will be noted and summarized in the table near the end of this document and any issue designated "No cost" must be remediated within 60 days. For discrepancies requiring a financial expense to remedy, establish a timeline and strategy for addressing each issue. Note, if there is not enough room to document deficiencies identified on an profile form, please record the deficiency in the table at the end of this document.

Summary of IAQ Profile Procedures: Upon completion of the IAQ profile and the tables below, provide a brief narrative summary of the profile process, observations, and findings.

In each applicable cell in the tables below, place either a:
"**Y**" = Yes, it complies or is satisfactory;
"**N**" = No, it does not comply or is unsatisfactory;
"**–**" = Not applicable.
For items marked "**N**", please provide a description of the discrepancy and its location.

Occupied Spaces																				
Description	**Floor Number**																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Air quality OK (no odors, stuffiness?)																				
Comments from occupants are positive?																				
No signs of occupant discomfort (e.g. heaters, fans)?																				
Thermal condition comfortable?																				
Lighting is adequate for tasks? No glare?																				

No noise interference or instructions?																					
Area is clean? Meets housekeeping standards?																					
No moisture damage or visible fungal/mold growth?																					
Weather-stripping condition on doors & windows OK?																					
Thermostat setting is appropriate for season?																					
Supply air flow adequate? No excess dirt/dust on diffusers?																					
Return/Exhaust air flow adequate? No excess dirt on register?																					
Minimal diffuser and register noise?																					
Flooring in good condition?																					
Ceiling tiles in good condition?																					
Furniture/partitions in good condition?																					

Noted Deficiencies (items marked “N”):	
Deficiency #1	
Deficiency #2	
Deficiency #3	
Deficiency #4	
Deficiency #5	

Building Exterior

Description	OK	Not OK	If Not OK, describe the discrepancy
Roof insulation adequate?			
Wall thermal insulation adequate?			
Doors and glazing – good condition?			
Potential for infiltration through doors (condition of weather stripping)			
Potential for infiltration through windows?			
Potential for infiltration through walls?			

HVAC Design, Operations and Maintenance			
Description	**OK**	**Not OK**	**If Not OK, describe the discrepancy**
Control Sequence of Operations is current?			
Minimum ventilation rates comply with ASHRAE 62.1			
Building Operations Plan is current?			
As-built mechanical/HVAC drawings are current?			
Preventive maintenance program is in place?			
Documentation of completed PM tasks are maintained?			
Inventory of PM equipment is current and accurate?			
Frequency of PM tasks is appropriate?			
Building engineers are sufficiently oriented and trained on equipment operations and controls?			

Air Handling Units (AHU's)																				
Description	**AHU Number**																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
No exhaust outlet w/i 25 ft of intake?																				
No cooling tower w/i 25 ft of intake?																				
No trash container w/i 25 ft of intake?																				
No other source w/i 25 ft of intake?																				
No noticeable odors from outdoors (e.g. roof tar, vehicle exhaust)?																				
No air intake obstructions, bird dropping, or nests?																				
Face and bypass damper in good condition, ease of movement?																				
Mixing plenum air temp and pressure (negative) OK?																				
Mixing plenum clean, no obstructions or odors?																				
All dampers are tight, good working condition?																				
Filters are easily assessable? No bypassing air?																				
Filter moisture/dampness and loading (dirt/dust) not excessive?																				
Heat/Cool Coils are easily accessible, clean and no rust or corrosion?																				
No condensing water droplets in air stream, no drainage																				

problems?																				
Condensate drain pans are clean, no odors or residue or clogs?																				
Drain pans are properly sloped and draining – no standing water?																				
No visible bacterial or fungal growth in drain pans?																				
Noted Deficiencies (items marked "N"):																				
Deficiency #1																				
Deficiency #2																				
Deficiency #3																				
Deficiency #4																				
Deficiency #5																				

Steam or Spray Humidifiers or Air Washer, if applicable																				
Description	**AHU Number**																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Properly installed, no mineral deposits																				
Drain properly, drain line trapped, pans clean, no standing water or overflow																				
Show no visible biological growth and if duct liner w/in 12 ft., no dirt or mold growth?																				
Provide complete coil coverage; nozzles working properly																				
Controls																				
Settings match schedule, sensors calibrated																				
Pneumatic controls line pressures for occupied/unoccupied settings, at thermostat and damper actuator OK?																				
Pneumatic system line drier preventing moisture buildup?																				
Freeze-stat tripping mechanism operating at proper temp?																				
Air Ducts																				
No damage, dents, leaks, mounting secure, connections sealed?																				
Easy access for maintenance?																				
No excess dirt or erosion, no debris, no water condensation or dampness, no mold or biological growth?																				
Fire damper open and accessible for maintenance? Access doors closed?																				
Grilles clean and unobstructed?																				

