Health Canada Santé Canada

Indoor Air Quality

Tools for Schools
Action Kit for Canadian Schools

March 2003

Canada

Indoor Air Quality

Tools for Schools
Action Kit for Canadian Schools

March 2003

Our mission is to help the people of Canada
maintain and improve their health.
Health Canada

Published by authority of the Minister of Health

Également disponible en français sous le titre
Qualité de l'air intérieur Outils de la trousse d'action pour les écoles canadiennes

This publication can be made available (in/on computer
diskette/large print/audio-cassette/braille) upon request.

Cat. H46-2/03-292E
ISBN 0-662-33401-9

Table of Contents

Acknowledgements

The *Indoor Air Quality – Tools for Schools Action Kit for Canadian Schools, March 2003 version* was prepared by the Indoor Air Quality working group of the Federal/Provincial/Territorial Committee on Environmental and Occupational Health (CEOH-IAQ). It is based on a similar document already developed by the US Environmental Protection Agency (EPA).

We appreciate the time and dedication that everyone, including all of the consultants, took to share ideas, experiences, knowledge and comments to the multiple drafts. A special thanks goes out to members of the CEOH for their valuable comments and guidance and to Dr. Don Figley for drafting the technical documents.

F/P/T Committee on Environmental and Occupational Health

Working Group on Indoor Air Quality (CEOH-IAQ):

Mr. N. Gilbert, Air Health Effects, Health Canada

Dr. M.A. Kasem, Indoor Environments Division, Health Canada

Dr. D. Leong, Ontario Ministry of Labour

Mr. T. Macaulay, Saskatchewan Health (Chair)

Mr. A. MacKenzie, Alberta Health and Wellness

Dr. D. Miller, Department of Chemistry, Carleton University

Mr. W. Robertson, Water Quality, Health Bureau, Health Canada

Dr. V. Salares, Canada Mortgage and Housing Corporation

Mr. H. Wooley, Saskatchewan Labour

Dr. J. Zhu, Environmental Health Science Bureau, Health Canada

Secretariat to CEOH-IAQ:

Current:

Josée Beauregard, Indoor Environments Division, Health Canada

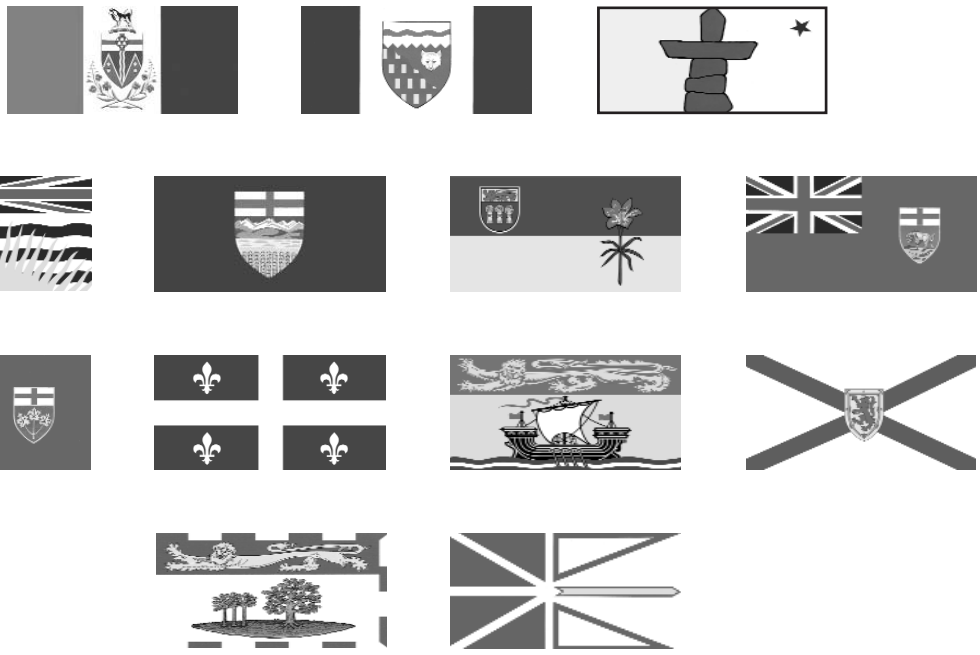
Raymonde Chénier, Indoor Environments Division, Health Canada

Former:

Elaine Easson, Indoor Environments Division, Health Canada

Ria Demos, Indoor Environments Division, Health Canada

Funding for this project was provided by Health Canada.



Environment Canada Environnement Canada

Human Resources Development Canada Développement des ressources humaines Canada

Health Canada Santé Canada

CMHC SCHL

Canada

Disclaimer

Any information gathered as a result of using this Kit is for the benefit and use of Canadian schools. Federal, Provincial, territorial and municipal regulations and guidelines should be respected when implementing this kit, including local fire regulations, building codes and occupational health and safety codes Information provided is based upon current scientific and technical understanding of the issues presented. Following the advice given will not necessarily provide complete protection in all situations or against all health hazards that may be caused by indoor air pollution. The tasks identified within each checklist should be carried out by/or with the assistance of trained professional in that field.

Mention of any trade names or commercial products does not constitute endorsement or recommendation for use.

As you prepare to use the IAQ Action Kit, please note:

1. The guidance in this kit is not intended as a substitute for appropriate emergency action in the event of a hazardous situation that may be an immediate threat to life and safety.
2. The modification of building functions, equipment, or structures to remedy air quality complaints may create other indoor air quality problems, or negatively affect safety systems and energy use. A thorough understanding of all the factors that interact to create indoor air quality problems can help to avoid this undesirable outcome. Consult with professionals if it becomes necessary. In the event that medical records are used while evaluating an IAQ problem, confidentiality must be maintained.
3. Although the focus of this kit is the school environment, many school occupants spend a proportionately larger amount of time in the home and other places. Individuals should be informed of the potential impact of other environments, especially the home, on their overall health and well-being. Canada Mortgage and Housing Corporation (CMHC) offers many useful publications and information materials related to IAQ in the home.

Reproduction

CHAPTER 1

Note to School Officials

Note to School Officials and Others Interested in Indoor Air Quality in Schools

Most people are aware that outdoor air pollution can damage their health, but fewer realize that indoor air pollution can also contribute to health effects, such as asthma. Studies by Health Canada, the U.S. Environmental Protection Agency (EPA), and other agencies indicate that levels of indoor pollutants may be significantly higher than outdoor levels. Since most people spend an estimated 90% of their time indoors, indoor air pollution is a significant concern. Children may be especially susceptible to air pollution.

The promotion of good indoor air quality (IAQ) in schools is particularly important, since poor IAQ can potentially affect the health of students and staff, as well as the educational process and costs. Good IAQ contributes to a favorable learning environment for students, productivity for teachers and staff, and a sense of comfort, health, and well-being for all school occupants. These combine to assist a school in its core mission – educating children.

Indoor air quality problems can be caused by a wide range of factors including indoor sources of contaminants such as building materials, furnishings, cleaning agents, pesticides, printing and copying devices, combustion appliances, tobacco products, allergens, fungi, molds, bacteria, viruses, radon, and lead. Tighter buildings combined with reduced ventilation can also reduce IAQ and affect the health and well-being of school occupants.

In addition to contributing to health problems, poor air quality can be costly for schools due to the potential for: expensive investigation and hasty solutions during a major indoor air problem; higher heating and cooling costs; damage to the physical building structure and mechanical equipment; and higher liability. Thus, the proper maintenance of indoor air is more than a “quality” issue, it encompasses safety and stewardship of the investment in students, staff and facilities.

Timely and effective response to IAQ problems will reduce the potential consequences that can affect health costs and the educational process (see *Introduction*).

This kit provides a process and the tools to help schools prevent, identify, assess, and address the majority of indoor air problems with minimal cost and involvement. This can be accomplished by using trained professionals to perform the limited and well-defined set of basic operations and maintenance activities that are explained in the kit.

It is recommended that implementation of the *IAQ Tools for Schools* program be started early in the school year.

Origin of the IAQ Action Kit

The *IAQ Tools for Schools Action Kit* was developed at Health Canada in collaboration with the Indoor Air Quality Working Group of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health (CEOH).

Based on a similar kit developed by the United States Environment Protection Agency (US EPA), this version of the kit has been tailored to Canadian schools. Three consultation workshops, involving approximately 250 stakeholders from across the country, were held to obtain feedback on the Canadian kit. In 2002, the kit was pilot tested in 44 schools across Canada. The results of the pilot study were used to further refine the contents of the kit.

CHAPTER 2

Introduction to IAQ Action Kit

Introduction to IAQ Action Kit

What is the IAQ Action Kit?

The *IAQ Action Kit* is a practical tool to help school boards, principals and their management teams, and school employees understand and address indoor air quality (IAQ) problems.

The kit provides clear and easily applied information and activities that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and promptly resolve problems if they do arise. It is flexible enough to conform to the specific needs of your school. In the broadest sense, using the kit represents an investment in people and school facilities to create a healthier school environment.

The kit is intended primarily for use by elementary and secondary schools, however its principles and activities can also benefit community colleges, universities, and preschool and daycare centres. In addition, architects and engineers could also apply many of the kit's principles when planning new schools or major renovations.

Guiding Principles of the IAQ Action Kit

The *IAQ Action Kit* strategy is based on the following principles:

- Many IAQ problems can be prevented by educating a school's management, staff and students about the factors that create them.
- When IAQ problems do arise, they can often be resolved using the skills of school staff and resource personnel. If outside assistance is needed to solve an IAQ problem, the best results will be achieved if school officials are informed customers.
- The expense and effort required to prevent most IAQ problems or to intervene at an early stage is much less than the expense and effort required to resolve problems after they develop.

The effective realization of these principles depends on the development of IAQ awareness, empowerment, and skills within a school.

Why Use the IAQ Action Kit?

Good indoor air quality is one of many factors that contribute to a favorable learning environment for students, performance of teachers and staff, and a sense of comfort, health, and well-being.

When a school suspects that it has an indoor air quality problem, this kit can help to identify areas of concern, outline potential solutions, solve simple problems, or gather the information needed to tackle more complex problems. All schools can benefit from using this kit to prevent IAQ problems and identify areas for improvement or development.

The proper use of this kit requires school boards and schools to define areas of individual responsibility and dedicate sufficient human, physical and fiscal resources to IAQ issues. This investment will result in healthier school environments, team building, and more efficient facilities management.

Failure to respond promptly and effectively to IAQ problems can result in a variety of consequences that can affect health, costs, and the educational process. These include:

- increased incidence of long- and short-term health problems such as cough, eye irritation, headache, asthma episodes, and allergic reactions, and, in rarer cases, life-threatening conditions such as severe asthma attacks, Legionnaire's disease or carbon monoxide poisoning;
- promoting the spread of airborne infectious diseases;
- aggravating asthma and other respiratory illnesses. Nearly one school-aged child in 13 has asthma, the leading cause of school absenteeism due to chronic disease. There is substantial evidence that indoor environmental exposure to allergens, such as dust mites, other pests, and molds play a role in triggering asthma symptoms. These allergens can be found in the school and other indoor environments;
- producing an unfavorable learning environment for children;
- reducing productivity of teachers and staff due to discomfort, sickness, or absenteeism;
- accelerating the deterioration of the school's physical plant and equipment, thereby reducing the efficiency;
- increasing the risk that school rooms or buildings will have to be closed, and occupants temporarily relocated;
- straining relationships among the school administration and parents and staff;
- generating negative publicity that could damage a school's or administration's image and effectiveness;
- creating potential liability problems.

What the Kit Contains

The *IAQ Action Kit* provides background information on indoor air quality and pollution control strategies, references to additional resources and information, and specific structured checklists for different building systems or school areas. These

checklists identify the major roles and responsibilities of those individuals who should be on the IAQ team. The checklists are intended to educate and direct principals and their management teams and other school employees in the collection and interpretation of IAQ-related information.

There are 11 checklists, including:

- Administration
- Health
- Air Handling
- Classroom
- Relocatable Classroom
- Building Maintenance
- Custodial
- Food Service
- Waste Managment
- Renovation and Repair
- Design/Build/Lease-Back Facilities

Some checklists require more expertise than others. Each checklist identifies the intended user.

Before you use the IAQ Action Kit

Before applying any of the checklists, IAQ team members should also read the *IAQ Backgrounder* (Chapter 3) and *How to Get Started* (Chapter 4) to obtain a general understanding of the entire process, common sources of indoor air contaminants, and basic control strategies. Each checklist provides specific instructions for identifying, preventing, and resolving indoor air quality problems.

CHAPTER 3

IAQ Backgrounder

IAQ Backgrounder

Understanding IAQ Problems and Solutions

Over the past several decades, people's exposure to indoor air pollutants has increased due to a variety of factors. These include:

1. the construction of more tightly sealed buildings;
2. reduced ventilation rates to save energy;
3. the use of synthetic building materials and furnishings;
4. the use of chemically formulated personal care products;
5. the use of pesticides and housekeeping supplies;
6. the increased complexity of modern building systems;
7. building deterioration due to age, improper maintenance or design;
8. increased loading of school buildings due to larger class sizes or expanded use of facilities; and
9. a reduction in resources (money and staff) to operate and maintain school facilities.

Other factors such as lighting, noise and electromagnetic fields (EMF) may also have an impact on the indoor environment. While these factors should be recognized, they are not typically addressed as part of an IAQ assessment.

In a broad context, IAQ is the result of the complex interactions among buildings, building systems and people. Four basic factors affect IAQ:

- sources of indoor air pollutants;
- heating, ventilation and air-conditioning (HVAC) systems;
- pollutant pathways; and
- occupants.

All of these factors must be carefully considered when assessing a building. A rational, balanced approach will result in the most healthy, efficient and effective building performance.

Sources of Indoor Air Pollutants

Indoor air contaminants can originate either within the school building or be drawn in from outdoors. If pollutant sources are not controlled, IAQ problems can arise, even if the HVAC system and other building components are properly operated and maintained.

Air pollutants consist of tiny particles or particulates (such as dust, pollen, soot or fungal spores), fibres, mists, aerosols, and gases. Some typical examples are listed in the following table.

Typical Sources of Indoor Air Pollutants

Outside Sources	Building Equipment	Component/ Furnishings	Other Indoor Sources
Polluted Outdoor Air: • pollen, dust, fungal spores • industrial emissions • vehicle emissions **Nearby Sources:** • loading docks • vehicle parking or loading • odours from dumpsters • unsanitary debris or building exhausts near outdoor air intakes **Underground Sources:** • radon • pesticides • leakage from underground storage tanks • soil gases	**HVAC Equipment:** • microorganisms growing in drip pans, ductwork, coils, and humidifiers • improper venting of combustion products • dust , debris or fibres in or from ducts or duct linings • plumbing traps or sumps **Non-HVAC Equipment:** • emissions from office equipment (volatile organic compounds, ozone) • emissions from shops, labs, cleaning processes • custodial practices • atria, planters, and other wet areas	**Components:** • microorganisms growing on soiled or water-damaged materials • dry traps that allow the passage of sewer gas • materials containing volatile organic compounds, inorganic compounds, or damaged asbestos • materials that produce particles (dust) or fibres • tunnels, basements and crawlspaces • exposed soil (walls/floors) **Furnishings/Finishings:** • emissions from new furnishings, flooring, or textiles • microogranisms growing on or in soiled or water-damaged furnishings	• science laboratories • vocational arts areas • copy/print areas • food preparation/eating areas • smoking lounges • cleaning materials • emissions from trash • pesticides • odours and volatile organic compounds from paint, sealants or adhesives • occupants with communicable diseases • markers and felt pens • insects and other pests • personal care products • animals • classroom materials or material storage • renovation activities

Many potential pollutants are found in the indoor environment. Contaminants may result from a single source or from a combination of sources.

In addition, indoor air pollutant levels can vary by time and location within the school building, or even within a single classroom. Pollutants may be present only once each week such as when floor stripping is done, or continuously such as when mould is growing in the air distribution system. Pollutants can be emitted from specific areas, such as laboratory storage rooms, newly installed or refinished flooring materials, or freshly painted surfaces. Each school should consider developing policies on fragrance use in consultation with provincial and territorial authorities.

HVAC System Design and Operation

The heating, ventilation, and air-conditioning (HVAC systems include all the heating, cooling, and ventilating equipment serving a school. A properly designed and functioning HVAC system:

- controls temperature and humidity to provide thermal comfort;
- distributes adequate amounts of clean outdoor air to meet the ventilation needs of school occupants;
- provides air circulation; and
- isolates areas and removes odours and pollutants through pressure control, dilution, filtration, and exhaust.

Not all HVAC systems are designed to accomplish all of these functions. Some older buildings rely only on natural ventilation. Others lack mechanical cooling equipment, and many buildings have little or no humidity control.

Here are some of the key characteristics of a properly functioning HVAC system:

- It must provide reliable, continuous operation.
- If the system is designed for variable air flows, it must provide adequate minimum amounts of clean outdoor air and total air distribution.
- The building operators must be trained in the operation and maintenance of the system.
- The system must provide adequate access for the inspection and maintenance of *all* components.

Many different unitary, central and hybrid ventilation systems can provide adequate performance if they are properly designed, installed, maintained and operated.

Pollutant Pathways and Driving Forces

The building envelope is designed to provide a barrier between the outdoor and indoor environments. Since these environments often vary, the building envelope will be subjected to loads from temperature, wind, humidity, mechanical forces, and other factors.

A well-functioning building envelope can resist these loads and provide durable, long-term performance. However, a building envelope that cannot resist the loads it faces – due to inadequate design or maintenance – will fail, and may cause indoor air quality problems.

Some examples of building envelope failures (and their primary causes) are:

- improper flashings that allow moisture to enter walls (***design*** or ***workmanship***);
- snow/ice build-up on roofs and subsequent water leakage (***design***: slope or insulation; ***maintenance***: membrane repairs, snow clearing; ***operation***: interior temperature);
- mould growth in exterior walls (***design***: air/vapour barrier and insulation details; ***maintenance***: inspection, sealing, repair; ***operation***: excessive humidity, building pressurization, furnishings placed on interior of exterior wall surface, air flow).

In many cases, an indoor air quality problem is the result of a number of inter-related building performance problems.

Airflow patterns within buildings result from the combined forces of mechanical ventilation systems, human activity, and natural effects such as wind and temperature. Air pressure differences created by these forces move airborne pollutants from areas of higher pressure to areas of lower pressure through any available openings in building walls, ceilings, floors, doors, windows, and the HVAC system.

These principles are important to consider when assessing how contaminated air from work areas, equipment, outdoors, or the soil can enter the building envelope and circulate within the building. They also identify potential control strategies such as providing adequate air sealing, reducing intentional or unintentional openings, proper balancing of air pressure, and the use of mechanical ventilation equipment.

Building Occupants

The occupants of schools include the staff, students, after-hour users and other people who spend extended periods of time in the school. The occupants can contribute to indoor air quality problems by their activities, what they bring to school, what they wear, and how they use the building. The occupants can also be affected by poor air quality. IAQ problems often cause non-specific symptoms rather than clearly defined illnesses.

Symptoms often attributed to IAQ problems include:

- headache, fatigue, and shortness of breath;
- sinus congestion, cough, and sneezing;
- eye, nose, throat, and skin irritation;
- dizziness and nausea; and
- inability to concentrate, short-term memory loss and hyperactivity.

All of these symptoms, however, may also be caused by other factors, and are not necessarily due to air quality deficiencies. Environmental stressors such as improper lighting, noise, vibration, overcrowding, poor ergonomics, and psychosocial problems (such as job or home stress) can produce symptoms that are similar to those associated with poor air quality, but require different solutions.

If these symptoms appear in school occupants, it is important that a physician be consulted to conduct a medical assessment and determine the causes.

Because of varying sensitivity among people, one individual may react to a particular IAQ problem while the surrounding occupants do not experience ill effects. In other cases, complaints may be widespread. In addition to different degrees of reaction, an indoor air pollutant or problem can trigger different types of reactions in different people.

Groups that may be particularly susceptible to indoor air contaminants include, but are not limited to:

- children;
- individuals with allergies or asthma, or people with sensitivity to chemicals;
- people with a respiratory disease;
- people whose immune systems are suppressed due to radiation therapy, chemotherapy, or disease;
- individuals who wear contact lenses; and people with pre-existing medical or psychosocial problems (such as job stress.)

Six Basic Control Strategies

There are six basic control methods for lowering the concentrations of indoor air pollutants and minimizing the exposure of school occupants. Specific applications of these basic control strategies are noted in the IAQ Action Kit checklists.

1. **Source Management** includes source removal, source substitution, and source isolation. Source management is the most effective control method since it addresses one of the basic causes of IAQ problems.

- ***Source removal*** is a very effective measure, and school employees should always be alert for opportunities to remove contaminant sources. Policies and actions that keep potential pollutants from entering the school are even better at preventing IAQ problems. Examples of source removal include not allowing buses to idle near outdoor air intakes (check to see what your municipal guidelines are), keeping garbage out of rooms, and banning smoking within the school.
- ***Source substitution*** involves the review of activities with the goal of replacing components/procedures with ones that reduce or eliminate air contaminants. Source substitution includes actions such as selecting a less toxic art material than products that are currently in use, using interior paint with low chemical emissions or replacing pressed wood cabinets with sealed or laminated surfaces.
- ***Source isolation*** involves placing a barrier around the source so that it releases fewer pollutants into the indoor air. Examples include asbestos control measures, or conducting activities that produce contaminants only in properly designed areas.

2. **Local Exhaust** involves the removal of point (single) sources of pollutants before they can disperse into the indoor air, by blowing the contaminated air directly outside. Sites where local exhaust is used include restrooms and kitchens. Other locations where pollutants originate at specific points and can be easily exhausted include science labs and housekeeping storage rooms, printing and duplicating rooms, and vocational/industrial areas such as welding booths.

3. **Ventilation** introduces cleaner outdoor air into the building to dilute polluted indoor air. Generally, local building codes specify the quantity (and sometimes quality) of outdoor air that must be continuously supplied to an occupied area. For activities such as painting, or in the event of chemical spills, a temporary increase in ventilation can help to dilute the concentration of noxious fumes in the air. Ventilation should not be considered as a substitute for proper work practices and other measures that eliminate or control the original source of the pollutants. Ventilation is most efficient and effective when applied to a well-designed and managed facility.

4. **Exposure Control** includes adjusting the time and location of use in order to minimize the exposure of school occupants to intentionally released air contaminants. For example, the best time for stripping and waxing floors is on Friday after school is dismissed. This schedule would allow the floor products to off-gas over the weekend, reducing the level of odours or contaminants in the air when the school is occupied. To remove odours over the weekend, the ventilation system should be left operating with the outdoor air intakes open. Extending or altering how long the ventilation system operates can reduce people's exposure to airborne pollutants. Adjusting the location of use involves moving the contaminating source as far as possible from school occupants, or relocating susceptible occupants.

5. **Air Cleaning** usually involves the filtration of particles from the air as it passes through the ventilation equipment. Gaseous contaminants can also be removed, but in most cases this type of system is complex and expensive and should be evaluated on a case-by-case basis.

6. **Education** of the school occupants regarding IAQ is critical. People must be provided with information about the sources and effects of contaminants (including those under their control), and about the proper operation of the ventilation system. With this knowledge, they will better understand their indoor environment and can take steps to reduce their personal exposure and improve the overall IAQ in the school.

Your Role in the IAQ Team

As one of the people occupying a school, your activities and decisions have an impact on the quality of indoor air. You can help to ensure the school provides the best possible air quality by applying the knowledge in this chapter and using the checklists that follow.

The IAQ Action Kit includes checklists for the following systems and school areas:

- Administrative
- Health
- Air Handling
- Classroom
- Relocatable Classroom
- Building Maintenance
- Custodial
- Food Service
- Waste Management
- Renovation and Repair
- Design/Build/Lease-Back Facilities

What are the Signs of an IAQ Problem?

IAQ problems may be present if school occupants experience specific symptoms or if there are facility-based indicators that suggest potential problems.

Occupant Symptoms

Diagnosing symptoms that relate to IAQ is complex. Acute (short-term) symptoms of IAQ problems are usually similar to symptoms from colds, allergies, fatigue, or the flu.

