

Final Project Guidelines



Bringing together technology and design methods to provide the information needed to create healthy homes and workplaces



Final Project: Putting Building Biology® Principles in Practice

This final project is the home stretch for your certification as a Building Biology Environmental Consultant. You are expected to demonstrate understanding of and proficiency in applying the testing protocols, analysis methods, data interpretation and new home design methods as taught in IBE's 200-level seminars:

1. IBE 211, *Indoor Air & Water Quality*
2. IBE 212, *Electromagnetic Radiation*
3. IBE 213, *Natural Healthy Building & Remodeling Practices*.

You will be working with a mentor who is an experienced BBEC. IBE will assign your mentor to you, based on the best match of a mentor's established skills and your stated goals. While IBE will make every effort to accommodate student requests for a particular mentor, IBE does not guarantee that the mentor requested will be available during the time frame you have selected, and IBE reserves the right to assign an alternate mentor to you.

Your mentor has volunteered for this responsibility, and is committed to devoting three to four hours aggregate of their time to your undertaking, via phone and e-mail, at no cost to you. Should your mentor agree to grant you additional time, and/or their more personalized involvement (for example, inviting you to accompany them on client house calls), with or without assessing a fee for their additional commitment, is solely at your mentor's discretion.

You must pass this final project in order to become a certified Building Biology Environmental Consultant (BBEC). Passing or failing this project rests solely on your mentor's judgment as to your ability to safely and effectively carry out the Building Biology assessment process. Please spend enough time interviewing your mentor prior to their selection to ensure that you and your mentor are suited to each other and that you can depend on full and accurate communication between the two of you.

We at the Institute look forward to welcoming you into our international community of certified Building Biology Environmental Consultants.

Part A: Home Assessment and Report

Conduct a home assessment and write a detailed report to your client explaining your findings. There are a number of core requirements that must be part of your assessment. These are listed on page 3 of this document. The sample report format recommended in the *IBE Business Support Program* (available soon) will be used as your template for this report. The maximum time to complete Part A is three months from the date of your assignment to a mentor.

Based on the specifics of the home you are going to evaluate, it may be advisable to look at additional environmental factors. All environmental factors are listed in the IBE document: *BBEC: Assessment Procedures v3.1*. You and your mentor will discuss the home you are going to assess and decide what additional factors need to be addressed. When you write your proposed assessment strategy for your mentor, please include an

explanation of why you decided to include other attributes beyond the core elements.

Remember, the purpose of this project is to perform your first assessment—*not* to execute the recommended mitigations. Should you discover the need for mitigation, you will need to reach out to a certified BBEC; your mentor can advise you in this.

While we are focusing on a subset of the BBEC Assessment protocol elements, you are expected to develop proficiency in all elements of the assessment procedure. This will occur over time as you encounter situations that demand these elements be assessed.

What you need to do now:

1. Discuss your specific assessment home and the assessment elements with your mentor. (You may NOT use your own home. We want you to interact with a client.)
2. Write a proposed BBEC Home Assessment Plan using the subset of the Building-Biology® Assessment Procedures that you and your mentor have selected.
3. Submit proposal to your mentor for review, discussion, modification and, finally, approval.
4. Upon approval of assessment plan, conduct the assessment of the home.
 - a. For EMF assessment use the IBE Protocol: *Measurement of Non-ionizing Radiation in Low-rise Residential Buildings* provided in the IBE 212 student materials.
 - b. For Indoor Air Quality Assessment use the *Indoor Air Quality Measurement Instructions* which are part of this document.
 - c. Any additional elements decided on with your mentor
5. Write a report following the *Business Support Program* report template. Include photos, diagrams if useful, results and mitigation recommendations.
6. Submit the report to your mentor. Your mentor will review the report and give you a *Pass*, or contact you to discuss further fine tuning.

Note: You are not yet a certified BBEC; Please do not present yourself as one. You may negotiate a nominal fee with your client if you desire to do so.

