Building/Facility Manager: Protocol for Responding to Indoor Air Quality Complaints or Concerns

When responding to an Indoor Air Quality (IAQ) complaint or concern, it is important that EH&S and Facilities/Building Management work together as early as possible. This Fact Sheet lays out an IAQ response protocol for Facilities/Building Management, Human Resources, Supervisor/Manager and EH&S to help ensure a timely coordinated effort with as little operational upset as possible.

1. **COMMUNICATION:**
   - Upon receiving an IAQ complaint, Facilities/Building Management and/or EH&S will notify one another, as soon as possible, with sufficient background information (i.e. person’s name, Harvard affiliation, symptoms, pre-existing medical conditions (if available), etc.)
   - It is important to notify the affected persons Supervisor/Manager and Human Resources consultant and keep them informed and updated immediately and throughout the investigation process.

2. **INITIAL INVESTIGATION STEPS:**
   The initial assessment of IAQ complaints are typically be conducted by Facilities/Building Management and include:

   **A. Heating Ventilation Air Conditioning (HVAC):**
   - Verify that operating systems, such as, heating, ventilation and air conditioning (HVAC) systems are working properly. This may require additional testing to ensure the system is operating optimally.
   - Ensure that appropriate preventative maintenance (PM) has been performed including, outside air intakes, distribution dampers, air filters, drain pans, heating and cooling coils, inside of air handling unit, fan motor and belts, air distribution ducts and VAV boxes, air humidification and controls.
   - Determine if maintenance activities had recently taken place such as, cleaning, filter changes, or repairs or clean ups of water leaks.
   - Verify that system is capable and set to provide adequate air exchanges for the area of concern.

   **B. External Sources:**
   - Identify processes with potential IAQ pollution sources, such as: renovation and remodeling, painting, new carpet installation, exhaust from idling delivery or operations equipment/vehicles, pesticide/rodenticide application and smoking.

   **C. Moisture Control:**
   - Ensure adequate moisture control is in place for the affected area. Moisture control prevents mold growth, particularly, in basements.
   - See Attachment 2 for additional guidelines for floor response measures.
   - Dehumidify, when necessary, and respond promptly to floods, leaks and spills. Care should be taken to restrict the use of porous materials, such as, carpeting in basements.
D. Flooding Response:
Quickly and thoroughly dry all porous (e.g., carpet and wallboard) and non-porous materials. It is strongly recommended to start response within 24 hours and complete it within 48 hours of the flood.

- Perform extraction with wet vacuums on carpets. Dehumidifiers alone will not effectively dry wetted porous materials.
- Move or elevate furniture and equipment, such as, filing cabinets and copiers so that the flooring (particularly porous material) is able to be dried.
- Cut or drill wetted wallboard (small holes or whole bottom sections) if necessary to promote drying inside the wall cavity. Lower portions of wetted sheetrock may need to be removed and replaced. See Attachment 2.

E. Suspect Mold:
- EH&S is available to conduct basic mold assessments, which include looking for signs of water damage or excess moisture and looking for visual signs of mold growth.
- In some cases, the survey may also include testing moisture levels on surfaces or within materials, using a moisture meter and/or measuring relative humidity, to evaluate areas of potential condensation. EH&S does not recommend sampling for mold as a practice, See Attachment 1 for Mold Sampling Strategies.
- Some basic assessments may require using a boroscope to perform visual inspections of hidden areas, such as, ventilation system ducts and wall cavities. In most cases, a visual inspection is all that is necessary to assess the seriousness of the situation and plan an appropriate response.

F. Cleaning Staff:
- Ensure cleaning staff are utilizing proper methods and products, cleaning schedules, materials storage and use, and trash disposal.

3. LEVEL 1 Survey:
- If the Facility/Building Manager is unable to identify the source of the IAQ problem and implement a fix, EH&S will conduct a Level 1 IAQ survey. This Level 1 survey is designed to identify the root cause of the IAQ complaint and provide recommendations for resolution. The survey will include a visual inspection of the space and surrounding areas noting odors, unsanitary conditions, visible mold growth, staining, presence of moisture in inappropriate places, hazardous chemicals, potential soil gas entry, poorly maintained filters, overcrowding, personal air cleaners, uneven temperatures, and blocked vents.
- Baseline air sampling is typically conducted to determine: Measurement of particulate, carbon dioxide (CO2), volatile organic compounds (VOC), temperature and relative humidity concentrations. In most cases, mold sampling will not be conducted nor is it recommended.
- Survey results will be delivered to Building/Facilities Management, Human Resources, and Supervisor/Manager.
- EH&S will limit conversations with the complainant to explaining the content or intent of the survey and results AFTER having reviewed the findings and recommendations with the Building/Facilities Management, Human Resources, and Supervisor/Manager.
If the EH&S survey does not yield the source of IAQ problem, a third party IAQ consultant/expert may be consulted to perform a Level 2 survey.

