

# Testimony Regarding the Adoption of Proposed Connecticut High Performance Building Standards

Public Hearing: April 11, 2008

By Diane Ethier,

Board member for the CT Foundation for Environmentally Safe  
Schools

M.S. in Mathematics

Former High School Mathematics Teacher

Trainer for the US EPA's *Indoor Air Quality Tools for Schools*  
Program

Indoor air quality mentor and presenter for the National Education  
Association Health Information Network

National Education Association's representative to the School  
Asthma Subcommittee of the National Institutes of Health's  
National Asthma Education and Prevention Program

19 Cooney Road  
Pomfret Center, CT 06259  
860-928-3036

My name is Diane Ethier and I am the acting president and legislative co-chair for the CT Foundation for Environmentally Safe Schools (ConnFESS). The primary focus of ConnFESS has always been and will continue to be educating the public on school environmental health issues. We have two main messages: 1) Indoor environmental quality (IEQ) issues can dramatically impact the long-term health of school occupants and the quality of education that students receive and 2) Healthier indoor environments in schools will lead to improved health for students and staff and ultimately lead to improved attendance, performance and productivity.

I am a retired high school mathematics teacher. Since my retirement in 2003, I have been educating adults about indoor air quality (IAQ) issues in schools. I have been a mentor and presenter for the National Education Association Health Information Network on "IAQ from a Union Perspective." I have also worked with the CT School Indoor Environment Resource Team as a trainer for the US EPA's *Indoor Air Quality Tools for Schools* Program. I have trained school-based teams in fifty-four school districts across the state to use this IAQ management plan to identify and make plans to remediate environmental health hazards in their schools. Regardless of the size or wealth of the school districts involved, I found that school IAQ problems occurred for the same five reasons: poor choice of site, poor design, poor choice of materials, poor construction or renovation practices and poor maintenance practices. Most Healthy, High Performance Schools protocols throughout the country address all five of these issues in an effort to build new schools in which IAQ problems are designed out and IAQ solutions are designed in.

For the last two years, I have been the National Education Association's representative to the School Asthma Subcommittee of the National Institutes of Health's National Asthma Education and Prevention Program (NAEPP). This subcommittee develops slide sets and fact sheets for school personnel on how to reduce asthma triggers in the school setting. Schools with healthier indoor air report fewer asthma attacks, fewer incidents of bronchitis and upper respiratory illnesses, better attendance and fewer visits to the school nurse. NAEPP describes a healthy or "Asthma-Friendly School" as one that:

1. Adopts and enforces a tobacco-free policy that prohibits tobacco use at all times, on all school property, by all people and for all school activities
2. Uses integrated pest management techniques to control pests
3. Uses the least toxic products available
4. Develops an IAQ management plan for preventing or reducing IAQ problems, allergens and irritants that make asthma worse. These allergens and irritants include tobacco smoke, chalk dust, dust mites (for example in carpets and upholstery), mold, mildew, cockroaches and other pests, insect and pet dander, strong odors or fumes from such products as pesticides, paint, perfumes and cleaning chemicals, scented products, and dust and debris from clutter, construction and remodeling.
5. Uses good housekeeping and maintenance practices such as keeping temperature and humidity at appropriate settings, maintaining HVAC systems and drying up damp and wet areas immediately
6. Reduces students' exposure to diesel bus exhaust before, during and after transportation to and from school.

During 2005 and 2006, I represented ConnFESS at the Alliance of New England Lung Associations (ALA) meetings on Promoting a Regional School Environmental Advocacy Agenda. Other attendees represented all six NE ALA chapters, the Northeast Asthma Regional Council, INFORM and the Northeast Energy Efficiency Partnership. These meetings focused on developing state and regional policies to reduce asthma triggers in schools and the need to include an environmental health element in all new policies governing school environments. Our discussions on high performance schools centered on two aspects:

1. Training of teachers on environmental health issues should be part of the high performance schools process
2. School buildings should be designed for health benefits by requiring such elements as optimal HVAC systems, windows that open, elimination of moisture incursion, reduced use of carpeting and the use of best cleaning practices that include using environmentally preferable/green cleaning products.

The introduction to the CT Compliance Manual for High Performance Buildings states: “Complying with these regulations will produce buildings that consume less energy, conserve natural resources, are more comfortable, and are easier and less costly to maintain.” With my background in educating school stakeholders to identify and resolve IAQ problems and reduce asthma triggers, I read the proposed CT High Performance Building Standards hoping to see the word healthy included in the above list of benefits. The U.S. Green Buildings Council (USGBC) Leadership in Energy and Environment Design (LEED) states that high performance or green schools “are healthy for students, teachers and the environment. Built right, green schools are productive learning environments with ample natural light, high quality acoustics and air that is safe to breathe.” and “By promoting the design and construction of green schools, we can make a tremendous impact on student health, test scores, teacher retention, school operational costs and the environment.” The Northeast Energy Efficiency Partnerships (NEEP), which prepared the CT Compliance Manual for CT Office of Policy and Management, describes high performance schools as “Healthy Safe Learning Environments which enable students and teachers to achieve their maximum potential by providing:

- High levels of acoustic, thermal and visual comfort;
- Large amounts of natural daylight;
- Superior indoor air quality; and
- A safe and secure environment.”

