Indoor Air Quality in Northwest Schools

Spring 2009

IAQ News

Washington State University
Extension Energy Program

"Students, too, can be involved in indoor air quality monitoring. Science club students in one Spokane-area school successfully conducted routine indoor air quality testing, referring problems they found to the facilities staff."

Gail Gensler

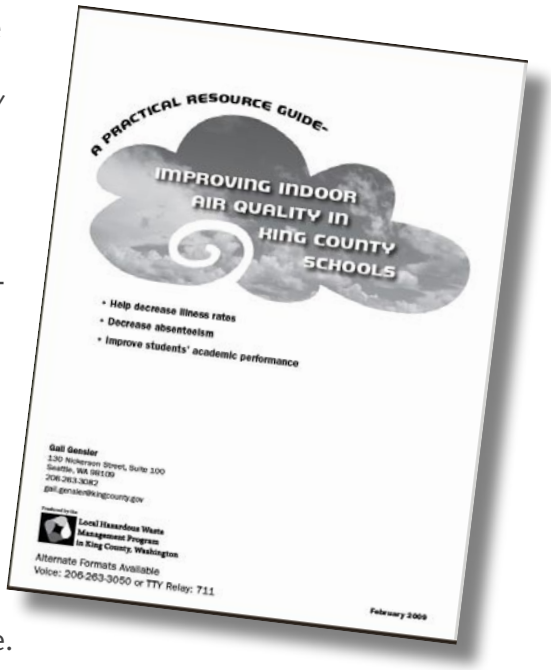
An electronic newsletter for school Indoor Air Quality exclusively for Northwest schools

A New School IAQ Guide

King County has a excellent school IAQ resource guide for schools

By Gail Gensler
Children's Environmental Health Programs
Local Hazardous Waste Management Program in King Count

Here are some highlights of the new resource guide: *Improving Indoor Air Quality in King County Schools*.



According to a report from the Environmental Protection Agency, indoor air quality problems can increase absences because of respiratory infections, allergic diseases from biological contaminants, or adverse reactions to chemicals used in school. The report cites research that shows a link between decreased ventilation levels and decreased student concentration and performance.

Improving the indoor air quality in your school can help:

- decrease illness rates
- decrease absenteeism, and
- improve students' academic performance

School districts, maintenance staff, teachers, and the rest of a school community can improve the school's indoor air quality by following these three steps.

I. **Keep your building dry and clean.**
II. **Control pollutants.**
III. **Ventilate adequately.**

*See **King County** on page 6*

IAQ News

Table of Contents

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What is the RCM Exchange?

By Karen Messmer, WSU Extension Energy Program

RCM Exchange (RCMx) is an interactive online resource for Resource Conservation Managers (RCMs). The *Guide to Success* in operating an RCM program includes checklists, sample reports, and other nuts-and-bolts resources. All materials are provided in electronic format to allow easy customization and sharing.

RCMx also provides Tip Sheets & Tools, Success Stories, Profiles of RCMs, and Networking opportunities such as meetings and electronic forums. RCMs are encouraged to recommend additional resources they've found helpful. The idea behind RCMx is to let this online resource evolve through the collective wisdom of your individual experiences

Public facility and energy managers can find help regarding resource conservation management at the WSU Energy Program RCMx website. *http://www.energy.wsu.edu/rcmx/*. The *Guide to Success* offers checklists and tools for managing energy and other resource costs.

You can also sign up for our monthly RCM newsletter summarizing articles and providing event announcements and references to useful resources. To subscribe, contact Karen Messmer: *messmerk@energy.wsu.edu*

IAQ News

A quarterly electronic newsletter exclusively for Northwest schools.

Please circulate this subscription opportunity throughout the Northwest to those who may be interested.

There are two ways to subscribe:
1) To view ***IAQ News***, click here:
www.energy.wsu.edu/projects/building/iaq_nl.cfm
The newsletter contains a link for subscription information.

2) Or, send a blank email message to: *subscribe-iaq@listserv.energy.wsu.edu*

You will receive a confirmation message. When you reply to that message you will be subscribed and will receive all future postings. You can easily unsubscribe at any time.