4. **Level 2 Survey:**
   - Indoor Air Quality (IAQ) – If the initial investigation by the Facility/Building Manager and subsequent Level 1 survey by EH&S do not resolve the IAQ issue. A third party consultant can be hired to perform a more deep cycle assessment.
   - EH&S maintains a master service agreement with several consulting firms that can be hired by schools/departments. EH&S will work with Building/Facility Manager regarding this process.
Attachment #1: Mold Sampling Strategies

Each year, the EH&S Department responds to multiple indoor air quality concerns throughout campus in multiple types of occupancies. Our Department has noted a significant increase in calls regarding potential mold which, in some cases, leads to occupants requesting mold testing or sampling for their area or building.

Mold is ubiquitous and present in the ambient air and on surfaces all around us on a day-to-day basis. Mold spores require moisture and a food source to grow and become problematic. Controlling these conditions is the best way to prevent mold growth in our buildings on campus. In general, the EH&S Department does not recommend sampling for mold as a practice during a mold investigation. Instead, EH&S focuses on identifying sources of moisture and humidity levels that are typically the source of mold in buildings.

Mold sampling will almost always reveal the presence of some mold regardless of the building, construction, or type of occupancy. A “mold free” environment is simply not realistic in a typical building setting. Currently, there are no regulatory guidelines regarding exposure levels to mold and their effect on human health.

Mold sampling provides a certain data set; species and a count of spores in the air. The problem lies in how to interpret the sampling data; associate it to a negative health effect and make it actionable. Sampling to identify specific mold species is also not warranted, since people are allergic to different molds (even those regarded as innocuous to the general population). Federal and State authorities recommend removing any observed mold, regardless of species.

The EH&S Department’s position on mold testing is consistent with other noted State and Federal agencies.

United States Environmental Protection Agency (EPA)

In most cases, if visible mold growth is present, sampling is unnecessary. Since no EPA or other federal limits have been set for mold or mold spores, sampling cannot be used to check a building’s compliance with federal mold standards.

Surface sampling may be useful to determine if an area has been adequately cleaned or remediated. Sampling for mold should be conducted by professionals who have specific experience in designing mold sampling protocols, sampling methods and interpreting results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA), the American Conference of Governmental Industrial Hygienists (ACGIH), or other professional organizations.

Are There Federal Regulations or Standards Regarding Mold Testing?

Standards or Threshold Limit Values (TLVs) for airborne concentrations of mold, or mold spores, have not been set. Currently, there are no EPA regulations or standards for airborne mold contaminants. Additional guidance:

- "A Brief Guide to Mold, Moisture, and Your Home" [EPA 402-K-02-003]
Centers for Disease Control and Prevention (CDC)

CDC does not recommend routine sampling for molds. Current evidence indicates that allergies are the type of diseases most often associated with molds. Since the susceptibility of individuals can vary greatly either because of the amount or type of mold, sampling and culturing are not reliable in determining your health risk. If you are susceptible to mold and mold is seen or smelled, there is a potential health risk; therefore, no matter what type of mold is present, you should arrange for its removal. Furthermore, reliable sampling for mold can be expensive, and standards for judging what is and what is not an acceptable or tolerable quantity of mold have not been established.

Harvard’s EH&S Department

Harvard’s EH&S Department’s stance on mold investigations - to evaluate moisture control and the removal of visible mold with cleaning, is consistent with current regulatory guidance.