NEEP’s website also defines high performance schools as “those which have been designed to meet specific performance objectives leading them to perform in the top ten percent of buildings in the U.S., and significantly above building code regulations in energy use, acoustic levels, indoor air quality, thermal comfort, water efficiency and storm water management.”

The introduction to the CT Compliance Manual for High Performance Buildings also states: “The regulations were adopted primarily to require state-funded buildings to be built using a high performance building standard equivalent to that of the United States Green Buildings Council (USGBC) Leadership in Energy and Environment Design (LEED) Green Building Rating System.”, but fails to mention a rating level. The Office

of Legislative Research (OLR) Summary for PA 07-242: An Act Concerning Electricity and Energy Efficiency says that the law requires certain state-funded buildings to “... meet specified energy and environmental standards. The standards are a silver rating under the Leadership in Energy and Environmental Design (LEED) program or its equivalent.” The Regulation Compliance Alternative for Building Standard Options states that LEED Silver level certification is an alternative compliance approach as long as all of the “mandatory” requirements of the CT regulations are met.

A review of the LEED website found many different LEED Rating Systems. The two that seem to apply in this situation are LEED for Schools and LEED for New Construction & Major Renovations, Version 2.2. The school document requires 9 prerequisites and 37-43 additional credits to achieve Silver certification, while the non-school document only requires 7 prerequisites and 33-38 additional credits for Silver certification. The two additional prerequisites for schools are for Environmental Site Assessment and Minimal Acoustical Performance. Additional credits for schools are offered for Site Master Plan, Joint Use of Facilities, Process Water Use Reduction (20% reduction), Low-Emitting Materials (Furniture & Furnishings), Low-Emitting Materials (Ceiling & Wall Systems), Enhanced Acoustical Performance and Mold Prevention. In addition, 1 original prerequisite (Minimum Energy Performance) and 5 original credits have been clarified for use in schools and another 2 prerequisites (Storage and Collection of Recyclables and Environmental Tobacco Smoke Control) and 19 credits and have had modifications, deletions or additions so that they better apply to school settings.

The LEED website clearly states **“As of April 20, 2007, all new construction and major renovations of K-12 school facilities seeking LEED certification must use the LEED for Schools Rating System. LEED for New Construction can no longer be used to certify K-12 school building projects.”** In developing a rating system for schools, the USGBC acknowledged that K-12 school buildings are different from other buildings, such as state office buildings, and cannot be designed and built in exactly the same way as other buildings. Their LEED for Schools website states “The LEED for Schools Rating System recognizes the unique nature of the design and construction of K-12 schools. Based on the LEED for New Construction rating system, it addresses issues such as classroom acoustics, master planning, mold prevention and environmental site assessment. By addressing the uniqueness of school spaces and children’s health issues, LEED for Schools provides a unique, comprehensive tool for schools that wish to build green, with measurable results. LEED for Schools is the recognized third-party standard for high-performance schools that are healthy for students, comfortable for teachers, and cost-effective.”

Comparing the Mandatory Regulations in the CT Compliance Manual for High Performance Buildings to the Prerequisites in both LEED for New Construction and LEED for Schools reveals that one of the essential Indoor Environmental Quality requirements for both LEED rating systems is missing in the CT regulations: LEED EQ Prereq. 1 – Minimum IAQ Performance. This LEED prerequisite was intended to “enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants” by balancing “the impacts of ventilation rates on energy use and indoor air quality to optimize for energy efficiency and occupant health.”

When the CT regulations are compared to LEED for Schools, two additional LEED prerequisites are missing from the CT mandates: Sustainable Site Prereq. 2 - Environmental Site Assessment and Indoor Environmental Quality Prereq. 3 - Minimal Acoustical Performance. The LEED intent of the requirement for Environmental Site Assessment for schools was to “Ensure that the site is assessed for environmental contamination and if contaminated, that the environmental contamination has been remediated to protect children’s health.” LEED for Schools requires school districts to “Conduct a Phase I Environmental Site Assessment (as described in ASTM E1527-05) to determine if environmental contamination exists at the site. If contamination is suspected, conduct a Phase II Environmental Site Assessment (as described in ASTM E1903-97 (2002)).” and “Sites that are contaminated due to the past existence of a landfill within 1000 feet of the site are prohibited. If the site is otherwise contaminated, then it must be remediated to meet local, state, or federal EPA region residential (unrestricted) standards whichever is most stringent. Documentation from the authority must be provided (such as EPA’s “Ready for Reuse” document) to prove “safe” levels of contamination have been achieved.” Only a Phase I Environmental Site Assessment is currently required by CT state law before a school is built.