This broadcast email list not only provides automatic delivery of the quarterly ***IAQ News***, but includes announcements about news of interest, training events, grant opportunities, and other information useful to school districts, agencies, and stakeholders involved in school IAQ and operations and maintenance.

IAQ News is an opportunity for all interested parties to communicate, and add to the collective wisdom.

Collaborative for High Performance Schools: Who, What and How

The mission of the Collaborative for High Performance Schools (CHPS) is to facilitate the design, construction and operation of high performance schools: environments that are not only energy and resource efficient, but also healthy, comfortable, well lit, and containing the amenities for a quality education.

Schools and School Districts:
CHPS is now offering free membership to schools and districts through the CHPS Registered program. To learn more and to apply, go to *www.chps.net/membership/index.htm*

CHPS helps facilitate and inspire change in our educational system. The goals of CHPS are to:

- Increase student performance with better-designed and healthier facilities,
- Raise awareness of the impact and advantages of high performance schools,
- Provide professionals with better tools to facilitate effective design, construction and maintenance of high performance schools,
- Increase school energy and resource efficiency, and
- Reduce peak electric loads.

CHPS Programs:

High Performance School Recognition and Rating Programs

CHPS oversees the nation's first green building rating program especially designed for K-12 schools. The CHPS Criteria is a comprehensive system of environmentally responsible benchmarks designed by the CHPS technical committee, which is made up of over fifty school facilities experts including state agency officials, designers, school district officials, contractors, product manufacturers and energy and water utility officials. A CHPS school is a school that has strived to achieve excellence in environmental efficiency and healthy building practices. CHPS recognizes superior design teams and school districts through award ceremonies, case studies and media outreach. Schools can self-certify their school through the free CHPS Designed program, or seek third-party verification of their high performance school through the CHPS Verified program.

High Performance School Trainings

CHPS, an American Institute of Architects registered provider of Continuing Education Services, offers accredited high performance school technical seminars to design professionals. A leader in the field of green school development, CHPS also offers workshops to school districts and other stakeholders on the green school development process, including assisting school districts in creating district-wide resolutions on green school construction. CHPS also offers an annual conference on high performance schools called Greentools for Healthy Schools.

CHPS Best Practice Manual

CHPS has developed and maintains a six-volume technical best practices manual for high performance schools. The manual covers planning, design, high performance benchmarks, maintenance and operations, commissioning and relocatable classrooms in high performance schools. The manual was developed through a consensus process with the assistance of school officials, state agencies, industry representatives and design professionals. CHPS periodically updates each volume of the manual.

CHPS High Performance Resources

CHPS manages a member directory of green school building services and products and a directory of certified low emitting materials for green school construction. CHPS also offers online trainings and presentations, specifications and informational fact sheets. CHPS is developing an individual professional accreditation program that will allow design

*See **CHPS** on page 8*

Are Your School's Vacuums Capturing Particles?

By Rich Prill, WSU Extension Energy Program

As I visit NW schools to assist with indoor air quality assessments and program implementations I always bring along my particle counter. Airborne particles can obviously have a significant impact on our school occupants, so the goal should be "prudent avoidance" to the extent practical. The trouble is the small particles of primary concern are too small to be visible to the naked eye. That's where the particle counter is useful – it "sees" the particles we cannot. Plus the instrument provides numbers that help you understand your HVAC filter effectiveness (indoor vs outdoor particle counts), as well as comparing various rooms and zones to one another. When indoor concentrations are higher than outdoors, it's clear the source is indoors. Identifying zones with higher particle counts allows you to focus your control strategies and cleaning efforts and compare before-and-after particle counts to ensure your efforts are effective.