IBE will rent a kit with all of the test equipment and supplies needed to perform the core tests. This kit can be rented for 5 days for \$150 not including return shipping (USA and Canada Only). Renting the kit requires a \$1200 credit card deposit. Additional details on page 6.



Core Testing Requirements

1. Measurement of Indoor Air Quality factors

a. Mold Level:

- Spore trap sampling (a snapshot in time) of indoor air to determine the probability of indoor mold growth; interpretation of findings for the client.
- ERMI Analysis (historical sample) of indoor dust to determine the probability of indoor mold growth (using a limited ERMI test); interpretation of findings for the

- client.
- b. **Air Particulates:**
 - Analysis of indoor dust to identify the types of particulate; interpretation of findings for the client.
 - c. **VOC and MVOC Levels:**
 - Sampling and analysis of indoor air for ‘top ten’ Volatile Organic Compounds; and Microbial VOCs; interpretation of findings for the client.
 - d. **Temp, RH, Dew Point:**
 - Measurement and interpretation of findings for the client.
2. **Measurement of Electromagnetic Radiation**
- a. **Magnetic field** mapping of all rooms; interpretation of findings for the client; remediation plan.
 - b. **Body Voltage** assessment in bedrooms; interpretation of findings for the client; BV reduction plan.
 - c. **Radio Frequency Radiation** measurement; interpretation of findings for the client; remediation plan.
 - Interior RF levels; ID sources
 - Exterior sourced RF levels; probable sources

Part B: Building Science/Building Biology Analysis & Improvement Report

Using the building that was the subject of part A, conduct a written analysis of the building from a building physics perspective which includes the movement of air gasses, temperature and moisture through the building. The maximum time to complete Section B is two months following the completion of Part A.

1. Begin with a written history of the building describing its floor, wall and roof construction. If these are not accessible then describe probable construction information based on its age and location. Record any specific site influences such as sun, wind and drainage patterns.
2. Where elevated levels were found for any of the Indoor Air Quality parameters or where potential problems were observed upon visual inspection (even if these have not yet affected IAQ measurement parameters) conduct a building science analysis of the building and describe the physical forces that were at play that caused the problem. Suggest improvements or renovations that could be carried out on the building and prioritize them. Explain:
 - What you propose on a limited budget
 - What you would propose given unlimited funds and if tearing down the building is not an option
3. Once basic building errors were fixed what further improvements would you suggest based on the principles of Building Biology

- List the Building Biology principles that you would address (<http://hbelc.org/pdf/standards/25Principles.pdf>).
 - Prioritize the improvements that you would make in terms of budget and effectiveness.
4. How would you educate the owners to alter their behavior within the building to improve IAQ . Write an outline for the contents of an “Occupant’s User Manual” to help the Owners achieve this objective.

Core Testing Detail

IAQ Evaluations

A. Mold In Air Evaluation

- 3- Air-O-Cell cassettes in the rental kit; purchase more from lab.
- Use *Pro'sKit MS-C001* vacuum pump.
- Collect air sample per the *IAQ Measurement Instructions* which follow.
- Send cassettes to the recommended lab.



B. Limited ERMI Mold Evaluation

- 1- *DustChek* vacuum cleaner cassette in the rental kit or purchase more from the recommended lab.
- Vacuum areas of house per the *IAQ Measurement Instructions* which follow.
- Send cassette to the recommended lab.



C. House Dust Characterization

- Collect house dust per the *IAQ Measurement Instructions* which follow.
- Send dust sample to the recommended lab.

D. Limited VOC and MVOC Assessment

- 1- VOC sorbent tube and collection pump supplied in rental kit (extra tubes can be ordered from the recommended lab).
- Collect sample using sampling pump in the rental kit following lab instructions.
- Send sorbent tube to the lab.