Noted Deficiencies (items marked "N"):	
Deficiency #1	
Deficiency #2	
Deficiency #3	
Deficiency #4	
Deficiency #5	

Air Plenums																				
Description	**AHU or Fan Number**																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Easily accessible for maintenance?																				
No unusual odors in plenum or space?																				
No debris, excess dirt, excess dampness, signs of biological growth?																				
No leaks from other systems?																				
Secure, clean, no erosion of fireproofing and insulation materials. Does not contaminate the space?																				
Fire dampers open?																				
Ceiling tiles in place, no stains																				
No unintentional openings?																				
Fan and Fan Chambers																				
Clean, no trash or storage?																				
Drain traps wet or sealed?																				
No air leaks, door seals tight?																				
No standing water or corrosion?																				
No excess vibration or unusual noise?																				
Fan blades clean, not damaged?																				
Belts with proper tension, no excess wear, guards installed?																				
Control sensors operational and calibrated?																				
Noted Deficiencies (items marked “N”):																				
Deficiency #1																				
Deficiency #2																				
Deficiency #3																				
Deficiency #4																				
Deficiency #5																				

Fan Coil Unit/Unit Ventilator/Induction Unit										
Description	**Fan Coil Unit/Unit Ventilator/Induction Unit #**									
No rust or corrosion? Visible ductwork condition and insulation OK?										
No unusual noise or vibration?										
Duct vibration isolation installed, in good condition?										
All parts accessible for maintenance?										
Filters are clean, pressure drop within manufacturer's spec's?										
Controls match design settings?										
Dampers are operational, no obstructions?										
No pipes leaking? Wall/floor cavity sealed?										
Drain pan clean, no biological growth? Sloped, no standing water, no leaks? No overflow, trapped drain?										
Heat Pumps										
Description	**Heat Pump #**									
No corrosion, air leakage? Visual ductwork condition OK?										
No unusual noise or vibration? Duct vibration isolation installed, in good condition?										
All parts accessible for maintenance?										
Filter condition OK? Installed properly?										
Pipe insulation OK?										
Evaporator coil and drain pan clean, pan drains OK?										
No bubbling in refrigerant sight glass.										
Proper refrigerant line outlet and inlet temperatures?										
No unusual odors in discharge air streams? No uncontained leakage from system										
Noted Deficiencies (items marked "N"):										
Deficiency #1										
Deficiency #2										
Deficiency #3										
Deficiency #4										
Deficiency #5										

Exhaust Fans in Special Use Areas										
Description	**Exhaust Fan #**									
Fans working during occupied hours?										
Registers open and clear?										
Adequate make-up air, clear path?										
Room pressure is negative relative to bldg?										
No excessive noise?										
Grilles are clean and unobstructed?										
Controls are operational?										
Doors are closed?										
Terminal Boxes (VAV / CAV)										
Description	**Terminal Box #**									
Overall exterior condition OK?										
Visible ductwork condition and insulation OK?										
No air or fan noise or vibration?										
All parts accessible for maintenance?										
Filter condition and installation OK?										
Dampers operational?										
Control set points match design set points?										
Reheat coils clean, operational, no obstructions?										
Noted Deficiencies (items marked "N"):										
Deficiency #1										
Deficiency #2										
Deficiency #3										
Deficiency #4										
Deficiency #5										

Elevator, Stairwells										
Description	**Elevator #**									
Shaft is clean (floor, walls and ceiling); adequately ventilated										
Elevator is clean, ventilated?										
Stairwells:										
No unusual odors?										
Doors close and latch properly?										
No openings allowing uncontrolled air flow?										
Clean, dry, no signs of smoking?										

Air Compressor and Pneumatic System										
Description	**Air Compressor #**									
No odor from compressed air?										
System sizing appropriate?										
Pneumatic lines in good condition?										
No observable system air leakage?										
Desiccator and filters in good condition?										
Effective compression?										
Belt tight fit, no excess wear?										

Noted Deficiencies (items marked “N”):	
Deficiency #1	
Deficiency #2	
Deficiency #3	
Deficiency #4	
Deficiency #5	

Mechanical Rooms										
Description	**Mechanical Room Number or Name**									
No unusual odors?										
Room is clean, no dirt/dust, buildup on floors and equipment?										
No storage of cleaning or maintenance supplies, no trash?										
No excess equipment noise and vibration?										
No leakage or penetrations to adjacent spaces?										
Proper drainage, no clogged drains or standing water?										
Humidifiers are clean, no mineral deposits, biological growth?										
Pipes not leaking or corroded?										
Visible ductwork condition and insulation OK?										
Adequate combustion air for boiler, hot water heater?										
Flues have no corrosion, leaks, breeching is tight?										
No fuel/gas leaks? No combustibles or unusual odors?										
No refrigerant leaks in chillers or refrigerant equipment?										
No problems with condensation on refrigerant lines?										
Refrigerants, fuels, and chemicals are properly stored and contained?										
Cooling tower sump and baffles are clean – no slime or algae?										
Condenser water condition is normal – no signs of algae? Biocide treatment working and effective?										
No signs of cooling tower leaks or mist migrating to inappropriate receptors?										
No unusual cooling tower noises or vibrations?										
Emergency generators: No odors? Negative Pressure? Exhaust stack in good condition?										
Noted Deficiencies (items marked “N”):										
Deficiency #1										
Deficiency #2										
Deficiency #3										
Deficiency #4										
Deficiency #5										

List of IAQ Profile Discrepancies				
Record each of the discrepancies from the tables above into this table and complete each cell as applicable. Items designated "No Cost" must be resolved within 60 days of identification.				
Page #	Description	No Cost Item? (Y/N)	Resolved or Expected Resolution Date	Recommended resolution strategy

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Additional Discrepancies		
If more deficiencies are identified on a page than there is room, note the additional deficiencies in this table.		
Page #	Deficiency #	Description