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INTEGRATIVE DESIGN: INDOOR ENVIRONMENTAL QUALITY

Description:

When designing, constructing, and maintaining a building, it is important to take a holistic view of how people interact with the building and how the building itself affects the occupants. There are elements in a building that can be uplifting and there are elements that can be toxic. Steps can be taken to make sure that the building is a safe and healthy place for people of all ages.

As we design, build, and maintain housing for families, multiunit senior housing, care facilities, or housing for people of all ages with disabilities, the buildings themselves should not make the residents ill. Elements within a building can lead to what is called Sick Building Syndrome (SBS)—a condition where an occupant's comfort and health are negatively affected by the building systems, materials, or both. Symptoms can range from sensitivity to odors to dizziness, headaches, and nausea. According to the Environmental Protection Agency, SBS can be caused by inadequate ventilation, chemical contaminants from indoor or outdoor sources, or biological contaminants, to name a few. Identifying and eliminating the source of the pollutants can solve most of these issues.

On the other hand, there are elements in a building that can have a positive impact on its users, by improving morale, health, and productivity. For example, providing natural day lighting and views to the outdoors has a beneficial effect on building occupants, and can decrease electricity load. Using light color paint can help decrease the lighting load, but can also help people who have difficulty seeing in low light. There are many opportunities to create a synergy between green building and universal design—everything from reducing water use to allowing individuals to control their own thermostats—which can be seen as opportunities to preserve the environment as well as make someone's life more comfortable.

As we learn more about how people are affected by certain chemicals and other external factors, it is important to keep the following factors in mind when making decisions about building design:

IAQ (Indoor Air Quality) during construction: During construction, keep all new ductwork sealed and safely stored. To protect from mold growth, protect all stored or installed materials from absorbing moisture.

Flush out: After the completion of any project but before occupation, set all the ventilation systems to run at full capacity for several days. At the end of the

several days, replace all of the filters. This will help remove potential smells, dust, and air-borne toxins left from construction and new finishes.

Insulation: Using blown-in insulation can greatly reduce energy consumption, but it also helps with noise pollution, especially for those with hearing issues. Insulating between rooms is also important where individual spaces have their own temperature controls.

Individual controls: Allowing individuals to adjust the temperature of their own localized areas helps reduce the need to heat all spaces at once. It also helps with an occupant's sense of comfort and autonomy.

Adequate ventilation: Design the Heating Ventilating and Air Conditioning (HVAC) system to provide adequate fresh air ventilation to all regularly occupied spaces.

HVAC: Specify energy-efficient Heating Ventilating and Air Conditioning systems (HVAC), with ducts that are insulated and sound-attenuated. Insulated duct systems reduce the vent noise that can create problems for those with hearing loss.

Air intake: By making sure that air filters are regularly cleaned, and by locating air intake vents away from cars and other motorized vehicles, smokers, trash receptacles, and other noxious sources, fewer pollutants will enter the building.

Fresh air: Installing a mechanical system that increases air circulation and makes most windows operable allows stagnant air to leave and permits fresh air to enter.

Indoor pollutants: When specifying building and finishing materials, choose products that do not off-gas toxins. Specify materials that do not contain urea formaldehyde, Polyvinyl chloride (PVC), or Volatile Organic Compounds (VOC).

Walk-off mats: Much of the dust in a building comes in on the soles of our feet. By providing walk-off mats at all regularly used entrances, dust can be collected before it enters the building. Be sure to clean the walk-off mats on a weekly basis.

Cleaning products: Using nontoxic cleaning products and storing them away from residents helps with indoor air quality. Create a storage room that has a continuous vent directly to the outdoors.

Carbon dioxide sensors: Install carbon dioxide sensors for the health and safety of the occupants.

Smoke free building: Institute a policy forbidding smoking inside the building to prevent issues caused by second-hand smoke. Locate a designated smoking area outdoors away from operable windows, doors, or fresh-air intakes.

Lighting: Replace old light bulbs with more efficient fluorescent and compact fluorescent bulbs, which are more energy-efficient and have a better color range.

Design the lighting to accommodate low-vision difficulties by sizing the light fixture correctly and using up-lighting techniques.

Occupant Sensors: Occupant sensors on the market today are more sophisticated than their predecessors. They are more energy-efficient because the lights turn on only when someone enters a space, and they turn off if no motion or sound is made for a certain period of time.

Fenestration: The use of natural day lighting can help those with light-vision difficulties and can help with the overall health and wellbeing of the residents. It is imperative that glare be minimized.