EMR Evaluations

A. Body Voltage Assessment

- Follow Body Voltage Assessment Protocol from the *IBE 212 Seminar Book v3.8*, page 82.
- Do bedrooms of all family members.
- Rate conditions according to *The Standard of Building Biology Testing Methods SBM-2008C*.
<http://hbelc.org/pdf/standards/SBM-2008C-v3.6.pdf>

B. AC Magnetic Field Assessment

- Follow the IBE Protocol: *Measurement of Non-ionizing Radiation in Low-rise Residential Buildings v7.1*, page 14. (Document is in Student Materials from IBE 212)
- Rate conditions according to *The Standard of Building Biology Testing Methods SBM-2008C*

C. RF Power Density Assessment

- Follow the IBE Protocol: *Measurement of Non-ionizing Radiation in Low-rise Residential Buildings v7.1*, page 16
- Rate conditions according to *The Standard of Building Biology Testing Methods SBM-2008C*

IBE Rental Kit: Equipment, Expendables & Terms

IAQ Equipment

- Air sampling Pump for use with Cassettes¹
Value: \$30
- Hygro-Thermometer
Value: \$400
- VOC Sampling Pump
Value: \$250



EMR Equipment

- AC Magnetic Field Meter- *Tesla-Tronics* 3-axis
Value: \$350
- RF Power density- GegaHertz HF59B
with UBB-27 and Log-Per Antennas
Value: \$1700
- Body Voltage Kit
Value: \$150



Shipping Case Value \$300

Expendables

- 3- Air-O-Cell Spore Traps
- 1- DustChek vacuum cassette
- 1- VOC Sorbant Tube



Sorbant Tube

Rental Terms

Rental cost: \$150 for five days in your hands (plus 4 days shipping)
 Rent beyond 13 days total time including shipping: \$50/day
 Deposit: \$1200 via credit card hold
 Shipping: USPS Priority mail 2 days to most zip codes in the USA
 Shipping Weight: 10 lbs (approximate)
 Total Equipment Value: **Insuring return shipment for \$3000**

¹ Zefon Air-O-Cell cassettes or Allergenco cassettes requiring 15 liter per minute air flow.

Estimate of Project Costs

| | |
|--------------------------------------|-------|
| Test Kit Rental | \$150 |
| Expendable Supplies ² | \$30 |
| Shipping & Handling | \$115 |
| Mold in Air | |
| Lab Fee (3) | \$45 |
| Limited ERMI for Mold | |
| Lab Fee | \$95 |
| Limited Dust Characterization | |
| Lab Fee | \$30 |
| Limited VOC/MVOC | |
| Lab fee | \$73 |
| Total | \$533 |

- We require a deposit using a credit card hold for \$1200 to cover the cost of damage to the equipment. Please insure your return shipment for \$3000 unless you can cover the loss of the shipment out of your own pocket.
- We expect you to return ship the equipment at your own expense, clean, undamaged in operating condition and packaged as delivered so as to avoid equipment damage in the return shipment.

These costs are applicable as of August 2016.
Please check early with supplier for current testing costs.
Your shipping cost to labs is not included in the above estimate.

² 3 Air-O-Cell Cassettes, 1-DustCheck, 1- Sorbant tube for VOCs

VOC & MVOC TESTING

Lab:

Prism Analytical Technologies, Michigan - 989-772-5088 – www.pati-air.com

VOC (Volatile Organic Compounds) can be tested by collecting air with a low-flow pump into a specially-prepared tube. The same air sample can also be used by the lab to report MVOC (Microbial VOC) levels. Quantities are reported by the lab in ppb (parts per billion) and in ng/L (Nanograms per Liter).

Supplies needed:

- Mini sampling pump and collection tube is in the Rental Kit (more tubes available from the lab).
- A Chain of Custody form, available from the lab's main webpage www.pati-air.com (bottom of main webpage).

