

Indoor Environmental Quality Policy

- For New Construction and Renovation

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I. Introduction

Effective management of the indoor environmental quality (IEQ) in buildings is essential to the maintenance of occupant health, satisfaction, and productivity. The purpose of this policy is to assist in minimizing the negative impacts of new construction or renovation to adjacent occupied spaces, and to ensure an acceptable IEQ in newly constructed or renovated spaces.

In some instances, this policy varies from other more traditional guidelines such as local codes. *It is the intent that when this policy is at variance with other accepted standards the more stringent shall apply.*

At all times, this policy is open to exceptions to make a reasonable accommodation to a specific project. Please contact Environmental Health and Safety at (352) 392-3393 or tladun@ehs.ufl.edu for assistance with questions regarding this policy.

II. Application

For new construction, all sections of this policy shall apply. For renovation or remodeling projects that do not include changes in an existing ventilation system, the requirements for sampling shall not apply.

III. Implementation

Submittals are to be provided to Environmental Health and Safety by the design architect/engineer or other party responsible for oversight of the project, in accordance with the schedule indicated in this policy.

Where sampling for IEQ parameters is required, it is the responsibility of the design architect/engineer or other party responsible for oversight of the project to arrange for the required pre-occupancy, 1-month post occupancy, and 1-month prior to warranty completion sampling by competent firms. The plan for performing this sampling must be developed by an American Board of Industrial Hygiene Certified Industrial Hygienist, and approved by Environmental Health and Safety prior to the sampling.

Environmental Health and Safety can perform this sampling with a charge to the project for costs.

Time to collect and analyze the prior to occupancy samples must be accounted for in the schedule of the project. This sampling cannot occur until there is an accepted test and balance, *and* all of the installation and use of adhesives, coatings, furnishings, sealants, and other parts of the building fabric are in place. Typically, this sampling will take a day to complete and a week to ten days to receive the report of results

IV. Design Phase Requirements

Outdoor Air Intakes

The project site and adjacent areas shall be surveyed for potential sources of contamination that may make the outside air unacceptable for use indoors with respect to odor and sensory irritation. Exhaust stacks and vents of adjacent facilities, loading docks, and vehicle traffic are a few examples of potential contamination sources.

Consideration must be given to the location of fresh air intakes to prevent introduction of pollutants to the building's air supply. Maximal distance from pollutant sources is ideal. At minimum, fresh air intakes shall be located away from potential sources of pollutants as indicated on Table 1.

Design planning must also ensure the building does not introduce any of the objects listed on Table 1 within the minimum distance to air intakes for existing buildings adjacent to the construction site..

Object	Minimum Distance in feet to Air Intake
Roof or grade	0.75
Mantles or ledges	3
Driveway	10
Landscaped grade	10
Building exhaust outlets	12
Plumbing Vent Outlets	12
Cooling Towers	15
Street or highway	25
Standing traffic	50
Garbage Storage/Treatment Area	50

Table 1

Outside air intakes shall be protected from rain entrapment through the use of louvers, mist-eliminators or rain hoods. Outside air intakes shall be covered with ¼ inch bird screening.

Modulated damper systems for outside air shall account for occupancy, or must be provided with mechanical stops in order to provide a minimum adequate amount of outside air for the building occupancy at all times.

Mechanical Equipment

The air filter cells must be sealed to prevent infiltration of by-pass air. Filters are to be located upstream of cooling coil(s) and humidifiers.

Air handler housings are to be double wall construction with internal insulation.

Condensate pans located under coils must be stainless steel and double wall-insulated construction. They shall be pitched, tapered, and bottom drained to prevent water stagnation.

Pan drains must be air-gapped to a trapped sanitary or storm drain line.

Provide sufficient clearance on all sides of equipment to perform maintenance activities. Install walkways for access to elevated equipment.

Economizer systems must provide for dehumidification of the air. System controls shall sense space humidity and initiate cooling and provide reheat for dehumidification as necessary during periods when there is no sensible cooling load.

Package units typically only provide ventilation and outside air when there is a temperature demand. Where package units are used, they should be used for heating and cooling only, and paired with a dedicated outside air unit to provide outside air for ventilation and building pressurization.

Duct Systems

Ductwork utilized for supply, return, or outside air must have a metal, or other hard internal surface with no internal lining. Specific sections of duct with internal insulation and Mylar® or other moisture repellant surface may be used for sound attenuating.

The supply and return duct system must be constructed in a manner to be considered a sealed duct.

Flexible duct may be used only in lengths of six feet or less to make the connection to diffusers. The use of extended or convoluted runs of flexible ducting for the purpose of sound deadening is not allowed.

The cavity space above ceiling tiles and below the deck of the roof or floor above shall not be utilized as an air supply or return plenum. Hallways may not be used as a return air plenum.