The LEED intent for requiring Minimum Acoustical Performance in schools was to “Provide classrooms that are quiet and in which teachers can speak to the class without straining their voices and students can effectively communicate with each other and the teacher.” LEED suggested that “Design considerations include reducing noise from exterior to interior spaces, between spaces within the building, and within the classroom space. External to internal noise transmission can be reduced by orienting classrooms away from external noise sources and using thick and/or massive materials in walls and roofs. Also, windows should be well sealed and have adequate air gaps between sheets of glass.”

ConnFESS believes that it is essential that all three of these missing LEED prerequisites (Minimum IAQ Performance, Environmental Site Assessment and Minimum Acoustical Performance) be added to the CT Compliance Manual for High Performance Buildings. If, as the OLR summary for PA07-242 says, “The standards are silver rating under the Leadership in Energy and Environmental Design (LEED) program or its equivalent.” then all LEED prerequisites should be satisfied in the CT regulations.

As part of the national Coalition for Healthier Schools, ConnFESS is familiar with many of the national models for building Healthy, High Performance Schools: LEED for Schools, the US EPA’s IAQ Design Tools for Schools, the Collaborative for High Performance Schools (CHPS) protocols for New York, the Northeast, Massachusetts and California, the New Hampshire Partnership for High Performance Schools and Washington Sustainable Schools. These national models address issues that are unique to K-12 school buildings such as: school-aged populations, school occupancy schedules, community use of the building, student transportation issues, landscaping needs for playing fields and playgrounds, stricter policies for low-emitting materials to protect children’s health, acoustics criteria to foster a better learning environment and the need for an IAQ management plan during occupancy to protect student health as well as ensure the longevity of building systems. ConnFESS believes that CT schools should benefit from the best practices mandated in these model programs in order to develop the



most effective High Performance School regulations in the country. The recommendations below reflect language found in the above-mentioned model programs that is not found or is not explicitly outlined in the proposed CT regulations.

## MANDATES

### **BUILDING COMMISSIONING- Mandatory Requirement Section 16a-38k-3(a)**

PA03-220: An Act Concerning Indoor Air Quality in Schools already requires school maintenance staff in schools being constructed or renovated to be trained in plant operations and IAQ issues. However, the integrity of the building systems can be undermined if all school occupants (administrators, educators, support staff and students) and other community stakeholders are not all trained to appropriately use or operate a green school. The proposed CT language requires the training of just facility management and maintenance personnel on proper equipment operation and the development of systems manuals. ConnFESS prefers the language in NY CHPS that says: “A third party must verify that effective and complete training and documentation on the operation and maintenance of the building systems was provided. This must include a complete guide for the maintenance staff and a user’s guide for all classrooms. The third party or school district official must verify that training programs for school maintenance staff, administrators, teachers, and other staff will be developed and completed. Training is an essential step to protect IEQ and maintain superior energy performance.” In NY, facilities staff training must include the interaction of the equipment operating together as a system. NY also requires “Post-construction documentation to prove that the building is performing as predicted. All documentation must be maintained where it can be accessed for a period of 5 years at the school district offices.” ConnFESS suggests that the commissioning agent also be responsible for developing a schedule for refresher training on a periodic basis because of high staff turnover in schools.

### **INDOOR AIR QUALITY MANAGEMENT PLAN (DURING CONSTRUCTION) – Mandatory Requirement 16a-38k-3(e)**

CT school building projects are already required to have an IAQ management plan during the construction phase. PA 03-220 states “The Department of Education shall not approve a school building project plan or site, as applicable, if: . . . in the case of a major alteration, renovation or extension of a building to be used for public school purposes, the plans do not incorporate the guidelines set forth in the Sheet Metal and Air Conditioning Contractors National Association’s publication entitled “Indoor Air Quality Guidelines for Occupied Buildings Under Construction” or similar subsequent publications”.

The EPA’s IAQ Design Tools for Schools states that any construction IAQ management plan should do two things. The plan should first identify specific measures to address problem pollutants (e.g., construction dust, chemical fumes, off-gassing materials, and moisture). The construction IAQ plan should make sure these problems are not introduced during construction, or, if they cannot be avoided, eliminates their

impact. Secondly, areas of planning (e.g., product substitutions and materials storage, safe installation, proper sequencing, regular monitoring, and safe and thorough cleanup) should be built into the construction IAQ management plan.