Instructions:

1. Break transport glass tube (follow instructions provided with the tube) and retrieve the testing tube. Look for the arrow on the charcoal containing testing tube. Insert the tube into the plastic sampling tube with the arrow aimed towards the pump.
2. Write down the start time and turn the pump on.
3. Collect the air sample for 2 hours and 20 min. For best results, a minimum of 2 hours of sampling is required.
4. Place tube in the protective flask provided, place the flask in the foam wrapper which will then be placed inside the cardboard transport tube.
5. Return the filled-out COC form, equipment and tube to the lab via USPS (regular mail is fine).
6. Please advise the lab in writing with your shipment that you are an IBE student to whom the lab has extended a discounted price of \$68 (arranged by Martine Davis).
7. Within 5 business days from the lab's receipt of your sample, you will be mailed a lab report indicating a total VOC level, a total MVOC level and the top 10 Compounds recovered from your air sample.
8. Analyze the report and provide information to your client about possible sources of these chemicals in their home or office.
9. Provide solutions to lower VOCs and MVOCs, if applicable.

MOLD TESTING

Lab:

Hayes Microbial, (804)562-3435 3007, East Boundary Terr, Ste F Midlothian, VA 23112 www.hayesmicrobial.com

Supplies needed:

- An air sampling pump set to 15 LPM (Liters per Minute) or use Pro'sKit Vac provided in your IBE rental kit which pumps at nearly 15 LPM.
- Four fresh AA Batteries are installed in pump with this orientation Pull out the paper tab at bottom of pump to connect batteries
- Three (3) Air-o-Cell (AOC) sampling cassettes provided in rental kit. (More available from EM Lab P&K <https://www.emlab.com/app/store/Store.po>).
- A timer (kitchen timer or use cell phone stop watch).
- A Ziploc bag large enough to hold the 3 Air-o-Cell cassettes.



Instructions:

1. Write sample numbers on cassettes (month, day and sequential sample number).
2. At location you wish to sample, remove labels from each side of cassettes. Fit vac tube into outlet of the air-o-cell using adapter supplied with pump. It should fit snugly.
3. Collect one 5-minute air sample outdoors, at least 15 ft away from structure.
4. Collect (2) 5-minute air samples inside. If an area is of concern to client, an air sample would be collected there and another air sample from no concern area³.

If no specific area is a concern, then collect samples as appropriate for the situation³ (You can collect more than 3 sample if situation warrants.):

Note: Do not collect air samples from crawlspaces or attics unless there is a specific objective³.

5. Obtain a Chain of Custody form from Hayes Microbial. The form is downloadable from the lab website www.hayesmicrobial.com
6. Fill out the COC Form with your name, phone number, email address, your sample numbers, sample location and desired analysis (code for analysis of air samples is S+ for indoors and S for outdoors). S+ provides additional details about the air sample such as pollen, mold fragments, dander, etc.

Note: Dander, an aggregate of skin cells from animals and humans, is used as an indicator of cleanliness or level of housekeeping. Even houses with no pets can have high quantities of residual dander. Mold fragments can be an indication that mold has been disturbed or that mold is present even if little or no mold spores were found in the air sample.

7. Send your samples regular mail to the address on the COC form.
8. Within 24 hours of receiving your samples, the lab will email a report.

³ Consult your mentor

PCR TESTING (A Limited ERMI Test)

Lab:

AssuredBio, 228 Midway Lane, Suite B, Oak Ridge, TN 37830 (865)813-1700
www.Assuredbio.com

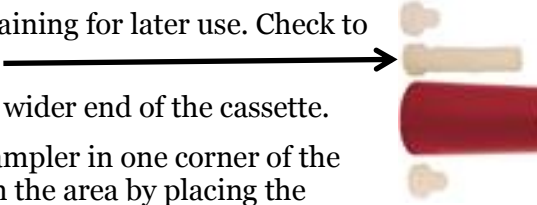
PCR Testing can be performed using a Swiffer cloth or a vacuum with a DustChek™ collector. For the purpose of this project, you will use the vacuum and DustChek™ and order a “TOXIC MOLD SCREEN” from this lab which utilizes the MS-QPCR method (DNA testing) for the identification and quantification of *Penicilium/Aspergillus* and *Stachybotrys chartarum*. Price is \$45.

