# WESTERN CONNECTICUT STATE UNIVERSITY

# INDOOR AIR QUALITY MANAGEMENT PLAN

# PROCEDURE E-106

Issued: 9/01/01
Revised: 9/29/04
Revised: 1/23/2020

Please direct any questions or comments about the applicability of this document to David Serino, Director of Environmental Health & Safety

# 1.0 INTRODUCTION

## 1.1 PURPOSE

The goal of this document is to define a systematic proactive process, which prevents IAQ problems from occurring, and in the event of an occurrence, provides prompt resolutions and long-term solutions to prevent future recurrence. The University is committed to meeting and/or exceeding all existing IAQ Standards and to continue to maintain and monitor its' building IAQ profile (See Appendix F).

## 1.2 APPLICATION

These requirements apply to the general building environment at all Western Connecticut State University buildings.

This procedure is designed to work in conjunction with preexisting procedures. However, if conflicts between this procedure and any other procedure do occur, they are to be resolved by the Director of Health and Public Safety Management.

## 1.4 REFERENCES

- ASHRAE 62-89 "Ventilation For Acceptable Indoor Air Quality"
- (See Attachment A).

## 1.5 DEFINITIONS

- Good indoor air quality is "building air that meets generally recognized standards of acceptability and does not present a significant health risk to building occupants."
- (See Attachment B).

# PROCEDURE

# 2.0 GENERAL

The quality of indoor air depends primarily upon building design, installation, operation, and maintenance. Other factors related to IAQ include potential contaminant sources originating from building materials and furnishings, activities inside and outside buildings, and even the personal hygiene of the building's occupants. If managed correctly, good IAQ can have a positive contribution to occupant health and enhance comfort and productivity.

## 3.0 MANAGEMENT

- The University's IAQ Program is managed by the Director of Environmental Health & Safety. That person or his or her designees participate on all new building and building renovation committees. His or her role on those committees is to ensure that IAQ factors are predominantly considered in the planning process.
- A building committee, comprised of faculty and staff people who work in that building is formed as a focal point to gather, collate, and facilitate to resolution, the IAQ problems of that building.
- All University Faculty and Staff members have a responsibility to understand IAQ issues, practice measures known to reduce IAQ problems, and make their respective building committees aware of any condition or event that may support poor IAQ, or symptoms which may indicate an IAQ problem.
- Attached is an organizational chart depicting the structure required to support the IAQ Program. (See Attachment C).

## 4.0 TRAINING

A training program is in place that is designed to make all University Employees aware of IAQ as a fundamental and significant problem, of the factors that contribute to poor IAQ, of the role each of us has in contributing to the problem, and conversely the role each of us has in minimizing the problem, and the process we will use to identify and resolve our IAQ problems.

At a minimum, the Chairperson of each building committee will receive additional training focusing on the protocol of resolving IAQ issues, and the interface between the several committees.

The core elements of the training program are:

- General overview of IAQ
- Potential Causes of poor IAQ
- Symptoms of poor IAQ
- Why IAQ problems are so difficult to identify and resolve
- Components of an IAQ evaluation
- IAQ identification
- IAQ prevention
- Initial documentation instructions required for an IAQ investigation

## 5.0 DOCUMENTATION

The complexities of identifying and resolving IAQ problems are designed to bring focus on each specific IAQ issue. Appendix C (Investigation Checklist), Appendix D (Occupant Interview), and Appendix E (Occupant Diary) will effectively begin the investigation.

An IAQ Building Profile will be maintained for each building on campus. As a document, it will include the building IAQ history, copies of the results of all investigations, and a source of information for any individual who may require outside expertise to resolve their personal IAQ issue.

## 6.0 MEASUREMENTS

In order to assess IAQ, random air measurements will be conducted in each building. Temperature, Humidity, Carbon Monoxide and Carbon Dioxide, Dew Point and Air Movement are the typical measurements. When evidence supports the need, substance specific measurement and analysis will be utilized. Chemical and Biological contamination levels are the typical measurements used, and require the use of special equipment and specialized laboratory analysis.