Potential signs that may indicate an IAQ problem include:

- The symptoms are widespread within a class or within the school.
- The symptoms disappear when the students or staff leave the school building for a day.
- The onset of symptoms is sudden after some change at school, such as painting, roof repairs, or renovation.
- Persons with allergies, asthma, or chemical sensitivities have reactions indoors but not outdoors.
- A doctor has found that a student or staff member has an indoor air-related illness.

Facility-Based Indicators

Sometimes, there are facility-based indicators of IAQ problems in a school. Some clues that may point to a potential air quality problem include:

- facility-related problems such as visual or physical evidence of water entry or damage, odours, maintenance or custodial deficiencies, a history of problems, or other "good practice" issues;
- building use that is inappropriate for the design, such as unvented kilns or laminators, the use of high contaminant sources in normal classrooms, storage of large amounts of materials or materials of unknown quality, or overcrowding.

There needs to be programs in place to control those contaminants which may cause long-term health effects but do not tend to cause short-term irritant effects. Management plans should be in place to control contaminants such as asbestos and radon. These plans would normally be separate from an IAQ strategy, and would include periodic inspections.

What if You Suspect an IAQ Problem?

Successful IAQ management requires the development and use of a systematic approach. If you receive complaints that seem to indicate a potential IAQ problem, and the problem is self-evident, try to correct the problem at the school level. If the problem cannot be corrected, or if the complaint seems to indicate a potentially severe IAQ problem, you should contact the IAQ coordinator immediately. Some problems may require professional assistance. Actions should be timely, thorough, and followed up to ensure the problem is resolved. Keep a complete written record of all the actions that you take.

Communication

Indoor air quality problems can jeopardize the health of students and staff, therefore parents and the public may react strongly to reports of bad indoor air quality in a school. It is recommended that follow-up actions be taken quickly and that the IAQ team follow communications guidelines established by the IAQ coordinator. Usually, this will involve referring questions from the public and media to one central source, the IAQ coordinator. In this way, students, parents, staff, and the public will not be confused by conflicting or inaccurate information, and will have a consistent and complete source of information regarding the quality of indoor air in the school.

CHAPTER 4

How to Get Started

How to Get Started

How to Get Started: Putting the IAQ Kit into Action

Using this Kit

The *Tools for Schools IAQ Action Kit* provides a process and tools to help a school board or administrative unit address all aspects of indoor air quality in each of its schools. The kit aims to foster an interdisciplinary team-based approach, which draws on the skills and commitment of everyone involved in the planning, maintenance, operation and use of a school building. The How to Get Started section will provide you with advice on how to put this kit into action.

Most school boards already have a structure in place to address health and safety issues. Typically, larger boards have a health and safety officer while individual schools may have designated health and safety representatives. Some boards have developed their own procedures for responding to IAQ complaints. Since situations vary, the IAQ Action Kit is intended to be flexible. School boards and schools may use it in its original form, or adapt it to suit their needs and augment existing IAQ procedures.

The successful implementation and management of the IAQ program requires that each school board designate an IAQ coordinator to oversee the program. In some cases, a school may elect to use the kit independently. However, the IAQ coordinator should ensure that adequate training or external resources are available to support the process, if necessary.

At a minimum, an individual designated to assess a specific area of the school should be provided with the *Introduction*, *How to Get Started* section, the *IAQ Backgrounder*, and the appropriate checklist. Teachers are important members of the IAQ management team and should be encouraged to assess their own rooms at least once a year.

It is recommended that implementation of the Tools for Schools program be started early in the school year.

School Administration and the IAQ Process

The commitment to address indoor air quality (IAQ) starts at the highest level of administration. To be most effective, the school must identify and the administration must empower an IAQ Coordinator. (The role and functions of this position are explained later in this chapter.)The school should also ensure that all school staff are motivated to carry out the problem-solving and problem prevention guidance provided in this Kit.

The importance of this role must be recognized by senior management. Adequate resources and time must be provided to ensure that a successful IAQ program is maintained. The IAQ coordinator position and mandate must be clearly defined so that different IAQ program elements are integrated into a comprehensive program.

Before Using this Kit

It is recommended that the IAQ Coordinator read the entire *How to Get Started* section and *IAQ Backgrounder* prior to implementing the IAQ process.

"How to Get Started" at a Glance

- Choose an IAQ Coordinator (task for school board and/or school administration)
- Become familiar with the IAQ Action Kit (this is particularly important for the IAQ Coordinator).
- Make note of *Start-Up Hints* in this chapter.
- Gain top administrative support
- Launch the IAQ Team – includes teachers, administrative staff, facility operators, custodians, health officers/school nurses, school board representatives, contract service providers, students, parents.

Start-Up Hints

In addition to the Coordinator's Forms, there is other information you should gather to make starting an IAQ program easier:

- Get a map/blueprint of the school (this will be invaluable).
- Count the number of staff and their job category, for example, the number of teachers, the number of maintenance staff, etc. (You'll need this information to distribute checklists to staff.)
- Obtain the names and contact information for any outside contractors the school uses, such as maintenance staff, or heating, ventilation, and air-conditioning contractors.

Before starting the program, some IAQ Coordinators have also found it useful to:

- Get support from the school and/or school district administration.
- Read the Introduction, IAQ Backgrounder and the How To Get Started sections of this kit and familiarize yourself with the checklists and other forms.
- Meet with the heating, ventilation, and air-conditioning technician to acquire a working knowledge of the various ventilation units at your school. Learn which systems serve which rooms.
- Set up a filing system for all the paperwork you will generate. Keep it in a convenient location. (Portable file boxes work nicely.) Set up a location for turning in checklists.
- Set up an IAQ Resource Center at your school in an area where staff members can access information at their leisure. This is also a great place to post important reminders and communicate with your staff when something comes up.

Implementing an IAQ management program is an on-going process. Be patient, consistent, and organized and remember that you are doing something important for the staff and students at your school.

- Assemble the IAQ Action Packets.
- Activate the IAQ management plan.
- Diagnose and solve IAQ problems.
- Evaluate effectiveness of your solution.
- Ensure effective communication.
- Keep track of IAQ assessments
- Develop indoor air policies as required.

Importance of the IAQ Coordinator

IAQ management within schools requires leadership and team management. Effective leadership will assist people in making informed choices regarding activities and issues that could affect indoor air quality. To be most effective, the school must identify, and the administration must empower, an IAQ Coordinator. This person will serve as a focal point for collecting IAQ information and handling IAQ issues.

Functions of the IAQ Coordinator

The IAQ Coordinator serves as a focal point for collecting IAQ information and handling IAQ issues. The coordinator should also ensure that adequate technical support and training/education is available for all school sectors and that all activities and issues are followed up.

Ideally, an IAQ Coordinator will oversee the assessment of all the schools in a school board. The IAQ Coordinator will prioritize the school assessments, based on need or urgency; identify individual coordinators for each school; ensure that people are assigned to complete the checklists; ensure that the assessments are carried out; compile the results, and implement any needed actions.

The primary functions of the IAQ Coordinator are:

Providing Team Leadership:

- Coordinates an "IAQ Team" and encourages cooperation and a sense of shared responsibility.
- Develops an implementation strategy for each IAQ control group, and determines which checklists and activities will be conducted by whom.
- Implements the IAQ Management Plan. Provides the team with the Team Information Packets (Action Packets) supplied in this Kit, and, in coordination with the IAQ Team.
- Ensures that all staff and contractors assume and complete their required roles and that all elements of the IAQ management plan are fully implemented.

Coordinating Emergency Response:

- Prepares for emergency response as outlined in the IAQ Management Plan.
- Follows the kit and makes decisions as outlined in Resolving IAQ Problems.
- Determines if and when outside professional assistance is needed, and coordinates their activities.

Serving as Key Authority:

- Disseminates IAQ information.
- Registers IAQ complaints and directs the response.
- Communicates IAQ issues and status to school administration, staff, students, parents, and the media as necessary.

Choosing an IAQ Coordinator

The choice of IAQ Coordinator will probably depend on the structure of your school system. In larger school boards, the IAQ Coordinator may be a school board-level administrative person, such as the business official, a health and safety officer, facilities manager, or someone else designated by the school board. In smaller school systems and individual schools, the IAQ Coordinator may be the principal, the school nurse, a teacher, or other school staff.

Who is chosen should be based on the functions and level of leadership required, and a genuine interest in improving the indoor environment in the school(s). Success depends on having someone who can manage the team and who is empowered to take action. This includes authority to interact with school board-level administration, school staff, students, and parents, and to make budget recommendations. The IAQ Coordinator does not need to be an expert in IAQ issues, but should have a broad technical knowledge of buildings, building systems, and IAQ principles. By using this Kit, the IAQ Coordinator and all team members will learn about indoor air quality as the work progresses.

In a few situations, it may become necessary to share the responsibilities of the IAQ Coordinator by having a Co-Coordinator, or by delegating many of the administrative items to a committee. The committee could include selected individuals from the community, such as local environmental or health department staff, parents, and volunteers from local businesses who have special skills, such as commercial building engineers.

Independent of team leader, it is important that the staff and students at each school have the opportunity to learn about the basics of indoor air quality (*IAQ Backgrounder*) so that their daily decisions and activities (IAQ Checklists) will not unnecessarily cause indoor air problems.

Launching the IAQ Team

The IAQ Team

In most schools using this kit, a committed team works with the IAQ Coordinator to implement the program. Apart from team management and leadership, which is the IAQ Coordinator's primary role, most of the other work can be shared among IAQ team members and the rest of the school staff. For example, others can assist with copying and disseminating the Action Packets to the staff, and summarizing responses from the checklists.

The IAQ team can (and probably should) include representatives from nine distinct groups:

Teachers: play a strong role because their decisions and activities can affect the sources of pollutants and levels of ventilation in their classrooms. Some teachers (ie. art, science, vocational and industrial arts, and home economics teachers) manage unique pollutant sources and ventilation equipment.

Administrative Staff: encompasses all administrative and support staff. They may manage unique pollutant sources such as printing and kitchen areas, or operation of the ventilation equipment in their areas.

Facility Operators: the people who have direct technical responsibility for operating and servicing the heating, cooling, and ventilation systems within the school. Their role is crucial in preventing and solving IAQ problems.

Custodians: and their responsibilities vary widely between school boards. (The Building Maintenance Checklist focuses on housekeeping activities within the school.

Health Officers/School Nurses: this group can assist by monitoring and recognizing trends in reported illnesses that may give early warning of IAQ problems.

School Board Representatives: can provide the resources and authority necessary to implement an IAQ Management Plan, and for solving any IAQ problems which may arise.

Contract Service Providers: need to be informed and active members of the IAQ Team because their activities can have a direct and significant impact on the quality of air within your school. Examples of these activities include pesticide application, renovation work such as re-roofing, and maintenance of ventilation equipment and air filters.

Students: the primary customers in your school. Information should be shared with students so they understand their role in maintaining good IAQ, such as maintaining good personal hygiene, and keeping lockers and classrooms clean.

Parents: it is important that they be included and made aware of the steps the school is taking to promote good IAQ. Sharing information with parents not only helps avoid miscommunication, it also has the potential to attract additional resources and expertise to the school.

Each team member may want to read the *Introduction*, *How To Get Started*, and *IAQ Backgrounder* for more detailed information on IAQ and on the process of using this Kit to prevent, identify and solve IAQ problems in the school.

Assembling the IAQ Action Packets

The Action Packets are designed to be useful during the three basic modes of improving a school's IAQ:

- developing a profile of the school's current indoor air quality;
- preventing IAQ problems; and,
- solving any IAQ problems which may arise.

Action Packets should be distributed to the school staff in order to complete the three tasks listed above. You may wish to introduce the Action Packets and the IAQ Management Plan during a meeting of the school faculty and staff.

Action Packets should be tailored to each specific group of people within the school (i.e. teachers, administrative staff, facility operators, custodians, health officers, school nurses, contract service providers, and others). Most of the Action Packets should include all of the three basic components. The exception is the Packets for parents and local media, which should contain only the first two components. The three components are:

1. **School Memo:** the memo or letter for school staff includes the school administration's request that staff members perform the activities as provided in their individual Action Packets. For the school board, contract service providers, students and parents, the memo notifies them that the school has undertaken an IAQ management program, and presents the IAQ Backgrounder. Sample memos are included in the Appendix of this section. These can be adapted to your needs.
2. **IAQ Backgrounder:** this generic backgrounder (**chapter #3 of this kit**) will provide all team and staff members with a summary of the important issues regarding indoor air quality.
3. **IAQ Checklists:** The IAQ Checklists provide detailed, yet simple, IAQ activities for each staff member. These activities – which deal with a specific pollutant source or ventilation issues – are based on the unique functions and locations of each staff member. A *Checklists Log* in the Appendix of this section, will assist in summarizing the data from the returned checklists.

Activating the IAQ Management Plan

To help ensure that the IAQ Management Plan gets off to a good start, the IAQ Coordinator can carry out the following steps as presented, or tailor the steps to the specific needs of the school. The checklist entitled *Activating the IAQ Management Plan* (in the Appendix of the section), simplifies tracking completion of these steps.

1. **Select an IAQ Coordinator:** this position is critical to the success of the IAQ Management Plan.
2. **Become Familiar with this Kit:** this is particularly important for the IAQ Coordinator.
3. **Gain Top Administrative Support:** the highest levels of a school or school board administration should be fully committed to implementing the IAQ Management Plan.
4. **Establish an IAQ Checklist Interval:** To help maintain a high level of indoor air quality, it is recommended that the *IAQ Coordinator's Checklist* be completed at least once, and preferably twice, each year. Completing the Checklist more than once each year is desirable, because the additional checkups will catch any new and potential IAQ problems. Since many complaints occur at the start of the new school year, completing the *IAQ Coordinator's Checklist* shortly before school begins would reduce these complaints. Midway through the school year, for example during winter break, could be an appropriate time for the second checkup.

5. **Establish an Emergency Response Plan:** Acute IAQ problems such as a chemical spill, unintentional shutdown of ventilation systems, and other events such as a flooded carpet will require some form of immediate response. Preparing for such events will help ensure that timely and cost-effective actions result.
6. **Inform Appropriate Committees and Groups:** IAQ activities may need to be coordinated with some committees such as a school or school district health and safety committee, or the parent-teacher association.
7. **Establish IAQ Policies as Needed:** Some activities that affect indoor air quality in schools may require clearly written policies from top management to ensure that all school occupants understand the issue and what is required to protect IAQ. Sample policies can be found in the Appendix of this section.

The IAQ Management Plan

Successful IAQ management requires the development and use of a systematic approach. If you receive complaints that seem to indicate a potential IAQ problem, and the problem is self-evident, try to correct the problem at the school level. If the problem cannot be corrected, or if the complaint seems to indicate a potentially severe IAQ problem, you should contact the IAQ coordinator immediately. Some problems may require professional assistance. Actions should be timely, thorough, and followed up to ensure the problem is resolved. Keep a complete written record of all the actions that you take.

The IAQ Management Plan involves implementing the following ***16*** steps on a periodic basis, at least once each year. The IAQ Coordinator and Team can perform the steps as presented, or tailor the steps to the specific needs of the school.

A checklist that simplifies tracking completion of these steps is found in the Appendix of this section. Complete the checklist entitled *Activating the IAQ Management Plan* before using the *IAQ Coordinator's Checklist*.

The steps are grouped into three categories:

- Assess Current Status
- Perform Repairs and Upgrades
- Final Steps.

Assess Current Status

1. **Start the Checklists Log:** This log, found in the Appendix of this section, is used to list all the people who will receive an Action Packet. The log is also used to keep track of which IAQ Checklists have been returned, and what unresolved IAQ problems, if any, have been identified.
2. **Activate the IAQ Team by Distributing the Action Packets:** Copies of the appropriate Action Packets should be provided to each of the team members as listed on the *Checklists Log* (Step 1). Refer to *Assembling the IAQ Action Packets* (earlier in this chapter) regarding what each Action Packet should contain.

Please note that many items in the checklists are marked with either a square, triangle, or circle. The meaning of those symbols is explained below. It is recommend that the IAQ Coordinator provide this explanation in the IAQ Action Packets:

SQUARE: denotes ***action to be undertaken*** on a specific issue (check the square once the action has been completed).

TRIANGLE: check the triangle if you ***do not*** require help with the activity.

CIRCLE: check the circle if you ***need additional help*** with the activity.

3. **Receive and Summarize the IAQ Checklists:** follow up until all checklists have been completed and returned. Then review the information on the checklists and transfer pertinent data to the *Checklists Log*. Make a list of irregularities that should be reviewed during the walkthrough inspection.
4. **Perform a Walkthrough Inspection:** Based on the new perspective you have gained from the information in this kit, and from the summary of the checklists, perform a walkthrough inspection of the school. The walkthrough is intended to be a quick overview of the conditions that affect the quality of air within your school. You may wish to have someone who is familiar with the operation of the building, such as a facility operator or custodian, assist you during the inspection.

During the walkthrough inspection, **you can learn a lot by using your sense of sight, smell, feeling, and hearing** to gain information on factors that affect indoor air quality:

- **Observe** the general level of cleanliness in classrooms and mechanical rooms. Look for pollutant sources such as mold, improperly stored chemicals, or excessively dirty air filters and ducts, and look for blocked airflows, such as those caused by books or papers on top of unit ventilators or plywood covering outdoor air intakes.
- **Smell** for unique or objectionable odors as you move from room to room.
- **Feel** for uncomfortable air temperatures, drafts, and high or low humidity, and feel for air flowing into and out of grilles and air vents.
- **Listen** to the concerns of school occupants regarding IAQ. Do they provide clues to problems such as turning off a ventilation unit because it's too noisy during class-time? Do you hear unusual equipment noises which may indicate potential problems, and do you hear air blowing out of supply vents?

The walkthrough inspection should also be carried out in all special-use areas, such as the cafeteria, art rooms, industrial arts areas, and science laboratories.

5. **Identify Recent Changes that Affect IAQ:** Consider whether there have been any recent changes to the school building, around the building, to the school schedule or activities, or to occupants, that could have an impact on IAQ. Examples include:

- *Has there been any flooding?* Look and smell for mold growth and an increase in IAQ complaints in flooded areas.
- *Have night or weekend classes started?* Check time clock(s) setting on the ventilation system(s) for these class areas.
- *Are there any new staff?* Give them an Action Packet.

Perform Repairs and Upgrades

6. **Set Repair and Upgrade Priorities:** In many cases, the checklists (Step 3) and your walkthrough inspection (Step 4) will identify some IAQ problems that have not been corrected. Based on your knowledge of the problem, and your resources of school staff and funding, set repair and upgrade priorities based on your specific needs, and make a to-do list. Include any unresolved problems from previous *IAQ Coordinator's Checklists*.

See *Diagnosing and Solving IAQ Problems* in this chapter for ideas on what may be involved in solving the problems, and basic criteria for determining the practicality of the proposed solutions ("Evaluating Solutions").

7. **Gain Consensus and Approvals:** an agreement from top school management and appropriate committees will probably be necessary in order to set priorities for repairs and upgrades (Step 6), and commit school resources.

8. **Distribute Status Report:** Keep school occupants and constituents informed about the general status of IAQ in your school (see *Effective Communication* in this chapter).

9. **Perform Repairs and Up-grades:** Ensure that the priorities set in Step 6 are met as the repairs and upgrades are being performed (see *Evaluating Solutions* in this chapter).

10. **Conduct Follow-up Inspections:** Determine if the repairs and upgrades were performed according to plan or specifications, and determine if the intended results were achieved (see *Diagnosing and Solving IAQ Problems* in this chapter).

Final Steps

11. **Develop a Schedule of IAQ Events:** It would be very helpful for the IAQ Coordinator to develop and maintain a schedule of events which may affect IAQ:

- Establish a date for the next round of implementing the *IAQ Coordinator's Checklist*.
- If any renovation or new construction are planned during school time, school breaks, or the summer, mark it on your schedule with enough lead time so that you can provide Action Packets or other information to the people performing the work.
- If new staff are being added, make a note to give them the appropriate Action Packets so that they can become part of the IAQ Team.

12. **Assess Problem-Solving Performance:** this will help you determine if changes need to be made in your ability to:

- respond to IAQ complaints and incidents quickly;
- solve IAQ problems, preferably permanently; and
- communicate in a way that prevents or reduces the concerns of school occupants and constituents.

13. **Establish and Update IAQ Policies:** Assess whether an IAQ policy needs to be established to prevent IAQ problems from recurring. Address any existing IAQ policies that are not being properly followed. See *Developing IAQ Policies* in this chapter.
14. **Distribute Summary Report:** It is important that school occupants and constituents, as well as the school administration, receive a report of IAQ issues from this round of the IAQ Management Plan.
15. **Check Contacts List:** Ensure that the contact information is still valid, so that assistance can be quickly obtained if needed.
16. **File all Paperwork:** file Checklists, Reports, Notes, Memos, and copies of letters and communication for future reference.

Effective Communication

Good communication can help prevent indoor air quality problems and allay unnecessary fears. Communication can assist school occupants in understanding how their activities affect IAQ, which will enable the occupants to maintain and/or improve their indoor environment through proper choices and actions.

The following five objectives are important in assuring good communication between you and the school occupants:

1. Provide accurate information about factors that are affecting IAQ.
2. Clarify the responsibilities and activities of the IAQ Coordinator.
3. Clarify the responsibilities and activities of each occupant.
4. Notify occupants and parents of planned activities that may affect IAQ.
5. Use good listening skills.

The Action Packets, forms, and information contained in this Kit will assist you in accomplishing the first three objectives.

The level of communication required often depends on the severity of the indoor air quality complaint. If the complaint can be resolved quickly and involves a small number of people (i.e., an annoying but harmless odor from an easily identified source), communication can be handled matter-of-factly like other minor problems without risking confusion and bad feelings among school occupants. Communication is more critical when there are delays in identifying and resolving an IAQ problem and when serious health concerns are involved.

The fourth objective deals with informing occupants and parents before the start of significant planned activities that produce odors or contaminants. If occupants and parents are uninformed, they may become concerned about unknown air contaminants, such as strange odors or excessive levels of dust, and register an IAQ complaint. Examples of planned activities include pest control, painting, roofing, and new flooring. Notification of planned activities can also prevent problems from arising with students and staff with special concerns, such as asthma.

Finally, effective communication also involves effective listening. Listening may provide information that helps prevent problems, and it may help defuse negative reactions by occupants if indoor air problems should occur.

Keeping Track of IAQ Assessments

The school, school board, and IAQ Coordinator should jointly determine the frequency of indoor air quality assessments. In schools with no history of IAQ problems, an annual assessment may be sufficient. When problems exist or are identified during an assessment, specific follow-up actions will be required.

If IAQ problems are not resolved in a timely fashion, the school or school board should consult a professional with experience in investigating IAQ issues in schools.

The outcomes of IAQ assessments, actions taken, and effectiveness of follow-up steps should be integrated into a long-term tracking system.

Over time, the use of the IAQ Action Kit will:

- increase general awareness of IAQ issues;
- minimize the occurrence of IAQ problems; and
- improve the ability of school boards and schools to effectively and efficiently manage their facilities.

Diagnosing IAQ Problems

The goal of diagnosing an IAQ problem is to discover the cause of the problem so that an appropriate solution can be implemented. Often, there will be more than one problem, requiring more than one solution.

The IAQ diagnostic process begins when a complaint is registered or an IAQ problem is identified. Many problems can be diagnosed easily, and require only a basic knowledge of IAQ and some common sense. If the cause (or causes) of the IAQ problem has already been identified, move on to the solution phase (see *Solving IAQ Problems* in this chapter).

How to Diagnose Problems

The *Problem-Solving Checklist* will help simplify the process. It helps lead the investigation in the right direction and offer suggestions for other areas to evaluate. Enlist the assistance of school staff to answer questions or perform activities posed by the Checklist. Remember that pollutant sources and the ventilation system may act in combination to create an IAQ problem.

If the investigation identifies a potential problem (e.g., you find a blocked vent), remedy the situation to see if the symptoms stop. You may find problems unrelated to the

symptoms or a number of potential causes. Resolve as many problems as is feasible and make note of any problems that you intend to fix later.

Once the likely cause of the IAQ problem has been identified, or if the solution is readily apparent, move on to the solution phase.

