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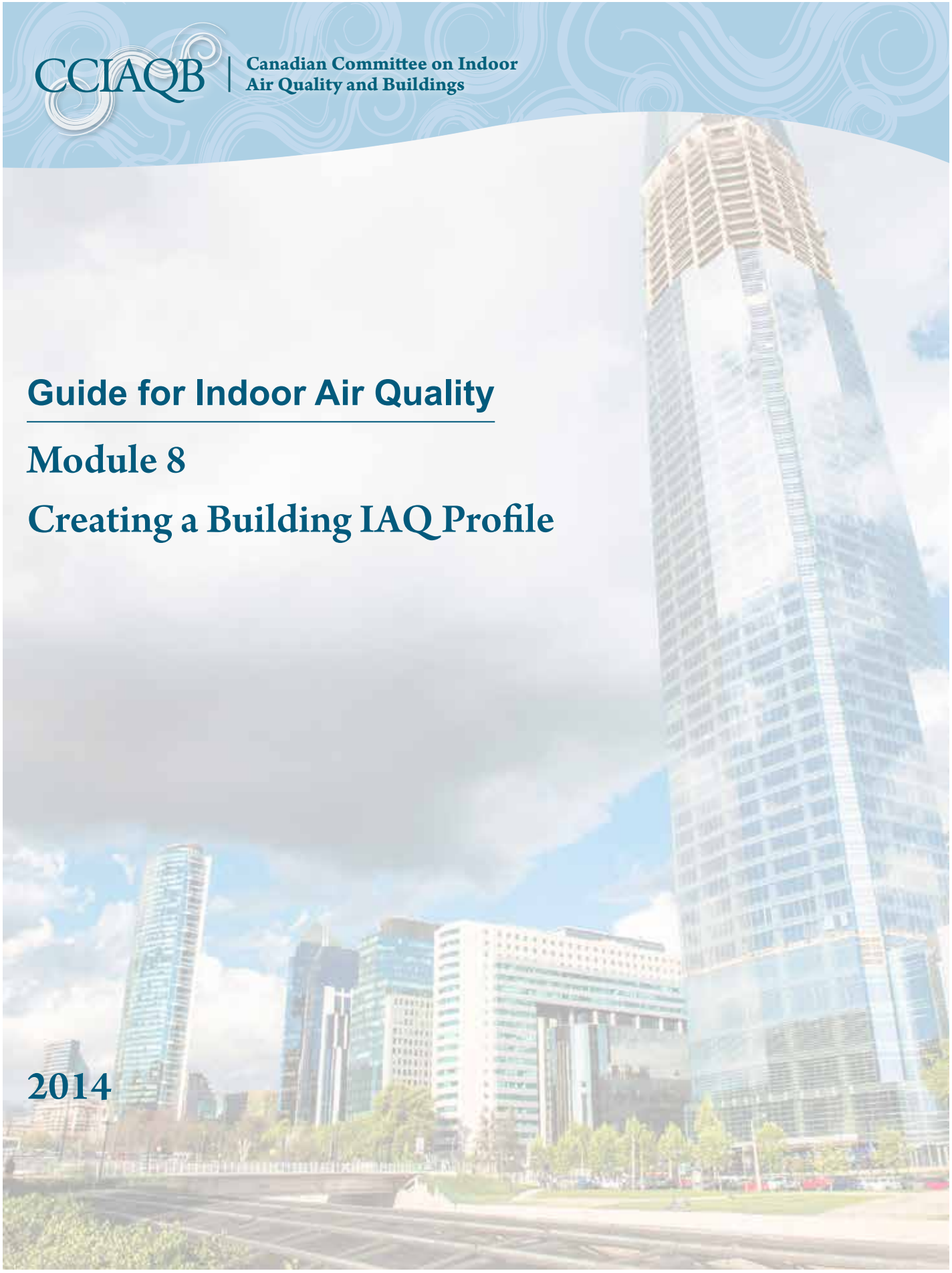

Guide for Indoor Air Quality

Module 8

Creating a Building IAQ Profile

2014

Canadian Committee on Indoor Air Quality and Buildings (CCIAQB)

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Indoor air quality is a very complex issue and there is currently a significant gap between knowledge of the effects of indoor air quality on the health of occupants and the effectiveness of various air quality technologies and solutions. User discretion is advised.

Preamble

The objective of the CCIAQB is, ultimately, to improve indoor air quality for all Canadians in every type of building. The CCIAQB has decided that its initial focus should be on buildings where many Canadians spend time outside their home, working, learning, shopping, being entertained, etc. For the most part, these buildings have relatively complex heating, ventilating and air conditioning systems (HVAC) that are operated and managed by knowledgeable persons. The table below gives examples of buildings that are covered using the classification found in the National Building Code of Canada (NBC). Documents produced by the CCIAQB are primarily intended for the use of building operators and facility managers, but the information contained in the guides can be helpful to anyone seeking a general understanding of indoor air quality issues.

The Committee welcomes feedback on the documents as well as ideas for the development of new materials. CCIAQB Secretary can be contacted at info@IAQforum.ca or register on the website at www.IAQforum.ca

NBC Classification	**Examples**
Group A, Division 1	Theatres, movie theatres and other facilities for the performing arts
Group A, Division 2	Art galleries, museums, libraries, educational facilities (schools, colleges and universities), gymnasia, air and rail terminals
Group A, Division 3	Arenas and swimming pools
Group C	Apartments, hotels, college residences
Group D	Offices, including medical and dental offices
Group E	Department stores, supermarkets, shops, retail space

Guide for Indoor Air Quality
Module 8: Creating a Building IAQ Profile

Table of Contents

List of tables, checklists and figures

1. Purpose of this Guide

This guide helps building operators and managers document the features of their buildings and occupants that affect air quality. The guide covers (but is not limited to) such buildings as offices, retail outlets, classrooms and hotels. It does not cover industrial buildings or institutional buildings such as hospitals.