Both NY CHPS and EPA's Design Tools for Schools have exemplary sections dealing with contaminant source control and the interruption of moisture and pollutant pathways during construction. All the elements included in the proposed CT guidelines are contained in these two national models for high performance schools. However, both NY and EPA plans are more explicit in their language and include elements ConnFESS does not see in the CT regulations.

EPA stresses the need to clean spills immediately. Design Tools for Schools states: "If solvents, cleaners, gasoline, and other odorous or potentially toxic liquids are spilled onto the floor, they should be cleaned up immediately. If the spill occurs on an easily replaced building material, it may be safest to discard it and replace it with new material. Odors from significant spills can linger sometimes for years, causing comfort and health problems for the future occupants of the school."

Both EPA and NY model plans include pre-conditioning of materials for out-gassing of VOCs. These products should be aired out before installation. They should be removed from packaging, unrolled and spaced apart in a well-ventilated heated warehouse so that fresh air can easily flow in and around the products. NY CHPS requires the following:

- Continuously ventilate during installation of materials that emit VOCs and after installation of materials for at least 72 hours or until emissions dissipate. Ventilate directly to outside areas; do not ventilate to other enclosed areas that are occupied.
- If continuous ventilation is not possible using open windows and temporary fans, then the building's HVAC system may be utilized on full exhaust provided that MERV 8 or higher filtration media are installed at each return air grille.

Pre-conditioning and superior ventilation practices improve IAQ by minimizing the amount of VOCs and other pollutants that are distributed and retained by the surface materials and ventilation systems during construction.

The CT mandate for an IAQ management plan during construction says: "As part of the plan, all installed or stored on site absorptive materials shall be protected from moisture and mold damage. All water-damaged materials shall be removed from the site." ConnFESS is pleased to see this acknowledgement that construction activities affect IAQ and that building materials must be kept dry. However, we feel that the CT regulation is not strong enough. We suggest that the following language from NY CHPS be adopted: "Building materials, especially wood, porous insulation, paper and fabric, should be specified to be kept dry to prevent the growth of mold and bacteria. During construction, cover these materials to prevent rain damage, and if resting on the ground, use spacers to allow air to circulate between the ground and the materials. Provide site drainage as needed. Schedule deliveries so that materials that are susceptible to mold growth are installed after the enclosure is watertight. Water damaged materials must be dried within 24 hours. Due to the possibility of mold and bacterial growth, materials that

are damp or wet for more than 24 hours may need to be discarded. Immediately remove from the site materials showing signs of mold and mildew, including any with moisture stains, and properly dispose of them. Replace moldy materials with new, undamaged materials.

When addressing mold source control in a construction IAQ management plan, it is essential to address the purchase and use of mold-resistant products, entry mat systems and HEPA vacuums. NY CHPS requires all interior and exterior wallboard and decking products to be mold resistant. Their manual explains: “Since many different types of water damage may occur – from roofs, windows, water pipes or flooding – some types of wall systems and deck materials can grow mold in areas that cannot be seen. During the life of a school, student health and maintenance costs will both benefit from wall and roof systems that are mold resistant. Specifying mold-resistant products will increase durability by reducing the frequency of having to tear out and rebuild wall and roof systems that have become damp and started to grow mold.”

NY CHPS and EPA both stress that walk-off mats and HEPA vacuums are not just a maintenance issue and that both issues should also be addressed during the design and construction phases of the building.

EPA states: “entry mat systems are critical in trapping soil, pollutants, and moisture that otherwise would spread into and throughout the building, and in the amount of cost to properly maintain the building. Increased grit tracked onto smooth-surface flooring can grind away the protective finish in as little as one day. Carpets can become loaded with pollutants and moisture, reducing the life of the carpet and potentially resulting in an air quality problem. . . .Moisture tracked onto hard-surface floors can increase the chance of injuries.”

NY CHPS requires that school plans “Provide a three-part, walk-off system for all high volume entryways, and all those adjacent to playing fields and locker rooms, to capture dirt, particulates, and moisture before they enter the building. Outside high-volume entrances, provide grills, grates, etc. to remove dirt and snow. If there is a vestibule, provide a drop through mat system within the vestibule. Inside the entranceway, provide walk-off mats. The recommended length of interior walk-off mats is 15 ft.” Their rationale is clearly stated in the NY CHPS compliance manual: “Particles tracked into school on shoes are one of the chief sources of contamination of carpets and floors. Research on school carpeting in particular shows that it can be a reservoir of pesticides, heavy metals, and dirt tracked in on students’ shoes. The best way to keep the school free of dust, dirt and contaminants is to prevent these unwanted items from entering the building in the first place. It is especially important to protect young school children since they are more likely to sit and play on classroom floors and therefore be exposed to contaminants.”

