

Indoor Environmental Quality (IEQ) covers a lot of area including day lighting, ventilation, Indoor Air Quality (IAQ), physical, acoustical, visual and ergonomic comfort.

I have always believed that we can have a great LEED building but if the people inside do not have the belief in the importance of “green” then it does not matter how “green” or sustainable the physical building is.

In the project that we are working on there are many IEQ problems. Every item listed is an issue. The Dansby home has poor day lighting, ventilation is poor, and the IAQ is poor and has caused and continues to cause problems.

Let's look at each item one at a time.

DAYLIGHTING

In many historic homes I have worked with there have been stained glass windows. Although they are beautiful they do not always allow the outside lighting to filter to the indoors. Also the color of the walls can reduce lighting such as a dark painted wall in the home reducing the “bounce” of incoming light off the wall that might project additional light into the room.

VENTILATION

Many of the windows throughout the home do not open. The air flow goes to the upstairs but does not flow out anywhere. The roof has seven layers of old roofing so not only is it weighing down the upper portion of the foundation nothing escapes.

IAQ Indoor Air Quality

In trying to determine the causes of health issues that the Dansby's were complaining about I performed an indoor air quality test using a CO and CO2 testing unit I have.

The first test was for CO carbon monoxide. Carbon Monoxide is an odorless, colorless gas some of the causes are tobacco smoke, space heaters using fossil fuels, automobile exhaust or defective central heating furnaces. The health implications caused by high levels of CO are headaches, dizziness, disorientation, fatigue, nausea, unconsciousness and death. My test did not find any CO in the home.

The next test was for CO2 carbon dioxide. Carbon dioxide is caused by humans and human activity. Health issues related to large volumes of CO2 in the air are drowsiness, headaches, eyes and nose irritation, lung impairment and can increase respiratory infections. ASHRAE

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recommends that carbon dioxide levels not exceed 700 ppm (points per million) above outdoor ambient levels. The Dansby home showed an average of 635.88 which is high but not surprising given the condition of the home.

The final test performed was a three day radon test. We are still waiting for the results. Radon comes from the natural breakdown of uranium in soil, rock and water. It is a cancer causing radioactive gas that cannot be seen and it can cause lung cancer. Radon enters the home through cracks in solid floors, construction joints, and cracks in the walls, gaps in suspended floors, and gaps around service pipes, cavities inside walls and also through water supplies.

Radon is measured in picocuries or pCi/L. The EPA suggests that if your home radon level is 4 picocuries per liter or higher you should fix the levels even with lower levels it can still pose a threat and should be reduced. Testing is simple and kits for testing are available and inexpensive. You can do a three day test for around \$40.

Because the Dansby's home was built in 1911 there are still areas on the outside of the house such as the siding and wood that have asbestos. There were many building materials such as shingles, fireproofing, heating systems and floor and ceiling tiles that contained asbestos. Asbestos fibers can be dispersed into the air when performing upgrades or modifications to the home so this would need to be contained.

The Dansby's are also dealing with mold. I found mold in the upper area of the home which given the number of layers on the roofing is not surprising. Mold can cause problems for people who are already dealing with asthma or respiratory diseases. The humidity level of a home should be between 30 to 60 percent. The humidity of the Dansby home as tested was at 56.29% on average in some areas.

Other items such as VOCs – Volatile organic compounds that are emitted as gases from several items such as paints, lacquers, cleaning supplies, furnishings, glues, adhesives, printers.

As you can see all of the above are the largest issues the Dansby's are facing for good indoor air quality and each must be addressed to ensure the health of the family.

Physical Comfort

Components of physical comfort in relation to IEQ are ergonomic, thermal, visual and acoustical.

Because of all of the other issues trying to achieve each item of physical comfort would be difficult.

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However in an ideal situation if the following were done the achievement for physical comfort would be ideal.

I believe the need to take the complete home down to the studs would be necessary but the outside would also need to be addressed. The roof needs to be totally stripped and replaced.

We could look at the cost of solar and add some skylights that open for ventilation.

Indoors we need to strip the walls to the studs. Add insulation such as cotton denim that also helps with sound. Replace the drywall to remove the mold issues, caulk and correct the leaks through the holes that have been found. This would be necessary from the basement to the attic.

There are places in the home that were found on the other side of the walls that were empty spaces. These areas could be used to give more room and openness to the upper floor.

Replacement of older windows from single pane to dual paned and that also open for ventilation.

Installing ceiling fans in the bedrooms would also help air flow.

The Dansby already have a great centralized and zoned Trane heating and cooling system with the additional cleaning effects added but because of the condition of everything else they have not been receiving the benefits of this system.

The electrical system needs to be done and brought into code. There are areas in the home such as in the kitchen where the electrical still does not work correctly.

Using low VOC paints when the walls are back up and ready for paint will help with the indoor air. Adding live plants that help eat VOCs.

We have currently been reviewing the different cleaning products used in the home and we are replacing them with greener options such as 7th generation, microfiber cloths that hold the dust.

We are looking at all of the items of IEQ and hoping that the costs will be handled through many different avenues such as clean energy works, grants because the home is also the place of their business.

We plan to evaluate all of the best options, present the costs and then work with the Dansby's to determine the affordable options and then prioritize the work.

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Although this paper was written for the IEQ portion of the home we are also concerned and evaluating the outside of the home.

Water issues will be addressed in our next paper.