2. Introduction

2.1. What is an IAQ profile?

An indoor air quality (IAQ) profile describes the features of a building's structure, function and occupancy that affect the quality of the air inside a building. An IAQ profile also describes the current quality of air in a building—known as 'baseline information'—that can be used to compare against a building's future air quality.

An effective IAQ profile is an organized set of records, materials and documents that building managers, operators and owners can refer to when they are planning for renovations or dealing with other issues. An IAQ profile contains information similar to information collected when solving other indoor air quality problems (see Module 4—Recognizing and Addressing IAQ Problems for more information). However, an IAQ profile focuses on an entire building rather than on specific areas that may have caused a problem.

Developing an IAQ profile is often a lengthy process and can be completed in stages at the convenience of building managers or operators (from now on referred to simply as building operators). Most important is to ensure an accurate portrayal of the building's IAQ in any profile. Taking the time to do it right the first time will produce information that can be used for years to come, that will potentially reduce the number of complaints from occupants, and reduce the building operator's workload in general.

2.2 Why is an IAQ profile important?

An IAQ profile can help building operators identify, document and manage potential IAQ problems and help prioritize budgets for maintenance and modifications. An IAQ profile, when combined with information on lighting, security and other building systems, is used as a reference manual for the building and as a tool to evaluate the impact of IAQ activities.

As discussed in Module 1—Introduction to Indoor Air Quality, a failure to maintain acceptable air quality can have negative consequences for human health, productivity and absenteeism, landlord/tenant employer/employee relations, and the building's overall reputation. Poor IAQ can also accelerated deterioration of a building. IAQ profiles are vital tools in preventing such consequences.

A completed IAQ profile will help building owners and operators meet the following American Society of Heating, Refrigerating and Air-Conditioning (ASHRAE) objectives, which are considered essential for improving and maintaining good indoor air quality over time:

1) Ensure that building operators are involved in any future design, commissioning[1] or construction process. This enables operators to better understand how building systems impact air quality work, as well as contribute to discussions during the design and commissioning process;
2) Limit outdoor contaminants and pollutants from entering the building;
3) Controlling moisture and contaminants in the building with particular attention to controlling moisture and contaminants from the building's mechanical systems and equipment;
4) Limit the number and type of indoor contaminants and pollutants from entering the building
5) Contain and eliminate contaminants from building equipment and activities that may involve pollutants and contaminants (i.e., painting, new construction materials); and
6) Reduce the amount and concentration of contaminants through the use of ventilation, filtration and air cleaning

1 Commissioning is a process that focuses on verifying and documenting that a building and all of its systems and parts are planned, designed, installed, tested, operated and maintained to meet the building owner's requirements.

3. Preparing for an IAQ Profile

3.1. Factors to consider

To determine a building's baseline indoor air quality, various factors need to be measured. These factors and their sources are discussed in more detail in Tables 4.2 and 4.3 of Module 4 and in Module 2—VOC Sampling Strategies and Methods. As building operators examine and investigate buildings for IAQ issues, they should consider the factors described in Table 8.1.

Table 8.1 Factors to consider in an IAQ profile

Factora	Examples	Where these will become important for an IAQ profile
The indoor climate of the building—"the thermal environment"	• Temperature (heat loss and gains) • Humidity • Air movement or airflow (velocity, volume and ventilation) of the building	Steps 1, 2 & 3
Biological contaminants and pollutants	Bacteria, fungi, viruses, molds, pollen, asbestos and lead, animal hair, dander and excrement	Steps 2 & 3
Chemical pollutants	Volatile organic compounds (VOCs) found in cleaners, solvents, fuels and adhesives Various combustion by-products (i.e., from broken heat exchanger), and emissions from furnishings, and floor and wall coverings, formaldehyde, and pesticides	Steps 2 & 3
Particles and aerosols	Dust, smoke, mist, fumes and condensates, combustion contaminants, particles and fibers (these are all coarse, fine and ultrafine solids or liquids that are light enough to be suspended in air)	Steps 2 & 3
Gases	Carbon dioxide and carbon monoxide (indoor concentration levels relative to outdoor levels), soil gases (radon, sewer gas, VOCs, methane), nitrogen dioxide, ozone	Steps 2 & 3

3.2. Key questions to answer when developing a building's IAQ profile

Before developing an IAQ profile, building operators must address several key questions and take specific actions:

Ask: How was this building originally intended to function? Was it designed to handle the current process for humidification? Can the original building envelope handle new humidification airflow systems?

Where to find the answer: Consider the building components and furnishings, mechanical equipment (HVAC and non-HVAC), and the occupant population and associated activities.

Ask: What was the purpose of the building when it was first built and has that purpose or function changed? Is the building functioning, operating or being used as originally as designed?

Find the answer: Find out whether the building was commissioned. Compare the information from the commissioning to its current condition.

Ask: What changes in building layout and use have occurred since the original design and construction?

Find the answer: Find out if the HVAC system has been modified and retested to reflect current usage.

Ask: What changes may be needed to prevent IAQ problems from developing in the future?