NY CHPS also requires vacuuming carpeted and soft surfaces with a HEPA vacuum prior to substantial completion. For phased, occupied renovations, HEPA vacuuming the carpet daily in occupied areas is mandated. Both construction practices “improve IAQ by minimizing the amount of indoor pollutants that are distributed and retained by the surface materials and ventilation systems during construction.”



To be truly effective, a construction IAQ plan must also deal with proper sequencing of construction activities and safe and thorough cleanup. NY CHPS mandates the following control measures to protect IAQ.

- Permitting adequate airing out of new materials
- Sequencing the installation of finish materials
- Proper curing of concrete before covering
- Installation during unoccupied periods
- Avoidance of building occupancy while construction related pollutants are still present.

The proper sequencing of installation of building materials should be mandated. EPA's Design Tools for Schools cautions that indoor air quality (IAQ) is affected not only by the materials that are used, but also by the order in which they are installed. The contaminants off-gassed by products such as adhesives, sealants and paints can be adsorbed by porous and woven materials and released long after the school building is occupied. NY CHPS requires that the construction IAQ plan include extensive cleaning procedures to be used prior to the building being occupied.

#### **SITE SELECTION – Mandatory Requirement 16a-38k-3(i)**

ConnFESS is not satisfied that the only Site Selection requirement in the CT Compliance Manual for High Performance Buildings is one that states: "Buildings, roads, parking areas, sidewalks, or other impervious surfaces shall not be built on land that is a wildlife corridor or in any area that is inconsistent with the state plan of conservation and development." Sites should be selected so that the health of building occupants is considered as well as the environmental impact of the building.

As previously stated, LEED for Schools requires a detailed environmental site assessment. Only a Phase I Environmental Site Assessment is currently required by state law before a school is built. If contamination is found, a Phase II Environmental Site Assessment should be mandated and the site should be required to be remediated to protect the health of school occupants. Building a school within 1000 feet of a former landfill should be prohibited.

CT regulations should prohibit schools from being constructed on or near hazardous sites and prohibit the placement of new hazardous facilities adjacent to or near existing schools. NE CHPS requires school districts to site schools away from sources of excessive noise, such as airport flight paths, major highways, or frequent industrial or agricultural use. Site design should also ensure that bus exhaust fumes do not enter schools or outdoor areas used by students.

#### **NO SMOKING – Mandatory Requirement 16a-38k-3(j)**

The language of the CT mandatory regulation for No Smoking Policy suggests that this requirement only applies to state buildings and not to public school buildings. ConnFESS would like to see this language corrected to include schools. No "Designated Smoking Areas" are allowed on school property. School-specific language must prohibit

all smoking and should read “Tobacco use is prohibited at all times, on all school property, by all people and for all school activities.”

### **INTEGRATED PEST MANAGEMENT PLAN (IPM) – Mandatory Requirement 16a-38k-3(k)**

ConnFESS is pleased to see that newly constructed and renovated schools in CT will now be required to have an Integrated Pest Management (IPM) Plan. CGS 22a-661 currently applies only to state buildings and departments. We would like to suggest that all of the additional IPM measures listed on page 42 of the CT Compliance Manual be included as requirements under Sustainable Site and Building Commissioning. The required building operating manuals (and classroom guides) developed by the commissioning agent should also include IPM practices.

The regulations in the CT Compliance Manual for High Performance Buildings are focused only on the design and construction of buildings. Operations and maintenance issues are addressed only through the mandatory commissioning process. Yet, IPM, a maintenance issue, is addressed in the regulations, even though it does not appear as a LEED for New Construction or LEED for Schools prerequisite or credit. ConnFESS assumes that IPM is included as a required element for CT high performance buildings because IPM is required by state law for state buildings. We then question why the following list of similar mandates for state buildings and/or schools has not produced a matching CT regulation :

- PA 07-100 requires state buildings to use green cleaning products and procedures
- PA 07-124 requires certain state buildings to inspect and periodically assess and remediate IAQ issues
- PA03-220 requires all school districts to perform proper maintenance of facilities and adopt and implement an indoor air quality program that provides for ongoing maintenance and facility reviews necessary for the maintenance and improvement of the indoor air quality of its facilities. School boards are also required to provide for a uniform inspection and evaluation program of the indoor air quality within the buildings, such as the EPA’s IAQ Tools for Schools Program, for schools constructed, extended, renovated or replaced on or after January 1, 2003. This inspection is only required every five years.