*See **Vacuums** on page 5*

Bellingham School District
Survey of Vacuum Equipment

Particles measured with Fluke 983 1 liter samples differential mode
Particle size range (micrometers)

Equipment	0.3	0.5	1.0	2.0	5.0	10.0
Back-pack 62-076757 (very clean filters)	47,748	5153	510	186	15	3
Back-pack 12579 (Dirty filters)	103,501	23539	5736	3230	506	109
Back-pack 12579 (Clean filters including hepa)	85,948	13948	2528	1493	401	120
Back-pack vacuum ID: 0116891 FXR "with dirty filter"	99,886	15819	1746	932	30	14
Back-pack vacuum ID: 0116891 FXR "with a clean hepa filter"	77,284	20902	3649	3278	651	196
Back-pack vacuum ID: 0117640 FXR "with dirty filter"	117,061	22666	1900	1026	71	16
Back-pack vacuum ID: 0117640 FXR "with a clean hepa filter"	93,133	13755	868	417	41	6
Back-pack vacuum cleaner #0116890 FXR dirty filter	281,750	67464	12918	6472	1707	995
Back-pack vacuum cleaner #0116890 FXR new filter	248,656	54535	13063	7259	1205	182
Back-pack 0116789 FXR (Dirty filters)	54,124	10971	1538	632	39	6
Back-pack 0116789 FXR (Clean filters)	40,701	8009	1247	571	73	16
Back-pack 0116788 FXR (Dirty filters)	24,482	3768	651	337	53	8
Back-pack 130822 (Dirty filters)	50,725	17418	4888	2491	316	69
Back-pack 130822 (Clean filters)	35,820	9391	2590	1290	171	29
Old Royal Vacuum Cleaner (rarely used)	19,518	4085	2580	2141	889	261
Back-pack 62-074935 (Dirty filters)	48,963	12401	3386	1996	662	223
Back-pack 62-074935 (Clean filters)	57,299	13846	3816	2317	661	167
Back-pack 62-034055 (Dirty filters)	53,213	14326	4016	2435	596	111
Back-pack 62-034055 (Clean filters)	58,022	15043	4281	2619	611	133
Back-pack #184163 (dirty filters)	149,427	23263	4385	2053	330	65
Back-pack #184163 (new filters)	88,125	15372	3655	1985	257	37
Up-right Windsor #131146 (very clean filter)	90,437	11513	1329	682	176	72

Vacuums

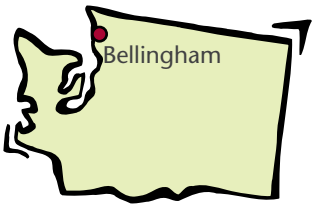
Continued from page 4

Another use of the particle counter is to check vacuum filtering effectiveness. I've measured particles being sprayed out of shiny new and expensive vacuums, old worn units, and equipment with "high efficiency HEPA filtration."

Unfortunately, in my experience, I am unable to predict how well a particular vacuum is capturing particles by brand, type, filter or bag type, age, appearance, or by what's written on the unit (e.g., Binford Premium Super Deluxe Maxi-Stage Eco Filtration XL Magnum Pro). The only way to know for sure how this equipment is working is to measure the particulates in the exhaust stream.

The time it takes for the smallest particles to settle out of the air is on the order of days, not minutes or hours. So using a vacuum with poor capture ability for a couple of hours in the evening can mean increased exposures the next school day. Plus, your custodians are taking the brunt of the exposure on a daily basis.

Take a look back at the Fall 2008 issue of this IAQ newsletter "Vacuum Cleaners and Suspended Particles in Homes and Schools" by Dave Blake: *http://www.energy.wsu.edu/documents/building/iaq/nl/08_fall_iaq_nl.pdf* .



The Bellingham School District *(National Tools for Schools IAQ Award Winner)* took the initiative to check a number of their vacuums. Chris Dean, BSD Custodial Supervisor conducted the testing (360-676-6544) and Dave Blake, Northwest Clean Air Agency, loaned the particle counter. I've summarized – with BSD's blessing – the results of these tests in the table on page 4.

Many factors can influence the performance of an individual piece of equipment. Note that we make no claims as to the scientific validity of these values nor should these results be interpreted as an endorsement or discredit of a particular type or brand of equipment. Your particular up-right or back-pack or "pig" vacuum performance may differ substantially. A thorough study would be useful in order to provide schools and others with clear and useful guidance.

