

Green Building: The Inside Story (Benefits We Can Breathe In)

By Ryan Rex and Robert DiBetta

Energy conservation, renewable energy sources, recycled materials, water conservation and tax rebates are economic drivers that resonate with developers, builders and consumers alike when contemplating “Going Green.” Lost in the conversation are the benefits to the health and comfort of workers and occupants that are derived from green building practices. Eco-friendly construction practices are about preserving the environment and creating a cleaner, more natural habitat for humanity. However, the real story in green building is not its impact to the outside environment, but inside where people live and work.

Studies of human activity patterns consistently show that for the average person living in the U.S. more than 90% of every day is spent indoors. Between the home, automobile and workplace, comparatively little time is actually spent outside; consequently, indoor air quality is the crucial component in any evaluation of environmental conditions. In fact, indoor air quality comprises more than 70% of the criteria necessary to achieve LEED certification.

Going green is far more comprehensive than just using recycled building materials and conserving energy. Much of the focus revolves around maintaining a clean work environment during the construction process. A clean workspace ensures safer and healthier working conditions for workers during the building process and creates a sustainably healthier environment for the people who will occupy the space.

Commercial Application

When renovating the Freedom Enterprise Inc. (www.freedomenterpriseinc.com) headquarters in East Norriton, PA, specific practices were utilized by the HVAC team during construction to qualify the building for LEED certification. Some of the building practices included:

- Elevating stored building material to separate the material from any dirt or debris that may accumulate on the floor;
- Isolating a designated area for cutting all material to limit the circulation of construction dust;
- Covering the ends of all open ductwork during installation to ensure that no dust or other airborne pollutants are circulated into the space when the HVAC equipment is started up;
- Utilizing adhesives and solvents containing little or no VOCs to remove a long-lived residual source of respiratory irritants; and
- Keeping smokers and idling vehicles at least 20 ft away from the building at all times.



Construction practices over the last century created significant health risks for tradesmen. Embracing environmentally responsible building practices yields both short- and long-term health benefits; each of which generates improved economic outcomes for the government and private sector in reduced healthcare and lost time costs and the resulting increase in productivity. Reduced exposure to harmful VOCs and construction dust helps to prevent life altering diseases, improving the quality of life for workers and their families.

Going Green does not stop with the health of tradesmen. After construction is completed, green building mandates a forced air flush out period that must take place before the building can be occupied. A calculation based upon the square footage and occupancy is performed to determine the amount of outside air needed to flush any remaining allergens from the indoor air.

A dense air filter with a MERV of 8 is used to prevent any dust that may have been missed from being blown outside preventing the harmful particles from re-circulating back in to the building. Following the completed flush out period, the MERV-8 filters were replaced with MERV-13 filters, which catch dust particles down to the 0.3-micron level.

Residential Application

Given the amount of time spent at home, an average of 15.6 hours per day, green building practices may be even more important in residential construction. When considering the health of one's family, regulating the spread of harmful airborne allergens, bacteria, and VOCs should be on top of everyone's list of home improvements. The building process for LEED-certified homes is extensive, but the end result is a benefit for every breath you take.

The Ice House Condominium complex in Philadelphia, PA is now considered the largest residential multi-family dwelling on the east coast to go green. Freedom Enterprise's HVAC team utilized KoolDuct technology, fabricated by PTM Manufacturing (www.ptmmanufacturing.com) in Newark, DE. When compared to sheet-metal ductwork, KoolDuct may be more expensive, however, there are advantages, including:

- Air leakage is less than 1%, meeting SMACNA Class 3 requirements. Consequently, smaller heating and cooling equipment is required, reducing both initial and ongoing HVAC expense for the customer;
- It is designed to be used for both residential and commercial applications;
- The ends of the ducts come pre-sealed, ensuring that the ductwork is free of airborne contaminants from fabrication to installation;
- The ductwork is made of a densely insulated Phenolic foam—a closed-cell foam board that is CFC/HCFC-free with a 0 ODP—that meets AST-E 84 smoke and flame rating and the NFP-255;
- Consistent thermal efficiency ensures there is 0% temperature change between the forced air in the ducts and the ambient air in the surrounding area lowering the supply air temperature;
- Ducts are 85% lighter than insulated sheet metal and can be installed quickly, reducing installation costs (and possibly offsetting higher material cost;
- Faced on both sides with a scrim reinforced aluminum foil
- The combination of thermal consistency and the decreased air leakage can improve the unit operation by decreasing the amount of temperature change over the refrigerant coils and reducing fan operation by as much as 30%, extending the life of equipment and reducing operating costs



The Ice House project utilizes state-of-the-art equipment throughout. Honeywell 8000 touch-screen thermostats were installed in all units for an accurate 7-day programming schedule. A built-in dehumidification control helps to prevent growth of harmful molds.

High-efficiency heating and cooling units were chosen for the job, including Carrier's 95% gas-fired furnace with variable-speed fan motor and 15-SEER air-conditioners that use Puron refrigerant. The variable-speed fan was implemented in the design for its ability to self-regulate the air flow within the space. A variable-speed fan actually increases the SEER of the air conditioner by nearly 10%. Lowered refrigerant pressures caused by the varied air flow will aid the air conditioner in absorbing more energy from the indoor air giving the unit an increased mechanical efficiency.

Aprilaire electronic air cleaners with a MERV-13 media filter were utilized in the installations. This type of electronic air filter is wired directly into the fan terminal on the furnace's control board, automatically cycling the HVAC fan if the unit's supply fan has been inactive for more than 24 hours. Inadequate air circulation creates stale living conditions and increased allergic reactions.

The materials and equipment utilized to construct the Ice House condominium project represent the best available in green building today. Cost is clearly a primary consideration in design, material and equipment selection and not everyone will opt for the Gold LEED Certification sought by the Ice House. Nevertheless, the Ice House example offers a host of ideas and options for improving indoor air quality.

Green building is a holistic approach to environmentally friendly and sustainable building practices with a clear goal in mind: improving the working and living conditions of the occupants. Energy conservation, renewable energy sources, recycled materials, water conservation and tax rebates are all a means to the end of an overarching goal of improved living conditions. The inside story of green building trumps outside environmental considerations: indoor air quality is the primary driver in green building certification. So the next time someone questions the value of an investment in green building practices, tell them the real value is something we can all breathe in.

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