The following measurements should be considered minimum standards for the maintenance of good IAQ:

- Carbon Dioxide level should be no more than 700ppm above the level of Carbon Dioxide in the outdoor air in close proximity to the area being measured.
- Carbon Monoxide level should be less than 30ppm.
- There should be no areas or articles where condensation is likely to collect.
- Total air supply should be 100cfm or greater per person in a normal density office space. (where possible)
- Acceptable airflow pattern (check flow with smoke tube).
- Temperature should be between 68.5 – 77° F.
- Relative humidity should be between 33-55%.

## 7.0 RESPONSE TO IAQ PROBLEMS

There are different levels of IAQ problems.

**Level 1** – An IAQ Emergency requires immediate and responsive action. The presence of a chemical odor could be a Level 1 problem. Chemical spills, detection of hazardous materials, fire, and evidence of biological contamination could also be Level 1 problems. In general a level 1 problem is any IAQ problem that has the capability of causing an acute health response.

The initial response to any IAQ emergency is to determine the cause of the emergency and, when necessary evacuate the area in question. In most cases the cause of the emergency is known and the appropriate response procedure is initiated. In all other cases and in any post emergency situation, the E&S Director, Director of Emergency Management, and WCSU's Facilities Department are required to determine the source of any immediate or residual IAQ problem, and effect any change and any test protocol necessary to correct and re-certify the building IAQ. No building occupant should reenter the building unless and until the emergency management director determines that the building IAQ is acceptable. Any building occupant directly affected or suspected to be affected by a Level 1 Event is required to complete an Occupational Injury Report.

In order to close out any IAQ problem, it is necessary that the EH&S Director publish a final report giving overview to the problem, its resolution, actions taken to prevent reoccurrence, and guidance to the other buildings to help them prevent the same type of occurrence in their building. The Planning and Engineering Department will update their "as built" records, and the IAQ staff will update the "Building Profile". (See Appendix G).

**Level 2** – A Level 2 IAQ problem occurs when a person or persons exhibit symptoms typical of poor IAQ and there are no obvious causes. A single person, several people sharing an office complex, several people occupying different and seemingly unconnected areas of the same building all exhibiting symptoms typical of poor IAQ are examples of a Level 2 problem. In these cases, health problems that result in gradual body change is the greatest concern. It is thought of as a chronic health hazard.

Initially, the EH&S Director takes responsibility for determining the cause of a Level 2 IAQ problem. It is a reiterative investigative process that requires the support of many disciplines, including the individual(s) affected, and much discipline in how the investigation is conducted. In most cases it will be an extended process.

The probability of success is inversely proportional to the number of people affected. In some cases no cause will be determined. In those cases where corrective action is identified and implemented, the close out procedure is the same as described in the logic of a Level 1 problem. (See Appendix H).

**Level 3** – Level 3 IAQ problems have quality of life as a concern. People who know a person who exhibits the symptoms of poor IAQ and are concerned for themselves, who are concerned that maintenance and/or custodial practices may result in poor IAQ, and who are concerned with the use of certain building materials or furniture, are examples of Level 3 problems. As building occupants are made aware of the issue of IAQ and many of the obvious causes of poor IAQ, they, along with the building committee of their respective building, will develop an expertise that over time will eliminate direct causes of poor IAQ and empower them to make alterations to the building that will reduce future poor IAQ from ever developing. It is essential that future occupants to any proposed building be represented in the pre-construction building committees.

A building committee will have input from the building occupants, support from the EH&S director, access to the building profile and the as built records, as well as feedback from the several building committees. Resolution of IAQ concerns is a reiterative process that requires understanding the concern, an involvement in the proposed resolution to the concern, understanding the short and long-term effects of the resolution and prioritizing the effort to resolve the concern. (See Appendix I).

## 8.0 PERSONAL RESPONSIBILITY

Every Employee of the University has a role in maintaining good IAQ. University employees have a responsibility to understand IAQ and to contribute to its' successful evolution.

