



Indoor Environmentalist -Fundamentals Level

Course Syllabus

The Indoor Environmentalist Fundamentals Level training program is designed to assist with the development of professionals interested in providing indoor environmental quality (IEQ) investigations, reporting results and make recommendations for solutions for IEQ problems in residential buildings. The course is taught over a three-day period.

This course provides the fundamental information necessary to perform many types of indoor environmental quality investigations including; moisture and microbial issues, allergens, toxic substances such as pesticides, and much more. There is no instruction on dealing with sound, lighting, ergonomics, electromagnetic fields and other less common IEQ related issues. *This course does not provide certification or licensing for regulated areas such as asbestos and lead paint but does provide important information on these IEQ topics that all IEQ professionals should know.*

Those starting out in this field should have or develop a strong team of professionals to assist them with specific areas. Examples of the type of team members include; laboratories, legal professionals, building scientists, medical professionals, industrial hygienists and others. It is crucial that those taking this course realize that often times a mentor is vital to ensure that you do not get in over your head on this type of project. IEQ issues often times involve the health of occupants and anytime you are dealing with health issues it is vital to know your limits and know who to call when you reach those limits. Experience IEQ professionals should be contacted to help mentor those new to the industry.

Day One – AM

Chapter 1 - Introduction to Indoor Environmental Quality

Chapter one of the Indoor Environmentalist -Fundamentals course provides students with an overview of the history of IEQ issues in the U.S. This entails related associations and agencies involved with IEQ. Students will learn the definitions of IEQ, and an overview of what Permissible Exposure Limits (PEL's), Threshold Limit Values (TLV's) and Recommended Exposure Levels (REL's) are and how they are related to IEQ. Upon conclusion of the chapter students will be able to:

- Discuss the History of Indoor Environmental Quality
- Recognize the Related Associations and Agencies
- Define Indoor Environmental Quality
- Discuss the concept of Permissible Exposure Limits
- Identify what Bioaerosols are and their importance to IEQ

Chapter 2 – Introduction: Essentials for Healthy Homes - National Center for Healthy Housing (NCHH)

Chapter two introduces the National Center for Healthy Housing (NCHH) “Essentials for Healthy Home Practitioners” curriculum to the indoor environmentalist students. The “Essentials” program from the NCHH provides a way of understanding how public health professionals, code officials, and others are commonly taught to deal with indoor environmental quality issues in residential properties. Chapter 1 introduces the key concepts behind the “Essentials of Healthy Housing” approach to IEQ issues. Upon conclusion of the chapter students will be able to:

- Recognize the link between housing and health
- Recognize that certain groups are at greater risk for adverse health effects
- Identify the basic public health and housing principles that can help us understand the link between housing and health
- Recognize that the “Healthy Homes” movement is a holistic approach to promote health through better housing
- Recognize that codes and regulations are tools that can help you achieve healthier housing in your community

Chapter 3 – Introduction to Health Effects - Start with People

Chapter three introduces an important concept that is at the foundation of the National Center for Healthy Housing (NCHH) “Essentials for Healthy Home Practitioners” curriculum. The “Essentials” program emphasizes that people are the reason we are concerned about IEQ. Chapter three goes into detail on this topic along with the following:

- Understand why we should “Start with People”
- Compare methods for interviewing occupants
- Identify routes of exposure
- Recognize categories of health effects
- Recognize the signs and symptoms of housing related disease
- Determine how you can identify housing conditions that may affect health

Day One - PM

Chapter 4 – The House as a System

Chapter four introduces the concept from the NCHH program that houses are a group of systems that are designed to work together. It provides an introduction to the types of systems found in homes and identifies how they may affect health of occupants. Upon conclusion of the chapter students will be able to:

- Recognize that there are many different types of houses
- Identify the different types of systems in homes
- Recognize what factors affect the health of homes

Chapter 5 – The Seven Principals of Healthy Housing

Chapter five introduces the NCHH principles of healthy housing and goes into some detail about each of the seven principles of healthy housing. Students learn the seven principles including, keeping homes dry, ventilated, contaminant free, clean, pest-free, safe, and maintained. These principles provide a framework that is easy for the indoor environmentalist and the home owner or occupant to understand. The principles are also an effective way of helping to control indoor environmental quality. There is not enough time in the three day course to go into detail on each of the seven principles so class time will be used to highlight the most important principles in detail. Students will be given the assignment to read these full chapters. Upon conclusion of the chapter students will be able to:

Keep it Dry

- Recognize that excess moisture creates conditions that can affect health
- Understand that moisture in the home comes from inside and outside
- Explain that excess moisture in the home should be prevented through appropriate construction methods and plumbing systems, temperature control, ventilation, and proper maintenance

Keep it Ventilated

- Recognize that ventilation plays an important role in maintaining health
- Explain how ventilation is necessary to remove humidity and dilute or remove contaminants
- Explain that local exhaust ventilation removes contaminants from a point source, while whole house ventilation uses fresh air to dilute contaminants