Spatial and Timing Patterns

If the cause has not been identified, use the spatial pattern (locations) of complaints to help define the complaint area. The *Spatial Patterns of Complaints* table in this chapter will assist you. Locations in the school where symptoms or discomfort occur should determine the rooms or zones that are given

Spatial Patterns of Complaints	Suggestions
Widespread, no apparent spatial pattern	• Check ventilation and temperature control for entire building • Check outdoor air quality • Review sources that are spread throughout the building (e.g., cleaning materials or microbiological growth inside the ventilation system) • Check for distribution of a source to multiple locations through the ventilation system • Consider explanations other than air contaminants
Localized (e.g., affecting individual rooms, zones, or air handling systems)	• Check ventilation and temperature control within the complaint area • Check outdoor air quality • Review pollutant sources affecting the complaint area • Check local HVAC system components that may be acting as sources or distributors of pollutants
Individual(s)	• Check for drafts, radiant heat (gain or loss), and other localized temperature control or ventilation problems near the affected individual(s) • Consider that common background sources may affect only susceptible individuals • Consider the possibility that individual complaints may have different causes that are not necessarily related to the building (particularly if the symptoms differ among the individual(s)

particular attention during the investigation. However, the complaint area may need to be revised as the investigation progresses. Pollutant pathways can cause complaints in parts of the school that are far removed from the source of the problems.

After a location or group of locations have been defined, look for patterns in the timing of complaints. The timing of symptoms and complaints can indicate potential causes for the complaints and provide directions for further investigation. Review the data for cyclic patterns of symptoms (e.g., worst during periods of minimum ventilation or when specific sources are most active) that may be related to HVAC system operation or to other activities in and around the school. See the *Timing Patterns of Complaints* table in this chapter.

Timing Patterns of Complaints	Suggestions
Symptoms begin and/or are worst at the start of the occupied period	Review HVAC operating cycles. Pollutants from building materials, or from the HVAC system itself, may build up during unoccupied periods
Symptoms worsen over course of occupied period	Consider that ventilation may not be adequate to handle routine activities or equipment operation within the building, or that temperature is not properly controlled
Intermittent symptoms	Look for daily, weekly, or seasonal cycles or weather-related patterns, and check linkage to other events in and around the school
Single event of symptoms	Consider spills, other unrepeated events as sources
Symptoms relieved on leaving the school, either immediately, overnight, or (in some cases) after extended periods away from the building	Consider that the problem may be building-associated, though not necessarily due to air quality. Other stressors (e.g., lighting, noise) may be involved
Symptoms never relieved, even after extended absence from school (e.g., vacations)	Consider that the problem may not be building-related

Solving IAQ Problems

The purpose of this section is to provide an understanding of basic principles involved in solving IAQ problems. This guidance can be helpful in selecting a mitigation strategy, and in evaluating the practicality and effectiveness of proposals from in-house staff or outside professionals.

Developing Solutions

Selection of a solution is based on the information gathered during diagnosis. For each problem that the diagnostics identify, develop a solution using the basic control methods described below. Some solutions, such as major ventilation modification, may not be practical due to lack of resources or the need for long periods of non-occupancy so that the work can be safely completed. In such cases, use temporary measures to ensure good IAQ in the meantime.

There are six basic control methods for lowering concentrations of indoor air pollutants. Often only a slight shift in emphasis or action using these control methods is needed to more effectively control indoor air quality. Specific applications of these basic control strategies can be found in each team member's checklist.

The six basic control methods are:

1. **Source Management** is the most effective control method when it can be practically applied. It includes source removal, source substitution, and source encapsulation.
   - *Source removal* is very effective. However, policies and actions that keep potential pollutants from entering the school are even better at preventing IAQ problems. Examples of source removal include not allowing buses to idle near outdoor air intakes, not placing garbage in rooms where HVAC equipment is located, and banning smoking inside the school.
   - *Source substitution* includes actions such as selecting a less toxic art material or interior paint than the products that are currently in use.
   - *Source encapsulation* involves placing a barrier around the source so that it releases fewer pollutants into the indoor air.
2. **Local Exhaust** is very effective in removing point sources of pollutants by exhausting the contaminated air outside before it can spread inside.
3. **Ventilation** involves using cleaner (outdoor) air to dilute the polluted (indoor) air that people are breathing. The ventilation system, when properly designed, operated, and maintained, will automatically take care of "normal" amounts of air pollutants. For emergency situations, such as quick removal of toxic fumes, increased ventilation can be useful. However, when considering long-term operating costs, it is better to try reducing the source of the pollutant before using "dilution as the solution".

4. **Exposure Control** includes adjusting the time, amount, and location of use to reduce exposure.

- *Time of use*. Try not to use a pollutant source when the school is occupied. For example, strip and wax floors on Friday after school is dismissed, so that the floor products have a chance to off-gas over the weekend, reducing the level of pollutants in the air when the school is reoccupied on Monday.
- *Amount of use*. If less of an air polluting source can be used, then less of it will end up in the air.
- *Location of use*. Move the polluting source as far as possible from occupants, or relocate susceptible occupants.

5. **Air Cleaning** primarily involves the filtration of particulates from the air as it passes through the HVAC equipment. Gaseous pollutants can also be removed, but these removal systems must be tailored to each case.
6. **Education** of school occupants about IAQ is a very important part of the process. If people have information about the sources and effects of pollutants in their control, and about the proper operation of the ventilation system, they can act to reduce their personal exposure.

Evaluating Potential Solutions

To help ensure a successful solution, mitigation efforts should be evaluated at the planning stage by considering the following criteria:

- **Permanence** – mitigation efforts that create permanent solutions to indoor air problems are clearly superior to those that provide temporary solutions, unless the problems are also temporary.
- **Durability** – IAQ solutions that are durable are more attractive than solutions that require frequent maintenance or specialized skills.
- **Operating principle** – The most economical and successful solutions to IAQ problems are those with an operating principle that makes sense and is suited to the problem. For example, if a specific point source of contaminants has been identified, treatment at the source by removal, sealing, or local exhaust is almost always more appropriate.
- **Installation and operating costs** – The solution with the lowest initial cost may not be the least expensive over the long run. Long-term economic considerations include: energy costs; increased staff for maintenance; differential cost of alternative materials and supplies; and higher hourly rates if odor-producing activities such as cleaning must be schedules for unoccupied periods.
- **Control capacity** – Select a solution whose size and scope fits the problem. For example, a local exhaust system should be strong enough and close enough to the source so that the contaminant doesn't spread to other areas of the building.

- **Ability to institutionalize the solution** – A solution will be most successful when it is part of the normal building operations. Supplies, procedure and schedules related to building maintenance may need to be altered as part of the solution.
- **Conformity with codes** – Any modifications to building components or mechanical systems should be designed and installed to comply with applicable fire, electrical, and other building codes.

Evaluating the Effectiveness of Your Solution

Two kinds of indicators can be used to evaluate the success of an effort to correct an indoor air problem:

- **Reduced complaints** – reduction or elimination of complaints may appear to be a clear indication of success, but it is not always the case. Occupants who realize that their concerns are being heard may temporarily stop reporting discomfort or health symptoms, even if the actual cause of their complaints has not been corrected. On the other hand, lingering complaints may continue after successful mitigation if people have become upset over the handling of the problem. A smaller number of ongoing complaints may indicate that there were multiple IAQ problems and that one or more problems are still unresolved.
- **Measurement of indoor air properties** – comparing measurements of airflows, ventilation rates, and air distribution patterns before and after can be used to assess the results of control efforts.While in some cases the measurement of pollutant levels can be used as a means of determining whether indoor air quality has improved, in many cases this may be difficult and/or prohibitively expensive. Concentrations of indoor air pollutants typically vary greatly over time; further, the specific contaminant measured may not be causing the problem. Measurement of a specific pollutant by a professional is appropriate if the problem was limited to that pollutant.

Persistent Problems

Even the best-planned investigations and actions may not solve some IAQ problems. If you have made several unsuccessful efforts to control a problem, then it may be advisable to seek outside assistance. The problem may be fairly complex, and it may occur only intermittently or cross the borders that divide traditional fields of knowledge. It is also possible that poor indoor air quality is not the actual cause of the complaints. Bringing in a new perspective at this point can be very effective.

Developing Indoor Air Policies

Written policy statements regarding specific indoor air quality issues are a good way to help prevent future IAQ problems. Policy statements can also be helpful if there have been problems with staff understanding or following through on verbal communication regarding specific activities that affect IAQ.

An IAQ policy statement demonstrates a strong commitment by the school administration to address the health and comfort of staff and students, as well as the environmental quality in the school. In addition, an IAQ policy sets an overall direction for efforts to prevent and correct IAQ problems. General issues which may require policies include, but are not limited to: painting; smoking; renovations and repairs; pest management; ventilation system operation; school supply and purchasing; food or pets in the classroom; and disinfectants.

This section presents general considerations related to developing an IAQ policy. Sample policies can be found in the Appendix to this section. The samples presented are only intended as guides, and may be modified in any way to meet the site-specific needs and intent of individual schools.

General Considerations

An IAQ policy could include the following components:

- a statement indicating that the school administration is concerned about IAQ and the health, safety, and comfort of staff and students;
- a statement indicating that the school administration is committed to preventing and correcting IAQ problems;
- authorization of an IAQ Coordinator for each school or district, and delegation of authorities to the IAQ Coordinator;
- guidance on appropriate steps for maintaining good IAQ (see specific activities in the various IAQ Checklists for ideas);
- guidance on appropriate actions for correcting IAQ problems;
- reporting requirements.

Developing an IAQ policy should be an open process. A health and safety committee is a good forum for developing consensus recommendations.

Appendices

Sample Memo for School Staff

[Date]

Dear Staff Member,

This month, [school name] begins a new program to monitor and improve indoor air quality in our school. This letter accompanies specific guidance that shows how you can help make this program a success.

The school's new indoor air quality (IAQ) initiative is based on the *IAQ Tools for Schools Action Kit*, which was developed at Health Canada in collaboration with the Indoor Air Quality Working Group of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health. The Canadian kit is based on a similar kit developed by the United States Environment Protection Agency (US EPA).

[School name] is proud to be taking a leadership role in providing a safe, comfortable, and productive environment for our students and staff so that we achieve our core mission – educating students. Using the *IAQ Tools for Schools Action Kit* as a guide, our school will improve our indoor air quality (IAQ) by preventing as many IAQ problems as possible, and by quickly responding to any IAQ problems that may arise.

Good air quality requires an on-going commitment by everyone in our school, because every day each of us makes decisions and performs activities that affect the quality of the air we breathe. You can make an important contribution to this IAQ improvement program by reading the background information and applying the simple, yet important, activities in your Checklist, which is attached.

When you have read the IAQ Backgrounder and completed the Checklist, return the Checklist to our IAQ Coordinator [name], so that [he or she] can follow up on any unresolved IAQ problems. [Name] has agreed to administer the IAQ Management Plan, which includes taking a team leadership role, coordinating emergency response, and serving as our information resource on IAQ. [Name] may be contacted at [phone and room number]. Please return the Checklist to [him or her] by [date].

The school newsletter will carry progress reports as we learn more about indoor air quality in our school.

Sincerely,
[Name]
[Principle or Superintendent]

Sample Memo for Contract Service Providers

[Date]

Dear [Name of Contract Service Provider],

[School name] now has in place a program to monitor and improve indoor air quality in our school. Since the work you will perform in our school can have an impact on the quality of air within our school, this letter accompanies specific guidance that shows you how you can help make this program a success.

The school's new indoor air quality (IAQ) initiative is based on the *IAQ Tools for Schools Action Kit*, which was developed at Health Canada in collaboration with the Indoor Air Quality Working Group of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health. The Canadian kit is based on a similar kit developed by the United States Environment Protection Agency (US EPA).

[School name] is proud to be taking a leadership role in providing a safe, comfortable, and productive environment for our students and staff so that we achieve our core mission – educating students. Using the *IAQ Tools for Schools Action Kit* as a guide, our school will improve our indoor air quality (IAQ) by preventing as many IAQ problems as possible, and by quickly responding to any IAQ problems that may arise.

You can make an important contribution in preventing IAQ problems by reading the IAQ Backgrounder and applying the simple, yet important, activities in your Checklist, which is attached.

If you have questions or concerns about how your activities may affect the air within our school, please contact me at [phone and room number].

Sincerely,

[Name]

IAQ Coordinator

Sample Memo for Parents

[Date]

Dear [Parent],

This month, [school name] begins a new program to monitor and improve indoor air quality in our school. [School name] is proud to be taking a leadership role in providing a safe, comfortable, and productive environment for our students and staff so that we achieve our core mission – educating students. Our school will improve our indoor air quality (IAQ) by preventing as many IAQ problems as possible, and by quickly responding to any IAQ problems that may arise.

The school's new indoor air quality (IAQ) initiative is based on the *IAQ Tools for Schools Action Kit*, which was developed at Health Canada in collaboration with the Indoor Air Quality Working Group of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health. The Canadian kit is based on a similar kit developed by the United States Environment Protection Agency (US EPA).

I thought that you would be interested in what we are doing, so with this letter I have enclosed a copy of the IAQ Backgrounder, which is from the *IAQ Tools for Schools Action Kit* that we are using in our school. Not only is this basic information useful to schools, you may also find it useful for application in your own home, which is where most people spend most of their time.

[Name] has agreed to administer the IAQ program for our school. [Name] may be contacted at [phone and room number]. If you have any questions or concerns, please do not hesitate to contact [him or her].

The school newsletter will carry progress reports as we learn more about indoor air quality in our school.

Sincerely,

[Name]

[Principle or Superintendent]

Sample Parental Notification Letter for School Painting

Dear Parents:

The Maintenance Division plans to start painting in our school on or about [day and date].

The school plant is an important factor in the functioning of the total educational program. Proper maintenance of school buildings is necessary to provide a healthy and pleasant atmosphere. The majority of paint being used in [name] Public Schools is latex water-based. Some heavy traffic areas and trim will require the use of oil-based paint. Paints for use on the surface of school buildings have been virtually free of lead and mercury since 1991. However, schools built before 1960 probably contain paint with high levels of lead and mercury.

Instructional areas will be empty during painting and drying times, and children will not be in the cafeteria while it is being painted.

We anticipate that paint crews will be in the school for a period of [# of days], beginning on [day and date].

The health and safety of all students is a primary consideration as the painting crews undertake this maintenance and beautification project. If you have any questions or concerns about the scheduled painting, please feel free to contact me at [phone #].

With the cooperation of parents, students, and staff, this painting project will result in a bright, new look for our school. I hope you will stop by when the project is completed to see the results for yourself!

Sincerely,

[Principal name]
[School name]

IAQ Management Plan Checklist

IAQ Coordinator School Date Completed

Use the checklist below to record and monitor the steps you have taken to activate the IAQ Management Plan

Steps Taken	Date	Comments/Notes
1. Selected IAQ Coordinator Name:		
2. Read Guidance		
3. Obtained Administrative Support		
4. IAQ Checklist Interval Established Number of times each year: Date:		
5. Prepared Emergency Response		
• Contacted local health agency		
• Identified and contacted IAQ professional		
• Prepared or identified equipment and supplies for wet carpets or contacted local professional cleaning firm		
• Completed local IAQ Service Providers form		
6. Informed Committees and Groups		
• Contacted health and safety committee(s)		
• Contacted building committee(s)		
• Informed/notified PTA		
• Others:		
7. Prepared and Distributed IAQ Policies		
• Smoking		
• Pest control		
• Ventilation system operation		
• Painting		
• Others:		

IAQ Coordinator's Checklist

IAQ Coordinator School Date Completed

Use the checklist below to record and monitor the steps you have taken to activate the IAQ Management Plan

Steps Taken	Date	Comments/Notes
1. Start Checklists Log		
2. Distribute Action Packets		
• All appropriate people have received an Action Packet		
• Each Action Packet type has been distributed		
3. Receive and Summarized IAQ Checklists		
• Receive all IAQ Checklists		
• Review IAQ Checklists		
• Transfer data to Checklist Log		
• List things to review during walk-through inspection		
4. Perform Walkthrough with Walkthrough Checklist		
5. Identified Recent Changes		
• Flooding/water damage		
• Night or weekend classes		
• New Staff		
• Other		
6. Set Repair and Upgrade Priorities		
• Made to-do list		
7. Gain Consensus and Approval for Repairs and Upgrades		
8. Distribute Status Report		
9. Perform Repairs and Upgrades		
10. Conduct Follow-up Inspections		
11. Develop Schedule of IAQ Events		
• Set next date for applying IAQ Checklist		
• Note upcoming renovation and repairs		
• Note future addition of staff		

IAQ Coordinator's Checklist *(cont'd)*

IAQ Coordinator School Date Completed

Use the checklist below to record and monitor the steps you have taken to activate the IAQ Management Plan

Steps Taken	Date	Comments/Notes
12. Assess Problem Solving Performance		
13. Establish and Update IAQ Policies		
14. Distribute Summary Report to:		
• Students and staff		
• Parents		
• School administration		
15. Check Contacts List		
16. File paperwork, Checklists, Reports, and Notes		

Checklists Log

IAQ Coordinator _______________ School _______________

Use this log to keep track of who has received a Checklist, who has returned their Checklist(s), unresolved problem(s)

Identified in the Checklist(s), who solved the problems, and when.

This log can also be used to record distribution of information to parents, school boards members, contract service providers, and local media.

Person Receiving Checklist	Location/ room #	Type of Checklist(s) Distributed											Date		Problems Require Follow-up	Follow-up Delegated To	Date Completed
		Administration	Health	Air Handling	Classroom	Relocatable Classroom	Building Maintenance	Custodial	Food Service	Waste Management	Renovation & Repair	Design/Build/ Lease-back facilities	Sent	Received			
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		
															❑ Yes ❑ No		

Local IAQ Service Providers List

Hazardous Materials Hotline	**Firm**	**Contact**	**Phone**	**Address**
		Title	**Emergency**	
Local Health Department	**Firm**	**Contact**	**Phone**	**Address**
		Title	**Emergency**	
Provincial/ Territorial Health Canada Department	**Firm**	**Contact**	**Phone**	**Address**
		Title	**Emergency**	
Carpet Cleaner	**Firm**	**Contact**	**Phone**	**Address**
		Title	**Emergency**	
IAQ Consultant	**Firm**	**Contact**	**Phone**	**Address**
		Title	**Emergency**	
Mechanical Systems Operator	**Firm**	**Contact**	**Phone**	**Address**
		Title	**Emergency**	
	Firm	**Contact**	**Phone**	**Address**
		Title	**Emergency**	
	Firm	**Contact**	**Phone**	**Address**
		Title	**Emergency**	
	Firm	**Contact**	**Phone**	**Address**
		Title	**Emergency**	
	Firm	**Contact**	**Phone**	**Address**
		Title	**Emergency**	
	Firm	**Contact**	**Phone**	**Address**
		Title	**Emergency**	

Problem Solving Checklist

Use this Checklist to assist you in resolving a single IAQ Complaint, or several complaints occurring at the same time that seem related. Mark a copy of the fire escape floorplan or use other means of recording and reviewing information. Since this Checklist becomes a record of your activities in resolving an IAQ complaint(s), date it and file it for future reference. Involve additional staff, such as engineers, during the problem solving process.

IAQ Coordinator

School

Complaint Data

Record complaints below at the beginning of your problem solving process. Interview the complainant(s) to get a

Complainant Name	Date Received	Description of Complain (symptoms or explanation)	Location(s) or Room Number(s)	Is Problem Ongoing?	Occurrence Date(s) & Time(s)
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	
				❑ Y ❑ N	

Problem Solving Checklist *(cont'd)*

Problem Solving Steps

These steps will help you investigate potential causes of the symptoms recorded above. Use the steps to help keep your Investigation organized and documented.

Step	Date Completed	Notes
1. Relate the symptoms from the complaints data box to a group of symptoms in the problems Notes column to the right		❑ Odors ❑ Temperatures or humidity problems (occupant discomfort) ❑ Headaches, lethargy, nausea drowsiness, and dizziness ❑ Swelling, itching, or irritated eyes, nose, or throat; congestion ❑ Cough; congestion; chest tightness; shortness of breath; fever; chills and/or fatigue ❑ Diagnosed infection or clusters of serious health problems

Step	Date Completed (for each location if more than one location or piece of equipment is involved)			Notes
	1	2	3	
Local Exhaust • Does exhaust turn on? • Is the exhaust used when needed? • Is air flowing out the exhaust vent? • Is exhaust duct work blocked? • Is a sufficient amount of air being exhausted? • If everything works, but not enough air is being exhausted, can make up air easily enter the room (e.g., through spaces under doors)?				
Biological Sources • Are animals or fungi (mold) present? • Is there an odor of mold or mildew in or near the complaint area? • Is there standing water near the complaint area or in the air handling unit? • Is condensation often present on window or cold surfaces? • Is indoor relative humidity above 60%? • Are contagious occupants present?				
Housekeeping Sources • Do complaints occur during or just after housekeeping activities? • Do housekeeping activities take place near the complainants? • Are any new products in use? • Are housekeeping products being used according to directions? • Are products stored in sealed containers or in a vented room(s)?				

Problem Solving Checklist *(cont'd)*

Step	Date Completed (for each location if more than one location or piece of equipment is involved) 1	2	3	Notes
Outdoor Sources • Are sources of odor or pollutants (e.g., vehicles, stored chemicals, trash, plumbing vents) located near outdoor air intakes? • Are there sources nearby or upwind: – Combustion by products from traffic, loading ducts, or flue exhaust? – Industrial, agricultural, or lawn care activity? – Construction activity? • Are pollen levels high? **Building Sources** • Has there been recent painting, roofing, or Other remodelling or construction? • Were pesticides applied recently near the Complaint area? • Are new furnishings or equipment in place? • Are drain traps dry? • Are chemicals stored in poorly sealed containers? • Is it overly dusty?				

Step	Date Completed	Notes
2. Repeat all diagnostics for each potential cause in All affected locations.		
3. If the diagnostics for the recommended potential Causes did not identify the problem(s), Investigate remaining potential causes in Step 4 Until the cause(s) of the complaint(s) are Identified and corrected.		
4. If problem remains unidentified or uncorrected, Obtain professions assistance.		Company: Person: Phone:
5. Provide notice if problem is not quickly resolved.		Notice to Occupants Notice to parents of minors

Problem Solving Checklist *(cont'd)*

Step	Date Completed	Notes
6. Problem resolved and preventive measures taken.		Describe solution: Preventive measures taken:
7. Provide a final report.		Final report to occupants Final report to parents of minors
8. To prevent future problems implement an IAQ Management Plan.		
9. File this Checklist and related information.		Done

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 5

Administration Checklist

Administration Checklist

This checklist is intended for use by:

- School-based administrators
- Program coordinators
- Head custodians

This checklist discusses these major topic areas:

- Policy
- Operations

Instructions

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read each item on this checklist. Check off each box (❑) as you complete the activity.
3. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
4. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help school-based administrators, program coordinators, and head custodians develop appropriate policies and practices to reduce or prevent IAQ problems.

Policy

The school administration provides a critical link between the activities that are conducted in the school and the school facilities team. The role of each person should be defined and integrated into a comprehensive indoor air quality and facility operations plan to ensure that all of the key elements listed below are covered.

While the school administration may not have expertise in all of the following areas, it is essential that they develop policy and practices to ensure that capable, responsible personnel and systems are in place. In performing tasks in this checklist, applicable federal, provincial, territorial and municipal regulations and guidelines should be

respected including local fire regulations, building codes and occupational health and safety codes.

Often, decisions concerning school practices and equipment purchases may not be reviewed by people with specific expertise. For example, equipment such as kilns or ozone generators may cause or contribute to IAQ problems.