# APPENDIX A

## REFERENCES

**Sources of standards:**

- **(OSHA) – Occupational Safety and Health Administration**
- **(EPA) – US Environmental Protection Agency**
- **American Lung Association**
- **(ASHRAE) – American Society of Heating, Refrigerating and Air-Conditioning Engineers**
  **Standard 62-89 – Ventilation for Acceptable IAQ**
  **Standard 55-1981 – Comfortable Temperature and Humidity Ranges for People Engaged in Largely Sedentary Activities**
  **Standard 62-2000 – The amount of outdoor air considered adequate for proper ventilation.**
- **(ACGIH) – American Conference of Governmental Industrial Hygienists**
  **Guidelines for "Bioaerosol Assessment and Control"**
- **(ASTM) –American Society for Testing Materials**
- **New York City Department of Health and Mental Hygiene. Bureau of Environmental and Occupational Disease Epidemiology**
  **Guidelines on Assessment and Remediation of Fungi in Indoor Environments**
- **The Consumer product safety Council (CPSC) administers the:**
  **The Federal Hazardous Substances Act (FHSA)**
  **The Poison Prevention Packaging Act (PPPA)**
  **The Consumer Product Safety Act (CPSA)**
  **The Lead Based Paint Poison Prevention Act**
- **(NIOSH) – National Institute for Occupational Safety and Health**
- **National Toxicology Program (NTP)**
- **International Agency for Research on Cancer (IARC)**
- **American Indoor Air Quality Council**
- **U.S. Consumer Products Safety Commission (CPSC)**

# APPENDIX B

## DEFINITIONS

**Airborne Infectious Agents** – Human-generated infectious agents include viruses and bacteria. High occupant density and air circulation are agents of cause and effect.

**Air Cleaners** – Portable units that include humidifiers, dehumidifiers, air fresheners, ionizing devices, etc.

**Ambient Air (Quality Standards)** – Outside air is drawn into or mechanically introduced to the inside of a building. It therefore plays a role in the quality of the inside air. The quality of outside air is generally believed to be 200% to 500% better than indoor air. The Clean Air Act of 1990 requires monitoring levels of Carbon Monoxide, Lead, Particulate Matter, Fine Particulate Matter, Ozone, Nitrogen Dioxide, and Sulfur Dioxide.

**Arrestance Test** – A test used to reference the efficiency of an air filter.

**Asbestos** – A mineral fiber that was commonly used in building products because of its thermal and strength characteristics. It may be found in insulation, fire retardants, shingles, textured paints, floor tiles and many adhesives. Asbestos can cause cancer.

**Atmospheric Dust Spot Efficiency Test** – A more stringent test to measure the efficiency of an air filter

**Benzene** – Found in environmental tobacco smoke, stored fuels and paint supplies, and automobile emissions.

**Biological Contaminants** – Molds, mildew, viruses, animal dander, cat saliva, house dust mites, cockroaches, and pollen. Some of these contaminants trigger allergic reactions. Some release disease-causing toxins. Symptoms of health problems caused by biological pollutants include sneezing, watery eyes, coughing, shortness of breath, dizziness, lethargy, fever and digestive problems.

Building Related Illnesses are those illnesses that can be specifically identified, i.e.: Legionnaire's Disease, Asthma, Hypersensitivity, pneumonitis, and humidifier fever.

**Carbon Dioxide** – A colorless, odorless gas that can also be liquid or solid. It is exhaled and is also a diesel exhaust component. OSHA exposure limits are 5000 PPM, but we are concerned with levels 800 PPM above outdoor levels. Exposure to high levels may cause headaches, dizziness, restlessness, paresthesis, dyspnea, sweating, malaise, increased heart rate, elevated blood pressure, pulse pressure, coma, asphyxia, and convulsions.

**Carbon Monoxide** – A colorless, odorless gas that interferes with the delivery of oxygen throughout the body. Generally released as a by-product of combustion. Headaches, dizziness, weakness, nausea, confusion, disorientation, fatigue to death. Symptoms are often confused with the flu and food poisoning. OSHA exposure limits are 35-PPM Time Weighted Average.