## **OPTIONS**

### **INDOOR ENVIRONMENT - Building Standard Optional Strategies and Additional Considerations 16a-38k-4(b)(1) to 16a-38k-4(b)(13)**

Research proves that optimizing ventilation rates, reducing pollutants and individual control of room conditions produces healthier and more productive learning environments. National High Performance School protocols include many of these CT options as mandates. NY CHPS has 38 required elements for school buildings, 23 of which deal with IAQ. NE CHPS has 39 prerequisites, 18 of which deal with IAQ issues.

Many models also cite what the CT Compliance Manual considers optional elements as essential components when they describe and/or define what a high performance school is.

In Greening America's Schools Costs and Benefits, Gregory Kats reports that research conducted in 2005 by the Carnegie Mellon University Center for Building Performance has shown that healthy, high performance schools can reduce the incidence of flu by 87%, sick building syndrome by 67%, upper respiratory symptoms by 46% and asthma by 38.5%. Healthier schools have been able to do this by improving indoor air quality, by using materials that do not off-gas toxic chemicals, requiring moisture and mold resistant materials, reducing water incursion, and properly designing and sizing optimal ventilation systems. This research also shows at least a 3-5% improvement in learning ability and test scores in green schools. Kats comments: "It makes sense that a school specifically designed to be healthy, and characterized by more daylighting, less toxic materials, improved ventilation and acoustics, better light quality and improved air quality would provide a better study and learning environment."

The Northeast Energy Efficiency Partnerships (NEEP) website section called High Performance Schools Exchange: Critical Elements & Building Blocks contains the statement: "A high performance school maximizes indoor air quality through:

- Controlling construction sequencing and practices;
- Installing superior ventilation systems;
- Incorporating use of outside air;
- Choosing non-toxic materials; and
- Establishing an IAQ Management Plan."
- Using natural ventilation technologies to introduce outside air as feasible.

NEEP also describes high performance schools as those that incorporate temperature and humidity monitors, classroom specific controls for teachers, appropriate daylighting, and natural ventilation to ensure thermal comfort and superior IAQ, thus reducing absenteeism.

CT GBC's list of mandatory elements for high performance buildings standards has as #1 "Indoor air quality standards that exceed current standards." PA03-220 already requires HVAC standards when it states: "Each local or regional board of education shall ensure that its heating, ventilation and air conditioning system is (1) maintained and operated in accordance with the prevailing maintenance standards, such as (ASHRAE) Standard 62, at the time of installation or renovation of such system, and (2) operated continuously during the hours in which students or school personnel occupy school facilities".

**ConnFESS believes that, in order to better protect school occupants from preventable environmental health hazards, some of the CT Indoor Environment Options should become mandates. Options 1, 9, 12 and 13 can remain optional. Options 2, 3, 4, 5, 6, 7, 8, 10 and 11 should be required, but with more explicit language than is currently provided. Furniture and Furnishing and Ceiling and Wall Systems need to be added to the Low VOC materials and also mandated.**

## **HVAC ISSUES (CT IE Options 2 and 8)**

NY CHPS requires all major HVAC components to be designed so that they are correctly matched to loads to avoid system over-sizing. These systems should also be designed to allow easy access to air handling units, controls and exhaust fans for maintenance and repair. ConnFESS suggests that the following NY CHPS language on HVAC design issues be included in the CT regulations:

- “Design to physically isolate activities associated with chemical contaminants from other locations in the building, and provide dedicated systems to contain and remove chemical pollutants from source emitters at source locations. Eliminate or isolate high hazard areas and design all housekeeping storage and mixing areas (central storage facilities and janitor closets) to allow for secure product storage. Design copy/fax/printer/printing rooms with structural deck-to-deck partitions and outside exhaust systems.
- Where chemical use occurs, including housekeeping areas, chemical mixing areas, copying/print rooms, photo labs, vocational spaces, science labs, and art rooms, use deck-to-deck partitions with dedicated outside exhaust at a rate of at least 0.50 cubic feet per minute per square foot, no air recirculation, and adequate make up air. These spaces must have negative air pressure.”

In a high performance school, air intakes should be located away from potential sources of contamination and ventilation systems should be designed to optimize quantities of fresh air. Designers should consider both current and future traffic and development patterns and consult the local board of health to locate nearby emission sources. NY CHPS requires school designers to:

- “Locate outside air intake openings a minimum of 25 feet away from any hazard or noxious contaminants such as vents, chimneys, plumbing vents, exhaust fans, cooling towers, streets, alleys, parking lots, loading docks, dumpster/recycling areas, bus loops or idling areas. When locating an intake opening within 25 feet of a contaminant source is unavoidable, such opening must be located a minimum of 10 feet horizontal distance and 2 feet lower than the contaminant source.
- Make sure to locate air intakes at least 2 feet above grade and away from areas of potential snow buildup and away from plantings. Locate with regard to prevailing winds. Be particularly careful to locate air intakes away from areas where school buses and other vehicles may be idling.”

