CITY OF PHILADELPHIA RISK MANAGEMENT DIVISION

Safety Guidance #G-1

July 21, 2006

Title: **Indoor Air Quality Evaluation Protocol**

Purpose: To provide guidance on how to investigate and resolve reported issues associated with symptoms, irritations, discomfort, or general poor air quality that may be related to employees/occupants indoor working environment.

Background: Indoor Air Quality concerns do not frequently present serious safety and health hazards as those presented by contaminants or processes in industrial or commercial workplaces. Pollution sources present in the work environment and ventilation issues are the primary causes of indoor air quality problems in buildings. These separate causes can also provide a combined concern because inadequate ventilation or its improper set up can increase indoor pollutant levels in the workplace. The relative importance of any single source depends on how much a given pollutant emits and how hazardous those emissions are. Some sources, such as building materials or furnishings, release pollutants more or less continuously. Other sources, related to activities carried out in the workplace, such as the use of office machines, supplies and cleaning products, release pollutants intermittently. It is important to note that high pollutant concentrations can remain in the air for long periods after some of these activities. These indoor air pollutants may cause some individuals irritation, depending on the occupant's sensitivity or the pollutant's chemical properties and concentration.

A. Introduction of Protocol for Indoor Air Quality Evaluations

The Departmental Safety Officers of the City of Philadelphia are responsible for programs and response for the health and safety of employees in 44 city departments. This protocol provides the tools needed to evaluate department indoor air quality (IAQ) concerns as they arise. The goal is to identify, eliminate, and prevent future IAQ problems. The protocol is based upon the *EPA Guide for Building Owners and Facility Managers*. The **Indoor Air Quality Protocol Flow Chart found in Section 2 should be used by Departmental Safety Officers to identify the steps and forms needed to assess all indoor air quality concerns**. Each form identified on the flow chart will be discussed with appropriate examples in this protocol guide.

Many IAQ complaints are associated with building operations. Therefore, Safety Officers are encouraged to work closely with building managers, any maintenance unit within their department, the Department of Public Property, or the Capital Programs Office to assess and solve IAQ problems.

Section 1 of this document reviews the steps a Safety Officer should take to investigate an IAQ concern. This section defines the elements of an investigation and the main sources of IAQ problems. Section 2 contains the flow chart that will guide the investigation process. Section 3 includes all the necessary IAQ forms and brief descriptions of how to use the forms.

The key to managing IAQ concerns is communication. Assure occupants that you are addressing their needs and update them on the progress of the investigation often. It is critical to seek their input and possible solutions as you work through the IAQ protocol process. It is also important to be proactive and open with occupants if there is a potential for an IAQ problem, such as during a renovation or pest control project. Open communication with occupants and early planning can eliminate many concerns.

Some IAQ issues, such as radon or asbestos remediation, require in-depth monitoring and regulation. These issues should be coordinated with the Risk Management Division (RMD).

SECTION 1

IAQ INVESTIGATIONS

IAQ Investigations

INITIAL WALKTHROUGH

An initial walkthrough of the area of concern will provide information on all four possible sources of IAQ complaints: occupants, heating, ventilation, and air conditioning (HVAC), pathways, and pollutant sources. Prior to the walkthrough notify occupants that you will be investigating a complaint and notify the building manager. If possible, have the building manager participate in the walkthrough investigation.

During the walkthrough begin to identify possible sources. For example:

- Identify odors (mold, exhausts, chemicals)
- Are there problems with dust (housekeeping, renovations)
- Are there activities that might cause a complaint (painting, spills, recent water damage)
- Changes from normal operations (new process, new neighbor, change of season- grass mowing, pesticide applications, waterproofing building exterior)

If an obvious source exists and the problem can be resolved immediately, fill out **Form 2** and submit to RMD.

COLLECT INFORMATION

If the walkthrough does not identify a clear source of the complaint, use Forms 3-6 to collect additional information to resolve the problem. *Use only the forms that the initial walkthrough suggests may be useful*. For example, if the complaint is isolated to one individual, Form 3 the Occupant Interview may provide enough information to determine if a building IAQ problem exists. Similarly, if there is an identifiable odor (i.e. exhaust fumes) one should initially try to locate the pollutant source (Form 6) rather than use occupant interviews.

PROPOSE A SOLUTION

As information is collected you should develop an explanation for the complaint. Additional information may have to be collected to support your explanation. If possible, test your explanation. You may identify more than one solution or have to re-investigate if your explanation does not solve the problem.