**Environmental Tobacco Smoke (ETS)** – A mixture of the smoke from the burning end of a cigarette, cigar, or pipe and the smoke exhaled by the smoker. It is a complex mixture of over 4000 compounds, more than 40 of which are known to cause cancers and many others are strong irritants.

**Formaldehyde** – A by-product of combustion, it is also found in many building materials and household products. Lately it has gained particular favor in press-wood products. Exposure results in watery eyes, burning sensation in the eyes and throat, nausea, and difficulty in breathing.

**Humidity** – High humidity levels and/or the presence of water act as hosts for biological contaminants. Low humidity causes the eyes to dry out results in dry skin, etc. ASHRAE recommends comfort levels of relative humidity of 30% to 60%.

**HVAC System** -uses a combination of filtered outdoor and re-circulated indoor air that may be heated/cooled, humidified/dehumidified. There are several types of filters:

**The Standard Cardboard Frame Filters** – 15% effective in removing dust and particles from the air. They have no effect on pollens, microorganisms, and smoke or other similar pollutants. Some filters include an antibacterial coating that inhibits the growth of mold, mildew, bacteria and fungi on the filter media.

**Electrostatic Filters** – Pollutants are attracted to the filter. They are more effective than the standard filters but need to be cleaned much more often. They are 20% effective in removing dust and particles from the air.

**Mechanical Air Filters** – They capture up to 90% of all airborne pollutants including bacteria, dust, animal hair, dust mites, mildew, lint, fungus, smoke, cooking grease, bacteria and even many viruses

**Indoor Air Pollution**: Gases, Particles, and Microbial Contaminants

**Inorganic Compounds** -

**Lead** – Found in the air, drinking water, food, contaminated soil, deteriorating paint and dust. Lead attacks practically all systems within the body. At high levels it can cause convulsions, coma, and even death. Lower levels of lead can adversely affect the brain, central nervous system, blood cells and kidneys.

**Mold** - Thrives in damp, dark, and poorly ventilated places. They can grow on Virtually any organic substance as long as oxygen and moisture are present. Mold produces tiny spores to reproduce. Mold spores waft through the indoor and outdoor air continually. When mold spores land on damp spot indoors, they begin growing and digesting whatever they are growing on in order to survive.

**Multiple Chemical Sensitivity (MCS)** – Acquired disorder characterized by reoccurring symptoms in multiple organ systems occurring in response to exposure to many chemically unrelated compounds at doses well below established standards. Multiple exposures may be additive and unpredictable.

**Mycotoxins** -are fungal metabolites that have been identified as toxic agents.

**Nitrogen Dioxide** – A colorless, odorless gas that irritates the mucous membranes in the eye, nose and throat and causes shortness of breath after exposure to high concentrations. Respiratory infection to emphysema.

**Organic Chemicals** – most commonly used commercial products contain organic chemicals. Paints, varnishes, wax, cleaning disinfectants, paint strippers, adhesive removers, cosmetic and fuel products are all products that may release organic chemicals. Eye and respiratory tract irritation, headaches, dizziness, visual disorders, and some are linked to cancers. See Volatile Organic Compounds.

**Ozone** – A molecule of three atoms of oxygen. Found in the stratosphere it is a good thing. Office equipment, some air cleaners, bleach, deodorizing agents and outdoor air are sources of bad ozone. Bad Ozone is very corrosive and can cause lung inflammation and over time permanent lung damage.

**Perchlorethylene** – A by product of the dry cleaning process

**Pesticides** – As a class of chemical compound. The "cide" in pesticides means to kill. Included in this class are:

Disinfectants – are used in the control of microbes
Insecticides are used in the control of insects
Rodenticides are used in the control of rodents
Termiticides are used in the control of termites

**Radon** – A colorless, odorless gas, and radioactive gas that is released from the soil or rock as uranium naturally breaks down. It has also been found in well water. Exposure to high radon levels causes lung cancer.

**Respiratory Particulates (Particles**) – A number of pollutants such as radon and benzopyrene attach themselves to small particles (particles smaller than 2.5 micrometers) that are inhaled and carried deep into the lung. Airborne particulate matter can result in chronic bronchitis, respiratory infections and premature death.