Policy items that must be defined include:

1. **Work Practice** (e.g., classroom, custodial, maintenance)

- ❑ Teachers may not realize that using certain art/craft supplies may cause IAQ problems. Custodial staff require training and planning to ensure that all school areas receive the necessary attention. Plan and schedule the operation of building services and ventilation systems to ensure adequate performance under all conditions.
- ❑ In consultation with provincial authorities, consider establishing a practice or policy on the use of scented products for personal care, educational activities, and custodial practices. Often, custodial staff use cleaning chemicals that contain deodorizers to mask odours, rather than investigating and removing the source of the odour. The Occupational Health and Safety (OHS) committee should review this issue and assist in developing guidance.
- ❑ Check to see if your municipality has guidelines concerning non-idling vehicle practices at school. Develop a policy for vehicle parking, idling and loading to minimize contamination of air intakes and openings. Post signs and inform drivers should be informed of proper procedures.
- ❑ Do not use plants as an IAQ control strategy. Although plants are sometimes viewed as air cleaners, their capacity to remove air contaminants is minimal. In fact, improperly maintained plants can be a source of many air contaminants including moulds, pollen, dust, insects, and chemicals. The use of pesticides, rodenticides, and herbicides should be discouraged. An integrated pest management (IPM) plan that focuses on prevention should be the primary pest control strategy.

2. **Animals, Food/Beverage Consumption and Other Special Activities**

- ❑ Define where and under what conditions special activities can be undertaken. Factors to consider include the type of space, suitability for use, custodial requirements and supervision.

3. **Material Purchasing, Storage and Assessment**

- ❑ Define the type and quantity of materials and storage requirements. Many unsuitable materials are found in schools, either due to hoarding, lack of planning, or neglect. All areas should be reviewed to determine if the current contents are acceptable or necessary, and all "junk" should be discarded. Many potential IAQ problems can be eliminated or avoided by conducting periodic reviews.

4. **Record Keeping**

Record keeping provides a mechanism for defining what IAQ-related actions need to be done and how/when they were done. Recording systems can become prompts to conduct necessary tasks such as inspections and maintenance.

❑ Every facility should maintain an event log for IAQ-related issues. The log should include a description of the event, background information, the date/time of specific occurrences, assessment, planned actions and follow-up. This information is useful for diagnosing problems and improving corporate "memory".

5. Facility Use

Many educational facilities are used for special activities other than traditional school functions, or are used by non-school personnel. Each special activity should be assessed to determine its potential impacts on indoor air quality, ventilation requirements, custodial needs and other factors. The conditions for using school facilities should be specified and monitored for compliance.

6. Team Building

Maintaining good indoor air quality requires a significant commitment of human and physical resources. Providing education, networking, implementation of the school IAQ plan, and ensuring contact with the IAQ coordinator are important administrative responsibilities.

7. Special Needs Groups

Providing an adequate environment for special needs students and staff will require a detailed investigation of the individual circumstances.

Δ Policy and practice guidelines or standards are in place.

❍ Need help developing policy and practices.

Operations

The school administration is normally responsible for the daily use and operation of the facility. In addition to ensuring that the necessary policies and practices are in place, the school administration should have an overview of the status of the facility, and should be aware of the following items:

- classroom area activities and operation;
- administrative area activities and operations;
- custodial practices, schedules and activities;
- rental/special use activities;
- OHS committee activities;
- health and hygiene education;
- current and future maintenance and renovation activities by in-house staff or contractors;
- team training and communication; and
- the contents and basic requirements contained in the checklists for all IAQ team members.

An administrative procedure is required to ensure that all tasks are conducted in an acceptable manner and that proper planning and recording systems are in place.

Proper training, planning, resources and record keeping will ensure that many potential IAQ problems are avoided and that early detection and intervention will occur.

Δ Operating guidelines or standards are in place.

❍ Need help developing operating guidelines or standards.

Problem Summary

- ❑ All activities on this checklist have been completed and no help is required.

  OR

- ❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 6

Health Checklist

Health Checklist

This checklist is intended for use by:

- Health professionals assigned to schools
- Custodial staff

This checklist discusses these major topic areas:

- Maintaining Student Health Records
- Public Health and Personal Hygiene Education
- Health Officer's Office

Instructions

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read each item on this checklist. Check off each box (❑) as you complete the activity.
3. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
4. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help health professionals and custodial staff prevent IAQ problems from developing or spreading in schools.

Maintaining Student Health Records

There is evidence to suggest that children, pregnant women, senior citizens and the frail are more likely to develop health problems from poor air quality than most adults. IAQ problems are most likely to affect individuals with pre-existing health conditions and those who are exposed to tobacco smoke.

Student health records should include information about known allergies and other medically documented conditions, such as asthma, as well as any reported sensitivity to chemicals. Privacy considerations may limit which student health information can be disclosed (check the confidentiality rules in

your jurisdiction), but to the extent possible, information about students' potential sensitivity to IAQ problems should be provided to teachers. This is particularly important for classes in which potential irritants such as gases or particles may be released from art, science, or industrial/vocational materials and equipment. Health records and the records of health-related complaints by students and staff are useful for evaluating potential IAQ-related complaints.

Encourage parents and students to self-identify pre-existing conditions that could be affected by indoor air quality. These include:

- ❑ Allergies, including reports of chemical sensitivities
- ❑ Asthma
- ❑ Anaphylaxis
- ❑ Other conditions or concerns
- Δ **Complete health records exist for each student.**
- Δ **Health records are being updated.**
- ❍ **Need help obtaining information about student health factors.**

Track health-related complaints by students and staff

- ❑ Keep a log of health, odour, and other IAQ complaints that notes the symptoms, location and time of symptom onset, and exposure to pollutant sources.
- ❑ Watch for trends in health complaints, especially in the timing or location of complaints.
- ❑ Ensure that procedures are in place for responding to anaphylaxis or other life-threatening situations.
- ❑ Develop a procedure for informing sensitive individuals of upcoming activities that could generate pollutants.
- Δ **A comprehensive health and IAQ complaint logging system and situation response protocols are in place.**
- Δ **Developing a comprehensive health and IAQ complaint logging system and situation response protocols.**
- ❍ **Need help developing a comprehensive health and IAQ complaint logging system and situation response protocols.**

Recognize indicators of health problems that may be IAQ-related

- ❑ Complaints are associated with particular times of the day or week.
- ❑ Other occupants in the same area experience similar problems.
- ❑ The problem abates or ceases, either immediately or gradually, when an occupant leaves the building, and it recurs when the occupant returns.
- ❑ The school has recently been renovated, refurnished, flooded, or damaged.
- ❑ The occupant has recently started working with new or different materials or equipment.
- ❑ New cleaning or pesticide products or activities have been introduced into the school.
- ❑ Smoking is allowed in the school.
- ❑ A new animal or activity has been introduced into the classroom.
- Δ **Understand indicators of IAQ-related problems.**
- ❍ **Need help understanding indicators of IAQ-related problems.**

Health and Hygiene Education

Schools are unique buildings from a public health perspective. They often accommodate more people within a given area than most buildings. The close proximity of occupants increases the potential for airborne contaminants (germs, odours, and constituents of personal products) to circulate among students. Raising awareness about the effects of occupant habits on the well-being of others can help reduce IAQ-related problems.

Inform students and staff about the importance of good hygiene in preventing the spread of airborne contagious diseases

- ❑ Provide written materials to students (local public health agencies and the Canada Mortgage and Housing Corporation (CMHC) may have information suitable for older students).
- ❑ Provide individual instruction/counseling where necessary.

Δ Written materials and counseling are available.

Δ Compiling information for counseling and distribution.

❍ Need help compiling information or implementing a counseling program.

Provide information about IAQ and health

- ❑ Help teachers develop activities that reduce students' exposure to indoor air pollutants, especially the exposure of students with IAQ sensitivities such as asthma or allergies.
- ❑ Collaborate with students and families to offer IAQ education programs for families.
- ❑ Conduct a teacher workshop that covers IAQ issues.
- ❑ Integrate IAQ into student class instruction.

Δ Information provided to student, parents and staff.

Δ Developing information and education programs for students, parents and staff.

❍ Need help developing information and education programs for students, parents and staff.

Establish an information and counseling program to discourage smoking

- ❑ Provide free literature on the effects of smoking and environmental tobacco smoke.
- ❑ Sponsor a "quit smoking" program and similar counseling programs.

Δ 'No Smoking' information and programs are in place.

Δ Developing 'No Smoking' information and programs.

❍ Need help with a 'No Smoking' program.

Health Officer's Office

Because the health office may be visited by sick students and staff, it is important to minimize the transmission of airborne diseases to uninfected students and staff (see your IAQ coordinator for help with the following activities).

Ensure that the ventilation system is properly operating

- ❑ The ventilation system is operated when the area is occupied.
- ❑ Provide an adequate amount of outdoor air to the area.
- ❑ Ensure that air filters are clean and properly installed.
- ❑ Ensure that air removed from the area does not circulate through the ventilation system into other occupied areas.

Δ **Ventilation system operates adequately.**

❍ **Need help with ventilation-related activities.**

Problem Summary

- ❑ All activities on this checklist have been completed and no help is required.

OR

- ❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 7

Air Handling Checklist

Air Handling Checklist

This checklist is intended for use by:

- School maintenance/facilities staff
- Contract service providers

This checklist discusses these major topic areas:

- Outdoor Air Intakes
- System Cleanliness
- System Controls
- Air Distribution
- Exhaust Systems
- Quantity of Outdoor Air
- How to Measure Air Flow

Instructions

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Make one copy of the Air Handling Log for each ventilation unit in your school.
3. Complete each activity for each ventilation unit and note the status of each activity on the Air Handling Logs.
4. Return the Air Handling Logs to the school board's IAQ coordinator and keep copies for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help school maintenance staff, facilities staff, and contract service providers identify and prevent potential IAQ problems resulting from inadequate school ventilation.

The tasks identified in this checklist should only be performed by or with the assistance of a trained professional in that field. In performing tasks in this checklist, applicable federal, provincial, territorial and municipal regulations and guidelines should be respected including local fire regulations, building codes and occupational health and safety codes.

Overview

Supplying an adequate amount of outdoor air to an occupied area (ventilation) is necessary for good indoor air quality. Schools use a variety of methods for ventilating the building with outdoor air: 1) mechanically based systems such as unit ventilators; central

heating, ventilation, and air conditioning (HVAC) systems; and central exhaust systems, and 2) passive systems that rely on operable windows, air leaks, wind, and the stack effect (the tendency of warm air to rise).

Not all school buildings can supply and distribute the same quantity of outdoor air as a modern, mechanically vented building. This does not mean that the school cannot meet acceptable IAQ standards. All buildings require an integrated plan to manage IAQ, with ventilation being only one component.

The Air Handling Checklist is designed to ensure that the school ventilation is suitable for the school's current requirements.

Most of the checklist activities apply mainly to mechanical ventilation systems, and are designed to accomplish several functions:

- Ensure that the ventilation system is clean.
- Ensure that an adequate amount of outdoor air is reliably supplied to occupied areas.
- Ensure that the system design, operation and maintenance are appropriate for its current use.

Many of the following activities should be performed by individuals with appropriate training in mechanical systems and safety procedures. Most activities can be performed with basic maintenance tools. If any problems or deficiencies are identified, a ventilation system specialist should be consulted.

Measuring airflow can only be done correctly with reliable equipment. A visual inspection or test for air movement can indicate basic airflow, but cannot determine how much air is actually moving.

Activities 17-21 can be applied to passive ventilation systems. For those activities that do not apply, write "NA" in the date column of the Air Handling Log.

A school may have multiple ventilation units and systems. Perform the following activities and complete the Air Handling Log for each unit. The activities are listed in a specific order to avoid needing to repeat any activities as the inspection of a unit progresses. The following process is recommended in order to save time when performing the activities:

Activities 1-3

Perform these activities for all outdoor air intakes while outside the building, and mark the results on the Air Handling Log for each unit.

Activities 4-12

Perform these activities as a set on each ventilation unit while in the room and the unit is open.

Activities 13-16

Perform these ventilation control system activities as required in specific situations.

Activities 17-21

Perform these air distribution and exhaust system activities as required in specific situations.

Activities 22-24

Perform these airflow measurement activities on all units when airflow measurement equipment is available.

Outdoor Air Intakes

If outdoor air intakes are deliberately blocked, become clogged with dirt or debris, or are contaminated, they are unlikely to supply sufficient outdoor air.

- ❑ On a small floor plan (e.g., a fire escape floor plan), mark the locations of outdoor air intakes, based on mechanical plans (if available) and observations made while performing these activities.
- ❑ Obtain chemical smoke (or a small piece of tissue paper or light plastic) before performing Activity 3. For more information on chemical smoke, see "How to Measure Air Flow", at the end of this checklist.
- ❑ Ensure that the ventilation system is on and operating in the "occupied" mode.

1. Ensure that the outdoor air intakes are unobstructed

- ❑ From outside the school building, check the intakes for obstructions, such as debris, clogged screens, damage, or makeshift covers (e.g., boards or plastic).
- ❑ Remove any obstructions.
- ❑ Install corrective devices if snowdrifts or leaves often block an intake.

2. Ensure that outdoor air intakes are clear of nearby pollutant sources

- ❑ Check the intakes from outside the school building to confirm that pollutant sources are not located near outdoor air intakes.
  - At ground level, look for dumpsters, loading docks, parking lots, and areas where buses idle.
  - At roof level, look for plumbing vents, exhaust outlets (such as kitchen, toilet, or laboratory exhaust fans), puddles on the roof, and mist from air-conditioning cooling towers.
- ❑ Ensure that birds and other pests do not roost or inhabit the areas around the air intakes.
- ❑ Resolve problems due to pollutants near intakes:
  - Remove sources, where possible (e.g., move a dumpster to another location).
  - Separate the source from the intake (e.g., add another pipe section to raise a nearby exhaust outlet above the intake).
  - Change operating procedures (e.g., turn off vehicles instead of idling them at loading docks and bus stands).
- ❑ Designated outdoor smoking areas should not be near an intake.

3. Confirm that outdoor air is entering the system intake (visual indication)

- ❑ Use chemical smoke (or a small piece of tissue paper or light plastic) to test whether air is flowing into the intake grille.
- ❑ Confirm the operation and positions of intake dampers during all operating cycles.

System Cleanliness

Accumulated dirt can prevent the ventilation system from operating properly, causing under-ventilation, uncomfortable temperatures, a reduction in operating efficiency (higher utility bills), more maintenance, and shorter equipment life spans.

WARNING: Do not clean dirt, asbestos, or biologically contaminated system components when the system is operating and the building is occupied. Follow proper procedures for maintenance and cleaning to isolate contaminants and ensure that they are not released into the ventilation system. Do not use biocides or ozone generators in air ducts.

If there is visible contamination, such as mould, minimize your exposure to air in the interior of ducts or other HVAC equipment, by ensuring proper respiratory protection equipment and area containment procedures are used. Obtain expert advice on what kind of respiratory protection equipment to use and how to use it.

Air filters are intended primarily to prevent dirt and dust from accumulating in the HVAC system. If filters are not properly selected and maintained, built-up dirt in coils and ducts can encourage the growth of microorganisms. Filters that are clogged with dirt restrict the flow of air through the HVAC system. If filters "blow out" or do not fit properly, they can allow the passage of unfiltered air. Dirt can accumulate on coils, creating a need for more frequent cleaning and reducing the efficiency of the heating and/or cooling plant. It is much less expensive to trap dirt with properly maintained filters than to remove it from ductwork, coils, fan blades, and other HVAC system components or the building interior.

4. Inspect air filters on ventilation equipment

- ❑ Review ventilation system filter components and specifications to ensure that the proper filters are being used.
- ❑ Install new filters as needed. Shut off ventilation system fans when replacing filters so that dirt will not blow downstream. Vacuum the filter area before installing the new filter.
- ❑ Confirm that filters fit properly in their tracks, with no air leaks around the air filter.
- ❑ Confirm that filters are installed in the proper direction for airflow.

5. Ensure that condensate (condensed water, frost, or "fog") drain pans are clean and drain properly

- ❑ Drain pans should slant toward the drain so they do not collect and hold water.
- ❑ Check for traps and drains within the plenums and ducts. Ensure that they are flushed and filled with clean water on a regular basis.

6. Ensure that heating and cooling coils are clean

7. Ensure that air handling units (air mixing chambers, coils, and fan blades) and duct interiors are clean

- ❑ Visually inspect the interior and exterior of all system components.
- ❑ Note that crawlspaces, tunnels, and other areas may be used as ducts, or may be in contact with the ventilation airstream. Understand the system layout and inspect *all* areas.

- ❑ Properly decommission and remove any unused system components.

8. Ensure that mechanical rooms are free of trash and chemicals

- ❑ Check mechanical rooms for unsanitary conditions, leaks, or spills.
- ❑ Confirm that mechanical rooms and air mixing chambers are not used to store trash or chemical products and supplies.

System Controls

Various controls are used to adjust ventilation systems to ensure that they provide acceptable and reliable performance. The main objectives of outdoor air controls are:

- to ensure that air dampers are always at least partially open (minimum position) during occupied hours; and
- to ensure that the minimum position provides an adequate amount of outdoor air for the occupants.

These activities apply to most ventilation systems.

Activities 9-11 generally serve multiple ventilation units, while activities 12-16 are related to and performed at each individual ventilation unit. Based on the equipment and your experience, perform as many of the activities, and make as many indicated repairs, as possible. Discuss the need for additional help to complete any activities or repairs with the maintenance supervisor.

9. Gather controls information

Ventilation controls may be unique. Since there are many different types and brands of control components, you should:

- ❑ Gather and read any controls specifications, as-built mechanical drawings, and controls operations manuals (check with the maintenance supervisor).
- ❑ Contact the system installer or HVAC maintenance contractor to obtain controls information that is missing.

10. Check clocks, timers, and seasonal switches

- ❑ Confirm that summer-winter switches are in the right position.
- ❑ Confirm that time clocks read the correct time.
- ❑ Confirm that time clock settings fit the actual schedule of building use (night/weekend set-back and set-up).

11. Check pneumatic control system components

- ❑ Test the line pressure at both the occupied (day) setting and the unoccupied (night) setting to determine whether the overall system pressure is appropriate.
- ❑ Confirm that the line dryer is preventing moisture buildup.
- ❑ Check the control system filters. The filter at the compressor inlet should be changed periodically in keeping with the compressor manufacturer's recommendation (for example, when you blow down the tank).
- ❑ Ensure that the line pressure at each thermostat and damper actuator is at the proper level (no leakage or obstructions).
- ❑ Repair or replace defective components.

12. Check outdoor air damper operation

Before continuing, the air temperature in the indoor area(s) served by an outdoor air damper must be within the normal operating range. Ensure that the outdoor air damper is visible for your inspection.

- ❑ Turn off the air handler connected to the outdoor air damper and confirm that the damper fully closes within a few minutes.
- ❑ Turn on the air handler and confirm that the outdoor air damper opens (at least partially) with little or no delay.
- ❑ Set the room thermostat to a temperature at least 5°C above and then below the current room temperature. Observe the damper for movement (damper should go to its design set-point position).
  - Confirm that the damper actuator is linked to the damper shaft and that any linkage set screws and bolts are tight.
  - Confirm that rust or corrosion is not preventing free movement.
  - Confirm that either electrical wires or pneumatic tubing is connected to the damper actuator.
- ❑ Reset thermostat(s) to appropriate temperature(s).
- ❑ Proceed to Activities 13-16 if the damper seems to operate properly..

NOTE: The minimum damper setting may need to be adjusted, using a nut or a knob, to create a larger damper opening.

13. Confirm freeze-stat condition

HVAC systems with water coils need protection from freezing. The freeze stat may close the outdoor air damper and disconnect the supply air when tripped. (The typical trip range is 2 to 5°C).

- ❑ If the freeze-stat has a manual reset button (usually red), depress the button. If a click is heard, the freeze-stat was probably tripped. Consider replacing manual reset freeze-stats with automatic reset freeze-stats.
- ❑ If the freeze-stat has an automatic reset, disconnect power to the controls and test for continuity across the terminals.

14. Check mixed air thermostat

- ❑ The mixed air stat for heating mode should be set no higher than 18°C (typically 13 to 18°C).
- ❑ The mixed air stat for cooling mode should be set no lower than the room thermostat setting.

15. Check air economizer setting

Economizers use varying amounts of cool outdoor air to assist with the cooling load of a room or rooms. The airflow will vary but should not be less than the minimum ventilation rate.

There are two types of economizers, dry-bulb and enthalpy. Dry-bulb economizers vary the amount of outdoor air based on the outdoor air temperatures, and enthalpy economizers vary the amount of outdoor air based on the outdoor air temperature and humidity level.

- ❑ Confirm proper settings based on design specifications or local practices (dry-bulb setting is typically 18°C or lower).

- ❑ Check the sensor to make sure that it is shielded from direct sunlight.

16. Confirm that fans operate continuously during occupied periods

Any fan that helps move air from outdoors to indoors must operate continuously during occupied hours, even though the room thermostat is satisfied.

- ❑ If the fan shuts off when the thermostat is satisfied, change the control cycle to prevent under-ventilation.
- ❑ Note any complaints of drafts or cold temperatures. Some equipment such as a gas-fired furnace has a limited capability for controlling the supply air temperature. As the outdoor air temperature decreases, the amount of supply temperature variation with the burners on or off increases.

Air Distribution

Even if enough outdoor air is brought into a building, IAQ problems can develop if the outdoor air is not properly distributed. In such cases, under-ventilation occurs in particular areas of the building rather than being widespread. Problems with air distribution are most likely to occur in areas where:

- ventilation equipment is malfunctioning;
- room layouts have been altered without adjusting the HVAC system; and
- the population of a room or zone has grown without adjustment to the HVAC system.

Air pressure differences move air contaminants from outdoors to indoors and transport them within buildings. In schools with mechanical ventilation equipment, fans are the dominant influence on pressure differences and airflow. In schools that lack mechanical ventilation equipment, natural forces (wind and stack effect) primarily influence airflow.

To prevent infiltration of outdoor air and soil gas (e.g., radon), mechanically ventilated buildings are often designed to maintain a higher air pressure indoors than outdoors. This is known as positive pressurization. (See "Exhaust Systems" and "How to Measure Airflow" for a description of building pressurization.) At the same time, exhaust fans control indoor contaminants by keeping rooms such as smoking lounges, bathrooms, kitchens, and laboratories under negative pressure compared to surrounding rooms. "Negative pressure" and "positive pressure" describe pressure relationships. A room can operate under negative pressure compared to neighbouring rooms, but at the same time it may be positive compared to outdoors.

17. Check air distribution

Verify that the air pathways in the original ventilation system design continue to function.

- ❑ Check to see whether operable windows have been replaced by windows that cannot be opened.
- ❑ Check to see whether passive gravity relief ventilation systems and transfer grilles between rooms and corridors are functioning. If they are closed off or blocked to meet modern fire codes, consult with a professional engineer for remedies.

Caution: Consult with your local fire department for more information on fire regulations and prevention.

- ❑ Verify that every occupied space has a supply of outdoor air (mechanical system or operable windows). If the building relies on passive ventilation, ensure that the occupants are aware of the need for ventilation and how ventilation can be provided.
- ❑ Confirm that supplies and returns are open and unblocked. If outlets have been blocked intentionally to correct drafts or discomfort, investigate and correct the cause of the discomfort and re-open the vents.
- ❑ In areas with no source of outside air, modify the HVAC system to correct the problem.
- ❑ Check for barriers, such as room dividers, large freestanding blackboards or displays, or bookshelves that could block the movement of air in the room, especially obstacles that block air vents.

18. Check air flow direction – building pressure

Conduct this activity after ensuring the following conditions:

- Confirm that the system, including any exhaust fans, is operating on the occupied cycle.
- Confirm that outdoor conditions are calm (wind less than 10 km/hour), since wind forces can cause large pressure differences within buildings.

- ❑ Use chemical smoke to determine whether air flows out of the building through leaks in nearby windows, doors, or other cracks and holes in exterior walls (pressurized interior).
- ❑ Use chemical smoke to determine whether air flows out of the building through below-grade cracks and holes such as floor joints or pipe openings (pressurized interior).

Exhaust Systems

Exhaust systems are used to remove air that contains contaminants, including odours. Some HVAC designs also rely on the operation of exhaust fans to create negative pressure that draws outdoor air into the building through windows and gaps in the building envelope.

19. Confirm that exhaust fans are operating

- ❑ Use chemical smoke to confirm that air is flowing into the exhaust grille(s).