- If visible mold or contributing factors (moisture, high humidity, standing water, odors) are identified during the course of an EH&S investigation, the recommendation is that that affected material be cleaned using household cleaning chemicals (bleach is not required).
- If that material cannot be easily cleaned, it should be removed from the building and replaced.
- If certain areas in a building are prone to moisture issues, these areas should be identified by the facility manager and monitored on a regular basis so they can be quickly dried out. Fans and dehumidification are acceptable, aggressive drying techniques.
- State and Federal guidance also note that it is more effective to conduct visual inspection of ventilation system components (fan coil condensate drip pans, cooling coils, etc.) and areas where water leaks may occur, and to dry building materials within 48-72 hours.
Attachment #2: Flood Response Guidelines for Building/Facility Managers

Key Terms Used

**Category 1 or Clean Water:** Water that originates from a source that does not pose a significant hazard to humans. Examples are burst potable water supply lines, failed water supply lines to appliances, tub or sink overflows, roof leaks, melting snow or rainwater, broken toilet tanks at rear (holding clean water, not the bowl water). Time, temperature and association with other materials may degrade category 1 water.

**Category 2 or Gray Water:** Water which begins with some degree of contamination at its source and contains microorganisms and nutrients for microorganisms that can potentially cause sickness or discomfort if consumed by humans. Time and temperature and association with other materials may degrade category 2 water. Examples are washing machine water, dishwasher water, sump pump failures, and broken aquariums.

**Category 3 or Black Water:** Highly contaminated water which could cause serious illness or death of consumed by humans. Examples are sewage from sanitary drains of any type, toilet backflows, rising flood water from rivers and streams, laboratory waste water, ground surface water containing silt and soil contaminants flowing into buildings.

**Porous material:** includes carpet, carpet pad, wallboard

**Non-porous material:** include metal shelves, filing cabinets, ceramic fixtures, etc.

<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>Clean water</th>
<th>Gray water</th>
<th>Sewage or other highly contaminated water.</th>
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<tbody>
<tr>
<td>Determine water source/Water type</td>
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<tr>
<td>Review facilities representatives’</td>
<td>Shut off water source as soon as possible.</td>
<td>Avoid discharge to drains within the</td>
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<tr>
<td>efforts to control water source</td>
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<td>building upstream of a blockage</td>
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<td></td>
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<td>Clear blockage as soon as practical</td>
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<tr>
<td>Determine who is on-scene</td>
<td>Area or facility operator.</td>
<td>Building manager or other facilities</td>
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<td></td>
<td></td>
<td>representative.</td>
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<td></td>
<td>Custodial supervisor.</td>
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<td>Lab representative, if necessary.</td>
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<td>Parties conducting the cleanup.</td>
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<td>Determine if additional resources are</td>
<td>The appropriate Operations Center will</td>
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<tr>
<td>required</td>
<td>have the contact info for the affected</td>
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<tr>
<td></td>
<td>building manager, custodial supervisor,</td>
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<td></td>
<td>and damage restoration vendors.</td>
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<td></td>
<td></td>
<td>Assist facilities representatives and</td>
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<td></td>
<td></td>
<td>custodial supervisors to mobilize</td>
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<td></td>
<td></td>
<td>their internal resources and equipment.</td>
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</tbody>
</table>
**FACT SHEET**
Program: Indoor Air Quality

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### On-scene activities
- **Recommend additional resources to facilities representative if you think they are needed.** The sooner adequate resources are available and set up, the less the impact on building materials.
- **Determine if you would best assist by responding on-site.**

### Close-out and follow-up
- **Ensure health and safety procedures are followed (see Health & Safety section below).**
- **Limit work area access to essential personnel.**
- **Ensure appropriate drying techniques are used based on the source and extent of the flood (see Preventing Subsequent Microbial Growth section below).**
- **Maintain communication with the Operations Center.**

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**HEALTH AND SAFETY**
For Responders and Others in the Immediate Area

**Electrical Hazards**
- **Facilities representative should have electrician evaluate need to shut off power.**
- Personnel should not be in standing water unless electrical hazards are assessed or mitigated.
- **Responders’ powered equipment should be GFCI protected (in wall outlet or integrated into extension cord).**
- Do not allow cords in or around standing water.

**Exposure to Water-Borne Microbial Contaminants**
- Direct contact and ingestion are the principal concerns. Responders should wear impervious gloves and tall, water-proof boots to prevent direct contact.
- Responders should wear splash protection including safety goggles if contact with highly contaminated water is likely.
- Responders must wash hands after removing protective clothing.
- Wet Vacuums used to extract flood water from highly contaminated sources such as sewage should preferably (and must in kitchens) be equipped with HEPA filters to minimize airborne exposures, and must be thoroughly decontaminated after use. [Exception: vacuums or pumps connected to pump trucks exhausted outdoors and not near air intakes].

