

## Comprehensive Assessment of Indoor Air Quality

The Indoor Air Quality (IAQ) of the CUSD house was considered from day one, when planning our construction process and material specifications. To improve IAQ, we aimed to minimize the levels of mold, radon, formaldehyde, carbon monoxide, carbon dioxide, and volatile organic compounds (VOCs) in our home.

We chose to construct the CUSD house similar to a manufactured home, built and tested in an indoor environment. To accomplish this, Cornell University generously granted us ample space in the Engineering College's High Volt Lab (HVL) for storage of building materials, construction, and testing. The HVL is a large, interior space, previously used for plasma research. By building the house and storing materials indoors, we greatly reduced the chance of moisture damage and mold growth in our building materials, thereby minimizing the presence of mold in the house.



By building the house indoors, we were able to minimize exposure to radon sources in the ground. In addition, a layer of Tyvek, plywood and latex paint was placed below the floor slab in order to eliminate moisture radon penetration during the shipping of the house to and from Washington, D.C., and to prevent radon gas from being absorbed into the house after the competition.

To prevent moisture and mold damage on the interior, significant moisture protection was implemented on the sides of the house, using a double skin, pressure neutral water-resistant siding detail, and on the roof with a thermoplastic roof membrane. The seams of the structural insulated panels (SIPs) were sealed with caulk, giving us a tight building envelope. The interior seams were sealed with a low-VOC caulk, to decrease VOC levels inside the house. To combat the accumulation of pollutants and stale air, we designed a whole-building ventilation system that provides a full air change every two hours. We modeled our HVAC system using computation fluid dynamics (CFD) software to ensure that there was no build-up of carbon dioxide and other common air pollutants. The air is passed through an air filtration system, capturing particulates and eliminating a large portion of the biotoxins present in the air. We sealed all of our ducts during the construction phase to minimize the amount of construction debris inside of our system.

In addition to changing the way we built, we chose better building materials. We chose to use wood with a low or no formaldehyde content. Our siding features a wood that requires no finish treatment, exemplifying the ideal characteristics of sustainably harvested wood. We made use of ventilation fans above our countertop and in our bathroom, exhausting smoky or odiferous air from both areas. In selecting adhesives, paints, and sealants, we attempted to minimize or eliminate VOC content, reducing the amount of pollutants in the space. All of these measures were taken to increase IAQ in the CUSD home, hopefully providing a more pleasant living experience to our visitors and guests.