20. Verify that local exhaust fans remove enough air to eliminate odours and chemical fumes

- ❑ If the fan is intended to exhaust the entire room, stand outside the room with the door slightly open and use chemical smoke to confirm that air is being drawn into the room from locations both high and low in the door opening.
- ❑ If the fan is running, but air isn't flowing toward the exhaust intake (or not enough air is moving to do the job), check for the following possibilities:
  - the backdraft damper at the exhaust outlet does not open;
  - obstructions in the ductwork;
  - leaky or disconnected ductwork;
  - broken fan belt;
  - motor running backwards; or
  - design problems (e.g., undersized fan).

21. If the exhaust fan is located close to the contaminant source, rather than on the roof, and exhaust air is ducted through the building under positive pressure

❑ Confirm that the exhaust ductwork is sealed and in good condition. Make any repairs permanent and take any other measures that help ensure there will be adequate outdoor air in the future.

How to Measure Airflow – Reference Information

This section provides basic guidance and options for determining air movement and measuring outdoor air supply. It is divided into three sections:

- using chemical smoke to determine air flow direction;
- measuring airflow to determine outdoor air supply quantity; and
- estimating outdoor air quantity using carbon dioxide measurements.

Deciding which Equipment to Use for Measuring Airflow

Both flow hoods and pitot tubes can be used to measure airflow. Flow hoods are designed to measure flow at grilles and diffusers. Pitot tubes and anemometers are designed to measure air velocity in ducts, which is then used to calculate airflow. While flow hoods are more expensive to purchase, they are quicker and easier to use. Flow hoods can be used to measure airflow in ducts by adding the airflows from all vents connected to a given duct.

Often, the amount of duct leakage is significant. By comparing the total airflow at the fan to the sum of all vents connected to the fan, an estimate of the duct leakage can be determined. If the variation is large or the sum of the vents is greater than the fan capacity, further investigation should be undertaken.

22. Using Chemical Smoke to Determine Air Flow Direction

Chemical smoke can help with evaluation of HVAC systems, tracking air and pollutant movement, and identifying pressure differentials. Chemical smoke moves from areas of higher pressure to areas of lower pressure if there is an opening between them (e.g., door, utility penetration).

Because chemical smoke is the same temperature as the surrounding air, it is extremely sensitive to air currents. Investigators can learn about airflow patterns by observing the direction and speed of smoke movement. Smoke released near outdoor air intakes will indicate whether air is being drawn into the intake. Puffs of smoke released at the shell of the building (by doors, windows, or gaps) will indicate whether the HVAC systems are maintaining interior spaces under positive or negative pressure relative to the outdoors.

Chemical smoke is available with various dispensing mechanisms, including smoke "bottles," "guns," "pencils," or "tubes". The dispensers allow smoke to be released in controlled quantities and directed at specific locations. It is often more informative to release several small puffs of smoke as you move along an air pathway rather than a large amount in a single puff.

Caution: Read the equipment manufacturer's information. Chemical smoke devices may use titanium tetrachloride to produce smoke. Although the small amounts of chemicals produced during testing are normally not hazardous, you should avoid inhaling smoke from these devices. The concentrated fumes from smoke devices can be very corrosive.

Determining Air Movement from Diffusers And Grilles

Puffs of smoke released near HVAC vents give a general idea of airflow. (Is it in or out? Vigorous? Sluggish? No flow?) This is helpful in evaluating the supply and return system and determining whether ventilation air actually reaches the breathing zone. For a variable air volume system, be sure to take into account how the system is designed to modulate. The system could be on during the test, but off for most of the rest of the day. "Short-circuiting" occurs when air moves directly from supply diffusers to return grilles, instead of mixing with room air in the breathing zone. If a substantial amount of air short-circuits, school occupants may not receive adequate supplies of outdoor air and pollutant emissions may not be diluted sufficiently.

Chemical smoke can also be used to assess the performance of fume hoods and exhaust fans. If the smoke released at a certain point is not captured, neither will any other contaminant.

23. Measuring Outdoor Air Supply Quantity

This section describes methods for determining the amount of outdoor air supplied by a single ventilation unit, using either a flowhood or air velocity measurement device. These are general instructions for measuring airflow. You should also follow the instructions provided by the manufacturer of your measuring equipment.

Step 1. Determine Airflow Quantity

Using a flowhood

Flowhoods measure airflow in cubic feet per minute (CFM) or litres per second (Lps) at a diffuser or grille. To measure airflow, hold the flowhood up to the diffuser and read the airflow value. Follow the instructions supplied with the flowhood regarding its use, care, and calibration.

Using Velocity Measurements

For information on measuring air velocity using a pitot tube or anemometer, and calculating outdoor air supply, see the instructions supplied with the equipment.

Airflow in ductwork can be estimated by measuring air velocity at various positions in the duct cross-sections. The airflow instrument should have instructions for conducting this procedure (airflow traverse).

- ❑ Measure the air velocity in the duct and calculate the airflow by multiplying the area-averaged velocity times the cross sectional area of the duct.

Systems with No Mechanically Supplied Outdoor Air

If the ventilation system does not use mechanically supplied outdoor air, the amount of outdoor air infiltrating the area can be estimated. Estimate air infiltration by measuring the quantity of air exhausted by exhaust fans serving the area.

- ❑ Using a small floor plan, such as a fire escape map, mark the areas served by each exhaust fan.

- ❑ Measure airflow at grilles or exhaust outlets using a flowhood. Determine the airflow in ductwork by conducting an airflow traverse.
- ❑ Add the airflows from all exhaust fans serving the area to determine the total air exhaust.

24. Estimating Outdoor Air Using Carbon Dioxide Measurements

Carbon dioxide (CO_2) is a normal part of the atmosphere. Exhaled breath from building occupants and other sources increase indoor CO_2 levels above the levels found in outdoor air. CO_2 should be measured with a direct-reading meter. Use the meter according to manufacturer's instructions. Indoor CO_2 concentrations can, under some test conditions, be used to assess outdoor air ventilation. A comparison of peak CO_2 readings between rooms and between air handler zones may help to identify and diagnose various building ventilation deficiencies.

Estimating the quantity of outdoor air supply for mechanical systems

Take CO_2 readings, with minimal delays between readings, at supply outlets or air handlers to estimate the percentage of outdoor air in the supply airstream.

The percentage or quantity of outdoor air is calculated using CO_2 measurements as shown below:

Outdoor air (%) = (CR-CS) divided by (CR-CO) x 100

Where: CS = CO_2 parts per million (ppm) in the supply air (if measured in a room), or in the mixed air (if measured at an air handler)

CR = ppm of CO_2 in the return air

CO = ppm of CO_2 in the outdoor air (Typical range is 300-450 ppm.)

All these concentrations must be measured, not assumed.

To convert the outdoor air percentage to a volume of outdoor air in litres per second, use the following calculation:

Outdoor air (Lps) = Outdoor air (percent) ÷ 100 x total airflow (Lps)

The number used for total airflow may be the air quantity supplied to a room or zone, the capacity of an air handler, or the total airflow of the HVAC system. However, the actual amount of airflow in an air handler is often different from the quantity stated in design documents. Only the measured airflow is accurate.

Interpreting Indoor CO_2 Concentration Measurements

Record the number of school occupants, time of day, position of windows and doors, and weather for each period of CO_2 testing.

- Take measurements to evaluate the adequacy of ventilation when CO_2 concentrations are expected to peak. It may be helpful to compare measurements taken at different times of day. Classroom CO_2 levels will typically rise during the morning, fall during the lunch period, then rise again, reaching a peak in mid-afternoon.
- Take several CO_2 measurements in the area under consideration. Collect CO_2 ventilation measurements away from any source that

could directly influence the reading (e.g., hold the sampling device well away from exhaled breath, preferably at a point of well-mixed air within the room such as an exhaust fan inlet).

- Take several measurements outdoors.
- For systems with mechanically supplied outdoor air, take one or more readings at the following locations:
  - at the supply air vent;
  - in the mixed air (if measured at an air handler);
  - in the return air.

Note locations where CO_2 concentrations are 1,000 ppm or higher. Short-term conditions where CO_2 levels exceed 1000 ppm may indicate temporary ventilation problems caused by increased occupancy or ventilation system changes. Chronic conditions where CO_2 levels exceed 1000 ppm (for several hours on each of several days) *may* indicate the need for increased ventilation, or a modification in the space occupancy or use.

Note that there may still be under-ventilation problems in rooms with peak CO_2 concentrations below 1,000 ppm. CO_2 is produced by human respiration (breathing), and concentrations can change rapidly as people move in and out of a room. Four to six hours of continuous occupancy are often required for CO_2 to approach peak levels.

Problem Summary

- ❑ All activities on this checklist have been completed and no help is required.

  OR

- ❑ A list of problems and/or assistance required is attached.

Air Handling Log

Instructions:

- Make one copy of this Log for each ventilation unit in the school
- Perform the activities in the Ventilation Checklist for each ventilation unit and use this Log to record results
- A "No" response requires further attention

Name

Room or Area

School

Date Completed

Signature

ACTIVITY	NEEDS ATTENTION IF "NO"	OK (DATE)	ACTIVITY	NEEDS ATTENTION IF "NO"	OK (DATE)
1. Outdoor air intake not obstructed	❑ Yes ❑ No		15. Economizer set per specifications	❑ Yes ❑ No	
2. Outdoor air intake clear of nearby pollutant sources	❑ Yes ❑ No		16. Fans supplying outdoor air operate continuously during occupied periods	❑ Yes ❑ No	
3. Outdoor air moving into intake	❑ Yes ❑ No		17. Air distributions functioning per design	❑ Yes ❑ No	
4. Filters in good condition, properly installed, and no major air leaks	❑ Yes ❑ No		18. Air flow direction (relative pressures) okay	❑ Yes ❑ No	
5. Drain pan clean and no standing water	❑ Yes ❑ No		19. Exhaust fan(s) operating	❑ Yes ❑ No	
6. Heating and cooling coil(s) clean	❑ Yes ❑ No		20. Local exhaust fan(s) remove enough air to eliminate odours and chemical fumes	❑ Yes ❑ No	
7. Interior of air handling unit and ductwork clean	❑ Yes ❑ No		21. Exhaust ductwork sealed and in good condition	❑ Yes ❑ No	
8. Mechanical room free of trash and chemicals	❑ Yes ❑ No		22. Use of chemical smoke to determine air flow direction	❑ Yes ❑ No	
9. Controls information on hand	❑ Yes ❑ No		23. Outdoor air supply quantity measured	❑ Yes ❑ No	
10. Clocks, timers, and switches set properly	❑ Yes ❑ No		24. Outdoor air using carbon dioxide measurements estimated	❑ Yes ❑ No	
11. Pneumatic controls okay	❑ Yes ❑ No				
12. Outdoor air damper operating properly	❑ Yes ❑ No				
13. Freeze-stat reset	❑ Yes ❑ No				
14. Mixed air thermostat set properly	❑ Yes ❑ No				

Activity Number	Notes and Comments

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 8

Classroom Checklist

Classroom Checklist

This checklist is intended for use by:
- Teaching staff
- Custodial staff

This checklist discusses these major topic areas:
- General Cleanliness
- Animals in the Classroom
- Excess Moisture/Thermal Comfort
- Ventilation
- Materials
- Local Exhaust Fans and Fume Hoods
- Art Supplies/Science Supplies
- Industrial/Vocational Education Supplies
- Locker Room

Instructions
1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read each item on this checklist. Check off each box (❑) as you complete the activity.
3. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
4. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help teachers and custodial staff identify and prevent potential IAQ problems in school classrooms.

The tasks identified in this checklist should only be performed by or with the assistance of a trained professional in that field. In performing tasks in this checklist, applicable federal, provincial, territorial and municipal regulations and guidelines should be respected including local fire regulations, building codes and occupational health and safety codes.

General Cleanliness

Regular and thorough cleaning of classrooms is important to ensure good indoor air quality. Classrooms also require some basic attention during low/no use periods such as class changes and holidays.

Unsanitary conditions can attract insects and vermin, leading to possible indoor air quality (IAQ) problems. The overuse or improper use of pesticides for secondary control of insects, vermin, and head lice can cause IAQ problems. The presence of dirt, moisture, and warmth also stimulate the growth of moulds and other microbiological contaminants.

Eating or drinking in classrooms introduces additional sources of contamination due to spills. Carpeted classrooms are particularly problematic since it can be difficult or impossible to adequately clean the floors. Hard surfaced flooring is much easier to keep clean. While janitors or custodians typically clean the classroom, teachers can also play an important role in promoting and maintaining classroom cleanliness.

Make sure that the classroom is cleaned properly

- ❑ Make sure the classroom is dusted and vacuumed thoroughly and regularly.
- ❑ Make sure blackboards/whiteboards are cleaned properly.
- ❑ Make sure trash is removed daily.
- ❑ Make sure food is not kept in the classroom overnight.
- ❑ Store food, if any, in tightly sealed containers.
- ❑ Look for signs of pests.
- ❑ Make sure desks and lockers are cleaned regularly.

Δ Classroom is cleaned thoroughly and regularly.

❍ Need help with cleaning or pest control.

Clean spills promptly

- ❑ For spills on carpets, contact custodial staff immediately (carpets should be cleaned properly and dried within 24 hours).
- ❑ Request that heating, ventilation, and air conditioning (HVAC) components be cleaned if spilled liquid or debris enters the equipment.
- ❑ Report previous spills on carpets or in HVAC components because they can affect current indoor air quality.

Δ No spills.

❍ Need help with spill clean up.

Animals

Excrement from animals is known to contain toxic fungi and pathogenic bacteria. Certain individuals, in particular those with asthma, are sensitive to animal fur, dander, body fluids, and feces, and may experience reactions to these allergens. Furthermore, individuals can become sensitized (become allergic) by repeated exposure to animal allergens. Check your school policy on keeping animals in classroom areas.

Minimize exposure to animal allergens

- ❑ Keep animals in cages as much as possible; do not let them roam.
- ❑ Clean cages regularly.
- ❑ Ensure a plan and supplies are in place for cleaning up excrement.
- ❑ Keep animals away from ventilation system vents to minimize the circulation of animal allergens.
- ❑ Investigate alternatives to keeping live animals in the classroom (e.g. field trips or visits).

Δ **No animals are in classroom.**

Δ **Animal management plan is consistent with school policy.**

❍ **Need help with animal management.**

Protect asthmatic and other sensitive students

❑ Consult the school health officer or nurse about student allergies or sensitivities (privacy laws may limit the information that health officials can disclose).

❑ Ask parents about potential allergies (in a note that students take home, or during parent-teacher conferences).

❑ Ask new students whether they have any allergies.

❑ Locate sensitive students away from animals and habitats.

Δ **No animals are in classroom.**

Δ **No students have animal allergies.**

Δ **Students with allergies have been identified.**

❍ **Need help determining if students have allergies.**

Blackboard/ Whiteboards

❑ Use low-dusting chalk and maintain general cleanliness.

❑ On whiteboards, use markers that release low levels of volatile organic compounds (VOCs).

❑ Do not use portable brush cleaners, vacuums, or other processes that generate or release dust.

Δ **Board use and maintenance is acceptable.**

❍ **Need help with board use and maintenance.**

Drain Traps

Drain traps can become a problem when they are used infrequently; the water in the drain trap evaporates and allows sewer gases to enter the room or the water becomes stagnant.

Fill drain traps regularly

❑ Request a list of all drain traps and locations.

❑ Pour water down floor drains once per week.

❑ Run water in sinks weekly to ensure that service water does not stagnate in supply lines, and drain traps are flushed and filled.

❑ Flush toilets at least once per week.

Δ **Drain traps are filled regularly.**

❍ **Need help filling dry drain traps regularly.**

Excess Moisture

Excess moisture contributes to the growth of mould and mildew, which causes odours and other IAQ problems. Excess moisture is the result of condensation on cold surfaces, leaking or spilled liquid, or excess humidity.

Note condensate (condensed water, frost, or "fog") on cold surfaces

❑ Windows, window sills, and window frames

❑ Cold water pipes or fixtures

❑ Indoor surfaces of exterior walls and floors

Δ **No condensate found.**

❍ **Excess condensate found.**

❍ **Need help controlling excess condensate.**

Check for leaks or signs of moisture from plumbing or roofs

❑ Around and under classroom sinks

❑ In classroom lavatories

❑ Ceiling tiles, walls and floors (discoloration may indicate periodic leaks).

Δ **No leaks or signs of moisture found.**

❍ **Found leaks or signs of moisture.**

❍ **Need help addressing leaks or excess moisture.**

Thermal Comfort

Temperature and relative humidity can affect comfort and IAQ. Changing thermostat settings or opening windows to try to control temporary fluctuations in temperature can worsen comfort problems, and can also have an adverse effect on other parts of the school.

Check comfort factors

❑ Temperature (generally 20 – 24°C)

❑ Draftiness

❑ Direct sunlight shining on students

❑ Humidity too high (<60% relative humidity [RH]) or too low (>30% RH)

Δ **Room is typically comfortable.**

❍ **Need help, room is frequently uncomfortable.**

Ventilation

Ventilation is the process by which stale indoor air is exhausted to the outside and outdoor air is drawn into the building. The classroom may have either mechanical ventilation (supplied by fans) or natural ventilation (operable windows). Improperly operated or poorly maintained ventilation systems may cause IAQ problems. Odours, or the temptation to use scented air fresheners, may indicate a ventilation or air contamination problem. The ventilation system can carry air contaminants from another location in the school to a classroom, or from a classroom to other school areas.

Determine how the classroom is ventilated

❑ Locate unit ventilator or other dedicated ventilation equipment (if any).

❑ Locate air supply and air return vents (if any).

❑ Determine whether classroom windows are operable (if there is no mechanical ventilation system).

Δ **Located the ventilation equipment.**

Δ **Located the air supply and return vents.**

Δ **Determined whether windows are operable.**

❍ **Need help determining the type of ventilation.**

If the classroom has mechanical ventilation, confirm that air is flowing into the room from the air supply vent(s)

- ❑ Discuss the proper operation of the classroom heating and ventilating equipment with the building operator.
- ❑ Check for airflow by holding a strip of lightweight plastic or piece of tissue paper near the air supply vent(s). If air is flowing, the plastic or tissue will flutter away from the supply vent.
- ❑ Make sure that the airflow is not diverted or obstructed by books, papers, furniture, curtains, or other obstacles. Never place anything on top of unit ventilators.
- ❑ Note any times when or conditions where the ventilation operation seems to change or be interrupted.

Δ Air is flowing without obstruction.

❍ Need help, no air supply or other problems noted.

If the classroom has mechanical ventilation, confirm that air is flowing from the room into the air return grille(s)

- ❑ Check for airflow at air return grille(s) in the same manner as described for the previous activity. If air is flowing, the plastic or tissue will be pulled toward the air return grille. Alternatively, a piece of plastic that nearly covers the grille will stick to the face of the grille if air is flowing.
- ❑ Make sure that the airflow is not obstructed by books, papers, furniture, curtains, or other obstacles.

Δ Air is flowing without obstruction.

❍ Need help, air is not flowing or problems noted.

Check for unexplained odours

- ❑ Vehicle exhaust
- ❑ Kitchen/food
- ❑ "Chemical" smell
- ❑ Mould or mildew
- ❑ Other

Δ No unexplained odours in classroom.

Δ Found source of odours and corrected problem.

❍ Need help, sometimes smell unexplained odours in classroom.

Building Envelope

The condition of the building envelope (floors, walls, and ceiling) is an important component of IAQ management. Certain conditions may indicate serious future problems, such as signs of moisture, unusual odours or changes in the colour of ceilings, walls, or floors.

- ❑ Assess the condition of the floor coverings. Worn or dirty carpets can be a source of contaminants. Cleaning with chemicals, improper drying, or vacuuming without adequate filtration will increase the release of contaminants from carpets.
- ❑ Open window coverings to maximize natural light.
- ❑ Note any unusual observations and record the time and building use conditions.

- ❑ Note any unusual odours, including damp or musty smells.
- ❑ Note any discoloured, damp or smelly building components or obvious signs of mould.

Δ **No building envelope problems noted.**

❍ **Need help with building envelope problems.**

Materials

The storage of materials in a classroom can contribute to indoor air contamination and may interfere with the ventilation system operation and custodial practices.

- ❑ Minimize the storage of materials and supplies within the classroom.
- ❑ Conduct an annual inspection and inventory. Discard all unnecessary components. Be ruthless. Junk collecting causes problems.
- ❑ Do not store materials, boxes or other components against exterior walls. This can create cold spots and problems with mould growth.
- ❑ Millwork, shelves and furniture should not be placed against exterior walls unless they are designed for this purpose.
- ❑ Arrange the classroom so it's easy for custodians to clean. They cannot clean what they cannot reach.

Δ **No material storage problems found.**

❍ **Need help with material storage.**

Odours

- ❑ Note any unusual odours, chemical smells, or damp/musty conditions.
- ❑ Note any excessive dust accumulation.

Δ **No odour problems found.**

❍ **Need help with odour problems.**

Occupants

Occupants may unintentionally bring different air contaminants into the indoor environment by wearing perfume, recently dry-cleaned clothing, or clothing soiled with spilled fuel or tobacco smoke, for example.

Indoor air quality can be improved by recognizing and minimizing contaminants that result from personal choices and lifestyles.

Minimize contaminant sources

- ❑ Encourage discussion within the classroom to raise awareness of and improve cooperation on IAQ issues.
- ❑ Minimize the use of scented personal care products.
- ❑ Provide remote storage for odourous or contaminated clothing and footware.
- ❑ Check lockers regularly.
- ❑ Arrange seating to minimize the exposure of students who are sensitive to classroom odours.
- ❑ Note any unusual or chemical odours such as fuel/solvents/smoke on clothing.

- ❑ Develop a policy on food consumption in classrooms. Provide an area with hard surface flooring, where possible.

Δ Consider developing policies of fragrance use in consultation with provincial authorities.

Δ The classroom "culture" minimizes contaminants and encourages cooperation.

Δ No unusual occupant sources found.

❍ Need help with occupant sources.

Note for teachers: Conduct the following activities as appropriate to your classroom.

Local Exhaust Fans and Fume Hoods

Local exhaust fans and fume hoods can be used to prevent air pollutants from accumulating in, or spreading beyond, the local area or classroom. Local exhaust fans may be used to exhaust entire rooms such as bathrooms or locker rooms. Fume hoods are appropriate for activities that generate significant amounts of pollutants in a local area within a room, such as science experiments, spray painting, or welding.

Determine whether your classroom activities generate air pollutants and whether your classroom is equipped with local exhaust fans and/or fume hoods

- ❑ If there are no activities that generate air pollutants, you do not need a local exhaust fan or fume hood.
- ❑ If there are or may be activities that generate contaminants such as dust or fumes, notify the building operator. Note that fans must operate continuously when the source is present, not only when the room is occupied.

Δ No major pollutant generating activities take place.

Δ Fume hood and/or exhaust fan is in good condition.

❍ Need fume hood and/or local exhaust fan, or need repairs.

Confirm that fume hoods and local exhaust fans function properly

- ❑ Check for airflow when fans are on. (Hold a piece of tissue paper near the fan, or within the fume hood space. If the paper is pulled inward, the fan is operating properly.)
- ❑ Fume hoods are not cracked, broken, or pulling away from the ceiling or wall.
- ❑ Fan is not operated due to noise or mechanical problems.
- ❑ No odours are present in adjacent rooms or halls.

Δ Fans function; no odours found in adjacent areas.

Δ Fume hood is in good repair.

❍ Need help because the hood or exhaust fan does not seem to function properly.

❍ Need help to assess whether a fume hood or exhaust fan is needed.

Confirm that fume hoods and fans are used whenever activities that generate pollutants take place

- ❑ Train staff, students and others who use the classroom to use the fume hoods and fans appropriately.
- ❑ Conduct pollutant-generating activities under the fume hood with the exhaust fan turned on.
- ❑ Monitor their use throughout the year.

Δ Fans and fume hoods are used properly.

❍ Need help to ensure that the fans and fume hoods are used properly.

Special activities or special use areas may require additional considerations. The activities should comply with the Workplace Hazardous Materials Information System (WHMIS) program, and Material Safety Data Sheets (MSDS) should be available for all appropriate materials. Some of these activities include:

■ ART/CRAFTS

Art supplies may emit contaminants during their use and storage. In addition, certain activities, such as firing ceramic kilns, may generate air contaminants or heat up the classroom, and cause discomfort to occupants.