Once you have identified a solution, fill out the **Indoor Air Quality Resolution, Form 2** and send the form, along with any additional forms or backup information, such as photos, to RMD. Highlight ways that the solution can be incorporated into other departments.

If you have followed the IAQ Investigation Protocol and cannot identify a solution, provide investigation forms, photos, backup documentation, to RMD for follow-up.

SOURCES

There are four main sources of building air quality complaints:

- Occupants
- The building heating, ventilation, and air conditioning (HVAC) system
- Pathways through the building
- Pollutant Sources

Occupants

Occupants are the employees or contractors who work in the department. Occupant complaints are typically associated with discomfort (headaches, watering eyes) or with building conditions (odors, temperature). Occupant concerns should be recorded using the **Occupant Interview, Form 3**. If there are multiple occupants with similar concerns each person should be interviewed individually using Form 3. If an occupant cannot be interviewed in person they can fill out Form 3 and forward it to the Safety Officer for review and follow up questions.

- Choose an interview location so that the employee is comfortable and able to speak freely.
- Explain the purpose of the interview and ask for possible explanations.
- Respect the employee's privacy if medical concerns are involved.

When reviewing the occupant information look for timing and symptom patterns. For instance:

- Do the symptoms subside on the weekend? (i.e. no allergy symptoms away from work)
- Do the symptoms occur at a certain time of day? (i.e. when trucks are parked outside)
- Do the symptoms only occur in one location? (i.e. related to a specific source or ventilation to a specific space)
- Did the symptoms only occur once? (i.e. spill)
- Is there a pattern to the symptoms? (i.e. headache, drowsiness- carbon monoxide; Itching eyes, dry throat- allergic response)
- Are the employee concerns comfort related? (See Table 1)

Table 1. Acceptable Ranges of Temperature and Relative Humidity
ASHRAE Suggested Guidelines

According to this guideline, an acceptable range of indoor temperatures that would satisfy 80% of building occupants is as follows:

Relative Humidity	Winter Temperature (ºF)	Summer Temperature (ºF)
30%	68.5-76.0	74.0-80.0
40%	68.5-75.5	73.5-79.5
50%	68.5-74.5	73.0-79.0
60%	68.0-74.0	72.5-78.0
The temperature ranges listed above assume a sedentary work level and normal office clothing ensembles for the respective summer and winter ranges .		

In addition to heat and humidity, indoor carbon dioxide (CO_2) concentrations may be measured as an indicator of poor air circulation within a building where no mechanical ventilation is available or operable. ANSI/ASHRAE Standard 62-2001 should be used as a guide to determine acceptable CO_2 concentrations.

HVAC

The HVAC system is comprised of the components needed to supply outdoor air to ventilate the building. Outdoor air may be heated, cooled, and conditioned for comfort. Air is pulled from outdoors using fans, is treated if necessary, and then is supplied to offices and work areas via ductwork. Air is circulated from the ventilated spaces back into the ventilation system and may be exhausted or mixed with fresh outdoor air for re-circulation.

The HVAC system can be a source of complaints as well as a solution to complaints. Many IAQ complaints are associated with the quality or distribution of outdoor air. Investigation of the HVAC system is warranted if the amount of air to the complaint area is not adequate, the temperature of the supplied air is improper, contaminants are being transported via the ductwork, or the HVAC system may itself be a source of contaminants.

Review the HVAC design and operating parameters to determine if the system is operating as intended. The **HVAC System Checklist, Form 4** should be used to identify deficiencies that might create an IAQ problem. It is important to include the facilities staff in this investigation as they can help identify conditions that might explain the IAQ complaint. Some areas to investigate include:

- Temperature and humidity (Check thermostat or direct monitoring device.)
- Inadequate ventilation (Check supply diffusers to see if air is moving)
- Equipment malfunction (Confirm operating schedules and control sequences, are fans installed correctly, are dampers open when they should be)
- Is the system installed as designed (Have ducts been modified)
- Is the HVAC system a possible source of contamination (Is there standing water in drip pans, is duct lining deteriorating)

When reviewing HVAC data look for

- Changes from design conditions
- Supply volume and temperature/ humidity differences
- Room use or occupancy changes
- HVAC system conditions-moisture, debris in ducts
- Air distribution problems
- Obstructed vents

