

## ***How do we get clean indoor air?***

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### **Q & A**

**Q.** I have a son with C.P. who also has Asthma. My husband and I also suffer from allergies. Mr .Schwab, Do your home plans in your book *Universal Designed Smart Homes, for the 21<sup>st</sup> Century* , take into consideration clean indoor air and building products that provide clean indoor air.

**A.** That is a great question that I very much appreciate. In a short answer: yes. Let me explain and give you some basic clean indoor air design parameters.

My concept of the *Universal Designed "Smart" Home, for the 21<sup>st</sup> Century*, is America's first accessible and energy efficient home plans that address the entire home environment and its building systems. They move beyond spatial accessible design by including smart features such as clean indoor air building products and systems, energy efficiency and storm safe-rooms.

Clean Indoor air has not until now been included as a Universal Design feature. In my humble opine, clean Indoor air is the common denominator that connects traditional Universal Design and what is known as 'Green' or Sustainable Housing. I believe the two have a natural and common sense symbiotic relationship. Either one without the other solves only half of the equation for a truly Independent living home for the 21<sup>st</sup> Century.

Many of you may be aware that respiratory disabilities in the U.S. have the highest rate among children under 18 and the fourth highest among adults. The U.S. Green Building council also promotes and encourages natural daylight, proper ventilation, lighting control, sustainable products and clean Indoor air. Clean Indoor Air quality is one of the "Smartest components in our home designs. Now lets talk about details.

The air quality in our homes can be a cause for concern. The EPA estimates we are exposed to two to five times more pollution indoors than outdoors. This is an ever changing and complex issue because so many factors contribute to and have a negative impact on indoor air. A few of the largest elements of indoor air problems are: odors or contaminants, a problem with a poorly designed heating, venting and air conditioning (HVAC) system , or people themselves living in a home. Since the majority of us spend 80 to 90 % of our time indoors, air pollutants in sealed environments have been proven to have significant effects on peoples health. People I have known personally, who use wheelchairs often spend considerable time in a wet bathroom. Or as I call some of my bathroom designs, simply "Wet rooms". Proper ventilation and product selection is vital to remove high rates of humidity and possible mold growth.

The concept of a tighter building envelope ( for energy savings and in an effort to keep out outdoor air contaminants) , can be also at odds with our desire for clean indoor air as, it will also keep contaminants IN the house without proper ventilation design .

**The characteristics of good indoor air are:**

- 1. Temperature: 72 to 78 degrees F**
- 2. Humidity: 40 to 60% Relative Humidity.**
- 3. Air velocity: 20 to 30 fpm in ducts.**
- 4. Dilution ventilation : 20 cfm per person.**

One of the most important considerations in U.D. Smart”Home is ventilation, especially in a wet room. In a bathroom ,you should have a min. of 8 air changes per hour. You can calculate the required CFM for a 8-0 clg. ht. Rm. By calculating the width of the bathroom x the bathroom length and multiplying that by 1.1. So a 10x 10 bathroom will require a min. 110 CFM (Cubic Ft. /min). The kitchen should have a min of 15 air changes per hour, CFM, = Lx W x 2, our room of 10x10 should have a 200 CFM. Rec. Rms Utility , laundry or basements. should be L x W X 0.8 or 80 cfm and min 6 air changes per hour in our 10x10 rm. Also consider the sone level which is the noise of the fan. One sone is approx. equal to the sound of a normal refrigerator in a quiet kitchen.

Another key tool for controlling indoor air quality is a well designed HVAC system. We prefer to specify radiant- In-floor heating systems as, they do not move air or dust and other irritants. This has major positive benefits for both your child with Asthma and is a long term energy saving solution. This is another common denominator that connects the UD “Smart” home with the “ Green” building movement. It helps those who suffer “Environmental Hypersensitivity disabilities” , providing clean indoor air and heat that can be connected to a geo-thermal heat pump or solar hot water heater or photovoltaic power ( for an electric system). Do you now see the natural common sense symbiotic relationship of UD and Green building which I promote with the UD Smart Home?

Nonetheless, if a forced air system is used, the filters should always be of high quality and well filtered to eliminate gaps that may allow unfiltered airflow. We are always researching products that will help keep your air as clean as possible. In our home plans we also specify and include an EPA designed passive radon emissions detail. Radon is prevalent in the Midwest and is at high levels throughout the country. Radon is an odorless colorless gas that can cause lung cancer. It radiates up through foundation walls and through cracks at the edge of concrete slabs. Radon is classified as a class A carcinogen (known to cause cancer in humans). Some other class A carcinogens are arsenic and asbestos.