Although potentially toxic supplies should have appropriate labelling, teachers should ensure that safety precautions are followed. Examples of art supplies and activities that may contribute to IAQ problems include:

- solvents
- inks
- adhesives and glues
- wax
- varnishes and lacquers
- powdered pigments
- acids
- clays/plaster/paper
- paints
- firing kilns
- spilled liquids

Learn about your arts and craft supplies

- ❑ Check to see whether your supplies (noted above) are listed as toxic or non-toxic.
- ❑ Discuss all art supplies and practices with the school administration to ensure that they comply with school policy.
- ❑ Read labels and identify precautions regarding fumes or ventilation.

Δ Materials and practices are appropriate.

❍ Need help managing supplies, interpreting label warnings, or modifying activities.

Confirm that supplies are safe to use Prior to purchasing them or recommending products for purchase

- ❑ Choose art supplies approved by school policy.
- ❑ Consider how the supplies may be used and ensure that proper guidance is provided.

Δ Supplies are safe to use.

❍ Need help determining if supplies are safe.

Follow good safety, handling, and storage practices

- ❑ Ensure appropriate procedures and supplies are available for controlling spills.
- ❑ Label all hazardous supplies with date of receipt/preparation and pertinent precautionary information.
- ❑ Tightly seal containers.
- ❑ Follow recommended procedures for the disposal of used substances.
- ❑ Secure compressed gas cylinders.
- ❑ Ensure that supply storage areas are separate from classroom and properly ventilated.

Δ Following good safety, handling and storage practices.

❍ Need help developing good safety, handling, or storage practices.

Minimize exposure to hazardous materials

- ❑ Substitute less or non-hazardous materials where possible.
- ❑ Use local exhaust fans.
- ❑ Isolate activities or operations that generate contaminants.
- ❑ Use techniques that require the least amount of materials.

Δ Exposure to contaminants is minimized.

❍ Need help minimizing exposure to art supplies.

■ SCIENCE/LABORATORY

Some supplies used as teaching aids in science laboratories may contribute to IAQ problems. Science experiments should be conducted in properly designed, well-ventilated rooms using fume hoods and local exhaust systems wherever appropriate. Basic safety precautions to prevent spills or other mishaps that cause air contamination should be followed at all times. Examples of science supplies or equipment that may contribute to IAQ problems include:

- solvents
- acids
- flammables
- caustics
- biological/microbiological agents
- compressed gases
- greenhouses, incubators

Learn about your supplies

- ❑ Read labels and identify precautions regarding the ventilation of fumes.
- ❑ Request information and Material Safety Data Sheets from suppliers and manufacturers.

Δ Supplies reviewed.

❍ Need help determining impacts of supplies.

Follow good safety, handling, and storage practices

- ❑ Obtain guidance and policy documents from the school administration.

- ❑ Ensure that appropriate procedures and supplies are available for spill control (e.g., absorbent materials to control the spread of spills).
- ❑ Label all chemicals accurately with date of receipt/preparation and pertinent precautionary information.
- ❑ Store supplies according to manufacturers' recommendations.
- ❑ Follow recommended procedures for the disposal of used substances.
- ❑ Secure compressed gas cylinders.
- ❑ Ensure that storage areas are separate from main classroom area and ventilated separately.

Δ Following good safety, handling, and storage practices.

❍ Need help developing good safety, handling, or storage practices.

Minimize exposure to hazardous materials

- ❑ Review teaching curriculum and ensure that only the materials required for current lessons are present.
- ❑ Use diluted substances rather than concentrates wherever possible.
- ❑ Use techniques that require the least quantity of hazardous materials.
- ❑ Ensure that fume hoods capture inhalable particles, gases, and vapours released within them.
- ❑ Confirm that exhaust fans operate.

Δ Exposure to hazardous materials minimized.

Δ All unnecessary materials are properly disposed of.

❍ Need help minimizing exposure to supplies.

❍ Need help reviewing curriculum and/or disposing of unnecessary materials.

■ INDUSTRIAL/VOCATIONAL EDUCATION SUPPLIES

Industrial and vocational education materials and operations can create IAQ problems. Examples of the kinds of activities and supplies that may contribute to IAQ problems include:

- machining
- solvents
- grinding
- fuels
- painting
- soldering
- welding
- baking/heating
- adhesives

Learn about your supplies

- ❑ Read labels and identify precautions regarding fumes or ventilation.
- ❑ Request information and Material Safety Data Sheets from suppliers and manufacturers.

Δ Supplies reviewed.

❍ Need help determining impacts of industrial/vocational supplies.

Follow good safety, handling, and storage practices

- ❑ Obtain guidance and policy documents from the school administration.
- ❑ Ensure that appropriate procedures and supplies are available for spill control (e.g., absorbent materials to control the spread of spills).
- ❑ Store supplies according to manufacturers' recommendations.
- ❑ Follow recommended procedures for disposal of used substances.
- ❑ Secure compressed gas cylinders.
- ❑ Ensure that storage areas are separate from classroom and ventilated.

Δ Following good safety, handling, and storage practices.

❍ Need help developing good safety, handling, or storage practices.

Minimize exposure to hazardous materials

- ❑ Use instructional techniques that require the least amount of materials.
- ❑ Ensure that fume hoods capture all inhalable particles, gases, and vapours released within them.
- ❑ Use the equipment correctly. Discuss equipment use and operation with the building operators, and determine who is responsible for maintaining and cleaning special equipment such as dust/fume collectors, cyclones and electrostatic precipitators.
- ❑ Confirm that exhaust fans operate.
- ❑ Confirm that special equipment functions and is properly maintained.

Δ Exposure to hazardous materials minimized.

❍ Need help minimizing exposure to materials.

■ LOCKER ROOMS/AREAS

Locker room conditions that affect indoor air quality include standing water, high humidity, warm temperatures, and damp or dirty clothing. In addition, some of the methods necessary to control germs and odours in the locker room (e.g., the use of disinfectants) may themselves contribute to indoor air quality problems if used improperly (e.g., sprayed into the air instead of directly onto surfaces).

Verify that showers and other locker room areas are cleaned regularly and properly

- ❑ Use chemical cleaners and disinfectants when areas are unoccupied.
- ❑ Run exhaust fans to remove moisture and odours.
- ❑ Run showers, basins, and drinking fountains weekly to ensure that service water does not stagnate in supply lines and drain traps are flushed and filled.
- ❑ Flush toilets once per week.
- ❑ Pour water down floor drains as required.

Δ Locker room and showers are cleaned regularly and properly.

❍ Need help to ensure showers and locker rooms are cleaned regularly and properly.

Maintain cleanliness and reduce excess moisture in the locker room

- ❑ Remove wet towels regularly.
- ❑ Wash and dry soiled practice uniforms regularly.
- ❑ Encourage students to clean lockers and take soiled clothes home regularly.
- ❑ Operate exhaust fans to remove moisture.

Δ Soiled clothes and towels are removed regularly.

❍ Need help to ensure soiled clothes or towels are removed regularly.

Problem Summary

- ❑ All activities on this checklist have been completed and no help is required.

OR

- ❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 9

Relocatable Classroom Checklist

Relocatable Classroom Checklist

This checklist is intended for use by:

- Facilities maintenance staff
- School custodial staff
- Contract service providers

This checklist discusses these major topic areas:

- Design
- Site Selection
- Installation
- HVAC Systems
- Foundations

Instructions

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Consult other checklists, where appropriate, for detailed assessment of specific items.
3. Read each item on this checklist. Check off each box (❑) as you complete the activity.
4. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
5. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help maintenance staff, school custodial staff, and contract service providers identify and prevent potential IAQ problems in relocatable (portable) classrooms.

The tasks identified in this checklist should only be performed by or with the assistance of a trained professional in that field. In performing tasks in this checklist, applicable federal, provincial, territorial and municipal regulations and guidelines should be respected including local fire regulations, building codes and occupational health and safety codes.

Background

Relocatable or portable classrooms were originally introduced to provide space to accommodate temporary increases in school populations, which could not be absorbed within the regular school facility.

Over time, some relocatable classrooms have become permanent fixtures, although their original design and installation may not have considered long-term use. Other, more modern relocatable classrooms are designed to be modular schools and have been assembled into complex building configurations.

Despite their "portable" nature, relocatable classrooms should perform and be maintained to the same standard as conventional classrooms.

Refer to other checklists for additional information on facility assessment. Use the Classroom Checklist in conjunction with this checklist.

Design

- ❑ Evaluate the basic design of the building envelope. Some units are not designed to be pressurized by the heating, ventilation, and air conditioning (HVAC) system, or to be humidified, because the building envelope lacks the required air tightness, vapour protection, or thermal insulation.

HVAC Systems

Because they are designed to stand alone and be moved, the HVAC systems in relocatable classrooms are usually self-contained. These systems should perform and be maintained to the same standards as other HVAC systems.

- ❑ Ensure that the HVAC system can *continuously* supply an adequate amount of fresh air.
- ❑ Check for proper operation of the air supply and exhaust equipment. Over- or under-pressurization can lead to problems with air leakage and moisture transport.
- ❑ Provide access for inspection and maintenance of the HVAC equipment, including rooftop equipment.
- ❑ Some HVAC systems may not provide adequate ventilation and space temperature controls. Supplemental heating or cooling may be required to ensure that thermal conditions are met under all environmental conditions.
- ❑ Provide outdoor air and recirculating air filters. Consult with the equipment manufacturer to select the highest efficiency filters that are compatible.
- ❑ The classroom teacher should be familiar with the required operation of the HVAC system and ensure that it is operated accordingly. If thermal comfort, drafts, or noise are problematic, teaching staff may not operate the HVAC equipment properly.

Site Selection

Relocatable classrooms are often added to existing buildings and may not receive adequate site selection or design. Problems with ground water, soil contaminants, and pest control often result from insufficient site preparation.

- ❑ Check that the site is well-drained and water does not collect under or around the unit.
- ❑ Provide adequate pavement, grass or other "clean" surfaces to prevent mud, snow, and water from being tracked into the unit.
- ❑ Review the previous site conditions and use this information to determine if any pre-existing problems exist.
- ❑ Avoid sites near outdoor contaminant sources, vehicle parking, or high voltage power transmission equipment.

Foundations

Relocatable classrooms may be free standing or grouped together. Their foundations should provide stable, clean, and well-ventilated platforms for the classroom units.

- ❑ Check that the foundation is secure from rodents and other pests.
- ❑ Ensure that the foundation is free from standing water and excessive humidity (a waterproof ground cover should be installed over the entire ground surface below the unit).
- ❑ Provide ventilation for foundations to control odours, humidity, and other contaminants.
- ❑ Provide eaves trough and downspout extensions or other means to ensure that precipitation is directed away from the foundation.
- ❑ Keep snow cleared from the foundation.
- ❑ Foundations must be either conditioned or unconditioned spaces. Unless the classroom unit is designed to be placed over a conditioned area foundation, ensure that the unit is properly isolated from the foundation and that ducts do not enter the unconditioned space.

Installation

Relocatable units are often installed in groups. The installation can affect how individual units function.

- ❑ Ensure that roofs drain free and do not accumulate snow.
- ❑ Corridors and common spaces should have ventilation and provide conditioned space. Foundations, building envelopes, and other details should be appropriate for the site.
- ❑ Ensure that there is adequate space for storing clothing, footwear, and other articles.
- ❑ Maintenance and custodial practices should be consistent with other school areas.

Inspection, Use and Maintenance

- ❑ Conduct inspection, use and maintenance checks using the checklists developed for these activities.

Prevention of Water Damage and Mold Growth

- ❑ Have the roof and exterior walls inspected yearly.
- ❑ Ensure that exterior caulking joints are maintained to prevent water entry.
- ❑ Ensure that there are eaves troughs and down spouts in good condition.
- ❑ Fix rapidly any water leakage or filtration.
- ❑ Identify and fix rapidly the cause of any damp stain.
- ❑ Should any visible mould or musty odour be noticed, verify if there is mould in adjacent non-visible areas (e.g. inside ceiling and walls), and then clean thoroughly.

Problem Summary

- ❑ All activities on this checklist have been completed and no help is required.

OR

- ❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 10

Building Maintenance Checklist

Building Maintenance Checklist

This checklist is intended for use by:
- School maintenance staff
- Facilities staff
- Contract service providers

This checklist discusses these major topic areas:
- Maintenance Supplies
- Dust Control
- Drain Traps
- Moisture, Leaks, and Spills
- Combustion Appliances
- Pest Control

Instructions
1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read each item on this checklist. Check off each box (❑) as you complete the activity.
3. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
4. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help school maintenance staff, facilities staff, and contract service providers identify and prevent potential IAQ problems by practicing proper building maintenance.

The tasks identified in this checklist should only be performed by or with the assistance of a trained professional in that field. In performing tasks in this checklist, applicable federal, provincial, territorial and municipal regulations and guidelines should be respected including local fire regulations, building codes and occupational health and safety codes.

Maintenance Supplies

Maintenance supplies may emit air contaminants during their use and storage. The overuse or improper use of supplies (such as mixing them with incompatible compounds) can cause serious IAQ and worker safety problems. Products with low emissions are generally preferable. However, a low-emissions product is not necessarily better if it is more hazardous despite the lower emissions, and if it must be used more often or at higher doses. Supplies that may contribute to IAQ problems include:

- caulks
- solvents
- paints
- adhesives
- sealants
- cleaning agents
- floor finishes

Learn about maintenance supplies

- ❑ Provide training to all staff to ensure that proper work practices are followed. Workplace Hazardous Materials Information System (WHMIS) training should be provided.
- ❑ Review and become familiar with maintenance supplies.
- ❑ Read labels and identify precautions regarding the effects of maintenance supplies on indoor air and ventilation requirements.
- ❑ Do not use air fresheners, scented products, ozone generators or other masking agents to cover up IAQ problems.

Δ Supplies reviewed and are acceptable.

❍ Need help determining the impact of supplies.

If you make purchase decisions, or recommend products for purchase, confirm that supplies are safe to use

- ❑ Ask vendors and manufacturers to help select the safest and most effective products.
- ❑ Obtain written documentation for all products.

Δ Supplies are safe to use.

❍ Need help determining if supplies are safe.

Follow good safety, handling, disposal, and storage practices

- ❑ Develop appropriate procedures and ensure that supplies are available for spill control.
- ❑ Exhaust air from chemical and trash storage areas to the outdoors.
- ❑ Store chemical products and supplies in sealable, clearly labelled containers.
- ❑ Follow manufacturers' instructions regarding the use of maintenance supplies.
- ❑ Automatic dispensing and mixing equipment can minimize spills, waste, and improper mixing.
- ❑ Follow manufacturers' instructions regarding the disposal of chemicals, chemical-containing wastes, and containers.

Δ Following good safety, handling, disposal, and storage practices.

Δ **Safety, handling, storage, and disposal practices are being revised to ensure acceptability.**

❍ **Need help with good safety, handling, disposal, and storage practices.**

Establish maintenance practices that minimize occupants' exposure to hazardous materials

❑ Substitute less-hazardous or non-hazardous materials where possible.

❑ Schedule work involving odorous or hazardous chemicals for periods when the school is unoccupied.

❑ Ventilate during and after the use of odorous or hazardous chemicals.

Δ **Procedures are established and followed to minimize occupants' exposure.**

❍ **Need help to develop and implement procedures to minimize occupants' exposure.**

Dust Control

By reducing the amount of dust and dirt that enters the school, and by reducing the amount of dust that escapes vacuum bags and dust cloths, it's possible to maintain a cleaner school with less effort. A cleaner school can have positive physical and psychological effects on the students and staff, since complaints of illness and discomfort are more common in dustier buildings. Effective dust control also reduces levels of other particles such as pollens, which can cause allergic reactions. Chalkboards and white boards can be significant sources of dust.

Purchase and maintain barrier floor mats for all school entrances

❑ Barrier mats should be long enough to allow five full steps for people entering the school. (Ideally, dirt need only be cleaned from the mats rather than from all over the school, saving cleaning costs.)

❑ Vacuum each barrier mat daily (or more often if required) using a beater brush or beater bar vacuum, in two directions (in-line and side-to-side).

Δ **Barrier mats are purchased and maintained.**

❍ **Need help with barrier mats.**

Use higher efficiency vacuum bags

❑ Standard paper or cloth bags allow lots of dust to pass completely through the vacuum, back into the air and onto surfaces. Use micro-filtration bags that retain dust and particles in the 3 micron size range, or smaller. Although the bags cost more, they reduce total cleaning labour costs.

❑ Ensure that each facility has easy access to a high efficiency particulate air (HEPA) filtration vacuum for use when cleaning up mould, rodent droppings, and other hazardous materials.

❑ Train staff to recognize and report mould, rodent droppings, and other hazardous materials. Develop written procedures for reporting and clean-up of these contaminants.

Δ **High efficiency bags are in use.**

Δ **HEPA vacuum is available.**

Δ **Written procedures are in place.**

❍ **Need help obtaining proper bags or HEPA vacuum.**

❍ **Need help developing written procedures.**

Use proper dust wiping techniques

❑ Ensure that collected dust remains on the wipe by using a wiping motion with a folded wipe, rather than a flicking motion with a crumpled-up wipe.

❑ Wrap hand-held feather-type dusters with a dust cloth. Use a wiping motion, rather than a flicking or sweeping motion.

Δ **Proper dusting techniques are practiced.**

❍ **Need help with dust wiping.**

Vacuum dust from heating, cooling, and ventilation air return grilles and air supply vents periodically

❑ In addition to vacuuming the grilles and vents using a soft bristle attachment, vacuum the ceiling and wall surfaces adjacent to the grilles and vents to remove visible dust. Because this dust is very fine, damp wipe surfaces before vacuuming, or use a HEPA vacuum.

Δ **Cleaning is performed regularly.**

❍ **Need help cleaning grilles and vents.**

Chalkboard/White Board Maintenance

Chalkboards and white boards can generate large amounts of dust, either during board cleaning or brush cleaning.

❑ Clean boards and ledges with a damp cloth or other method to collect dust and prevent the release of dust.

❑ Clean brushes using a method that will not generate or release dust. Vacuum-style brush beater/cleaners can release large amounts of dust into the air.

Δ **Brushes and boards are cleaned frequently and efficiently.**

❍ **Need help with brush or board cleaning.**

Floor Cleaning

Regardless of floor covering, use the manufacturer's recommendations for cleaning to remove accumulated contaminants. For carpets, the Canadian Carpet Institute recommends periodic extraction cleaning, wet or dry, and complete removal of the moisture and cleaning agents. Contact floor suppliers or manufacturers for their recommended maintenance techniques, or contact the Canadian Carpet Institute (CCI) at 1-819-684-8444 (website: www.canadiancarpet.org).

❑ Vacuum at least daily, as needed for soil removal. Use a vacuum with brushes, beater bars, strong suction, and a high efficiency filter bag that will filter particles down to the 3 micron or smaller range.

❑ Remove spots and stains immediately, using the flooring manufacturer's recommended techniques. Take care to prevent excess moisture or the accumulation of cleaning residue, and ensure that cleaned areas will dry quickly.

Δ **Floors are cleaned daily as needed and moisture has been removed.**

❍ **Need help with daily floor maintenance.**

Perform restorative maintenance

❑ Apply the manufacturer's recommended guidelines when cleaning to remove accumulated contaminants. For carpets, the Canadian Carpet Institute (CCI) recommends periodic extraction cleaning, wet or dry, and complete removal of the moisture and cleaning agents.

Δ **Restorative maintenance is properly performed as needed.**

❍ **Need help with restorative floor maintenance.**

Drain Traps

Drain traps can cause IAQ problems when water in the drain trap evaporates due to infrequent use. If the building interior is under negative pressure, soil gas or sewer gas can be drawn indoors through a dry drain trap.

Confirm that all drains have drain traps

❑ List all drains and traps.

❑ Install traps on any untrapped drains.

Δ **All drains have drain traps.**

❍ **Need help with traps.**

Confirm that all drain traps are filled in areas that only you have access to

❑ Pour water down floor drains regularly.

❑ Run water in sinks at least once per week.

❑ Flush toilets once per week.

Δ Traps are filled regularly.

❍ Need help filling traps regularly.

Moisture, Leaks, and Spills

Mould and mildew can grow almost anywhere that provides a food source and a small amount of moisture, whether from leaks and spills or condensation. Mould and mildew do not require standing water in order to grow. The higher the relative humidity, the higher the probability of fungal growth.

Each school facility should have written procedures for responding to: 1) emergency conditions (spills, leaks or sewer backup), and 2) maintenance and repairs (clean-up and repair of components).

Assemble the following tools before conducting these activities:

- a small floor plan for taking notes and logging observations;
- an instrument to measure relative humidity (e.g., sling psychrometer); and
- a flashlight.

Inspect the building for signs of moisture, leaks, floods, spills, or water damaged/mouldy materials

When conducting an inspection, use visual and odour clues. Do not disturb suspect areas until a proper clean-up and repair plan is in place, since large amounts of contaminants could be released.

❑ Check for mouldy odours.

❑ Look for stains or discoloration on the ceiling, walls, or floor.

❑ Examine inaccessible or limited access areas such as crawlspaces, sub-floor cavities and service tunnels.

- ❑ Identify any areas that have exposed soil or appear cool/damp.
- ❑ Check cold surfaces such as locations under windows, in corners formed by exterior walls, and uninsulated or poorly insulated cold water piping.
- ❑ Check areas where moisture is generated such as locker rooms, bathrooms, and sinks.
- ❑ Check for the presence of stained, deteriorated, or mouldy materials including textiles, cardboard boxes, and other building contents.
- ❑ Look for signs of water damage in:
  - indoor areas in the vicinity of known roof or wall leaks;
  - walls around leaky or broken windows;
  - floors, ceilings, or cabinets under plumbing or piping;
  - duct interiors near humidifiers, cooling coils, and outdoor air intakes; and
  - crawlspaces.
- ❑ Identify moisture-damaged but dry materials, note their location, and make arrangements for their proper removal and repair.
- ❑ If active leaks or damp areas (such as exposed soil) are discovered during the inspection, note their location(s) on your floor plan and repair them as quickly as possible.

Δ There are no signs of moisture, leaks, or spills.

❍ Found signs of moisture, leaks, or spills, or need help inspecting.

Respond promptly when you see signs of moisture, or when leaks or spills occur

- ❑ Clean and dry damp or wet building materials and furnishings.
- ❑ Work with manufacturers of furnishings and building materials to learn the recommended cleaning procedures and/or identify competent contractors who can clean damp materials.
- ❑ Porous, absorbent building materials or furnishings, such as ceiling tiles, wallboards, floor coverings, etc., must be thoroughly dried and cleaned as soon as possible. In some cases, these materials may require disinfection. If the materials cannot be dried and cleaned within 24 hours, they may have to be removed and later replaced after the cause of the moisture problem has been corrected.

Δ Moisture, leaks, or spills are fixed.

❍ Need help fixing damage from moisture, leaks, or spills.

Prevent condensation

There are several methods to prevent condensation:

- ❑ Reduce the potential for condensation on cold surfaces (piping, exterior walls, roof, or floor) by adding insulation. (Note: when installing insulation that has a vapour barrier, put the vapour barrier on the warm side of the insulation.)
- ❑ Raise the air temperature. Unheated building areas are susceptible to moisture problems if there are moisture sources, air leaks from indoor spaces, or poor ventilation.

❑ Improve air circulation in the problem location.

❑ Decrease the amount of water vapour in the air.

- In dryer climates or winter, supply more outdoor ventilation air.
- In humid climates or during humid times of the year, use a dehumidifier or desiccants to dry the air.
- Increase the capacity or operating schedule of existing exhaust fans or add a local exhaust fan near the source of the water vapour.
- Note that ventilation with outdoor air *can* cause moisture problems in some locations.

Δ Moisture prevention activities are completed.

Δ Moisture prevention activities underway and will be completed promptly.

❍ Need help with moisture prevention activities.

Combustion Appliances

Combustion appliances are potential sources of carbon monoxide and other combustion gases. Carbon monoxide is odourless yet toxic, so it is important that appliances are properly vented to remove combustion gases. If inadequate combustion air is available to an appliance, air may be pulled, or back drafted, down the flue, bringing combustion gases back indoors instead of exhausting them outside.