Pathways

If an obvious source of contamination is not identifiable in the complaint area, the contaminant may be located in a surrounding area and may be entering the space via a building pathway. Typical pathways are

- Doors
- Windows
- Stairways
- Elevator shafts
- Utility chases
- Ductwork

When reviewing pollutant pathways a floor plan diagram is helpful for mapping air flow. Use the **Pollutant Pathway Form for Investigation, Form 5,** to track connected rooms/ zones and air flow between them. Air flow can be observed visually with the use of smoke tubes or tissue paper. Often air flow in and out of a space can be determined by opening and closing of doors. If air flows out of a space, mark the floor plan with a + (under positive pressure). If air flows into a space mark with a – (under negative pressure). Air flow can change with weather, equipment operation, and door traffic. Therefore, Form 5 may be used multiple times to get a better picture of building conditions throughout a day or week.

When reviewing pollutant pathway data

- Determine if there are unintentional pathways (Cracks, chases, elevator shafts, floor penetrations, and etc.)
- Identify what surrounding locations might impact the complaint area

Pollutant Sources

The goal of the IAQ investigation is to identify a pollutant source that may be causing the occupant complaint. Few sources are continuous and constant over time. As Forms 3-5 are used in the IAQ investigation the source of complaints will narrow. The **Pollutant and Source Inventory, Form 6**, can be used to record your investigation of possible sources. When filling out Form 6 keep in mind the location of sources and timing of emissions.

- Compare source location and complaint location (Same, connected)
- Identify pathways from source
- Identify patterns (Day of week, time of day)
- Determine if incidents that have occurred that could be a source (Spills, leaks, fires)

When possible sources have been identified test if the source is the problem. For example, remove the potential source or change a parameter.

Other Factors

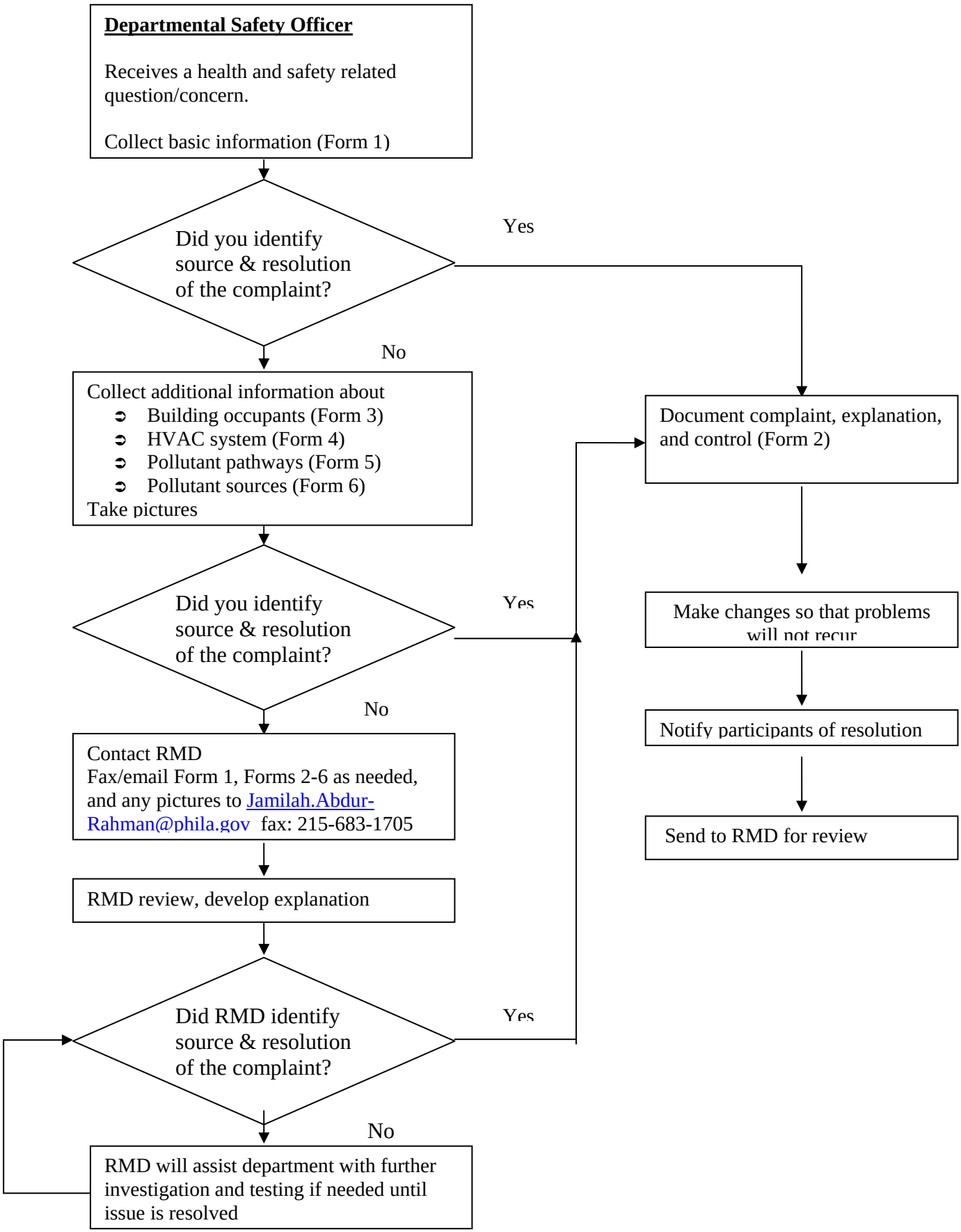
The following stressors may complicate an IAQ investigation. These stressors may add to an IAQ concern, or may be unrelated. Each should be evaluated in conjunction with a thorough IAQ investigation. They are:

- Environmental stressors (Lighting, noise)
- Ergonomic stressors (Uncomfortable work station)
- Job-related stressors (Work dissatisfaction)

SECTION 2

IAQ PROTOCOL AND FORMS

IAQ Protocol Flowchart



Form 1 - Instruction sheet

Indoor Air Quality Investigation Request

The first step of an investigation is to document every air quality inquiry using Form 1. If there is an immediate, obvious solution to the inquiry the Safety Officer should fill out Form 2 and send Forms 1 and 2 to the Risk Management Division (RMD) **[Fax- 215-683-1705, or email Jamilah.Abdur-Rahman@phila.gov]**.

Encourage employees to be specific about their inquiry and to include possible solutions. Each inquiry should be given a tracking/file number to coordinate with any additional forms. **The Filing # system shall be set-up as follows (IAQ/ Abbreviate Department name/Date of complaint/ Filing # (001))**

Example: [IAQ/PWD/7-19-06/001]

Form 1
Indoor Air Quality Investigation Request

This form can be filled out by the building occupant or by a member of the departmental safety office.

Date: _____ Department:_____

Location in Building: _____

Occupant Name: _____

Completed by._____

Title: _____ Phone: _____

This form should be used if your concern may be related to indoor air quality. Indoor air quality problems include concerns with symptomatic complaints, ventilation, and air pollutants. Your observations can help to resolve the problem as quickly as possible. Please use the space below to describe the nature of the complaint and any potential causes.

We may need to contact you to discuss your complaint. What is the best time to reach you?
_____

So that we can respond promptly, please return this form to:

[Enter Departmental Safety Officer Name Here]

[Enter Departmental Safety Officer Mail Location Here]

OFFICE USE ONLY

File Number: _____Received By: _____Date Received:_____

Form 2 – Instruction Sheet

Indoor Air Quality Resolution

Form 2 summarizes the source of the IAQ problem and what was done to eliminate the problem. This information will be used to prevent future similar events. The four main sources of IAQ complaints are occupants, the heating, ventilation and air conditioning (HVAC) system, a pathway from a source, or a direct source of contamination. Some complaints will have an obvious source and the detailed forms in this protocol (Forms 3-6) will not be necessary. Examples of possible complaints and immediate solutions for these sources are:

Source	Example	Solution
Occupant	Employee wearing perfume	Policy to limit office odors including perfumes, candles, air fresheners
HVAC	System shut down- no outdoor air	Get HVAC running correctly, check outdoor air vents for blockage
Pathway	Neighboring building has a chemical spill	Limit air from entering building from neighboring building (i.e. close windows on neighboring side, provide additional clean air)
Source	Photocopy machine emitting odors/ ozone	Enclose machine and/or provide additional ventilation

In most cases, however, additional information must be collected to determine how to respond to an IAQ complaint. Forms 3-6 should be used in these circumstances.