Results From Other School District Vacuums

Particles measured with Fluke 983 1 liter samples differential mode

Particle size range (micrometers)

Equipment	0.3	0.5	1.0	2.0	5.0	10.0
Up-right (dirty filter)	74,000	24,000	4,700	4,500	267	55
Up-right (dirty filter)	143,000	23,000	1,700	2,000	600	300
Back-pack (dirty filter)	101,000	25,000	2,200	736	0	0
Up-right (dirty filter)	29,000	4,200	480	460	40	15
Up-right (dirty filter)	42,000	9,500	1,000	589	250	345
Back-pack (dirty filter)	70,690	20,600	2,900	2,000	393	230
Up-right (old) (dirty filter)	45,000	20,000	5,000	6,000	1,000	400
"Pig" (dirty filter)	1,800	300	100	375	550	590
Up-right Windsor (dirty filter)	120,000	38,000	3,300	1,000	160	110
Hoover Wind-Tunnel Up-Right (residential model)	4,900	170	0	6	6	0
Up-right Windsor (dirty filter)	81,000	20,000	1,500	530	52	68
Back-pack (dirty filter)	47,000	10,000	1,000	700	160	160

Note 1: Some rounding of values was performed

Note 2: "Dirty filter" means the unit was operated as-found with the used filter/bag in place

King County

Continued from page 1

If options are limited, take these priority actions:

- Minimize the amount of dust and dirt tracked in.
- Avoid allergens and asthma triggers.
- Make sure that building heating, ventilation, air-conditioning (HVAC) systems meet the standards.

NOTE: The Washington State Board of Health is revising its K-12 school environmental health and safety rules (Chapter 246-366, Washington Administrative Code) which include rules about indoor air quality. The final rule is expected to be adopted by June, 2009. Schools can check details on the rule revision at www.doh.wa.gov/ehp/ts/School/s-rdc/default.htm.

I. Keep your building dry and clean

1. Get rid of mold. Mold can trigger allergies.

If you see or smell mold or mildew, there's probably a water or moisture problem. Find the mold and remove it. Dry up the source of the water to prevent more molds from growing.

2. Minimize the amount of dust and dirt tracked indoors.

- Keep pesticides, herbicides, grit, dirt and other outdoor pollutants outside the building.

Maintenance staff:

1. Stop dirt and toxic pollutants at the door. Place walk-off mats inside each entrance (preferably as wide as the doorway and twice as long, often 6'x12').
2. If possible, also have walk-off mats outside entrances to capture dirt, mud, water, and snow.
3. Clean walk-off mats regularly.

3. Keep the inside space as clean as possible.

Maintenance staff:

1. On existing vacuum cleaners, replace dust bags with double-layered or other higher efficiency filter bags.
2. When purchasing new vacuums, choose "true HEPA" or "sealed HEPA" models.
3. Vacuum thoroughly and deeply every day, make sure that every room gets a thorough and deep vacuuming at least once a week
4. For carpet cleaning, use hot water carpet extraction only – soaps and detergents leave a residue that will become airborne when dry and expose occupants to these chemicals.

Teachers and students:

Place chairs on top of desks and tables at the end of the day to help give custodians more time to clean and better access to carpet and floor areas.

II. Control pollutants

1. Avoid allergens and asthma triggers.

Asthma is the leading cause of school absenteeism from a chronic childhood condition. Thirteen million school days are missed each year due to asthma, and an average of one out of every 13 school-aged children has asthma.

Reduce exposure to these asthma triggers:

- dust mites
- molds
- cockroaches
- pet dander
- fumes and fragrances
- chemicals
- dust
- products of combustion

Maintenance staff:

1. Eliminate the use of paradichlorobenzene urinal blocks and other air freshener products.
2. Many air fresheners work by adding toxic scents to the air, not by eliminating existing odors. For normal odors, flush fresh air through the heating, ventilating and cooling system or open windows.
3. Reduce or eliminate the use of fragrances in the school, particularly air fresheners. Fragrances may be allergy triggers.

Continued on next page

King County

Continued from page 6

Teachers:

1. Avoid or remove fabric and fleece materials such as upholstered furniture, blankets, area rugs, pillows and stuffed animals/toys from the classroom. They can gather dust, dander, fragrance and other asthma and allergy triggers.
2. Do not keep pets in classrooms. The WA State Department of Health also recommends this. See *www.doh.wa.gov/ehp/ts/IAQ/schooliaqbmp.pdf*.
3. Use only low odor dry erase markers and keep use to a minimum.