Find the answer: Consider how the building's uses may change in future.

Ask: Will the IAQ profile process include the various individuals and groups that have a vested interest in the building, and how will they be included?

Find the answer: This could involve discussions, consultations and interviews with individuals and groups who use or live in the building, health and safety committees, staff, etc.

3.3. Skills involved in creating an IAQ profile

Building operators need several skills to conduct an IAQ profile, and many issues must be addressed.

Checklist 8.1, on page 5, suggests skills that building operators and owners should consider as they determine who should conduct an IAQ profile. It also lists the types of resources, materials and people needed to conduct such a profile effectively.

3.4. Resources building operators may need

If a building's operator and owner complete the skills checklist and determine they have at least most of the skills for creating an IAQ profile—but still feel uncomfortable or unsure—they may find it useful to use this Module series and other resources to gather the information they need.

Checklist 8.1: Skills needed to perform an IAQ Profile				
Skill	**Where is this skill needed in an IAQ profile**	**Does the building operator have this skill or authority?**	**Are additional resources, tools and training needed to gain this skill?**	**Should an external team be hired to address this aspect of the profile?**
Understand how heating, ventilation and air conditioning systems work.	Steps 2 & 3			
Be able to read architectural and mechanical plans and understand manufacturer's catalog data on equipment in the building.	Step 1			
Identify items of office equipment or other building equipment (e.g., equipment for pools).	Step 1			
Work cooperatively with building occupants to gather information about the building.	Steps 1, 2 & 3			
Collect information about HVAC system operation, equipment condition, maintenance schedules, and an electronic version of the buildings management control system (if available).	Steps 1, 2 & 3			
Collect information from subcontractors about work schedules and materials used (particularly cleaning and pest-control activities).	Step 1			
Understand documents about the safety of the different materials used in the building during its construction and maintenance (material safety data sheets, or MSDSs), if available.	Steps 2 & 3			

Checklist 8.1: Skills needed to perform an IAQ Profile				
If direct measurements are to be included in the IAQ profile, the building operator should have the tools and training to make the following measurements: • Air volumes at supply diffusers and exhaust grilles • CO_2 concentration • Temperature • Relative humidity • Difference between areas of negative and positive pressure (air flow)	Step 3	This skill can be learned over time, and is not needed at the outset		

3.5. Hiring IAQ professionals and other professionals

Building operators who feel unqualified to conduct an IAQ profile or who lack the skills noted above may find it useful to hire an IAQ professional. A list of resources can be found at the end of this report and on the websites of several provincial and national governments and organizations. Information about IAQ, including education and training materials, can be found on the websites of businesses and professional associations devoted to IAQ. Some businesses conduct IAQ assessments; others—such as licensed mold or asbestos professionals—focus on particular aspects of IAQ. It also may be practical to find help by:

- Searching the Yellow Pages under Engineers, Environmental Services, Laboratories—Testing, or Industrial Hygienists, Ventilation Engineers and Toxicologists
- Seeking out referrals for firms that conduct building audits or profiles. Individuals or groups that offer services in this evolving field should be questioned closely about their related experience and their proposed approach to IAQ profiles.
- Seeking out firms and individuals working in IAQ. These parties may come from a variety of disciplines. Typically, the skills of HVAC engineers and industrial hygienists are useful, although it may also be important to solicit input from other disciplines such as chemistry, chemical engineering, architecture, microbiology and medicine.

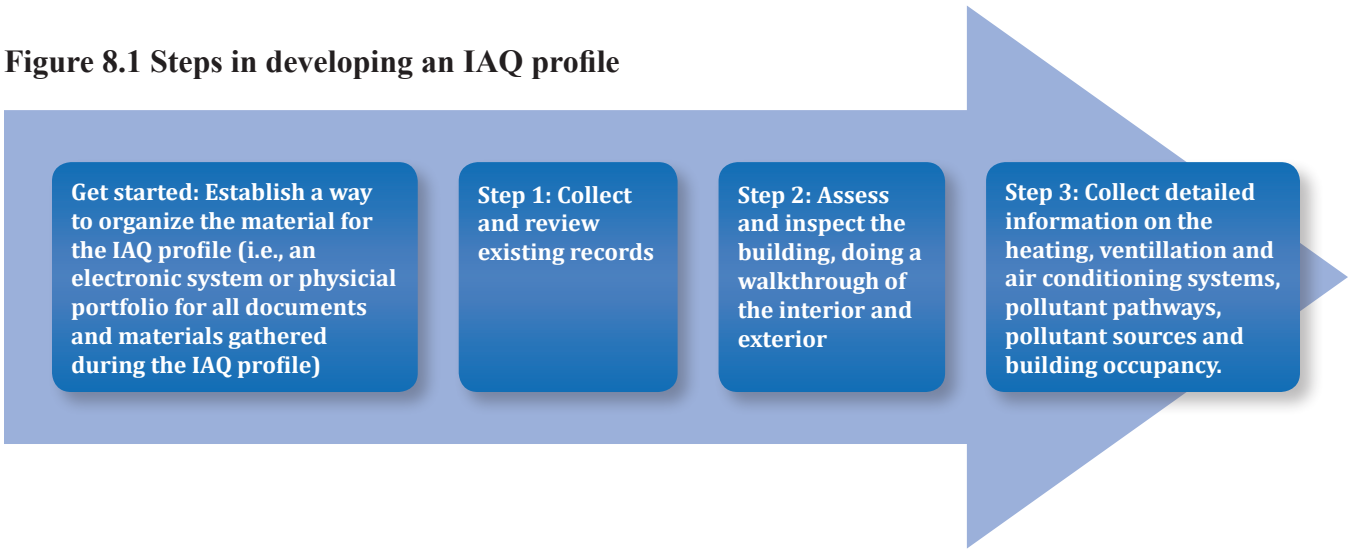
4.0 Conducting an IAQ Profile

4.1. Steps in developing an IAQ profile

After the building operator has sufficiently prepared for developing an IAQ profile, he or she should follow the steps as shown in Figure 8.1, below.