Supplies Needed for the vacuum method:

- A vacuum cleaner or vacuum pump.
- A DustChek™ collector provided in the rental kit. (More available from emlab.com [\$7]).
- A Ziploc bag to store the DustChek™ sample for transport.

Detailed Instructions (vacuum method):

Dust samples are collected by vacuuming approx. 2 m² in the living room and 2 m² in a bedroom for 5 minutes each with the DustChek™, directly adjacent to the sofa or bed.

1. Remove the top and bottom caps and set aside, retaining for later use. Check to make sure the cassette contains the collection filter. 
2. Insert the hose attachment of the vacuum into the wider end of the cassette.
3. Start the vacuum. Start the stopwatch, place the sampler in one corner of the marked sampling area, and begin to collect dust from the area by placing the collection end of the DustChek™ in contact with the sampling surface.
4. Slightly tilt the sampler to one side to allow a slight gap between the sampling surface and the sampler. (If allowed to remain flush to sampling surface airflow will be restricted.)
5. Slowly sweep the sampling area from one end to the other using overlapping passes, adjusting the rate until the entire 2 m² is covered over the course of the five minutes.
6. Tilt the cassette nozzle upward before turning off the vacuum. To prevent loss of material,
7. Remove the DustChek™ from the hose and visually inspect it to verify it contains enough sample. The full sampler should contain 30 – 100 mg dust. If more dust needs to be collected, repeat steps 3 - 6.
8. Replace the caps on cassette ends, write sample number on cassette and place the cassette directly into zip-type bag. Do not tap the DustChek™ as the micro-fine dust is needed for analysis. Record the sample description on the Chain of Custody form.

DUST ANALYSIS

Lab:

Hayes Microbial, (804)562-3435 3007, East Boundary Terr, Ste F Midlothian, VA 23112 www.hayesmicrobial.com

Dust analysis can be performed from: a tape lift¹, a bulk dust⁴ or from an air sample collected with a spore trap (\$20); alternatively use the AOCs from mold test for a dust analysis (+\$20) .

For the purpose of this assignment, you will choose a tape lift OR an air sample. *You can use the air AOC Cassette sample from your previously collected mold air samples. Add the analysis code P to that sample on the lab COC form. This will direct the lab to do a particle analysis on that air sample, in addition to the mold analysis or, you can collect a tape sample.

A. TAPE LIFT

Supplies needed for tape sample:

- Sandwich-size Ziploc bag
- Clear Scotch tape (do not use opaque tape)
- Flashlight

Instructions for doing a Tape Lift sample:

Choose a specific area to be tested, preferably in the area of concern to the client. If the area of concern is unknown, select an area in the room most often occupied like a MBR or Family Room. An area that has not been dusted in a while with a thick layer of dust will give more historical information while an area that was recently dusted with give more recent data.

1. Cut a piece of clear scotch tape 3-4” long. Fold each end over to create a “handle”.
2. Lay the flashlight at a parallel angle onto the surface to be tested (this makes the dust visible).
3. Gently apply the sticky portion of the tape to the dusty area.
4. Immediately place the tape onto the inside surface of your Ziploc bag. Do NOT press hard, this crushes the particles which are then no longer recognizable by microscope.
5. Seal the bag.
6. Fill out the COC Form from Hayes Microbial – you can use the same form you filled out for the mold testing.
7. Enter your sample number, sample description, and analysis code (use P for Particle Analysis).

⁴ Direct microscopic exam (DME): \$15. DME + fibers, dander, skin cells, pollen: \$16. Mold fragment count provided for both \$15 and \$16 analysis.

B. Air Sample

Supplies needed for air sample:

- An Air-o-Cell Cassette (spore trap). You can use the AOC cassettes collected for mold. See above*. If sampling separately please see the Mold section for procedure.