In our home with lower levels, (called basements in the 20<sup>th</sup> century), they were wet dreary places, (if not properly designed) so I don't condone the term. we prefer insulated concrete foundation walls ( I.C.F.s). These walls as well as the use of egress window wells that bring in natural light are designed to control moisture in an effort to reduce MOLD. Molds do have the potential to cause health problems, produce allergens

(substances that can cause health problems). Senior citizens, physically challenged people with weakened immune systems may be more vulnerable to mold exposure. For this reason moisture and humidity levels must be controlled, as discussed above.

In an effort to keep indoor air quality in check, the following steps should be taken by your HVAC building Engineer.

1. Set the outside air ventilation rate to meet ASHRAE levels of 20cfm/person.
2. Check air –tight integrity of the HVAC unit and fiber-holding frames.
3. Review the location of outside air intakes to ensure they are not near polluted sources or downwind of such sources. (I know, wind direction always changes)
4. Make sure the HVAC system is in accordance with ASHRAE standards, verify this with your Mechanical Contractor or bldg. Center.
5. Have the HVAC system inspected twice a year and cleaned as determined by the inspection report.
6. Indoor houseplants are an inexpensive way to aid in improving indoor air quality, due to their oxygen/carbon dioxide exchange properties.
7. Select building materials with low emissions of toxic substances. In our home plans we specify the options of “green” building products with low or no volatile organic compounds (V.O.C, s) and that are Formaldehyde free.

We also encourage those of you with extreme indoor air hypersensitivity to consider installing and “Andair” bacteria and gas filtering system. This is the system we specify in our alternate U.D Safe-Rooms and are the only units specified by the U.S. Army for biological and Nuclear fallout protection. They come from Switzerland. (See below for contact info) Radical I know, but you would be surprised how many people are building Safe- Rooms with clean indoor air filtration devices. Also there are more contaminant local gas spills nationally than we care to think about. I believe a safe room is a wise alternative for those with physical challenges. That may be the topic of another article about the U.D. Smart home in Special Living Magazine.

We also specify air to air heat recovery ventilators (HRV’s). These are in addition to the spot vents in the wet areas such as the bath ,kitchen and utility. They provide constant fresh air. As fresh air is drawn in the heat energy is taken out of the exhaust air and is exchanged into the fresh incoming air. The best types also have a HEPA air filter included. This provides constant fresh air. This is very important in a home that is very tightly insulated .

As discussed our goal is to design homes that are truly Inclusive with Universal designed physical access and including features for those who are environmentally sensitive a clean Indoor air and energy efficient environment.

Happy Independent living in your Universal Designed Smart home.

**Here is a brief list of resources.**

EPA free brochures. [www.epa.gov](http://www.epa.gov) or 800- 438-4318

The Inside Story; A guide to Indoor air quality :EPA # 402-K-93-007

Intro. To Indoor Air Quality, A self paced learning module: EPA # 40013-91/002

Building Radon out: EPA.402/F-00-009

Indoor air quality and student performance: EPA 402-F-00-009

**Sustainable building Industries Council:** [www.sbicouncil.org](http://www.sbicouncil.org)

A book titled: *Green Building Products*, Sustainable ,low Voc, and clean air products.

**Avail at:** [www.BuildingGreen.com](http://www.BuildingGreen.com)

**NAHB Research Center:** [www.nahrc.org](http://www.nahrc.org)

**Geothermal Heat Pump Consortium:** [www.geoexchange.org](http://www.geoexchange.org)

**Center for Renewable energy and SustainableTechnology:** [www.Solstice.crest.org](http://www.Solstice.crest.org)

**Andair Cleaning unit:** Info avail at [www.f-5stormshelters.com](http://www.f-5stormshelters.com) or 1-888-485-0769

Say you saw it from Charles Schwab Architect at UD ‘Smart’ homes and receive a 5% discount.

[www.UniversalsmartHomes.com](http://www.UniversalsmartHomes.com) **Visit the U.D Smart Home** website for more info and a new ,free monthly newsletter about the UD Smart Home. Including Clean Air home and UD details, homeplan of the month and various articles.

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