Before launching into Step 1, a building operator should get started by establishing a framework for organizing, recording and storing the information to be collected. We suggest setting up a portfolio, either paper-based or electronic (or both).

Figure 8.1 Steps in developing an IAQ profile



Step 1—Collect and review existing records

S1.1. Review design, commissioning, construction and operating documents

This first step should be completed swiftly. To begin, the building operator should collect all documents that describe the construction and operation of the building. Checklist 8.2 lists documents to be collected.

Checklist 8.2: Documents to be collected for review

- ✓ Architectural and mechanical plans
- ✓ Specifications documents
- ✓ Submittals documents
- ✓ Sheet metal drawings
- ✓ Commissioning report (a report that verifies and documents that the building and all its systems and parts are planned, designed, installed, tested, operated and maintained to meet the building owner's requirements for the building)
- ✓ Adjusting and balancing reports (for HVAC systems)
- ✓ Inspection records
- ✓ Operating manuals

Many buildings lack some or all of these documents, which can be problematic. For example, if there are no commissioning reports or balancing reports, there is no way to verify that ventilation quantities match those indicated on mechanical design drawings. Additionally, if there are no operating or maintenance manuals for HVAC equipment, it may be difficult for building staff to carry out an adequate preventive maintenance program. If the building operator lacks these documents he or she should try to find them. If that is not possible, the building operator should continue with the IAQ profile but note that certain documents are missing.

Next, the building operator needs to study the original architectural and mechanical design to understand the building's layout and intended functions. The operator should note locations where changes in equipment or room use could create IAQ problems—and give those areas special attention during the walkthrough (which takes place in Step 2).

During this process the operator should ask the questions listed in Table 8.2 about the different types of information collected.

Table 8.2: Questions building operators should ask themselves about materials collected

Issue	Questions to be asked
Commissioning reports	Was the building properly commissioned when it was first constructed, including testing and balancing of the HVAC system?
Documents about the history of the building and how it has been maintained	How much have the building and the technology of the systems in the building changed over time?
Operating manuals	Does staff understand how the HVAC equipment is intended to operate?
Remodeled areas	Has the HVAC system layout been changed to accommodate new walls, rearranged partitions, or for similar architectural changes?
Addition, removal, or replacement of HVAC equipment	Where original equipment has been replaced, do the newer units have the same capacity as the original units? Has new equipment been properly installed and tested? Where equipment has been removed, is it is no longer needed?
Changes in room use	Is there a need for additional ventilation (supply and/or exhaust) due to a larger occupant population or new activities within any area of the building? Have new items of equipment (non-HVAC) been provided with local exhaust where needed? (Look for unusual types or quantities of equipment such as copy machines or computer terminals).
Changes outside of the building	Are there new buildings, development, roadways and parks outside the building? How has this changed over time?

S1.2. Check HVAC maintenance records against equipment lists

Next, the building operator must collect existing maintenance and calibration records and check them against the construction documents (e.g., equipment lists and mechanical plans). The operator will determine whether all components appear to be receiving regular attention. Note that equipment that has been installed in inaccessible or out-of-the-way locations (items such as filter boxes and small-capacity exhaust fans) are frequently overlooked during routine maintenance.

S1.3. Review Records of Complaints

Next, if there is an organized record of complaints about the building environment, the building operator should review it to identify areas that deserve special attention. A record of complaints may have been organized in a hard-copy log, could be found in the records of a health and safety committee or other occupant committee, or might be located in an electronic record. It may be useful for the building operator to find out if the city or province has records of complaint for the building.

S1.4 Materials and products you should have at the end of the collection and review

The building operator should create a binder labeled IAQ profile where all pertinent documents reside. At the end of Step 1 the operator should have all the materials listed in Checklist 8.3. Those materials should be clearly labeled as: Step 1—"Collect and review existing records."

Checklist 8.3: Materials for Step 1—Collect and review existing records
✓ A description of the HVAC system design and operation (e.g., original plans and specifications with changes indicated or new sketch plans and notes, commissioning reports, testing and balancing reports). ✓ A set of operating instructions, maintenance and calibration records for HVAC system components (e.g., fans, dampers, filters, chillers, boilers and control systems). ✓ An inventory (list) of locations where architectural or engineering modifications have taken place. ✓ An inventory (list) of locations in which current occupancy or HVAC system operation represents a change from the original design. ✓ An inventory (list) of locations where complaints have been common in the past