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Revision Date: 12/19/2017
### Exposure to Water-Borne Microbial Contaminants

- Dripping onto other porous surfaces should be prevented (e.g., by wrapping in plastic or placing in secondary containment tubs) from materials soaked in sewage during transport into outdoor solid waste receptacles (e.g., dumpsters).
- Only uncontaminated storm or groundwater intrusion should be discharged to storm drains. Otherwise, discharge wastewater to a sanitary (building) drain in the area: A toilet or mop sink;
- Leaks from lab drain lines should be sent to the lab wastewater neutralization system;
- Evaluate content of chilled water blow down or leaks within a garage to determine proper disposal method.
- Affected personnel (e.g., staff) should be reminded about cleaning and disinfecting their response equipment and reusable items that came in contact with highly contaminated water.

### Disturbance of Hazardous Materials

- **Assume that any disturbed suspect materials** (i.e. wall board, cove molding, tile (ceiling and floor) or adhesive) are **hazardous until confirmed otherwise**.
- Only licensed asbestos abatement contractors can disturb or remove asbestos-containing building materials that are friable (able to be crumbled by hand pressure).
- **Disturbance of surfaces with lead-based paint must be done in a controlled manner.** In older residential or child-occupied facilities, post-flood renovation activities may fall under state lead laws.

### Preventing Subsequent Microbial Growth

Mobilize responders to:
- Quickly and thoroughly dry all porous (e.g., carpet and wallboard) and non-porous materials (strongly recommend starting response within 24 hours and complete within 48-72 hours of the flood).
- Perform extraction with wet vacuums on carpets. Dehumidifiers alone will not effectively dry wetted porous materials.
- **Move or elevate** furniture and equipment such as filing cabinets and copiers so that the flooring (particularly porous material) is able to be dried.
- Cut or drill wetted wallboard (small holes or whole bottom sections at the baseboard) if necessary to promote drying inside the wall cavity. Lower portions of wetted sheetrock may need to be removed and replaced.
- Clean and **disinfect** all hard surfaces in contact with sewage or other highly contaminated water source, before aggressively drying with floor blowers or fans.

Provide air movement through floor blowers or fans, or natural ventilation (if outside air is not humid), to promote evaporation from wetted materials.
### Salvaging Porous Materials and Contents

<table>
<thead>
<tr>
<th>Carpets</th>
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<tbody>
<tr>
<td>Carpets saturated with <strong>clean water</strong> may be salvaged in place with aggressive drying if response is relatively quick. Moisture should be frequently monitored during this process. If an underlying pad is present, proper drying may require lifting the carpet, and in some cases, the pad will need to be discarded.</td>
</tr>
<tr>
<td><strong>Disposal of carpets and carpet pads saturated with sewage or other highly contaminated water source is recommended.</strong> In some cases, carpets may be decontaminated by multiple cycles of cleaning, disinfection and extraction, but pads contaminated with sewage should be discarded.</td>
</tr>
</tbody>
</table>

### Important Books and Documents

- Important books and papers can be salvaged. This is best done by professional restoration companies off site. The appropriate Operations Center will have contact information for such vendors. **Consider contacting the Harvard University Library Collections Emergency Team for 24-hour assistance on library collections at 617.240.2500.**

### Clothing

- Wetted clothing with clean or contaminated water may be salvaged by standard submersion cleaning methods (e.g., laundry machine).

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**Note:**

(1): Most materials must first be cleaned, followed by disinfection in order for the disinfectant to be effective.

Disinfectants may include those with broad spectrum activity that target enteric pathogens, molds, fungi and viruses, and the label will state what materials the disinfectant is appropriate for. Alcohols (60 to 90% in water), quaternary ammonium compounds (0.4 to 1.6%), phenolics (0.5 to 5%), iodophors (75 ppm), glutaraldehydes (2%), household bleach (sodium hypochlorite, diluted 10%), and hydrogen peroxide (3 to 6%), with a typical contact time of 20 minutes unless otherwise specified by the manufacturer, may all be suitable depending on the material to be disinfected and contaminant.