When the IAQ inquiry is resolved, Form 2 should be used to document the source (occupant, HVAC, pathway, individual source) and resolution of the problem. The appropriate forms (Form 3-6) should be attached to Form 2. Copies of Form 2 will be provided to RMD, the Safety Officer, the building manager if necessary, and the employee who requested the investigation (Form 1).

Form 2
Indoor Air Quality Resolution

File Number: _____

Building Name: _____

Address: _____

Completed by: _____

Complaint location:

Complaint summary (Describe IAQ issue and attach all necessary forms):

Issue related to (check all that apply)

Occupants (Form 3)	HVAC (Form 4)	Pathway (Form 5)	Source (Form 6)

Resolution of complaint:

Copy to:

RMD- Jamilah.Abdur-Rahman@phila.gov /Fax: 215-683-1705 Phone: 215-683-1733	Departmental Safety Officer

Form 3 – Instruction Sheet

Indoor Air Quality Occupant Interview

If an employee is directly affected by the IAQ concern they should be interviewed using Form 3. The use of symptom and timing patterns can help identify whether the concern is a building operations related matter, such as amount of fresh air, or due to a possible source of contamination, such as a mold exposure.

- Form 3 should be filled out by the Departmental Safety Officer during an interview. Note: employee should not fill out form, only the safety officer should be completing the interview form.
- The Safety Officer should review the form and ask additional questions if necessary to understand the concern.
- Always ask the employee if they have an explanation or solution to the problem.

Pattern	Investigation Suggestion
Localized space	Check ventilation and temperature of space Review possible sources Check HVAC system
Individual	Check for drafts, ventilation to area Consider if person has pre-existing health issues
Conditions worse at beginning of day	HVAC cycles off Emissions from materials build up
Conditions worse as day progresses	Ventilation not adequate
Intermittent symptoms	Look for cycles (weather-related, building events)
Recent onset	Look for change in events- remodeling, HVAC adjustments, new materials
Symptoms relieved when leaving the building	May need more investigation or may be related to other work stressors
Symptoms not relieved when away from building	May be other than building-related

Form 3 - Indoor Air Quality Questionnaire

[ENTER DEPT NAME AND SAFETY OFFICE CONTACT HERE] (215) 68X-XXXX

Building Location: _____ File Number: _____

Completed by: _____ Date: _____

Occupant Name: _____

Job Title _____

Where is your specific work area? _____

How long have you worked for the department? _____

How long have you worked in this physical area? _____

Briefly, what are your job duties? _____
_____
_____

Do you use any chemical products, biological organisms or radioactive material on your job?… ☐ Yes ☐ No
If so, what are they? _____
_____
_____
_____

Have you experienced symptoms that you feel may be associated with your work environment?… ☐ Yes ☐ No
If yes, what symptoms have you experienced? _____
_____
_____

What time of day have you experienced these symptoms? _____

What day of the week have you experienced these symptoms on? _____

Do the symptoms only occur at these times? ……..……☐ Yes ☐ No

Is there an odor associated with the symptoms? ……... ☐ Yes ☐ No ☐ Sometimes

If yes, describe the odor. _____

How frequently do these symptoms occur? _____

When was the last time you had these symptoms? _____

Have you sought medical attention for your symptoms? ……☐ Yes ☐ No

Do you have any allergies? ……☐ Yes ☐ No
If yes, to what? _____

Have you ever had asthma? ……☐ Yes ☐ No

Have you ever had any severe respiratory ailments? ……..☐ Yes ☐ No

Do you currently smoke cigarettes? …….□ Yes □ No

Have you ever been a cigarette smoke? ……..…..…□ Yes □ No

If yes, how long were you a cigarette smoker? _____

Do you wear contact lenses? ……..…..…□ Yes □ No

ADDITIONAL INFORMATION

How well is the temperature regulated in your area?
□ Excellent □ Very Good □ Good □ Fair □ Poor □ Unacceptable

How is the housekeeping in the area?
□ Excellent □ Very Good □ Good □ Fair □ Poor □ Unacceptable

How is the lighting?
□ Excellent □ Very Good □ Good □ Fair □ Poor □ Unacceptable

Have there been any recent changes to the area (new furniture, fixtures, carpets)? ……□ Yes □ No