Step 2—Initial assessment and inspection of the building

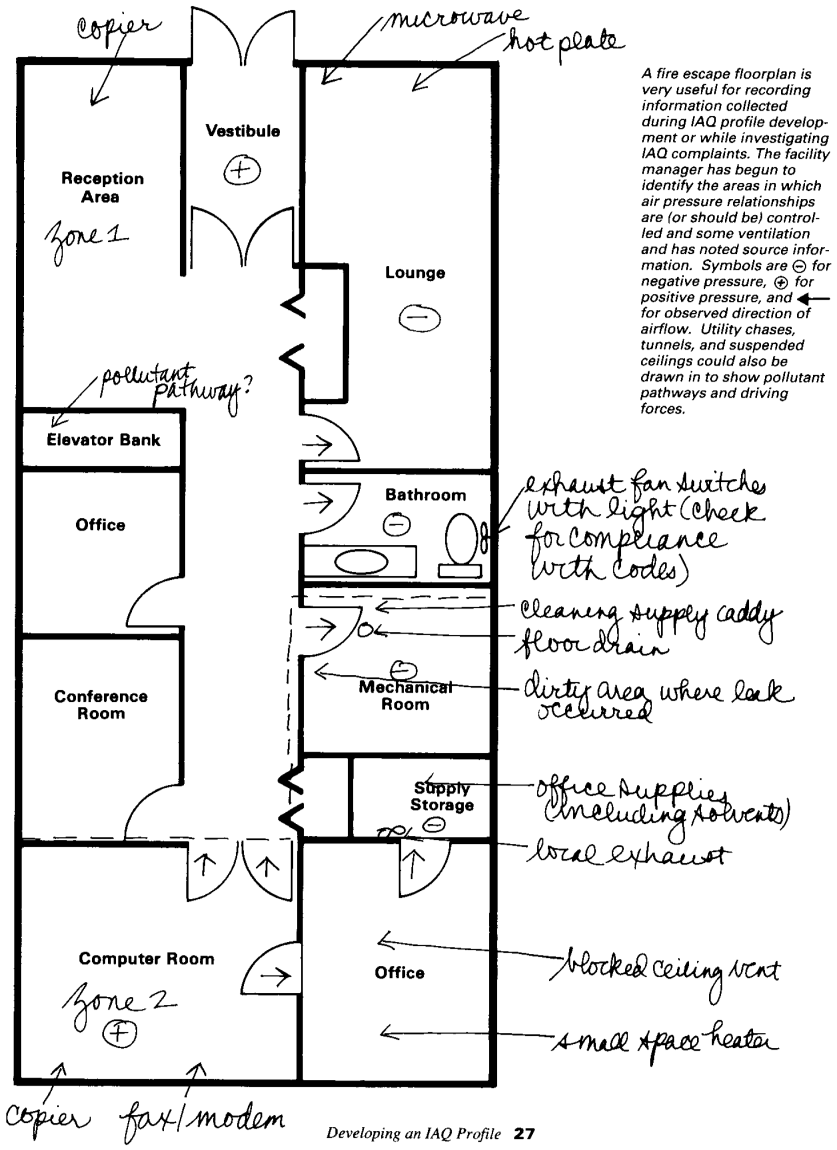
Step 2 should be completed swiftly. It is an essential step, as it helps sets up the important and comprehensive work to be completed in Step 3.

S2.1. Conduct a walkthrough inspection of the building

The goals of the walkthrough inspection are to get an overview of how occupants use the building, gain a thorough understanding of the building's various functions, and look for indications that there could be an IAQ problem. The building operator should have a sketch plan of the building and its surroundings, such as a small floor plan showing fire exits so that his or her notes can be referenced to specific locations (see Figure 8.2).

This is not the time to take detailed measurements of temperature, humidity, airflow and other factors. Those actions are more appropriate at a later stage of profile development. However, the operator should look for noticeable problems, or for where the factors indicated in Section 3.1 may become an issue, and note any such potential problems on the sketch plan (see Figure 8.2). For instance, chemical smoke can indicate airflow patterns and pressure relationships between special-use areas and other identified pollutant sources and surrounding rooms. Odors in inappropriate locations (e.g., kitchen odors in a lobby or chlorine outside of a pool area) may indicate that ventilation system components require adjustment or repair.

Figure 8.2: Sketch plan with notes (taken from EPA Building Air Quality: A Guide for Building Owners and Facility Managers)



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S.2.2. Talk with staff and other occupants about facility operation and management, housekeeping, pest control, etc.

A walkthrough inspection is an opportunity to introduce facility staff and other building occupants to the topic of IAQ, and to understand staff and contractor responsibilities for housekeeping and maintenance. Building operators should provide advance notice to staff and occupants about any inspection, as advance notice feels less intrusive and may prompt staff and occupants to recall important information.

Discussing routine building activities in this manner will help clarify which elements should be included in an IAQ management plan. (The IAQ management plan is a long-term action plan for the building that is developed after, and as a complement to, the IAQ profile.) Generally, the building operator should ask staff about their job responsibilities, training and experience. It is helpful to meet with responsible staff and contractors to discuss:

- facility operation and maintenance (e.g., HVAC, plumbing, electrical, interior maintenance)
    - HVAC operating schedule (e.g., occupied/unoccupied cycles)
    - HVAC maintenance schedule (e.g., filter changes, drain-pan maintenance)
    - use and storage of chemicals
    - schedule of shipping and receiving, handling of vehicles at loading dock
    - scheduling and other procedures for isolating odors, dust and emissions from painting, roof repair and other contaminant-producing activities
    - budgeting (i.e., how do staff members influence budget decisions?)
- housekeeping
    - cleaning schedule
    - trash storage and schedule of refuse removal
    - use and storage of chemicals
- pest control
    - schedule and location of pesticide applications
    - use and storage of chemicals
    - pest control activities other than use of pesticides

Communicating with building occupants and staff is critical to developing an accurate and useful IAQ profile. Module 7—Communicating with Tenant Organizations and Individual Occupants. provides an interview tool that building operators can use to spur discussions on various issues with staff and occupants.