In addition to completing the checklist items, a competent individual should conduct a complete inspection of all combustion equipment and systems at least once per year.

Note odours upon entering a location containing combustion appliances

❑ The nose quickly becomes accustomed to odours, but the initial detection of combustion gas odours or a damp, musty smell may indicate a leak or backdrafting problem.

Δ No combustion odours noted.

❍ Need help resolving combustion odours or problems.

Visually inspect exhaust components

❑ Inspect flue components for leaks, disconnections, and deterioration.

❑ Inspect flue components for corrosion, soot or staining.

❑ Ensure that all ducts are sealed and equipment doors are properly installed. Negative pressures caused by mechanical equipment can easily backdraft chimneys and vents.

❑ Check that combustion air intake ducts and grilles are unobstructed.

Δ No apparent problems found.

❍ Need help repairing exhaust components.

Check for backdrafting of combustion appliances

- ❑ When the combustion appliance is operating, and the building ventilation systems are in normal operating mode, use chemical smoke to determine whether air is flowing up the flue by puffing smoke near any vent openings or joints.

Δ No backdrafting noted.

❍ Need help resolving backdrafting problem.

Pest Control

Use Integrated Pest Management (IPM) methods of pest control. A pest control plan should contain information on approved products, methods, and communication requirements.

Pest management plans should ensure that the building is well-sealed to prevent pest entry and that food sources are not available to attract and support pests.

- ❑ Do not rely on the widespread, indiscriminate use of pesticides to control pests. Pesticides should be considered only for specific, short-term problems, when other methods cannot be effectively applied. The pesticide use should be carefully monitored and recorded.
- ❑ Regularly inspect all building areas to monitor pest activity.
- ❑ If you are in charge of pest control, obtain information about IPM from the IAQ coordinator.
- ❑ If pesticides are used outdoors, do not apply them near outdoor air intakes for the ventilation system. However, if this is unavoidable, shut down the affected ventilation system(s) and remove school occupants until the pesticide application has been completed and ventilation has been restored. Similarly, avoid applying pesticides near doors and open windows.
- ❑ Provide signs and barriers around all pesticide work areas.

Δ No pest problems found.

Δ Already using Integrated Pest Management methods.

❍ Need information or assistance with IPM.

Problem Summary

- ❑ All activities on this checklist have been completed and no help is required.

OR

- ❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 11

Custodial Checklist

Custodial Checklist

This checklist is intended for use by:

- School custodial staff
- Teaching/administrative staff
- Contract service providers

This checklist discusses these major topic areas:

- General Cleanliness
- Food and Beverage Consumption
- Excess Moisture/Thermal Comfort
- Local Exhaust Fans/Ventilation
- Materials
- Printing and Duplicating Equipment

Instructions

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read each item on this checklist. Check off each box (❑) as you complete the activity..
3. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
4. Return this checklist to the IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help custodial staff, teachers, administrative staff, and contract service providers identify and prevent potential IAQ problems in the school building.

The tasks identified in this checklist should only be performed by or with the assistance of a trained professional in that field. In performing tasks in this checklist, applicable federal, provincial, territorial and municipal regulations and guidelines should be respected including local fire regulations, building codes and occupational health and safety codes.

Background

The roles of custodial staff vary from school to school. In some cases, custodial staff are primarily involved with cleaning the school interior, while in others the duties also include a variety of maintenance/repair tasks.

The job description and duties of staff should be reviewed to ensure that all custodial and maintenance issues are fully addressed.

General Cleanliness

Regular and thorough cleaning is important to ensure good indoor air quality. Unsanitary conditions attract insects and vermin, leading to possible IAQ problems from animal or insect allergens or pesticide use. The presence of dirt, moisture, and warmth also stimulates the growth of moulds and other microorganisms. While janitors or custodians typically clean school areas, they can also play an important role in promoting and maintaining school cleanliness.

Confirm that all school areas are cleaned properly

- ❑ Make sure that the school is dusted/vacuumed thoroughly and regularly.
- ❑ Remove trash daily.
- ❑ Make sure that food is not kept overnight unless adequate storage is provided.
- ❑ Look for signs of pests and note the details.

Δ School is cleaned thoroughly and properly.

❍ Need help with school cleaning or pest control.

Clean spills promptly

- ❑ For spills on carpets involving more than a litre of liquid, custodial staff should respond immediately (carpets need to be cleaned and dried within 24 hours).
- ❑ Request that heating, ventilation, and air conditioning (HVAC) components be inspected and cleaned or replaced if spilled liquid or debris enters a unit. Disposable items such as filters should be replaced.
- ❑ Report previous spills on carpets or in HVAC components because they can affect current indoor air quality.

Δ No significant spills found.

❍ Need help with cleaning spills or addressing past spills.

Food and Beverage Consumption

- ❑ Make sure that all non-packaged food and beverage dispensing or preparation equipment is located in a non-carpeted area and that the floor is cleaned properly.
- ❑ Ensure that all food is consumed in a non-carpeted area and that the floor is cleaned properly.

Δ Food preparation, consumption and clean-up areas are appropriate.

❍ Need help with food preparation, consumption and clean-up areas.

Drain Traps

Drain traps can become a problem when, due to infrequent use, the water inside the drain trap evaporates causing sewer gases to enter the room, or the water becomes stagnant.

Inspect drain traps in your area each week

- ❑ Develop a list of all drain traps and locations.
- ❑ Pour water down floor drains as required.

- ❑ Run water in sinks weekly to flush traps and to ensure that service water does not stagnate in supply lines.
- ❑ Flush toilets at least once each week.

Δ Drain traps are filled regularly.

❍ Need help filling drain traps regularly.

Excess Moisture

Excess moisture contributes to the growth of mould and mildew, which causes odours and other IAQ problems. Excess moisture results from condensation on cold surfaces, leaking or spilled liquid, or excess humidity..

Check for condensate (condensed water, frost, or "fog") on cold surfaces

- ❑ Window glass, frames or sills
- ❑ Plumbing (pipes and fixtures)
- ❑ Inside surfaces of exterior walls and floors

Δ No condensate found.

❍ Excess condensate found.

❍ Need help with moisture control.

Check for leaks or signs of moisture from plumbing or roof

- ❑ On ceiling tiles, walls and floors (discoloured patches may indicate periodic leaks)
- ❑ Around and under sinks
- ❑ In lavatories

Δ No leaks or signs of moisture found.

❍ Found leaks or signs of moisture and have a response plan.

❍ Need help with leaks or moisture control.

Thermal Comfort

Temperature and relative humidity can affect comfort and indoor air quality. But changing thermostat settings or opening windows to try to control temporary fluctuations in temperature can worsen comfort problems and adversely affect other parts of the school. Ensuring the comfort of all school occupants is a worthy objective, but because of the different comfort requirements and clothing worn by occupants, it's more practical to ensure that at least 80% of the occupants are comfortable. The relative humidity should be controlled to prevent condensation on windows and other building envelope components. Excess humidity can result in moisture damage and mould growth.

Check comfort factors

- ❑ Temperature (generally 20 to 24°C)
- ❑ Draftiness
- ❑ Direct sunlight shining on occupants
- ❑ Humidity too high (>60% relative humidity [RH]) or too low (<30% RH)

Δ Room is typically comfortable.

❍ Need help room is often uncomfortable.

Local Exhaust Fans

Local exhaust fans can be used to prevent air pollutants from accumulating in, or spreading beyond, the local area or room where pollutants are generated. A local exhaust fan can be linked to the operation of a particular piece of equipment (such as a duplicator) or used to treat an entire room (such as a smoking room or custodial closet).

Determine whether room activities generate air pollutants and whether the room or area is equipped with local exhaust fans

- ❑ Assess activities that may generate air pollutants, such as smoking, the operation of some office equipment, and food preparation and eating.
- ❑ Determine whether there are any activities that generate air pollutants but which do not have exhaust systems.
- ❑ Consider installing local exhaust fans in the school nurse's office to help prevent the spread of germs throughout the school.
- Δ **No major pollutant generating activities found.**
- Δ **Local exhaust fan(s) available for all pollutant-generating activities.**
- ❍ **Need local exhaust fan(s) for (specify)**

Confirm that local exhaust fans function properly

- ❑ Check that air is flowing in the proper direction when fans are switched on (use chemical smoke or pieces of tissue).
- ❑ Odorous pollutants seem to be removed properly.
- ❑ Fan noise is acceptable.
- Δ **Local exhaust fans function acceptably.**
- ❍ **Need help evaluating or fixing fan(s).**

Confirm that fans are used whenever activities that generate air pollutants take place

- ❑ Conduct pollutant generating activities only when the exhaust fan(s) is(are) on.
- ❑ Staff and students understand the proper operation of the exhaust fans.
- Δ **Fans are used properly.**
- ❍ **Fans are not used properly.**

Ventilation

Ventilation is the process by which stale indoor air is exhausted to the outside and outside air is drawn into the building. Your building may have mechanical and/or natural ventilation.

Improperly operated or poorly maintained ventilation systems may cause IAQ problems. Odours may indicate a ventilation problem. The ventilation system can carry air pollutants from one location in the school to another.

Determine how the area is ventilated

- ❑ Locate unit ventilators or other dedicated ventilation equipment.
- ❑ Locate air supply and return vents (if any).
- ❑ Determine whether the windows (if any) are operable.
- Δ **Located the ventilation equipment.**
- Δ **Located the air supply and return vents.**
- Δ **Determined whether windows are operable.**
- ❍ **Need help determining the type of ventilation.**

If there is mechanical ventilation, confirm that air is flowing into the room from the air supply vent(s)

- ❑ Discuss the proper operation of the office ventilating equipment with the building operator.
- ❑ Check for airflow by holding a tissue or strip of lightweight plastic near the air supply vent(s). If the air is flowing, the

plastic or tissue will flutter away from the supply vent.

- ❑ Make sure that the airflow is not diverted or obstructed by books, papers, furniture, curtains, or other obstacles. Never place objects on top of unit ventilators.
- ❑ Note any times when or conditions when the ventilation operation seems to change or be interrupted.

Δ Air is flowing without obstruction.

❍ Need help, no air supply or other problems noted.

If there is mechanical ventilation, confirm that air is flowing from the room into the air return grilles

- ❑ Check for airflow at air return grilles in the same manner as described for the previous activity. If air is flowing, the plastic or tissue will be pulled toward the air return grille. Alternatively, a piece of plastic or tissue that nearly covers the grille will stick to the face of the grille if air is flowing
- ❑ Make sure that the airflow is not diverted or obstructed by books, papers, furniture, curtains, etc.

Δ Air is flowing without obstruction.

❍ Need help, no exhaust air or other problems.

Check for unexplained odours

- ❑ Vehicle exhaust
- ❑ Kitchen/food
- ❑ "Chemical"
- ❑ Mould or mildew
- ❑ Other

Δ No unexplained odours.

❍ Need help, sometimes smell unexplained odours.

Building Envelope

The condition of the building envelope is an important component of IAQ management. Certain conditions may predict serious future problems arising. Note any unusual observations and record the time and building use conditions.

- ❑ Building envelope inspected for defects, damage, or moisture problems.

Δ No building envelope problems noted.

❍ Need help with building envelope problems.

Materials

- ❑ Minimize the storage of materials and supplies within the area.
- ❑ Conduct an annual inspection and inventory. Discard all unnecessary materials. Be ruthless. Junk collecting causes problems.
- ❑ Do not store materials or boxes against exterior walls.
- ❑ Millwork, shelves and furniture should not be placed against exterior walls unless they are designed for this purpose.
- ❑ Make it easy for custodians to clean. They cannot clean what they cannot reach.

Odours

- ❑ Note any unusual odours, chemical smells or damp/musty conditions.
- ❑ Note any excessive dust accumulation.

Δ No odour problems found.

❍ Need help with odour problems.

Occupants

- ❑ Note any unusual or chemical odours such as personal care products, fuel, solvents, or smoke on clothing.
- ❑ Check lockers/cupboards on a regular basis.
- ❑ Store outdoor clothing outside of normally occupied areas where possible.
- ❑ Check that food consumption areas are consistent with school policy. Provide an area with hard surface flooring, where possible.

Δ No unusual occupant sources found.

❍ Unusual occupant sources suspected.

Printing/Duplicating Equipment

Printing, duplicating, laminating, binding and other office equipment can generate indoor air pollutants. Common types of duplicating and printing equipment include: photocopiers, spirit duplicating machines, mimeograph machines, diazo dyeline (blueprint) machines, electronic stencil makers, and computer (laser) printers. Spirit duplicating machines and diazo dyeline (blueprint) machines pose particular IAQ problems due to the presence of methyl alcohol and ammonia, respectively. Local exhaust and ventilation is important (see the previous activities).

Confirm that the equipment functions properly

- ❑ Equipment does not leak.
- ❑ No odours detected.
- ❑ Equipment is regularly maintained.

Δ No complaints received from individuals who are exposed to the equipment.

Δ Equipment functions properly and is regularly serviced by trained personnel.

❍ Need help determining whether equipment functions properly.

Minimize staff and student exposure to printing/duplicating equipment

- ❑ Equipment is located in a well-ventilated area with sufficient outdoor air.
- ❑ Ensure that spirit duplicating equipment and diazo dyeline copiers are located in a separate room with a fan to exhaust air to the outside.
- ❑ Store extra materials and supplies in a properly designed storage area.

Δ Equipment is located in a well-ventilated area or separate room with appropriate local exhaust.

❍ Need help moving equipment or minimizing exposure.

Problem Summary

- ❑ All activities on this checklist have been completed and no help is required.

OR

- ❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 12

Food Service Checklist

Food Service Checklist

This checklist is intended for use by:

- School-based food service staff
- School custodial staff
- Contract service providers

This checklist discusses these major topic areas:

- Cooking Area
- Food Handling and Storage
- Waste Management
- Receiving

These activities also apply to home-economics instructional areas.

Instructions

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read each item on this checklist. Check off each box (❑) as you complete the activity.
3. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
4. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help food service staff, custodial staff, and contract service providers identify and prevent potential IAQ problems arising from the preparation or disposal of food.

Consult with your local fire department for information on fire regulations and prevention.

Cooking Area

Cooking activities generate odours, moisture, food waste, and other trash, all of which must be managed carefully to avoid IAQ problems. Food odours can be a distraction to students and staff if they circulate through the school.

Food service areas are sometimes added to existing spaces that are not designed for this purpose. Verify that all food service areas are properly equipped and maintained.

Confirm that local exhaust fans function properly

- ❑ Check for airflow when fans are on. (Hold a piece of tissue paper near the fan to see whether it is pulled toward the fan.) Check the flow of steam released from cook tops or ovens to ensure it is drawn into the exhaust hood.
- ❑ Check for cooking odours or smoke in areas adjacent to the cooking, preparation, and eating areas.
- ❑ Make sure the fan is not too noisy (excessive noise may indicate a problem or discourage use of the fan).

Δ Fans function; no odours or smoke found in adjacent areas.

❍ Need help, local exhaust system does not appear to function properly.

Use exhaust fans whenever cooking, dishwashing, or cleaning

- ❑ Make sure that the staff understands the importance of using the exhaust fans to prevent moisture accumulation and the spread of odours and fumes.
- ❑ Train staff to use fans when cooking, dishwashing, or cleaning.
- ❑ Monitor the use of fans throughout the year.

Δ Fans are used appropriately.

❍ Need help to confirm whether fans are used appropriately.

Confirm that gas appliances function properly

- ❑ Verify that gas appliances are vented properly and have sufficient air for combustion and ventilation.
- ❑ Check for combustion gas odours, headaches when gas appliances are in use, or natural gas odours at any time.

Δ All gas appliances are vented appropriately.

Δ No leaks or exhaust odours found.

❍ Need help checking for (or detected problems with) leaks, odours, back drafting, or venting to outdoors.

Clean kitchen after use

- ❑ Inspect kitchen for signs of micro-biological growth (check for mouldy odours, slime, algae).
- ❑ Check hard-to-reach places such as the upper walls and ceiling for evidence of mould growth.
- ❑ Clean affected areas as needed.
- ❑ If biocides are used, select only products registered for such use, follow the manufacturer's directions for use, and pay careful attention to the method of application.

Δ No signs of microbiological growth found.

❍ Need help checking for mould or cleaning.

Inspect kitchen for plumbing leaks

- ❑ Check sink faucets and area under sinks.
- ❑ Look for stains or discoloration, and/or damp or wet areas.
- ❑ Ensure that water is not splashed onto walls, floors or other areas, which may promote the wetting of building materials.

Δ No plumbing leaks found.

❍ Need help to assess or fix leaks.

Food Handling and Storage

A clean kitchen with food stored in secure containers discourages vermin. Integrated Pest Management (IPM) practices minimize the need for pesticides and discourage pests by eliminating the food sources, pathways, and shelter they need. Refer to the Building Maintenance checklist for more information on pest control. The IAQ coordinator can help you and your staff learn more about IPM.

Check food preparation, cooking, and storage areas regularly for signs of insects and vermin

- ❑ Look for dead insects or rodents.
- ❑ Look for feces.
- ❑ Notify the IAQ coordinator if insects or vermin infestation is discovered.

Δ No signs of insects or vermin found.

❍ Need help investigating or addressing insects or vermin.

Confirm that appropriate food preparation, cooking, and storage practices are implemented

- ❑ Review food handling and storage practices. Containers should be well-sealed, with no traces of food left on the outside surfaces of containers.

Δ Food handling and storage is acceptable.

❍ Need help with food handling and storage.

Maintain general cleanliness

- ❑ Dispose of food scraps properly and remove crumbs.
- ❑ Wipe counters clean with soap and water or a disinfectant, according to school policy.
- ❑ Sweep and wet mop floors to remove food.
- ❑ Clean stoves and ovens after use.

Δ Food service area is clean.

❍ Need help cleaning food service area.

Waste Management

Food wastes and food-contaminated paper products produce odours and attract insects and vermin. The proper placement of dumpsters prevents odours from entering the building and minimizes opportunities for insects and vermin to enter the building.

Place waste in appropriate containers

- ❑ Containers should have lids that close securely.
- ❑ If possible, separate food waste and food-contaminated items from other wastes.
- ❑ Remove indoor waste daily.

Δ Waste is stored in appropriate containers.

❍ Need appropriate containers.

Locate dumpsters well away from air intake vents, operable windows, and food service doors

- ❑ Waste containers should be emptied regularly and cleaned as necessary to control odours and contamination.

Δ Dumpsters are properly located.

❍ Need help determining proper dumpster placement, or moving dumpsters.

Receiving

The kitchen is often the busiest part of the school for deliveries. Because fans are exhausting air from the kitchen (i.e., the kitchen is negatively pressurized), air from an adjacent loading dock may be drawn into the kitchen. If delivery trucks or other vehicles idle at the dock, exhaust fumes can be drawn in and cause problems. Open doors can also provide a point of entry for pests. A program of pest monitoring and management should be provided.

Remind drivers not to idle their engines

- ❑ Post a sign prohibiting vehicles from idling their engines in the receiving area.
- ❑ Ask drivers to turn off their engines if they don't follow instructions on the sign.

Δ Drivers turn off engines in receiving area.

❍ Need help, drivers do not turn off engines.

Keep doors or air barriers closed between the receiving area and kitchen

- ❑ Doors are regularly closed and properly weather-stripped.

Δ Doors are closed properly.

❍ Need help keeping doors closed.

Problem Summary

- ❑ All activities on this checklist have been completed and no help is required.

OR

- ❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 13

Waste Management Checklist

Waste Management Checklist

This checklist is intended for use by:

- School custodial staff
- School food services staff
- Contract service providers

Instructions

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read each item on this checklist. Check off each box (❑) as you complete the activity.
3. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
4. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help school staff and contract service providers anticipate and address waste management issues that may contribute to IAQ problems in the school.

Consult with your local authorities for further information on waste management.

Hazardous Wastes

Hazardous wastes should be identified and handled according to a specific hazardous waste management plan.

Proper waste management practices promote good indoor air quality by controlling odours and contaminants. Good sanitation also decreases the need for pesticides to control vermin.

Select waste containers by considering the kind of material that is placed in them

- ❑ Food waste or food-contaminated papers and plastics should be contained securely (e.g., covered containers, tied-off plastic bags) to discourage flies and other vermin.
- ❑ Recycling bins should be clearly labelled so people don't put other types of trash in them.
- ❑ Some materials may require special handling (e.g., waste generated in art classes, science classes, and vocational/industrial education classes). Work with teachers or administrators to identify the best methods for handling special wastes.
- ❑ Discourage the storage of food in classrooms and offices. Where necessary, food should be stored in sealed, durable containers and inspected frequently.

Δ Existing waste containers are appropriate and do not need to be changed.

Δ New waste containers appropriate to their waste are being installed.

❍ Need help to select and obtain appropriate waste containers.

Locate dumpsters away from outdoor air intakes, doors, and operable windows

- ❑ Ideally, prevailing winds should carry odours and contaminants away from the building.

Δ Dumpsters are located away from air intakes, doors, and operable windows.

Δ Dumpsters are being moved.

❍ Need help to find appropriate location and/or move dumpsters.

Empty waste containers regularly and frequently, and store them in an appropriate location

- ❑ Follow a regular schedule that minimizes odours and deprives vermin of their food source.
- ❑ Containers with plastic liners that are regularly replaced do not need to be cleaned and disinfected as often as unlined containers.
- ❑ Do not store waste containers in rooms with heating, cooling, or ventilation equipment that supplies conditioned air to other rooms.

Δ Waste containers are emptied regularly and frequently.

Δ Waste containers are stored in an appropriate location.

❍ Need help to modify the waste removal schedule.

Problem Summary

- ❑ All activities on this checklist have been completed and no help is required.

OR

- ❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 14

Renovation and Repair Checklist

Renovation and Repair Checklist

This checklist is intended for use by:

- Facilities maintenance staff
- School custodial staff
- Contract service providers

This checklist discusses these major topic areas:

- Design
- General Activities
- Painting (separate section)
- Flooring (separate section)
- Roofing (separate section)

Instructions – General Renovation and Repair Checklist

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read each item on this checklist. Check off each box (❑) as you complete the activity.
3. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
4. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help facilities maintenance staff, custodial staff, and contract service providers identify and prevent potential IAQ problems resulting from school renovations and repairs.

The tasks in this checklist should be performed by individuals with appropriate training in building renovation and safety procedures including personal safety. Ensure that work is carried out in compliance with appropriate fire and building codes.

Basics

When planning and conducting renovations in schools, it is important to remember some potential causes of indoor air problems:

- workers entering non-work areas to use washrooms, telephones, or other services;
- demolition that releases toxic materials;
- construction dust and fumes;

- designs that interfere with ventilation or create potential areas for concealed condensation;
- off-gassing from building materials and new products;
- providing access for inspection and maintenance; and
- masking/deodorizing products used to cover up the odour from mould, sewage, or fire.

These problems can be minimized by making good indoor air quality one of the criteria during project planning. Start with good design based on building science fundamentals. Renovations must be carefully thought through to ensure they do not interfere with the building performance or create new problems. Sensitive individuals should be notified of upcoming activities so they can be aware of potential issues. Scheduling should ensure that exams, conferences, and other time-critical activities are not compromised. Contract language and negotiations with the service providers (contractors) can help ensure that proper materials and procedures are used. This checklist is intended for use before and during renovation projects.

Depending on who is performing the work, it may be necessary to give certain sections of this checklist to in-house staff or contractors. Instruct those who receive a portion of the checklist to return it to the IAQ coordinator.

Design

Careful planning can eliminate existing IAQ problems and prevent new ones. Adding carpet to a poorly insulated floor, which was previously covered in tile, may encourage the growth of microorganisms and prevent effective cleaning. Bookshelves and cabinets added to the interior of exterior walls can change the thermal conditions and cause condensation and mould growth within the wall and millwork.

Key questions to ask include:

- ❑ Will the work cause a change in air movement or thermal conditions within the building envelope?
- ❑ Will the work allow adequate access for inspection and maintenance?
- ❑ Are the materials and systems appropriate for this application?
- ❑ Who is responsible for the design and inspection of the work?