Is pest extermination provided in your area? ……...□ Yes □ No

Is there excessive noise in your work area? …….□ Yes □ No

Is there any glare on your computer monitor? ……..……□ Yes □ No

Has the work flow or work load changed recently? ……....□ Yes □ No

If yes, how? _____

What kind of shift do you work? (Check box, then circle start/stop time)
□ Day Shift 7,8 or 9 to 3,4 or 5 □ Night Shift 11,12 or 1 to 7,8 or 9
□ Evening Shift 3,4 or 5 to 11,12 or 1 □ Rotating Shifts
□ Other _____

Do you work any overtime on a regular basis? ……..……□ Yes □ No

List time schedule beyond normal work hours. _____

How much time do you spend keying information into a computer? _____

Are there any operable windows in your area? ……...…□ Yes □ No

Have there been water leaks in or near your work area? ……□ Yes □ No
If yes, when _____

Are there ceiling, wall or carpet materials that show signs of water damage? ……...□ Yes □ No
If yes where and when? _____

Do you have any other comments? _____
_____
_____
_____

Form 4 – Instruction sheet

HVAC System Checklist

IAQ inquiries are often related to the quantity, quality, or distribution of outdoor air. The HVAC system is used to provide outdoor air to building occupants. The supply may be 100% outdoor air, or more likely, a mix of outdoor air and re-circulated building air. Problems can arise if the outdoor air is contaminated, the amount of air provided to a space is inadequate, or if the HVAC system itself is a source or pathway of contamination.

The HVAC System Checklist is a very detailed evaluation of the HVAC operating system. During an investigation some or all of the form may be used to help identify a contaminant.

Note: the attached checklist is the abbreviation of the EPA HVAC checklist

- Begin the investigation with the components of the system that directly impact the complaint area or surrounding spaces.
- The facilities department should be included in the HVAC investigation. They will provide invaluable information regarding set points, maintenance procedures, modifications, and operating conditions.
- Always consider if the HVAC system could be a source of contaminants.

System	Investigation Suggestions
Ventilation and temperature	Confirm set points
Operating cycles	Compare to design
Outdoor air	Check if vents obstructed Check damper controls
Change in occupant density or space use	See if number of occupants has changed, but not amount of outdoor air, temperature, humidity Is ventilation designed for different activity (offices vs. smoking lounge)
Moisture, debris, dust, mold in system	Clean and prevent recurrence
Underventilation	Provide more outdoor air

Form 4
HVAC System Checklist

Building: _____File Number: _____

Completed by: _____Title: _____Date Checked: _____

Component	OK	Needs Attention	Not Applicable	Comments
Outside Air Intake				
Location_____				
Unobstructed?				
Standing water, bird droppings in vicinity?				
Odors? Describe.				
Carryover from exhaust heat?				
Cooling tower within 25 ft?				
Exhaust outlet within 25 ft?				
Trash compactor within 25 ft?				
Near parking, busy road, loading dock?				
Bird Screen				
Unobstructed?				
General condition?				
Outside Air Dampers				
Operation acceptable?				
Seal when closed?				
Actuators operational?				
Outside Air (O.A.) Quantity				
Minimum % O.A.				
Measured % O.A.				
Maximum % O.A.				
Is minimum O.A. a separate damper?				
For VAV systems: is O.A. increased as total system airflow is reduced?				
Mixed Plenum				
Clean?				
Floor drain trapped?				
Air tight				
Outside air damper				
Return air damper				
Exhaust air damper				

Component	OK	Needs Attention	Not Applicable	Comments
All damper motors connected?				
All damper motors operational?				
Air mixers or opposed blades?				
Mixed air temperature control setting ____ º F				
Freeze stat setting _____ ºF				
Is mixing plenum under negative pressure?				
Filters				
Type_____				
Complete coverage? (no bypass)				
Correct pressure drop?				
Contaminants visible?				
Odor noticeable?				
Face and Bypass Dampers				
Damper operation correct?				
Damper motors operational?				
Cooling Coil				
Inspection access?				
Clean?				
Any indication of condensation problems?				
Condensate Drip Pans				
Accessible to inspect and clean?				
Clean, no residue?				
No standing water, no leaks?				
Noticeable odor?				
Visible growth (e.g. slime)?				
Drains and traps clear, working?				
Trapped to air gap?				
Water overflow?				
Mist Eliminators				
Clean, straight, no carryover?				
Supply Fan Chambers				
Clean?				
No trash or storage?				
Floor drain traps are wet or sealed?				
No air leaks				
Doors close tightly?				
Supply Fans				
Location _____				
Fan blades clean?				
Belt guards installed?				
Proper belt tension?				
Excess vibration?				