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**References:**

(1) "Suggested Guidelines for Remediation of Damage from Sewage Backflow into Buildings" (Journal of Environmental Health, Oct 94, Volume 57, Number 3 published by the national Environmental Health Association) - available on web via [www.oseh.umich.edu/pdf/guideline/fdrappe.pdf](http://www.oseh.umich.edu/pdf/guideline/fdrappe.pdf); and

# Attachment #3
## INDOOR AIR QUALITY SURVEY

### Section I Background Information

<table>
<thead>
<tr>
<th>BUILDING</th>
<th>Date:</th>
<th>Time:</th>
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<tbody>
<tr>
<td>Building Manager Contact</td>
<td>On Site Contact 1</td>
<td></td>
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<tr>
<td>Department Contact</td>
<td>On Site Contact 2</td>
<td></td>
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<tr>
<td>Human Resources Contact</td>
<td>On Site Contact 3</td>
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<tr>
<td>Building Maintenance Organization</td>
<td>On Site Contact 4</td>
<td></td>
</tr>
</tbody>
</table>

**Problem Description:**

### Section II Work Area Survey

<table>
<thead>
<tr>
<th>SPACE</th>
<th>Type of Occupancy</th>
<th>Size and Occupancy Load</th>
<th>Floor of Building</th>
<th>Adjoining Occupancies</th>
<th>Additional Notes:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>THERMAL CONTROL</th>
<th>Describe Heating System</th>
<th>Central HVAC</th>
<th>Fan Coil</th>
<th>Radiators</th>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Describe Cooling System</td>
<td>Central HVAC</td>
<td>Fan Coil</td>
<td>Window AC</td>
<td>None</td>
</tr>
<tr>
<td>Thermal Conditions Comfortable?</td>
<td></td>
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<tr>
<td>Occupant Reports</td>
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<tr>
<td>Thermostat Location</td>
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<td>Thermostat Setting</td>
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<tr>
<td>Thermal Measurements</td>
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<tr>
<td>Thermal Loads</td>
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<tr>
<td>Fans/Heaters in Use?</td>
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<tr>
<td>Humidifiers/Dehumidifiers in Use?</td>
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</table>
### VENTILATION

<table>
<thead>
<tr>
<th>Additional Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe Ventilation System</td>
</tr>
<tr>
<td>Location of Supplies, Returns, Exhaust</td>
</tr>
<tr>
<td>Supply Working?</td>
</tr>
<tr>
<td>Return/Exhaust Flow Present?</td>
</tr>
<tr>
<td>Diffusers Blocked or Closed?</td>
</tr>
<tr>
<td>Filters on Returns or Supplies?</td>
</tr>
<tr>
<td>Excess Dust on Supply or Return</td>
</tr>
<tr>
<td>Carbon Dioxide Measurements</td>
</tr>
</tbody>
</table>

### INDOOR POLLUTION SOURCES

<table>
<thead>
<tr>
<th>Additional Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture damage /Visible Mold</td>
</tr>
<tr>
<td>Odors?</td>
</tr>
<tr>
<td>Excess dust? Cleaning Schedule?</td>
</tr>
<tr>
<td>Carpets? Condition?</td>
</tr>
<tr>
<td>Pests and Pest Control</td>
</tr>
<tr>
<td>List Other Indoor Pollution Sources</td>
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</tbody>
</table>

### Section III Outdoor Areas

<table>
<thead>
<tr>
<th>Additional Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird Screens/Animal Activity</td>
</tr>
<tr>
<td>Dampers Work</td>
</tr>
<tr>
<td>Pollution Sources within 25 Feet</td>
</tr>
<tr>
<td>Present Damper Setting</td>
</tr>
<tr>
<td>Construction Activity</td>
</tr>
<tr>
<td>Carbon Dioxide Measurement</td>
</tr>
</tbody>
</table>
## MOISTURE
- Water Collecting Around Building
- Down Spouts Intact
- Potential Breeches of Envelope

**Additional Notes:**

## DIRT
- Walk Off Mats at All Entries to Building

**Additional Notes:**

## Section IV Air Handling Units

<table>
<thead>
<tr>
<th>Filters</th>
<th>Easy Access</th>
<th>Filter Type and Efficiency</th>
<th>Filter Tightness</th>
<th>Filter Condition</th>
<th>Replacement Schedule</th>
</tr>
</thead>
</table>

**Additional Notes:**

<table>
<thead>
<tr>
<th>Coils</th>
<th>Drip Pan is Draining/No Standing Water</th>
<th>Clean</th>
<th>Cleaning Schedule</th>
</tr>
</thead>
</table>

**Additional Notes:**

<table>
<thead>
<tr>
<th>Fan</th>
<th>Fan Type</th>
<th>Fan Condition</th>
<th>Fan Coil Units Clean and Draining</th>
<th>Fan Room Clean/No Smoking</th>
</tr>
</thead>
</table>

**Additional Notes:**