## **BUILDING FLUSHOUT (CT IE Option 3)**

NY CHPS requires a building flush out as part of their Construction IAQ Plan. IAQ testing should not be considered as an alternative approach. EPA’s Design Tools for Schools does not even mention testing the air in its section on reducing pollutant levels by airing out new materials and flushing out the building. NY CHPS states that the use of 100% outside air removes odors and VOCs that accumulate during the construction process and also prevents particles from continuing to re-circulate throughout the building. They ban “baking out” the building by increasing the temperature of the space as an alternative. The procedure for building flush out in NY CHPS is:

- “Prior to flush out, filters must be replaced with at least MERV 10 filters and replaced again after flush out with a minimum of MERV 10 filters. For unit ventilator systems, a minimum of MERV 7 filters must be installed and then replaced with MERV 7 filters after flush out.
- Flush out Option 1: The entire building must be flushed out continuously (24 hours/day) with 100% outside air for at least 10 days prior to receipt of certificate of occupancy.
- Flush out Option 2: Flushing of each space begins only after all major finish materials have been installed on floors, walls and ceilings, this includes all casework. At that time, each space may be flushed out separately and occupied once 3,500 ft<sup>3</sup> of outside air per ft<sup>2</sup> of floor area of the space has been delivered. The space may then be occupied provided that it is ventilated at a rate of 0.30 cfm/ft<sup>2</sup> of outside air or the design minimum outside air, whichever is greater, a minimum of three hours prior to occupancy and during occupancy, until the total of 14,000 ft<sup>3</sup>/ft<sup>2</sup> of outside air has been delivered to the space.”

### **LOW VOC PRODUCTS (CT IE Options 4, 5, 6 and 7)**

The need for a building flush out is reduced if non-toxic products are used in the first place and if all new materials are aired out and correctly stored before installation. Designers should select the most durable, least toxic, low emitting, moisture-resistant and chemically stable materials that can easily be installed and maintained. The approval process for substitutions should be clearly spelled out in the building specifications. VOCs are known to be carcinogenic, cause nervous system disorders and deplete the ozone layer. NY CPHS says: “Many common indoor building and surfacing materials contain a variety of potentially carcinogenic or toxic chemicals. These chemicals are released into the air and can cause a variety of health problems, from minor irritation to major health problems. Since a single material can off-gas enough toxins to cause health problems, it is important to evaluate and specify materials that are low emitting, non-irritating, nontoxic and chemically inert. This is especially important in schools because children can be more sensitive to indoor air pollutants than adults.” EPA suggests that schools select materials that :

- Use the least toxic, low VOC, water based adhesives and coatings constituents
- Emit little or no odor
- Are easy to clean and maintain and do not require the use of odorous, irritating, or toxic cleaning supplies for ongoing maintenance
- Are not susceptible to moisture damage that can foster mold growth

ConnFESS would like to see mandated low VOC materials for school construction and renovation. NE CHPS does have such a mandate. Furniture and Furnishings and Ceiling and Wall Systems should be added to the list of Low VOC materials that are included in the CT list of materials to reflect the changes made to the materials list in LEED for Schools.

### **CONTROLS (CT IE Options 9 AND 10)**

Research reported in Kats’ Greening America’s Schools indicates that teachers emphasize that their ability to control temperature in classrooms is very important to



student performance. A review of 14 studies by Carnegie Mellon University on the impact of improved temperature control on productivity found a positive correlation for all studies, with productivity improvements ranging from 0.2% up to 15%, with an average (mean) of 3.6%. CA CHPS describes a green school as one where “Building systems are easy to use. Teachers have control over temperature and lighting in their classrooms and are trained how to most effectively use them.” NY CHPS requires the controllability of systems “To provide a high level of thermal comfort with individual teacher control of thermal, ventilation, and lighting systems to support optimum health, productivity and comfort conditions.”

## **BUILDING OCCUPANT SURVEY (CT IE Option 11)**

The CT Compliance Manual provides for an option to “Administer an anonymous survey for building occupants within the first twelve months after initial occupancy to assess occupant satisfaction with building thermal comfort.” Any post occupancy survey should deal not only with satisfaction with thermal comfort, but also with indoor air quality, acoustics, lighting, safety/security issues and general functionality of space. Any survey should be followed up with a report on the action steps that will be taken to correct the identified problems. Building occupants participating in the survey should be school staff and not school children.