S2.3 IAQ problem indicators; what should building operators look for?

The walkthrough inspection helps identify areas with high potential for IAQ problems. Table 8.3 lists the general indicators of IAQ problems that building operators should note on their building sketch plans.

In addition to these general indications, some common ones are listed in Table 8.4.

Table 8.3: General indicators of IAQ problems to be recorded on the sketch plan

- Odors
- Dirty or unsanitary conditions (e.g., excessive dust)
- Visible fungal growth or moldy odors (often associated with too much moisture)
- Poor sanitary conditions at equipment such as drain pans and cooling towers
- Poorly maintained filters
- Signs of mold or moisture damage at walls (e.g., below windows, at columns at exterior corners), ceilings and floors
- Staining and discoloration (Make sure that stains are removed after leaks are repaired so that there will be visible evidence if the leak recurs.)
- Smoke damage (Note: If a fire has occurred involving electrical equipment, determine whether polychlorinated biphenyls (i.e., or PCBs) may have been released from the equipment.)
- Presence of hazardous substances
- Potential for soil gas entry (e.g., unsealed openings to earth, wet earth smells)
- Unsanitary mechanical room, or trash or stored chemicals in mechanical room
- Unusual noises from light fixtures or mechanical equipment

Table 8.4: Common problems to be recorded on the sketch plan	
Problem indicator	What to look for, what to check
Inadequate maintenance	Look for leaks of oil, water or refrigerants around HVAC equipment. Also, be aware of signals such as un-replaced, burned-out light bulbs in fan chambers, and staff members who have difficulty locating specific pieces of equipment. Dry drain-traps can also cause indoor air quality problems. If traps are not kept charged with liquid, they could be allowing sewer gas to enter occupied spaces.
Signs of occupant discomfort	Notice uneven temperatures, persistent odors (including tobacco smoke), drafts and sensations of stuffiness. You may find that occupants are attempting to compensate for an HVAC system that doesn't meet their needs. Look for propped-open corridor doors, blocked or taped-up diffusers, popped-up ceiling tiles, people using individual fans or heaters, or wearing heavier or lighter clothing than normal.
Overcrowding	Future occupant density is estimated when the ventilation system for a building is designed. When the actual number of occupants approaches or exceeds this occupant design capacity, managers may find that IAQ complaints increase. At that point, the outdoor air ventilation rate will have to be increased. However, the ventilation and cooling systems may not have sufficient capacity to handle the increased loads.
Blocked airflow	Check for under-ventilation caused by obstructed vents, faulty dampers or other HVAC system malfunctions, or from problems within the occupied space. Furniture, papers or other materials can interfere with air movement around thermostats, or block airflow from wall or floor-mounted registers. Where office cubicles are used, a small space (i.e., two to four inches) between the bottom of the partitions and the floor may improve air circulation.
Ceiling plenums	Lift a ceiling tile and examine the plenum for potential problems. Walls or full-height partitions that extend to the floor above can obstruct or divert air movement in ceiling plenums unless transfer grilles have been provided. If fire dampers have been installed to allow air circulation through walls or partitions, confirm that the dampers are open. Construction debris and damaged or loose material in the plenum area may become covered with dust and can release particles and fibers.
Heat sources	Be aware of areas that contain unusual types or quantities of equipment such as copiers or computer terminals. Also look for over-illumination. High concentrations of electrical fixtures and equipment can overwhelm ventilation and cooling systems.
Special-use areas	Confirm that the HVAC system maintains appropriate pressure relationships to isolate and contain odors and contaminants in mixed-use buildings and around special-use areas. Examples of special-use areas include attached parking garages, loading docks, print shops, smoking lounges, janitorial closets, storage areas and kitchens.

Table 8.4: Common problems to be recorded on the sketch plan (continued)	
Improperly located vents, exhausts and air intakes	Check the outdoor air intakes to see whether they are located near contaminant sources (e.g., plumbing vents, exhaust outlets, dumpsters, loading docks and other locations where vehicles idle).
Unsanitary mechanical rooms	See if the space containing the HVAC system is clean and dry. Examples of problems include: cleaning or other maintenance supplies stored in the mechanical room; dust and dirt buildup on floors and equipment; moisture in the mechanical room because of inadequate insulation, lack of conditioned air or failure to provide for air movement. Unsanitary conditions in the mechanical room are particularly a problem if un-ducted return air is dumped into and circulated through the mechanical room.

S2.4 Materials and products you should have at the end of the initial inspection

By the end of this step the building operator should have the materials listed in Checklist 8.4. These materials should be included in the IAQ profile binder under a new section, entitled Step 2—Initial assessment and inspection of the building.

Checklist 8.4: Materials for Step 2—Initial assessment and inspection of the building

- ✓ List of responsible staff and contractors with responsibilities that could affect IAQ, including contact information
- ✓ Names, telephone numbers, job descriptions
- ✓ Notes on training and experience of building staff, as well as evidence of training
- ✓ Job descriptions of staff
- ✓ Identification on sketch plan of areas where positive or negative pressures should be maintained. Sketch plan with notes showing: the pressure relationships between special-use areas and surrounding rooms; the locations where indicators showed that IAQ problems could be present, and that indicate a need for close monitoring or corrective action
- ✓ Record of locations that need monitoring or correction
- ✓ Notes on the schedules and procedures used for:
    - facilities operation and maintenance
    - housekeeping
    - pest control

Step 3—Collect detailed information on the HVAC system, pollutant pathways, pollutant sources and building occupancy

This step, unlike the first and second, can be performed over a much longer period of time and is divided into a series of activities. Step 3 can be conducted by a variety of individuals if the building operator feels the need for outside support. Overall, the activities to be performed include:

1) inspect HVAC system condition and operation
2) develop an inventory of pollutant pathways
3) create an inventory of pollutant pathways
4) collect and diagram information about the building's occupants (zone/room record)

S3.1. Inspect HVAC system condition and operation

To begin, check current maintenance records and the HVAC Checklist (Form 8.1) to make sure that HVAC equipment is in good operating condition. The system must provide uniform temperature and humidity, use an appropriate quantity of outside air, have properly installed filters and a correctly operating drain pan. The equipment must also be free from any obvious source of contamination.