Supply air diffusers are very important with regard to both occupant comfort and effective contaminant control. Ensure through field verification that the diffusers will adequately throw and mix the air, while minimizing drafts on occupants. Any system resulting in gross short-circuiting between supply and return grills is prohibited.

Supply and return diffuser grills shall not be located on the end of a duct run. Instead, branches should be used near the end of a run.

HVAC Controls

Manual damper controls located on the supply and return ducts must have their full open and shut positions marked with indelible ink or paint, and be locked or fixed in place after final balance

Temperature control zones shall not combine areas with very different heating and/or cooling loads. Thermostats shall not be located where they are subject to drafts, direct sunlight, or heat from nearby equipment.

Ventilation Requirements

Spaces utilized for contaminant or odor-generating activities must be isolated from the return air system, and provided with exhaust air of adequate quantity to remove the generated contaminants and odors, and provide negative pressure relative to surrounding office or reception areas. Examples of these types of areas include, but are not limited to spaces used for: cooking, reprographics, high volume copying, laboratories, lavatories, animal holding facilities, and autoclaving.

Local-exhaust ventilation systems must be designed utilizing a recent version of the American Conference of Governmental Industrial Hygienists' *Industrial Ventilation, a Manual of Recommended Practice*.

Exhaust stack discharge design and height must be in accordance with the American Conference of Governmental Industrial Hygienists' *INDUSTRIAL VENTILATION, a Manual of Recommended Practice*.

Roof access is to be provided by adequate openings with stairs, not ladders.

The overall building pressure differential must be slightly positive in relation to the outside atmosphere.

V. Construction Procedure Requirements

Submittals: prior to building occupancy provide to Environmental Health and Safety:

- A copy of the air handling system test and balance.
- The sampling results for the prior to occupancy parameters: formaldehyde, inhalable dust, and total volatile organic compounds.

Protection of Materials

All stored materials must be protected from moisture and microbial growth. All water-damaged materials are to be discarded and replaced.

Installed air handling equipment must be protected from dust, insect, vertebrate, moisture and microbial contamination. Air handling equipment, including ductwork, which becomes contaminated during construction must be cleaned or replaced prior to start-up.

Ducted supply air systems shall not be operated without filters in place. Filters used in air handling equipment operating during construction shall have a minimum dust spot rating of 80-85%.

Interior Finishes

After the building or room is fully weatherized, and before interior finishes are applied, the HVAC system should be operating and drywall and plaster should show less than 40 on the 0 – 100 reference scale of a Delmhorst or other similar moisture detector.

Alternatively, before applying interior finishes the HVAC system should be run 24 hours per day for a minimum of 3 days after a stable temperature and a constant humidity below 60% have been demonstrated. The HVAC system will remain in 24-hour operation throughout the installation of finishes.

Vinyl wallpaper and other water impermeable coverings are not permitted on the interior side of exterior walls.

Whenever possible, preference is to be given to the use of low emission paints, glues, carpets, and solvents.

VI. Renovation and Construction Adjacent to Occupied Spaces

Construction and renovation projects adjacent to occupied spaces present additional IEQ concerns. It is not uncommon for odors, noise, and dust from projects to create problems for the adjacent occupants.

Even levels of contaminants that are well below toxic levels can cause asthma attacks, allergic reactions, headaches, and mucous membrane irritation in building occupants. The following recommendations are intended to prevent these reactions.

Renovation areas and occupied spaces shall be separated with solid, full height barriers. These barriers are intended to block the transmission of dust, odors, and other contaminants from the worksite to the occupied spaces.

The air handling system shall be adjusted to provide a slight positive pressure in the occupied spaces relative to the construction space. No return air shall be drawn from the construction space.

After the renovation has been completed, provide a system test and balance to correct adjustments made during renovation.

Regular housekeeping shall be performed to prevent the transport of dust and dirt from the construction zone into occupied spaces by tracking.

Internal combustion powered equipment, tar pots, paintbrush cleaning stations, construction site lavatories, smoking facilities, and other sources of pollutants shall be located with consideration of the outside air intakes.

VII. Sampling

Indoor Environmental Quality Parameters

There are specific parameters which experience has shown to be reliable predictors of occupant comfort in a building. Criteria limits have been set for these specific parameters. Sampling for compliance with different parameters is required at specific scheduled times. In designing the project, systems and materials shall be selected with these parameters in mind.

Immediately prior to occupancy the ambient formaldehyde level in the building air shall not exceed 0.05 ppm. The total volatile organic vapor level shall not exceed 300 micrograms per cubic meter. The inhalable dust level shall not exceed 25 micrograms per cubic meter during an aggressive sample.