Component	OK	Needs Attention	Not Applicable	Comments
Corrosion problems?				
Controls operational, calibrated?				
Control sequence conforms to design/specifications?				
No pneumatic leaks?				
Heating Coil				
Inspection access?				
Clean?				
Supply Ductwork				
Clean?				
Sealed, no leaks, tight connections?				
Fire dampers open?				
Access doors closed?				
Lined ducts?				
Flex duct connected, no tears?				
Light troffer supply?				
Balanced after recent renovations?				
Short circuiting or other air distribution problems? Location_____				
Terminal Equipment (supply)				
Housing interiors clean and unobstructed?				
Controls working?				
Delivering rated volume?				
Balanced within 3-5 years?				
Filters in place?				
Condensate pans clean, drain freely?				
VAV Box				
Minimum stops _____%				
Minimum O.A. _____%				
Minimum air flow _____cfm				
Minimum O.A. _____cfm				
Supply set point____ºF (summer) ____ ºF (winter)				
Thermostats				
Type _____				
Properly located?				
Working?				
Set point ____ºF (summer) ____ ºF (winter)				
Space temperature _____ ºF				

Component	OK	Needs Attention	Not Applicable	Comments
Room Partitions				
Gap allowing airflow at top?				
Gap allowing airflow at bottom?				
Supply and return each room?				
Stairwells				
Doors close and latch?				
No openings allowing uncontrolled air flow?				
Clean, dry?				
No noticeable odors?				
Return Air Plenum				
Tiles in place?				
No unintentional openings?				
Return grilles?				
Balancing capability?				
Noticeable flow of air?				
Transfer grilles?				
Fire dampers open?				
Ducted Returns				
Balanced within 3-5 years?				
Unobstructed grilles?				
Unobstructed return air path?				
Return Fan Chambers				
Clean and no trash or storage				
No standing water?				
Floor drain traps are wet or sealed?				
No air leaks?				
Doors close tightly, kept closed?				
Return Fans				
Location _____				
Fan blades clean?				
Belt guards installed?				
Proper belt tension?				
Excess vibration?				
Corrosion problems?				
Controls working, calibrated?				
Control sequence conforms to design/specifications?				
Exhaust Fans				
Central?				
Distributed (locations)				
Operational?				
Controls operational?				
Toilet exhaust only?				
Gravity relief?				

Component	OK	Needs Attention	Not Applicable	Comments
Total powered exhaust _____cfm				
Make-up air sufficient?				
Toilet Exhausts				
Fans working occupied hours?				
Registers open, clear?				
Make –up air path adequate?				
Volume according to code?				
Floor drain traps wet or sealable?				
Bathrooms run slightly negative relative to building?				
Garage Ventilation				
Operates according to code?				
Fans, controls, dampers all operate?				
Garage slightly negative relative to building?				
Doors to building close tightly?				
Vestibule entrance to building from garage?				
Mechanical Rooms				
General condition?				
Controls operational?				
Pneumatic controls				
Compressor operational?				
Air dryer operational?				
Electric controls? Operational?				
EMS (Energy management system) or DDC (Direct digital control)				
Operator on site?				
Controlled off-site?				
Are fans cycled “off” while building is occupied?				
Is chiller reset to shed load?				
Other: _____				
Preventative Maintenance				

Form 5- Instruction Sheet

Pollutant Pathway Form for Investigations

Some IAQ problems are not associated with a contaminant in the occupants immediate work area. Surrounding areas and locations connected to the work space should be evaluated for possible sources. The Pollutant Pathway Form will assist in investigating connected spaces and determining air flow through the building.

- Use a floor plan or sketch of the complaint area and adjoining spaces to identify pollutant pathways.
- Inspection of the pathways is necessary to determine if air flows out of the space (positive pressure) or into the space (negative pressure).
- Use of smoke tubes, tissue paper, or visual inspections will identify air flow patterns.
- Note potential sources in connected spaces on Form 5 for investigation.

Form 5
Pollutant Pathway Form for Investigations

Building Name: _____File Number: _____

Address: _____Completed by: _____

This form should be used in combination with a floor plan such as a fire evacuation plan.

Building areas that appear isolated from each other may be connected by airflow passages such as air distribution zones, utility tunnels or chases, party walls, spaces above suspended ceilings (whether or not those spaces are serving as air plenums), elevator shafts, and crawl spaces.