On each floor of the building, identify items of equipment that need to be repaired, adjusted or replaced. Record the HVAC equipment's control settings and operating schedules so that they can be compared to occupancy schedules and the way space is being used. It may be useful to observe and inspect the HVAC system several times per day over several days when most building occupants are in the building to check for discrepancies between control settings and operating conditions.

Form 8.1: Sample Short Form for HVAC

Building Name: _____

Address: _____

Completed by: _____ Date: _____ File Number: _____

MECHANICAL ROOM

Clean and dry? _____ Stored refuse or chemicals?_____

Describe items in need of attention _____

MAJOR MECHANICAL EQUIPMENT

Control System

Type _____ System operation _____

Date of last calibration _____

Boilers

Rated Btu input _____Condition _____

Fuel or combustion odors _____

Air Handling Unit

Outdoor air intake ___ Mixing plenum, and damper _____

Fans _____ Coils _____ Humidifier _____

DISTRIBUTION SYSTEM

Condition of distribution system and terminal equipment (note locations of problems)

_____

OCCUPIED SPACE

Thermostat types _____ Humidistats/dehumidistats type _____

Thermal comfort or air circulation (drafts, obstructed airflow, stagnant air, overcrowding, poor thermostat location)

_____

Major sources of odors or contaminants (e.g., poor sanitation, incompatible uses of space)

_____

S3.2. Create an inventory of pollutant pathways

Using the sketch plan of the building that was created during the walkthrough inspection (S2.1), indicate architectural connections (e.g., chases) and mechanical connections (e.g., ductwork, temperature control zones). Observe and record airflow between spaces intended to run positive or negative and the areas that surround them, including airflow between perimeter rooms and outdoors. Note that hidden pathways such as chases may travel both vertically and horizontally and transport pollutants over long distances. Record results on a document entitled Pollutant Pathway Record for IAQ Profiles (Form 8.2), the sketch plan, or both.

Form 8.2: Sample Pollutant Pathway Record for IAQ profile

Building area (zone, room)	Use	Intended pressure		Needs attention (Yes/no)	Comments
		+	-		

S3.3. Create an Inventory of pollutant sources

Create a Pollutant and Source Inventory Form (Form 8.3) to record the sources of potential pollutants in the building. Major sources such as large items of equipment can be recorded on the floor plan. The Chemical Inventory Form (Appendix - Form 8.4) can be used to record the names and locations of chemicals or hazardous substances used or stored within the building—such as those in cleaning materials, biocides, paints, caulks and adhesives. Ask suppliers to provide material safety data sheets, or MSDS.

Using the list of potential source categories in Form 8.3, record any indications of contamination or suspected pollutants that may require further investigation or treatment. The inventory should include chemicals stored or used in the building for cleaning, maintenance, operations and pest control. If you have an MSDS for the chemical, put a check mark in the right-hand column. If not, ask the chemical supplier to provide the MSDS, if possible.

Form 8.3: Sample Pollutant and Source Inventory

Source category	Checked	Needs attention	Location	Comments
Sources outside the building				
Contaminated ambient air				
Pollen, dust				
Industrial contaminants				
General vehicle contaminants				

Figure 8.4: Sample Chemical Inventory

Date	Chemical/ brand name	Use	Storage locations	MSDS on file?

S3.4. Zone\Room Record—Collect and diagram information on building occupants

Use the Zone/Room Record (Form 8.5 contained within in the Appendix provides a detailed example section to maintain an up-to-date record of the way each building area is used, its source of outdoor air, and whether or not it is equipped with local exhaust. Problems with under-ventilation (where there is a lack of proper distribution and mixing of supply air with room air) should be noted on the Zone/Room Record. Form 8.5 should be used to record more general information about the entire building.

Figure 8.5: Sample Zone/Room Record

Profile and diagnosis information				
Building Area (Zone/room)	Use	Source of outdoor air?	Mechanical exhaust? (No, or estimate airflow)	Comments
Diagnosis information only				
Peak number of occupants or sq. ft. area	Total air supplied	Outdoor air supplied per person or per 150 sq. ft. area		