To achieve compliance with these parameters consideration must be given to out gassing of volatile organics and other chemicals when selecting coatings, adhesives, flooring, and other building materials. The use of low emission materials is likely to reduce the period of time required after installation to allow chemicals to dissipate. Use of materials without regard for out gassing of chemicals may result in a delay of building acceptance due to an elevated total volatile organic compound or formaldehyde level.

	Parameter	Criteria
At all times subsequent to occupancy and through warranty completion, the renovated space or building air shall meet the criteria indicated on Table 2.	Carbon Dioxide	≤ 1,000 ppm
	Carbon Monoxide	< 4 ppm
	Radon	≤ 2 pCi/L
	Relative Humidity	30% - 60%
	Drybulb Temperature	69 - 79° F
	Fungi	< $\frac{1}{3}$ outdoor result, similar rank order and no visible growth

Table 2

The sampling strategy is to be designed and performed under the supervision of an ABIH Certified Industrial Hygienist in coordination with the University of Florida Environmental Health and Safety

Department. Minimum samples per parameter shall be collected as indicated in this document, or as agreed to by Environmental Health and Safety. The sampling locations shall be selected in a manner to ensure equal distribution. Testing must be conducted with the HVAC systems operating in their design modes, documented by a prior test and balance approval.

Sampling techniques can include direct reading instruments or media analysis approved by Environmental Health and Safety. Colormetric tubes are not acceptable. Sampling shall not be carried out without Environmental Health and Safety's written approval of the sampling strategy.

Sampling Schedule

Prior to occupancy, the ambient formaldehyde, total organic vapor and inhalable dust levels in the building air shall be tested. A minimum of three samples per air handling zone shall be collected. The maximum allowable concentrations for occupancy are 0.05 ppm for formaldehyde, and 300 micrograms per cubic meter for total volatile organic vapors. The inhalable dust level shall not exceed 25 micrograms per cubic meter in an aggressive sample.

At one month subsequent to occupancy, data logging devices shall be placed in the building to measure carbon dioxide level, relative humidity and dry-bulb temperature. These devices shall be placed in each occupied ventilation zone, and shall be left in each location for a minimum of 24 hours. Only data collected during days of typical building occupancy shall be considered.

At one month prior to warranty completion, the carbon dioxide level, relative humidity and dry-bulb temperatures shall again be measured using data logging devices as described above. In addition, sampling for mold contamination will be carried out. These samples will be collected on media plates using an Anderson sampler or the Air-O-Cell cassette technique. Three samples per air handling zone,

plus three outdoor samples shall be collected. At least one of the outdoor samples is to be in the vicinity of the outside air intake(s), sites for remaining samples shall be in the vicinity of primary building entrances.

VIII. Summary

Adherence to this process will provide significant assistance in the maintenance of acceptable indoor environmental quality in University of Florida buildings.

The process reinforces the need for building occupants and the design professionals to engage in early and meaningful dialogue about the intended building design. The mandated sampling not only assures a minimum level of compliance at building occupancy, it provides a baseline to use in comparison should problems arise in the future.

Questions concerning these requirements should be addressed to Environmental Health and Safety at (352) 392 – 3393 or tladun@ehs.ufl.edu.

Summary of Testing and Sampling Requirements

When	Type of Sampling	Acceptable	Comment
Start-up	Ventilation Test and Balance	90% of design or greater	Prior to pre-occupancy samples
Pre-Occupancy	Formaldehyde	< 0.05 ppm	
Pre-Occupancy	Total volatile organic vapor	<600 ppb as measured on a pid with 10.6 eV bulb	ppbRAE as example of instrument
Pre-Occupancy	Inhalable dust	<25 micrograms per m ³	
1 Month Post- Occupancy	Carbon Dioxide	<800 ppm	Continuous 24 hour reading
1 Month Post- Occupancy	Humidity	30 - 60%	Continuous 24 hour reading
1 Month Post- Occupancy	Temperature	69° - 79° F	Continuous 24 hour reading
1 Month Post- Occupancy	Radon	<2.0 pCi/L	
1 Month Prior to Warranty Completion	Carbon Dioxide	<1,000 ppm	Continuous 24 hour reading
1 Month Prior to Warranty Completion	Humidity	30 - 60%	Continuous 24 hour reading
1 Month Prior to Warranty Completion	Temperature	69° - 79° F	Continuous 24 hour reading
1 Month Prior to Warranty Completion	Mold and Fungi	< 1/3 outside, similar rank	No visible growth

Summary of Submittal Schedule

Project Stage	Submittal Required	Comment
Pre-Occupancy	Test and balance report	Prior to Pre-Occupancy sampling.
Pre-Occupancy	Formaldehyde, dust, and total organic vapor sampling reports	
Post Occupancy	1 month post occupancy sampling reports	
Prior to Warranty Completion	Sampling results 1 month prior to warranty completion	

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