## **A NECESSARY POST OCCUPANCY CONSIDERATION**

### **OPERATIONS AND MAINTENANCE and IAQ MANAGEMENT PLAN**

Effective operation and maintenance procedures are essential to protect the investment in and the performance of a high performance school building. One-time training of school facilities and maintenance and the existence of maintenance manuals does not ensure correct operations and maintenance practices over the life of the building. The National Academy of Sciences report on Green Schools: Attributes for Health and Learning has three major recommendations dealing with this subject:

- Future guidelines should emphasize the importance of appropriate operation and preventive maintenance practices for ventilation systems, including replacing filters, cleaning coils and drip pans to prevent them from becoming a source of air pollution, microbial contamination, and mold growth.
- Future green school guidelines should place greater emphasis on operations and maintenance practices over the lifetime of a building. Systems that are durable, robust, and easily installed, operated and maintained should be encouraged.
- Future green school guidelines should encourage the periodic monitoring of indoor environmental characteristics including moisture levels, absolute humidity, classroom temperatures, and ventilation effectiveness to ensure that performance objectives are maintained over the service life of the school.

The EPA’s Design Tools for Schools stresses that student and staff health and productivity can suffer when building systems fail to operate as designed. Deferred maintenance due to budget cuts, poor maintenance practices, lack of regularly scheduled

training of school staff on the operation and maintenance of systems, staff turnover and lack of communication can all eventually lead to sub-standard maintenance and incorrect operation of building systems. Schools should be required to:

- a) Adopt and implement a written Preventive Maintenance Plan
- b) Adopt and implement the EPA's *Indoor Air Quality Tools for Schools* Program or its equivalent
- c) Provide annual training to all school staff (appropriate to their roles) on operation and maintenance of building systems.

All national models include the existence of a preventive maintenance plan in their descriptions of necessary components of a high performance school. NH Partnership for High Performance Schools states that superior indoor air quality in a high performance school can only be achieved and maintained by properly siting buildings, limiting the use of toxins and biological agents (during construction, operation and maintenance over the life of the building), controlling sources of contamination and providing adequate ventilation. NE CHPS says: "The key to an energy efficient high performance school is both the design process AND what happens after the building is occupied!" NE requires schools to implement the EPA's Tools for Schools Program. NE and NY CHPS both require a school maintenance plan that includes an inventory of all equipment in the new or renovated school and its preventive maintenance needs.

NY CHPS recognizes that schools must be properly maintained to be energy efficient and healthy. NY requires a maintenance plan, Green Cleaning, Integrated Pest Management and the purchase of Green Label Vacuums. The operations and maintenance plan must be updated annually. Part of the plan must show how the school will address and monitor IAQ conditions. The required maintenance plan must include the following elements:

- "The HVAC must be inspected at least annually, and problems found during these inspections must be corrected during a reasonable time. Air conditioning systems must be inspected twice a year – before the cooling season and again after the cooling season.
- Inspections and maintenance of the HVAC system must be documented in writing. The facilities manager (or individual responsible for oversight of facilities maintenance and operation) must record the name of the individual(s) inspecting and maintaining the system, the date of the inspection and maintenance, and the specific findings and actions taken. The facilities manager must ensure that such records are retained for at least five years.
- Sensors must be calibrated in accordance with manufacturer's instructions.
- Means to monitor and address any IAQ issues.
- Ongoing training of maintenance staff, calibrations of all sensors that are part of the HVAC system on a routine basis including CO<sub>2</sub> sensors for CO<sub>2</sub> demand controlled ventilation."

In requiring the use of Green Clean products and practices, NY CHPS states:

"Appropriate use of least toxic cleaning products that achieve the same function and utility as more toxic traditional cleaning chemicals is critical to the success of a high performance school and will contribute significantly to improved indoor air quality."

## CONCLUSION

There is enough knowledge now about how to build a truly effective green school that we in CT should be aiming for state of the art High Performance Building Regulations, not just minimal ones. However, to do so, it is important to recognize that a one-size-fits-all approach to building green does not necessarily address the uniqueness of school buildings or the urgent need to protect school children from preventable health hazards. To provide healthy, productive, energy-efficient and cost-effective learning environments for all school occupants, it is essential that the CT mandates address all of the reasons that IAQ problems and energy waste occur in CT schools: poor choice of site, poor design, poor choice of materials, poor construction or renovation practices and poor maintenance practices. In order to do this, the proposed CT regulations for schools should:

1. include all the prerequisites currently found in LEED for Schools and missing from the CT mandates: Minimum IAQ Performance, Environmental Site Assessment and Minimal Acoustical Performance
2. amend the language in the current mandatory requirements to reflect stronger and/or additional elements found in national models for High Performance Schools
3. change some of the CT Indoor Environment Options into requirements, but with more explicit language than is currently provided
4. address the need for a Post-Occupancy IAQ Management Plan and a long-term Preventive Maintenance Plan that includes ongoing training of all school staff to protect IEQ, keep the building systems working as designed and maintain superior energy performance.

ConnFESS is grateful for this opportunity to provide input on the proposed CT High Performance Building Standards.