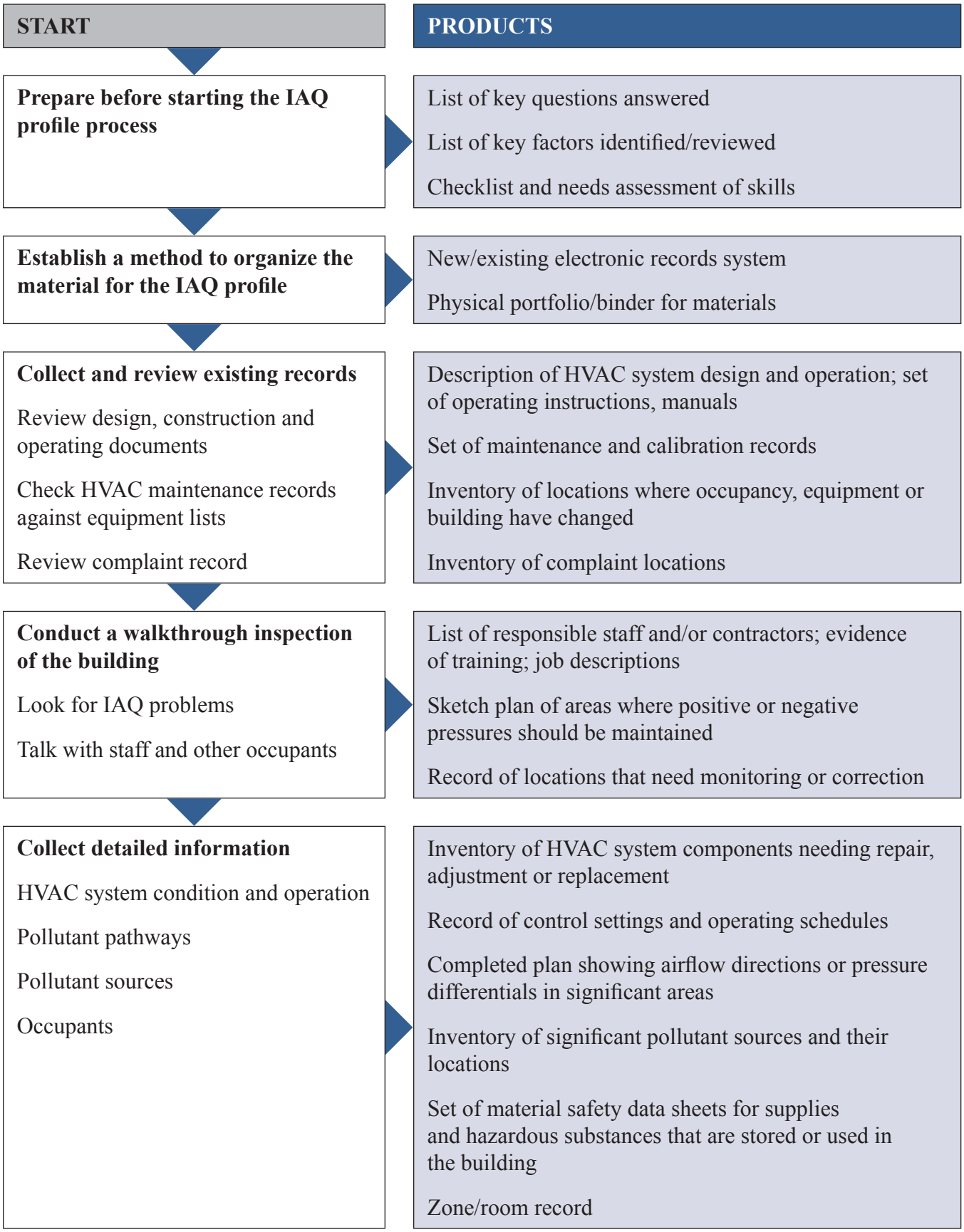
S3.5. Materials and products that building operators should have at the end of the information-collection phase

By the end of Step 3, the building operator should have the following materials for inclusion in the IAQ profile binder. These should be organized under a new section called Step 3—HVAC system, pollutant pathways, pollutant sources, and building occupancy.

Checklist 8.5: Materials for Step 3—HVAC system, pollutant pathways, pollutant sources, and building occupancy

- ✓ Inventory of HVAC system components needing repair, adjustment or replacement
- ✓ Record of control settings and operating schedules
- ✓ Completed plan showing airflow directions or pressure differentials in significant areas (a floor plan of the building showing airflow directions or pressure differentials around areas intended to run positive or negative (e.g., special-use areas)
- ✓ Inventory of significant pollutant sources and their locations
- ✓ Set of material safety data sheets (MSDS) for supplies and hazardous substances either stored or used in the building
- ✓ Zone/Room Record (a record of usage for each zone or room, including the source of outside air and the presence of local exhaust, if any

Figure 8.3 Overview of IAQ Profile Process



5. What to do if you find IAQ problems

If the building operator collects information while developing a profile that indicates the building has one or more IAQ problems, the problems will naturally need to be addressed. It is useful to begin by prioritizing the problems with respect to seriousness. For example, combustion gas odors demand a more rapid response than thermostats that are not properly calibrated.

It is also important for building operators and owners to disseminate any urgent and important findings by communicating with occupants, relevant committees and staff. Even in the event that no issues are in need of urgent attention, communicating the IAQ profile and next steps is important for involving individuals and groups in the IAQ management process. Involvement is one of the building operator's goals.

Over the long term, the IAQ profile should be used to help create an IAQ management plan for the building, which involves not only the building operator, but also the owner, staff and occupants, if possible. Module X provides more information about an IAQ management plan and how it is developed.

6. Sources of additional information

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Indoor Air Quality Management Group. (2003). A Guide on Indoor Air Quality Certification Scheme for Offices and Public Places: http://www.iaq.gov.hk/cert/doc/GN-eng.pdf

Trust. Science. Innovation. (2011). Indoor Air Quality Handbook: http://www.tsi.com/uploadedFiles/_Site_Root/Products/Literature/Handbooks/IAQ_Handbook_2011_US_2980187-web.pdf

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