.

**Sick Building Syndrome** – A situation in which building occupants experience acute health or discomfort effects in the form of headaches, dizziness, sinus congestion, itchy or watery eyes, scratchy throats, nausea, lethargy, and an inability to concentrate that "appear" to be linked with the time spent in the building.

**Stack Effect** – The pressure driven flow produced by convection (The tendency of warm air to rise). The stack effect exists whenever there is an indoor-outdoor temperature difference whose effect is to transport air quality contaminants between floors

**Temperature** – Temperature, like humidity can affect the behavior of many personal IAQ irritants. ASHRAE recommends winter comfort levels of 68 degrees to 76 degrees Fahrenheit

**Ventilation or Air Exchange Rate** – The number of times a volume of indoor air is replaced by an equal volume of (fresh) outdoor air.

**Volatile Organic Compounds** – There is a growing concern that highly irritating VOCs (Aldehydes) are being produced by chemical reactions between less irritating but common VOCs and oxidizers such as ozone. See Organic Chemicals.

**Wind Effect** – Creates local areas of high pressure (on the windward side) and low pressure (on the leeward side) of buildings. The wind effect is to transport air quality contaminants to move between rooms at the same level.

# APPENDIX C

WESTERN CONNECTICUT STATE UNIVERSITY

INDOOR AIR QUALITY INVESTIGATION CHECKLIST

Name of Person:

Date:

Location:

Employee Related Questions

Type of symptoms:
_____

When did symptoms begin:
_____

Time of day, duration and frequency of symptoms: _____

_____

Number and location of others affected:_____

_____

Any recent occupational or non-occupational changes: ☐ Yes ☐ No

Any past history of concerns in the area: ☐ Yes ☐ No

Building Related Questions

Are outside air intake dampers in position to provide at least 20cfm of outside air per person (ASMRAE 62-1889) ☐ Yes ☐ No

Possible cross contamination of outside air intakes ☐ Yes ☐ No
Possible contaminants _____

HVAC filters changed per PM schedule ☐ Yes ☐ No

Microbiological growth in wet areas ☐ Yes ☐ No
(ducts, condensate pans)

Changes in work schedule ☐ Yes ☐ No

**IAQ Investigation Checklist (Continued)**

Any pollution generating sources in work areas ☐ Yes ☐ No
(copiers, chemicals)

Recent maintenance or construction activities ☐ Yes ☐ No

Any possible non-IAQ causes (glare tension) ☐ Yes ☐ No

# APPENDIX D

WESTERN CONNECTICUT STATE UNIVERSITY

INDOOR AIR QUALITY OCCUPANT INTERVIEW

Building Name:

_____

Location:

_____

Occupant Name:

_____

Completed by: _____

Symptom Patterns

What kind of symptoms or discomfort are you experiencing?

_____

_____

Are you aware of other people with similar symptoms or concerns? ☐ Yes ☐ No

Do you have any health conditions that may make you particularly susceptible to environmental problems?
☐ Contact Lenses ☐ Allergies ☐ Cardiovascular Disease ☐ Respiratory Disease

Timing Patterns

When did your symptoms start?

_____

When are they generally worst?

_____

Did they go away? ☐ Yes ☐ No If so, when _____

Have you noticed any other events that seem to coincide with your symptoms?
☐ Yes ☐ No

# APPENDIX E

WESTERN CONNECTICUT STATE UNIVERSITY

INDOOR AIR QUALITY OCCUPANT DIARY

On the form below, please record the time and date and your location as accurately as possible. Try to identify thins going on around you (e.g., copier usage, maintenance work). Describe the severity and duration of the event. Any other observations that you think may help in identifying the cause of the problem should be noted in the "comments" column. Feel free to attach additional comments to help describe your observations.

| Time/Date | Location | Symptom | Severity/Duration | Comments |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# Appendix F

Building Profile

It is important to maintain a set of records for each building in order to help focus any IAQ investigation, and to help support a knowledge base of good IAQ products, procedures and practices. A Building Profile will consist of:

- Original Construction Records
  a). As built records

- Renovation Records
  a). As built records
  b). Pre-renovation environmental impact study

- Interior Decorating Records

- Designated Storage Areas
  a). Identification of stored items
  b). Magnitude of stored items

- Maintenance Records
  a). Project Records
  b). Pre-project environmental impact study
  c). Maintenance work orders
  d). Environmental accident Report

- Custodial Records
  a). Procedures and policy
  b). Schedule of operation
  c). (Where appropriate) Pre-operation impact study

- IAQ Measurement Records

- IAQ Investigation Records

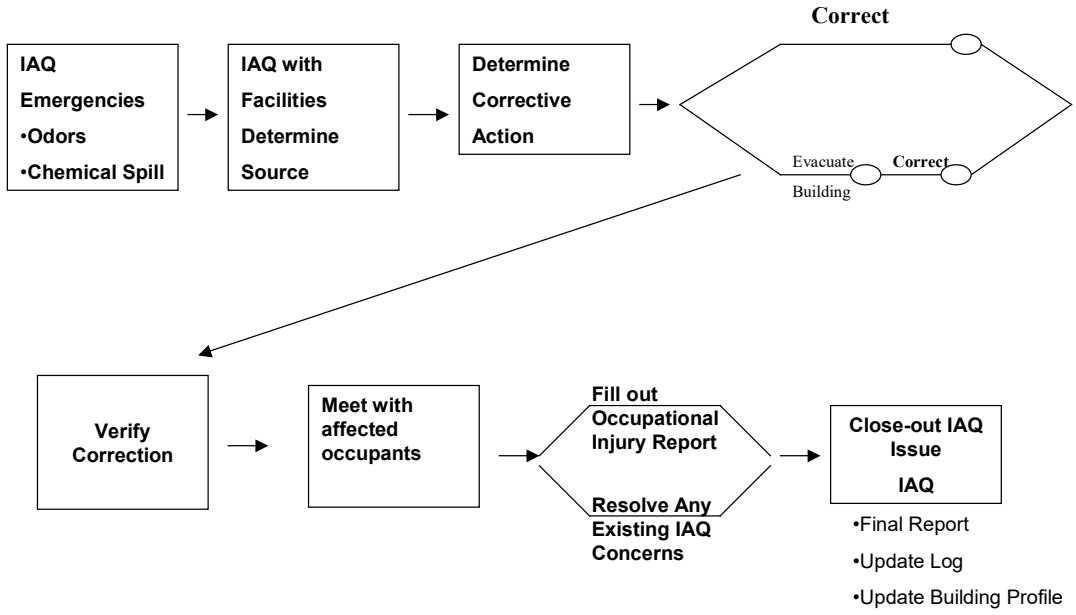
- Training Records

- Building Committee Meeting Minutes

# Appendix G

## Level 1- IAQ Issue Response

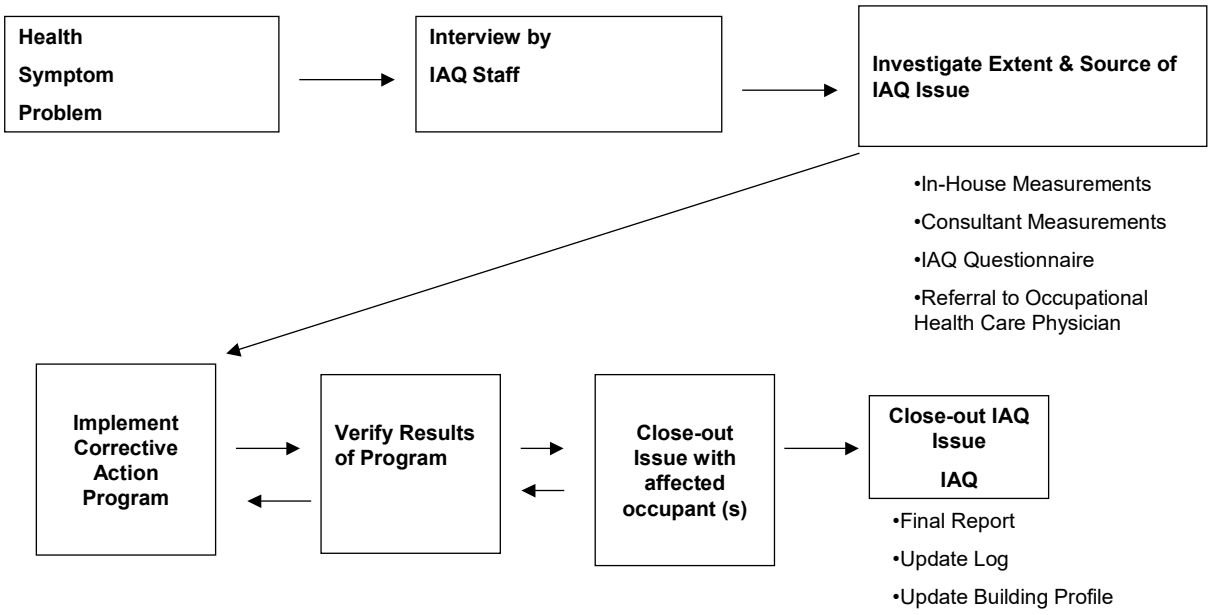