Window type: Use casement windows instead of double-hung windows. Casement windows allow for greater ventilation and egress. In addition, casement windows are opened with a single handle, making them easier to open.

Water efficiency: Installing water faucets with sensors helps reduce the amount of water consumption by portioning the amount of water that is provided. Water faucets with sensors are also a good universal design feature because everyone can operate them.

Front load washers: Front-load washers reduce the amount water and energy it takes to wash a load of laundry. In addition, front-load washers are easier to use by individuals using a wheelchair.

Monitoring: Staff in facilities and multiunit housing, as well as residents in single family homes, should continuously monitor the indoor environment to make sure that systems are functioning as originally intended.

Benefits:

- Residents' well-being and quality of life are improved:
 - Residents' physical and mental health are not adversely affected by the elements of their living environment.
 - Incidences of specific chronic illnesses, such as asthma, chronic fatigue, migraine headaches, allergies, and others are reduced.
 - Productivity by children and adults of all ages is improved.
- Environmental elements that support the ability of residents to see and hear well allow both older people and younger-aged people with vision and hearing loss to retain a sense of competency and autonomy, two traits that are associated with emotional, mental, and physical health status.
- Environmental elements, such as individual-room-based temperature adjustment, support an individual's sense of control over his living environment. Perceived personal control over one's daily life is a major factor associated with mental and emotional health status.

- In a time of limited and costly resources, water and energy are conserved and used more efficiently.
- When indoor environmental quality standards are integrated into a building's design from the outset, many benefits are realized with little or no increases in construction and maintenance costs.

Impediments or barriers to development or implementation:

- Many builders, homeowners, and facility operators are unaware of:
 - The impact of environmental factors on the health, safety, and mental and physical well-being of residents.
 - The impact that the quality of the living environment has on costs to the health care system, the educational system, and the work place.
- Many builders, homeowners, and facility operators are not knowledgeable about specific ways or tactics to improve the quality of the living environment, or of the availability of specific appliances, equipment, building materials, furnishings, products, etc., that can replace traditionally used methods and items.
- Retrofitting a building or home to improve environmental quality, such as adding new windows or upgrading a mechanical system, can be costly. During times of economic hardship, even though the pay-off in health and safety is great, homeowners or facility operators may find themselves unable to argue for incurring the added tangible cost.

Resource—examples:

- The Patrick H. Dollard Discovery Health Center in Harris (Sullivan County), New York, is a diagnostic and treatment facility providing primary care, specialty medical care, and dental care to 250 residents with profound neurological and developmental impairments. It is the first medical center in New York State to implement green building standards that meet the State Department of Health's requirements. It is estimated that the building will save 30 per cent in energy use and expense over time, and the building is considerably more healthful and comfortable for the children and adults who use its critical and everyday health care services. <http://leedcasestudies.usgbc.org/overview.cfm?ProjectID=233>.
- Solidarity House Housing Cooperative, Tivoli (Dutchess County), New York, is an affordable, 11-resident cooperative; is extremely environmentally responsible; uses safe, nontoxic, and sustainable materials; makes very efficient use of water and energy; and is being certified as the "Greenest Building in the Eastern United States." <http://www.commonfire.org/community/coopwelcome.html>.
- Mirabella Portland, Portland, Oregon, is a 30-story high-rise Continuing Care Retirement Community that will open in the South Waterfront area of Portland in 2010. The South Waterfront area is "one of the 'greenest' and most energy-efficient neighborhoods in the nation . . . striving to achieve a 'Leadership for Energy and Environmental Design (LEED) for Neighborhood Development'

certification, which is a rating system that integrates smart growth, urbanism, and sustainability, and that encourages healthy living." Mirabella Portland is designed to achieve LEED Platinum certification; residents will benefit from water savings, energy conservation, high indoor air quality, and access to alternative modes of transportation.

<http://www.mirabellaretirement.org/portland/>

<http://www.mirabellaretirement.org/portland/community.htm>.

Resource—written and web:

- The U.S. Environmental Protection Agency (EPA): <http://www.epa.gov/iaq/>.
- Occupational Safety and Health Administration (OSHA): <http://www.osha.gov>.
- American Lung Association: <http://www.lung.org/#>.
- Centers for Disease Control and Prevention: <http://www.cdc.gov>.
- Center of Design for an aging community: <http://www.centerofdesign.org>.

Resource (free or fee-based)—technical assistance contact names:

- Phinney Design Group
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518-587-7120
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- Donald F. Minnery, AIA, NCARB
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