Keep it Contaminant Free

- Recognize that it is easier to prevent exposure to contaminants than it is to remove them and treat their effects
- Explain that should contamination occur: control, contain, and cleanup
- Illustrate that contaminants are not always detectable by our senses

Keep it Clean

- Recognize that pesticides, allergens, and general chemicals in the home can cause allergic reactions, asthma and asthma exacerbation, and toxic exposure effects
- Give examples of the potential sources of allergens and contaminants in the home that come from outdoor and indoor sources
- Explain that keeping a home clean includes controlling the source, creating smooth and cleanable surfaces, reducing clutter, and using effective cleaning methods

Keep it Pest Free

- Recognize that pests can create allergens and be vectors of disease
- Explain that control of pests through pesticides can lead to poisonings and other neurological problems
- Explain that some pesticides found in homes have been banned
- Explain that making homes less hospitable for pests includes preventing entry, controlling food, water, and places for shelter
- Recommend that Integrated Pest Management (IPM) is the best strategy

Keep it Safe

- Recognize that injuries are not accidents, they are preventable
- Understand that there are many simple and inexpensive ways to prevent home injuries
- Explain that children and older adults are more at risk for injuries in the home
- Explain why falls, poisoning, and fires/burns are the most common causes of injury deaths in homes

Keep it Maintained

- Explain that systems should be inspected regularly to ensure proper function
- Distinguish between maintenance activities that require the use of trained professionals and activities that can be done by homeowners

Day Two – AM

Chapter 6 – The Science of Indoor Environmental Quality

Chapter six provides an overview of the scientific foundation behind the practice of indoor environmental quality consulting and remediation. Attendees are given an overview of the important science based foundation behind the practice of indoor environmental quality investigation and remediation. Upon conclusion of the chapter students will be able to:

- Recognize that the foundations of their practice are the Physical Sciences
- Understand the Metric System and its importance to IEQ measurement, report interpretation and building science
- Explain the mechanism's of Moisture Transfer
- Understand the origins of air flow

- Understand the mechanism's of heat transfer
- Understand how using psychrometrics can be important in helping solve IEQ problems

Chapter 7 – Industrial Hygiene and IEQ

Chapter seven provides an overview of the art and science of industrial hygiene as related to indoor environmental quality issues. Anticipation, recognition, evaluation and control of indoor environmental quality issues are the foundation behind how industrial hygienists view IEQ issues. Attendees will also learn about the following key concepts and strategies of industrial hygiene as related to IEQ. Upon conclusion of the chapter students will be able to:

- Define industrial hygiene as explained in the OSHA document “The Occupational Environment: It’s Evaluation, Control and Management”
- Recognize key points from “The Occupational Environment: Its Evaluation, Control, and Management”
- Recognize what health professionals are encouraged by EPA to understand about IEQ in the document “Indoor Air Pollution an Introduction for Health Professionals”

Chapter 8 – Common IAQ Contaminants

Chapter eight is a review of the common IAQ Contaminants as described by EPA documents required for the American Council of Accredited Certification (ACAC) Certified Residential Indoor Environmentalist (CRIE) program. ACAC requires that those wishing to be certified through this entry level program can answer the following questions about the contaminants within the EPA document “Reference Guide to Major Indoor Air Pollutants in Your Home.”

1. How can I identify this contaminant (chemical structure, physical appearance, etc)?
2. Where or when is this contaminant most likely to be found in the residential environment?
3. What health effects may result from exposure to this contaminant?
4. What steps can I take to reduce exposure to this contaminant?

The contaminants outlined include:

Asbestos, biological pollutants, radon, Carbon Monoxide, Carbon Dioxide, Lead Paint, Formaldehyde, Nitrogen Dioxide, Pesticides, Respirable particles, Environmental Tobacco Smoke, Combustion Products and Volatile Organic Compounds (VOC's)

- Understand the EPA document “Reference Guide to Major Indoor Air Pollutants in Your Home”
- Recognize where to go for additional information on specific IAQ contaminants
- Discuss answers to the questions outlined above and found on the ACAC exam for CRIE

Day Two – PM

Chapter 9 – Building Science

Understanding building science is vital to understanding how some IEQ problems develop and how they are solved. This chapter provides an introduction to building science and lists some of the most important documents and resources for more information on building science. The key concepts of building science are discussed and specific examples of how to use building science to evaluate and solve IEQ issues is explained and illustrated. Upon conclusion of the chapter students will be able to:

- Understand the foundations of Building Science
- Explain the EPA Pen Test as described in the EPA document “Moisture Control Guidance for Building Design, Construction and Maintenance”
- Recognize what has changed about buildings over the past 50 years that can lead to IAQ problems today
- Identify the types of moisture issues commonly found in residential buildings.
- Use the issue of damp crawl spaces to illustrate how building science can explain the reason buildings get damp and provide solutions
- Locate important building science resources

Chapter 10 – Heating Ventilation and Air Conditioning (Residential)