Describe the complaint area in the space below and mark it on your floor plan. Then list rooms or zones connected to the complaint area by airflow pathways. Use the form to record the direction of airflow between the complaint area and the connected rooms/zones, including the date and time. (Airflow patterns generally change overtime). Mark the floor plan with arrows or plus (+) and minus (-) signs to map out the airflow patterns you observe using observation or chemical smoke. The "comments" column can be used to note pollutant sources that merit further attention.

Rooms or zones included in the complaint area: _____

Rooms or Zones Connected to the Complaint Area By Pathways	**Use**	**Pressure Relative to Complaint Area**		**Comments (e.g. potential pollutant sources)**
		+/-	**Date/Time**	

Form 6 –Instruction Sheet

Pollutant and Source Inventory

The Pollutant Source Inventory Form provides a checklist of possible sources in the following building categories:

Sources outside of the building

- Contaminated outdoor air
- Emissions from nearby sources
- Soil gas
- Moisture or standing water

Equipment

- HVAC equipment
- Office/ lab equipment

Human activities

- Personal activities
- Housekeeping
- Maintenance

Building components

- Dust on furnishings
- Unsanitary conditions/ water damage
- Chemicals released

Other

- Accidental release
- Special use areas: labs, smoking lounges, print shops, parking garages
- Renovation/ repair

Use Form 6 to help identify possible pollutant sources and to identify sources that may not be related to the present complaint, but could create a future complaint.

Form 6
Pollutant and Source Inventory

Building Name: _____ Address: _____

Completed by: _____ Date: _____ File Number: _____

Using the list of potential source categories below, record any indications of contamination or suspected pollutants that may require further investigation or treatment. Sources of contamination may be constant or intermittent or may be linked to single, unrepeated events. For intermittent sources, try to indicate the time of peak activity or contaminant production, including correlations with weather (e.g., wind direction).

Source Category	Checked	Needs Attention	Location	Comments
SOURCES OUTSIDE BUILDING **Contaminated Ambient Air**				
Pollen, dust				
Industrial contaminants				
General vehicular contaminants				
Emissions from Nearby Sources				
Vehicle exhaust (parking areas, loading docks, roads)				
Dumpsters				
Re-entrained exhaust				
Debris near outside air intake				
Soil Gas				
Pesticides				
Leaking underground tanks				
Sewage smells				

Source Category	Checked	Needs Attention	Location	Comments
Moisture or Standing Water				
Rooftop				
Crawlspace				
EQUIPMENT **HVAC System Equipment**				
Combustion gases				
Dust, dirt, or microbial growth in ducts				
Microbial growth in drip pans, chillers, humidifiers				
Leaks of treated boiler water				
Non HVAC System Equipment				
Office equipment				
Supplies for equipment				
Laboratory equipment				

Source Category	Checked	Needs Attention	Location	Comments
HUMAN ACTIVITIES **Personal Activities**				
Smoking				
Cosmetics (odors)				
Housekeeping Activities				
Cleaning materials				
Cleaning procedures (e.g., dust from sweeping, vacuuming)				
Stored supplies				
Stored refuse				
Maintenance Activities				
Use of materials with volatile compounds (e.g., paint, caulk, adhesives)				
Stored supplies with volatile compounds				
Use of pesticides				

Source Category	Checked	Needs Attention	Location	Comments
BUILDING COMPONENTS/FURNISHINGS **Locations Associated with Dust or Fibers**				
Dust-catching area (e.g., open shelving)				
Deteriorated furnishings				
Asbestos-containing materials				
Unsanitary Conditions/Water Damage				
Microbial growth in or on soiled or water-damaged furnishings				

Source Category	Checked	Needs Attention	Location	Comments
Chemicals Released From Building Components or Furnishings				
Volatile compounds				
OTHER SOURCES **Accidental Events**				
Spills (e.g., water, chemicals, beverages)				
Water leaks or flooding				
Fire damage				

Source Category	Checked	Needs Attention	Location	Comments
Special Use/Mixed Use Areas				
Smoking lounges				
Food preparation areas				
Underground or attached parking garages				
Laboratories				
Print shops, art rooms				
Exercise rooms				
Beauty salons				
Redecorating/Repair/Remodeling				
Emissions from new furnishings				
Dust, fibers from demolition				
Odors, volatile compounds				

Source Category	Checked	Needs Attention	Location	Comments