2. Keep carbon monoxide levels down.

Maintenance staff:

1. Place carbon monoxide alarms in areas of the school with combustion equipment (boilers, furnaces, water heaters, etc.). Carbon monoxide is colorless and odorless. Low level concentrations can cause fatigue, headaches and dizziness depending on the length of exposure. High levels can be deadly.

III. Ventilate adequately

1. Maintain a healthy air flow.

District:

1. Prohibit air cleaners that emit ozone, either intentionally, or as a by-product. Ozone is a respiratory irritant that can severely aggravate asthma and respiratory conditions.
2. Institute a "no idling close to school" policy for all vehicles., see *http://your.kingcounty.gov/solidwaste/greenschools/transportation-resources.asp.*
3. Invest in basic indoor air quality monitoring equipment to allow operations and maintenance staff to make routine checks as well as respond promptly to concerns.

   The equipment should check the following:
   - Carbon dioxide
   - Carbon monoxide
   - Moisture
   - Air flow direction
   - Temperature
   - Relative humidity

   A basic set of equipment will cost around $1,000.

Maintenance staff:

1. Make sure that building heating, ventilation, air-conditioning (HVAC) systems meet the following standards. Standards generally measure the amount of carbon dioxide in a room.
   - The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 62, recommends that indoor CO_2 levels should be no more than 700 parts per million above outdoor, background levels (typically around 300-400 parts per million). This results in an indoor CO_2 limit of approximately 1,000 parts per million.
   - Chapter 51-13, Washington Administrative Code requires 15-20 cubic ft./minute of fresh air intake in school buildings.
2. Maintain and inspect HVAC systems as prescribed by the manufacturer.
3. Ensure HVAC filters are clean and tight fitting, and the HVAC systems are clean and free of moisture, molds, deteriorating linings, and other contaminants. Mold indicates a moisture problem, so fix leaks promptly and keep the whole school building dry and clean.
4. Change ventilation system filters at least three times a year; write the change date on the filter, and maintain a logbook recording changes. Assure filters fit tightly and cannot be bypassed.
5. Ventilate exhaust fumes from labs, art classes, photocopy machine spaces, auto shop spaces and other shop spaces directly to the outside of a building.

Continued on next page

King County

Continued from page 7

Teachers:

1. Keep classroom ventilator units unobstructed. Do not store teaching materials, student projects, or plants on them.
2. If ventilation systems are controlled by basic thermostats in the rooms, set the thermostat to "FAN ON" during occupied hours and to "AUTO" when you leave.
3. If the existing ventilation system does not provide sufficient fresh air, open windows for a few minutes every hour to flush out the room.

III. Provide education

1. Adopt an indoor air quality plan for the district.
2. Provide training to key school district.
3. Students, too, can be involved in indoor air quality monitoring. For example, science club students in one Spokane-area school successfully conducted routine indoor air quality testing, referring problems they found to the facilities staff.
4. Raise awareness among all school district staff and students about the importance of preventing exposure to indoor air pollutants.

Follow this link to the full resource guide: *http://www.govlink.org/hazwaste/publications/index.cfm#2180*

CHPS

Continued from page 3

professionals to become CHPS-accredited.

For further information, contact CHPS at 142 Minna St., Second Floor, San Francisco, CA 94105; call them at 415-957-9888; or email *info@chps.net*

Washington State CHPS

The Washington Sustainable Schools Protocol is the state's benchmark for design and construction of high performance schools. The Protocol is based on the CHPS Criteria, and was a result of a three-year long pilot program during which it was decided that CHPS was the best high performance building program for the state. The Protocol was developed out of the CHPS program.

WASHINGTON COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS
CHPS
Better buildings. Better students.

All major facility projects of public school districts receiving any funding in a state capital budget must be designed and constructed to the Washington Sustainable School Design Protocol or a LEED Silver Standard.

Recent recognized designed schools in Washington

to have completed the CHPS program are:

- Washington Middle School, Olympia
- Chester H. Thompson Elementary School, Tacoma
- Cottage Lake Elementary, Woodinville
- Fern Hill School, Tacoma (above)
- Lincoln Heights Elementary, Spokane

For more information, contact the Washington State Office of Superintendent of Public Instruction:

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