The heating ventilation and air conditioning (HVAC) system in homes can be both the source of and transport mechanism for indoor contaminants. In this chapter we look at the types of residential HVAC systems and the different types of components and equipment that are part of the HVAC system. Indoor Environmentalists must have a good understanding of how HVAC systems work and what can go wrong when they are not working properly. The large variety of HVAC systems can be a challenge for IEQ professionals and this chapter is designed to give them a solid foundation about residential HVAC issues on which to build. We also provide resources for further study and understanding of HVAC systems. It is important for attendees to recognize that this is only the foundation and that they will most often need to continue their studies in this important area. Upon conclusion of chapter ten students will be able to:

- Explain what HVAC is and why it’s important when it comes to IEQ issues
- Discuss how HVAC and IEQ are inextricably linked
- Describe the different residential HVAC System Types
- Describe various types of residential HVAC equipment and components

Day Three – AM

Chapter 11 – Residential IEQ Diagnostics and Sampling

This chapter provides specifics on how to use simple diagnostics and more complex testing or sampling to help with IEQ investigations and reports. We start with emphasis on how all diagnostics and testing should be used within the larger context of providing an investigation that follows the steps outlined in our chapter on investigation and report writing. Sampling should be used to answer questions or prove/disprove a hypothesis. From there we discuss the various types of simple diagnostics and more complex diagnostics (sampling) for IEQ issues. The foundation of the discussion of various types of sampling is on understanding the “data quality objectives” for the project. In addition we discuss environmental measurement instrument variables such as accuracy, range, resolution and sensitivity. The final discussion is on how to interpret various types of sample results with an emphasis on microbial sampling results. Upon conclusion of the chapter students will be able to:

- Understand Basic Measurements Techniques
- Discuss how to develop data quality objectives for the project
- Discuss how accuracy, range resolution and sensitivity affect choices on diagnostics and sampling
- Explain the difference between simple diagnostics and complex diagnostics
- Describe the types of diagnostics used by IEQ investigators
- Discuss Microbial Sampling Types and Issues –Fundamentals Level
- Discuss Interpretation of sampling results
- Discuss Final Clearance/Post Remediation Verification on IEQ projects
- List other Types of IEQ Sampling –Introduction to Intermediate level materials

Chapter 12 – Residential IEQ Investigations & Reports

Chapter twelve is designed to provide a framework for indoor environmentalists to perform IEQ investigations and report on their findings. We use various references from recognized authorities such as EPA and OSHA plus industry standards to help IEQ professionals develop their own framework for performing IEQ investigations and reporting the results. Standards such as the ASTM D7297 “Standard Practice for Evaluating Residential Indoor Air Quality in Your Home” are used to illustrate how a proper investigation should be done. This chapter includes an emphasis on how procedures for a systematic investigation using the iterative process that includes problem definition, information gathering, formulation of hypothesis measurements (if necessary) and problem identification as outlined by ASTM is used to evaluate and provide the foundation for a report on IEQ issues in residential properties. Upon conclusion of the chapter students will be able to:

- Explain the ASTM “Standard Practice for Evaluating Residential Indoor Air Quality in Your Home”
- Discuss EPA, OSHA and other publications related to IEQ investigation and reporting
- Developing an IEQ investigation and report

Chapter 13 – Introduction to Remediation of Indoor Environments

IEQ investigations can be proactive but are more commonly requested to find solutions to existing problems within buildings. Understanding the fundamentals of the remediation of indoor environments is a crucial for indoor environmentalists. This chapter provides an overview on what we refer to as indoor environmental contracting. For some IEQ related remediation projects contractors may need to be licensed to do the type of work being specified, for others certification may be more appropriate and for many common indoor environmental contracting projects there is no specific certification, license or accreditation required. Knowing how to develop a scope of work, who to use for the work and how to determine when the project is complete are important topics for indoor environmentalists’. IEQ pros must know what standards, guidelines and regulations apply to the work being recommended. This chapter goes into the fundamentals on this subject and provides resources to help finding other solutions to these issues. Upon conclusion of the chapter students will be able to:

- Explain the concept of Indoor Environmental Contracting
- Discuss the critical concepts for Indoor Environmental Contractors
- List the principles of Indoor Environmental Contracting
- Develop a scope of work for a project
- Understanding Water Damage Restoration & HVAC Cleaning and Restoration
- Recognizing the complexities and liabilities behind Asbestos & Lead Abatement
- Explain the nuances of Mold Remediation
- Determine when a project is complete, final clearance post remediation verification, etc.

Day Three – PM

Instructor led hands on activity - walk through a residential property to look at the building envelope, HVAC and other systems. During the walk through attendees take notes and perform simple diagnostics for Temperature, Relative Humidity, CO, CO₂, VOC’s and particles using a six channel laser particle counter. Also, they will map pressure differentials between rooms and note visual and olfactory observations.

Following the hands-on walk through class reconvenes for participants to compare their observations, discuss their findings and recommendations for either more investigation or for remediation of issues noted during the walk through.