## IAQ Issue Response



# Appendix H

## Level 2- IAQ Issue Response

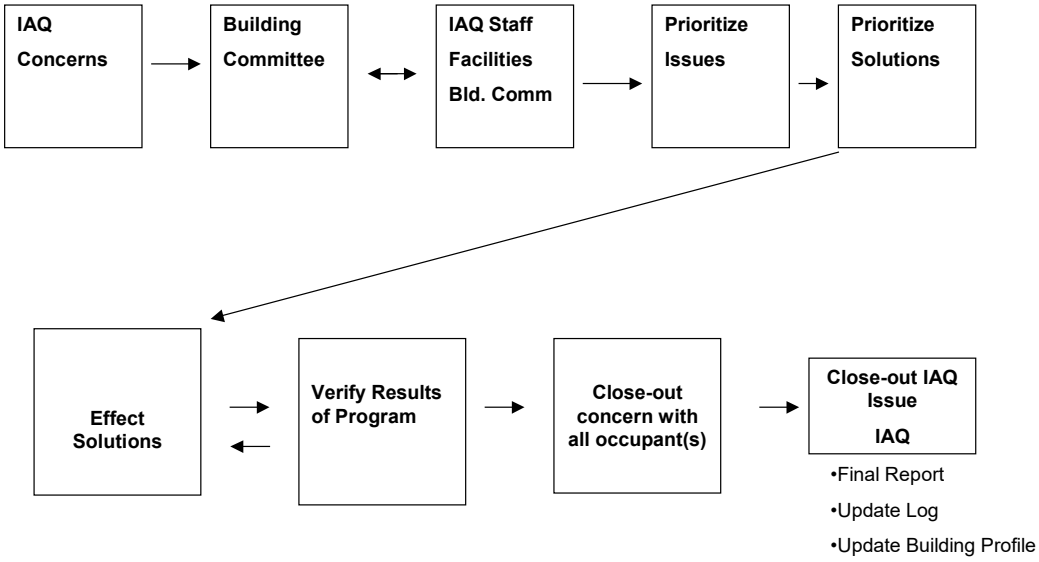
## IAQ Issue Response



# Appendix I

## Level 3- IAQ Issue Response

## IAQ Issue Response



## University Certification

Procedure E-106 (Indoor Air Quality Management Plan), for the Western Connecticut State University campus located in Danbury, Connecticut, has been reviewed and approved by the appropriate personnel at Western Connecticut State University. The procedures in this plan will be implemented and amended, as necessary, due to expansions, modifications, and improvements at the campus.

Signature:  Date: 4/22/2020

Luigi Marcone
Chief Facilities Officer & Associate Vice President for Campus Planning
Telephone Number: (203) 837-9314
Western Connecticut State University
181 White Street
Danbury, Connecticut 06810