General Activities

- ❑ Do not disturb asbestos during demolition. Most schools have identified and dealt with asbestos in the school under provincial or federal requirements. Schools that have asbestos-containing materials should have a management plan on file. Refer to the management plan when considering whether the planned renovations will require disturbing areas that contain asbestos. Use an asbestos professional to consult and assist with such renovation work. Be sure to update the asbestos management plan to reflect any abatement activities.
- ❑ Test for lead-based paint before removing old paint. Use a certified inspector or a reputable testing firm for areas to be demolished, sanded, or stripped. Use appropriate personnel and precautions when removing and disposing of lead-based paint.

- ❑ Avoid exposure to fungi and bacteria. If the renovation is likely to expose large areas of growing microorganisms such as mould and mildew (for example, while repairing water damage), consult with an environmental professional about adequate protective measures to ensure both worker and occupant safety. Refer to the reference documents listed in the *IAQ Action Kit – Introduction* for more information.
- ❑ Plan to isolate students and staff from any dust or fumes generated during renovation work. Use plastic sheeting, portable fans, and a mechanical ventilation strategy (where applicable) to prevent dust and fumes from reaching school occupants through hallways, doors, windows, and the ventilation system. Consider conducting renovation work during times when the school is unoccupied.
- ❑ Provide alternate washrooms, showers, eating areas, and telephones so that workers do not enter non-work areas in the school.
- ❑ Consider the effect of the renovation on ventilation and the mixing of air in rooms. Beware of cutting off a room from its supply of outdoor air, enclosing a pollutant source (like photocopiers) in a room with inadequate exhaust or supply air, or erecting barriers that prevent the adequate movement of air throughout the occupied area of a room.pied area of a room.
- ❑ Consider the long-term maintenance and custodial requirements of materials and systems. For example, flooring systems require a range of maintenance, and some maintenance systems generate more air contaminants that the original product.
- ❑ Minimize and provide engineering controls for off-gassing from new products. New products contain volatile components, such as resins, solvents, and binders, which off-gas volatile organic compounds for a period of time. Whenever possible, obtain information on the emissions of potential new products to be installed in the school, and select lower-emitting products when available. Be sure that the information is specific for the actual product being considered. Generic information or information on a similar product is not reliable when making specific material choices. Whenever new products with the potential for off-gassing are installed, allow adequate time for off-gassing before reoccupying the area, and increase ventilation with outdoor air until off-gassing odours and any irritation symptoms no longer occur.
- ❑ The emissions from building products vary greatly, both within a class of products (e.g., types of paneling) and between classes or products (e.g., carpet vs. sheet vinyl flooring). For many materials, the chemical emissions can last for long periods of time (months or years), so the building should be designed accordingly. Examples of products that will potentially off-gas include:
  - wall-paneling and wallpaper
  - draperies
  - furniture and cabinets
  - cubicle dividers
  - carpet and vinyl flooring
  - paints and finishes
  - adhesives
  - manufactured and solid wood products

- ❑ Repairs to smoke, fire, mould, or sewage-damaged buildings should focus on the removal or cleaning of contaminated materials. The use of masking agents or deodorizers will add additional chemicals to the building. Many of these products can cause additional IAQ problems.

If using this section separately:

Instructions – Painting checklist

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read the *General Renovation and Repair Checklist*.
3. Read each item on this checklist. Check off each box (❑) as you complete the activity.
4. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
5. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Painting

There are many factors to consider before beginning a painting project. Special care should be taken if sanding a surface is required prior to painting, because of the dust released into the air. The dust may contain lead particles. Exposure to lead can affect children's mental growth, and interfere with their nervous system development, which may cause learning disabilities and impaired hearing. In adults, lead can increase blood pressure.

The type of paint is an important decision. For instance, both solvent-based and water-based paints release volatile organic compounds (VOCs), which can cause indoor air quality (IAQ) problems. Water-based paints produce less VOCs than solvent-based paints, but *may* produce them over a longer period of time.

Durability is important. A relatively low-emitting paint may cause more IAQ problems in the long run than a higher-emitting paint, if the surface covered with low-emitting paint must be repainted more often. In addition, until recently, many water-based paints (even interior paints) contained mercury as a fungicide. Any paint that contains mercury should not be used indoors.

Confirm that the painted surface is lead-free before preparing a surface for repainting

- ❑ Check painting records or old paint cans to determine whether the paint contains lead.
- ❑ Conduct an initial screen using a trained lead paint inspector.
- ❑ If there is lead in the existing paint, contact a trained lead-based paint contractor.

Δ No lead found in existing paint

❍ Paint contains lead or testing is needed to determine if lead is present in existing paint.

Select a low-VOC emitting paint that is free of lead and mercury

- ❑ Evaluate existing stocks of paint (properly dispose of paints containing lead or mercury, or that have higher VOC emissions than new paints).
- ❑ Evaluate new paint before you purchase it. Express your indoor air quality concerns to paint suppliers and use their technical personnel as a resource. Not all paint suppliers have information on pollutant emissions; consult other sources (e.g., manufacturers) if your paint supplier cannot provide adequate information.

Δ Selected an appropriate paint.

❍ Need to discuss which paint to use with an IAQ specialist.

During exterior painting, minimize occupants' exposure to odours and contaminants

- ❑ Schedule exterior painting to occur when the building is unoccupied (e.g., weekends or vacation periods).
- ❑ Keep nearby windows and doors closed as much as possible.

Δ Occupants' exposure is minimized.

❍ Need help to minimize occupants' exposure.

During interior painting, minimize occupants' exposure to odours and pollutants

- ❑ Schedule painting to occur when the area is unoccupied (for example, on weekends or during vacation periods), and allow time for paint odours to dissipate before occupants return to the area. If the area being painted has a heating, cooling, and ventilation system that is shared with other areas, those areas should also be unoccupied. Special consideration should be given to exam periods and other times when sensitive individuals may be less able to modify their activities to avoid contaminants.
- ❑ Use supply and exhaust fans to remove paint fumes from the building. Operate supply fans continuously (24 hours/day, 7 days/week), at the highest possible outdoor air supply setting, from the beginning of the painting work until several days after painting has been completed.

❑ Block return openings to prevent air circulating from the work area to occupied areas.

Caution: Consult with your local fire department for more information on fire regulations and prevention.

❑ Keep records on IAQ outcomes resulting from painting activities. Consider testing air at various times to characterize the airborne concentration of VOCs. This will help to determine what ventilation rates and times are required to ensure acceptable IAQ for occupants. Air testing is not a regular requirement but may provide valuable general information for planning and executing future painting projects.

Δ Occupants' exposure is minimized.

❍ Need help to minimize occupants' exposure.

Use appropriate storage and disposal practices for paints, solvents, clean-up materials, and asbestos-containing materials

❑ Seal containers carefully after use.

❑ Keep paint containers in designated storage areas equipped with exhaust ventilation. Do not store materials in heating, ventilation, and air conditioning equipment rooms.

❑ Use an appropriate waste disposal method to dispose of any paints containing lead or mercury.

❑ Follow appropriate provincial or federal requirements for the disposal of asbestos-containing materials.

Δ No problem found with storage and disposal.

❍ Need help with storage and disposal.

Problem Summary

❑ All activities on this checklist have been completed and no help is required.

OR

❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

If using this section separately:

Instructions – Flooring Checklist

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read the *General Renovation and Repair Checklist*.
3. Read each item on this checklist. Check off each box (❑) as you complete the activity.
4. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
5. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Flooring

Flooring materials have the potential to impact indoor air quality (IAQ), therefore the selection of flooring materials is an important consideration during the renovation process. Potential pollutants released by flooring materials, which can impact IAQ, include volatile organic compounds (VOCs) that off-gas directly, fibres and dust from many flooring materials, and the cleaning products used to maintain the flooring. Dirty and persistently damp flooring materials can stimulate the growth of biological contaminants, such as fungi. The proper cleaning and maintenance of flooring materials helps to improve IAQ.

Carpet in schools can contribute to IAQ problems. The cleaning and maintenance of textiles in areas where moisture, food, or other contaminants are present represents an ongoing challenge. Smooth, hard-surface flooring materials provide a more easily and effectively cleaned surface.

When installing flooring materials, the following selection, repair, and installation activities will help protect the indoor air quality in the school.

Determine whether resilient tile flooring scheduled for removal contains asbestos fibres

❑ Previous asbestos surveys may have identified asbestos-containing floor tiles. Refer to the inspection report and management plan on file at the school.

- ❑ Follow notification and handling procedures defined by provincial or federal regulations if renovations will disturb asbestos-containing tile flooring.

Δ No asbestos-containing flooring will be disturbed.

❍ Renovation may/will disturb asbestos-containing flooring.

Select low-emitting adhesive when installing glue-down flooring

- ❑ Use low-emitting adhesives.
- ❑ Follow manufacturer's recommendations for ventilating the work area.

Δ Selected a low-emitting adhesive.

❍ Need additional information for selecting low-emitting adhesive.

Select low-emitting flooring materials

- ❑ Ask manufacturers to submit information about product constituents and emissions that may adversely impact IAQ. Many manufacturers and suppliers can provide this information.
- ❑ The Canadian Carpet Institute (CCI) has a carpet testing and labelling program. If the school's carpet supplier cannot provide information on any carpets being considered, this information may be obtained by contacting the CCI (1-819-684-8444).

Δ Selected a low-emitting flooring system.

❍ Need additional information to select a low-emitting flooring system.

Air out new products before installation

- ❑ If practical, unwrap and unroll flooring products and cushion them in a well-ventilated location prior to installation, preferably in a location other than the school.

Δ Flooring products will be aired out before installation.

❍ Need help airing out of flooring products.

Air out the space during and after flooring installation

- ❑ Install carpet, vinyl, and related flooring materials only when the school building is not in use, except for small installations or repairs where air can be exhausted directly to the outdoors and the room can be maintained under negative pressure relative to the surrounding rooms and hallways.
- ❑ Try to continuously operate the building ventilation system at normal temperature and maximum outdoor air from the start of installation until at least 72 hours after the installation is completed. Please contact the Canadian Carpet Institute for airing and other installation procedures for carpets.
- ❑ Avoid recirculating air from the installation area, through the heating, ventilation, and air conditioning system, and into occupied areas. Seal return air grilles, open door ways and stairways, and use exhaust fans to remove airborne contaminants.

Δ **Space will be aired out as prescribed.**

❍ **Need help airing out space during and after installation.**

Require the installer to clean flooring with a high efficiency particulate air (HEPA) filtration vacuum

❑ Vacuum the old carpet that is being removed and subfloor surfaces (once the carpet is removed) to reduce the release of particles such as dirt, dust, and biological materials into the air and onto the new carpet.

❑ Consider cutting flooring (especially carpet) into strips and sealing it in polyethylene bags or sheets before removing it from the work area.

❑ Vacuum new flooring after installation to remove loose matter and particles generated by the installation process as well as general construction in the area.

Δ **Surfaces are vacuumed before removal and/or after installation.**

❍ **Need help vacuuming the work site.**

Do not install carpet near water sources

❑ In areas where there is a perpetual moisture problem, do not install carpet, (e.g., beside drinking fountains, classroom sinks, or concrete floors with leaks or frequent condensation).

❑ Do not install carpet in areas where it will be in contact with cool surfaces, (e.g., slabs on grade, near poorly insulated exterior walls) since high relative humidity or condensation can occur.

❑ Do not install carpet in areas where food or beverages will be consumed, or near other sources of moisture or nutrients.

❑ To reduce the potential for microorganisms growing in the joints of hard surfaces or porous flooring installed near water sources, make sure to seal the entire surface.

Δ **No carpet will be installed near water sources.**

Δ **Seams near water sources are sealed.**

❍ **Need help, carpet installation is planned near water sources or porous hard surface flooring is unsealed.**

Problem Summary

❑ All activities on this checklist have been completed and no help is required.

OR

❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

If using this section separately:

Instructions – Roofing Checklist

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read the *Renovation and Repair Checklist*, pages 1 and 2.
3. Read each item on this checklist. Check off each box (❑) as you complete the activity.
4. Check the triangle (Δ) if you ***do not*** require help with the activity OR check the circle (❍) if you ***need*** additional help.
5. Return this checklist to the school board's IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Roofing

Roofing work often involves the use of tar or other pollutant-producing chemicals that may cause indoor air quality (IAQ) problems if fumes enter the building. The removal of old roofing materials can generate dust, mould, and other debris. School officials and roofers can cooperate to prevent these problems and minimize complaints from school occupants.

Schedule pollutant-producing activities for unoccupied periods (e.g., weekends or vacation periods)

❑ Check to ensure that pollutant-producing activities occur during unoccupied periods.

Δ **Work is scheduled for an unoccupied period.**

❍ **Work is scheduled for an occupied period; need help rescheduling or planning to minimize occupants' exposure.**

Locate "hot pots" of tar and other pollutant-producing materials away from outdoor air intakes, windows that open, or frequently used doors

❑ Consider wind patterns at the work site, and arrange equipment, material storage, and trash disposal so prevailing winds carry contaminants away from the building.

❑ Contain any debris (trash containers with lids or tarps) and remove debris from the work site on a regular basis.

❑ Consider lightly spraying friable or fibrous materials with water to minimize the generation of dust.

Δ Pollutant-producing materials are away from and downwind of outdoor air intakes.

❍ Need help identifying a location for pollutant-producing materials.

Modify ventilation to avoid introducing odours and contaminants

❑ Advise staff and students to keep doors and windows closed until the roofing work is finished.

❑ Consider temporarily close the outdoor air intakes of air handlers, particularly rooftop units in the vicinity of (and downwind from) the work area. *(Note: to avoid creating IAQ problems from under-ventilation, provide a temporary means (fans and/or ducts) to supply unaffected outdoor air, or relocate classes to other areas.)*

Δ Ventilation is arranged to avoid the entry of pollutants.

❍ Need help to modify ventilation.

Problem Summary

❑ All activities on this checklist have been completed and no help is required.

OR

❑ A list of problems and/or assistance required is attached.

Comments Form

Indoor Air Quality
Tools for Schools Action Kit
for Canadian Schools

We anticipate revising the Tools for Schools Action Kit in the future. To help us ensure that the Kit meets the needs of those who are using it, please send us your comments about how easy or difficult you found the Kit to use. Suggestions for how to make the Kit more useful are especially welcome. If a reply is requested, please provide your name, address and phone number along with the completed sheet and mail it to:

Health Canada
Healthy Environments and Consumer Safety Branch
Indoor Environments Division
Room 120, Environmental Health Centre (P.L. 0801D)
Tunney's Pasture, Ottawa, Ontario K1A 0L2

Comments or Suggestions:

Your role at the school (e.g., custodial staff, teacher, etc.): _____

Checklist (s) used: _____

Optional for correspondence purposes:

Name: _____

Address: _____

Telephone: ( ) _____ Fax: ( ) _____ E-mail: _____

CHAPTER 15

Design/Build/ Lease-Back Facilities Checklist

Design/Build/ Lease-Back Facilities Checklist

This checklist is intended for use by:

- School Board Members/Administrators
- School Administration
- Facilities maintenance staff
- School custodial staff
- Contract service providers

* *(Use this checklist with other checklists that apply to specific areas/activities.)*

This checklist discusses these major topic areas:

- Design/Intended Use
- Service/Maintenance Plans

Instructions

1. Read the *IAQ Action Kit – Introduction*, *Backgrounder* and *How to get started* sections.
2. Read each item on this checklist. Consult other checklists, where appropriate, for detailed assessment of specific items.
3. Check off each box as you complete the activity.
4. Return this checklist to the IAQ coordinator and keep a copy for future reference.

Name

Room or Area

School

Date Completed

Signature

Introduction

The IAQ Action Kit is a practical tool to help school boards and school employees understand and address indoor air quality (IAQ) problems. The kit provides clear and easily applied information that can be used to improve the indoor environment of schools, help prevent indoor air quality problems, and resolve problems promptly if they do arise.

This checklist provides instructions to help school boards, school staff, and contract service providers anticipate and address specific design, use, service, maintenance, or continuity issues that may contribute to IAQ problems in design/build/lease-back schools.

Background

Design/Build/Lease-Back (DBL) schools should perform to the same standard as any school facility of a similar age and design intent.

One fundamental difference between a DBL facility and a conventional owner design/build facility is the nature of the relationships between the designers, owners, operators and users. Often, the users are not as

intimately involved with the school's design or construction and may not be as aware of its strengths and limitations.

When the operation and maintenance of a DBL school are provided by external sources, the need for specific use plans and needs assessments increases, since the potential for problems will also increase. Clear communication of the intended use, service/maintenance plans and other operational issues is critical to the successful operation of DBL schools.

In addition, the lifecycle of DBL facilities can be significantly different from traditional school facilities, since over time, school boards can assume various roles and responsibilities.

Design/Intended Use

A clear statement of the main design criteria for the facility should be provided to ensure the building is suitable for the intended use.

- ❑ Classroom occupancy design/use criteria are specified.
- ❑ School use and operating plans have been developed in close consultation with the school administration and users.
- ❑ The school administration has clear operating plans for the facility and protocols for raising issues.
- ❑ Ventilation system design criteria and parameters are specified.
- ❑ Simplified ventilation system layout drawings and control schematics are provided.
- ❑ A facility commissioning plan has been developed and implemented.
- ❑ IAQ design goals are defined and assessment criteria are outlined.
- ❑ Energy management objectives, strategies, and implications for design/operation/use are clearly defined.

Service/Maintenance

Many relationships related to DBL facility operation may exist. One key issue to address and clearly document involves the roles and responsibilities of the owner, operator and user. Items including commissioning, equipment set points, and emergency response must be addressed or problems will eventually occur that may go undetected or unresolved.

- ❑ Service intervals and record-keeping systems are defined.
- ❑ Emergency service response plans exist.
- ❑ Specifications for all replacement parts, such as filters, are provided.
- ❑ Equipment manuals and technical information are available.
- ❑ A single point of contact for the school administration is specified.
- ❑ Custodial practices and requirements are specified.

Continuity of Process

At some point in time, the ownership, stewardship and/or operational responsibility for DBL facilities may change. It is critical that the "corporate memory" and collective operating experience be preserved to ensure a smooth transition of responsibility. Long-term plans should be developed early to ensure that any turnover of duties or responsibilities is smooth, and that the entities assuming the new roles and responsibilities are fully prepared (physically and financially).

In addition to ensuring that the “Design/Use” and “Service/Maintenance” issues are fully in place, several additional items should be addressed.

- ❑ Condition assessments and short/long-term maintenance requirements for building envelope components and building systems are in place.
- ❑ Transition training plans for staff are available for implementation.
- ❑ An organizational chart and action flowsheets are in place to ensure that roles, responsibilities and procedures are fully documented.

Problem Summary

- ❑ All activities on this checklist have been completed and no help is required.

OR

- ❑ A list of problems and/or assistance required is attached.

CHAPTER 16

Resources

Resources

The purpose of this Section is to provide some examples of resources which will allow the reader to acquire further information on indoor air quality.

In Canada, regulation of issues concerning indoor air/indoor environments usually falls under provincial, territorial or municipal jurisdiction. For this reason, it is suggested that queries on indoor environmental issues be addressed to local, provincial or territorial health authorities as a first resource.

1. Federal Government Departments and Agencies

Canada Mortgage and Housing Corporation (CMHC)

700 Montreal Road
Ottawa, Ontario, K1A 0P7
Phone: 613-748-2000
Fax: 613-748-2098
E-mail: chic@cmhc-schl.gc.ca
Web site: www.cmhc-schl.gc.ca/

Environment Canada

General Information
Inquiry Centre
351 St. Joseph Boulevard
Gatineau, Quebec, K1A 0H3
Phone: 819-997-2800 or 1-800-668-6767
Fax: 819-953-2225
E-mail: enviroinfo@ec.gc.ca
Web site: www.ec.gc.ca/

Health Canada

General Inquiries
A.L. 0900C2
Ottawa, Ontario, K1A 0K9
Phone: 613-957-2991
Fax: 613-941-5366
E-mail: info@hc-sc.gc.ca/
Web site: www.hc-sc.gc.ca/

Indoor Environments Division
Healthy Environments and Consumer Safety Branch
Room 120, Environmental Health Centre (A.L. 0802D)
Ottawa, Ontario, K1A 0L2
Phone: 613-946-6458
Fax: 613-957-0900

Human Resources Development Canada (HRDC)

For general information on federal programs, services and initiatives:
Phone toll-free: 1-800-622-6232
Web site: http://www.hrdc-drhc.gc.ca/common/home.shtml

For publications:
Publication Centre
140 Promenade du Portage, Phase IV
Gatineau, Quebec, K1A 0J9
Fax: 819-953-7260
E-mail: pub@hrdc-drhc.gc.ca
Web site: www.hrdc-drhc.gc.ca/

Occupational Health and Safety: Labour Program

Ottawa, Ontario, K1A 0J2
Labour Program:
http://labour-travail.hrdc-drhc.gc.ca/index.cfm

National Research Council Canada (NRC)

NRC Communications and Government Relations
Building M58, Montreal Road
Ottawa, Ontario, K1A 0R6
Public Inquiries:
Fax: 613-952-9696
E-mail: R&D@NRC.CA

Institute for Research in Construction

Indoor Environmental Research Program
Phone: 613-993-9580
Fax: 613-954-3733
Web site: www.nrc.ca/

Natural Resources Canada

General Inquiries:
Phone: 613-995-0947
To order publications call toll-free:
1-800-387-2000
Web site: www.nrcan-rncan.gc.ca/inter/index.html

Public Works and Government Services Canada

Personal Environmental Control Technology Directorate
Place du Portage, Phase III, 8B1
Gatineau, Quebec, K1A 0S5
General Inquiries:
Phone: 819-997-6363
Fax: 819-956-0573
E-mail: NCR.Editor@pwgsc.gc.ca
Web site: www.pwgsc.gc.ca/

U.S. Environmental Protection Agency (Headquarters)

Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
Phone: 202-260-2090
Website: www.epa.gov
Tools for Schools Information at:
www.epa.gov/iaq/schools/tools4s2.html

2. Product Manufacturer Associations

Canadian Carpet Institute
647 Alesther
Ottawa, Ontario, K1K 1H8
Phone: 819-684-8444
Fax: 819-684-8444
E-mail: info@canadiancarpet.org
Web site: www.canadiancarpet.org/

Canadian Plastics Industry Association
5925 Airport Road, Suite 500
Mississauga, Ontario, L4V 1W1
Phone: 905-678-7748
Fax: 905-678-0774
E-mail: info@cpia.ca
Web site: www.plastics.ca

This web site includes a Teacher's Resource Site on the subject of plastics in the classroom.

3. Municipalities

Federation of Canadian Municipalities
24 Clarence Street
Ottawa, Ontario, K1N 5P3
Phone: 613-241-5221
Fax: 613-241-7440
E-mail: federation@fcm.ca
Web site: www.fcm.ca/

4. Professional and/or Standard-Setting Associations

Canadian Standards Association
5060 Spectrum Way, Suite 100
Mississauga, Ontario, L4W 5N6
Phone: 416-747-4000
Fax: 416-747-2473
Call toll-free 1-800-463-6727
Web site: www.csa.ca

5. Building Services Associations

Canadian Home Builders' Association (CHBA)
General Inquiries:
E-mail: chba@chba.ca
Web site: www.chba.ca/

6. Environmental/Health/Occupational/Consumer Organizations

Canadian Association of Physicians for the Environment

208-145 Spruce Street
Ottawa, Ontario, K1R 6P1
Phone: 613-235-2273
Fax: 613-233-9028
E-mail: info@cape.ca
Website: www.cape.ca

This organization designed a "Children's Environmental Health Project" that is intended to introduce clinicians and their patients to the broad context of children's environmental health issues. This encompasses both the built and the natural environments.

Canadian Centre for Occupational Health and Safety (CCOHS)

250 Main Street East
Hamilton, Ontario, L8N 1H6
Inquiries Service:
Phone toll-free in Canada: 1-800-263-8466
Phone: 1-905-572-4400
Fax : 1-905-572-4500
Web site: www.ccohs.ca/

This national information centre has an Inquiries Service which answers many health or safety concerns people have about their work places. It also has a Client Services program which can be contacted at:
Phone toll-free in Canada: 1-800-668-4284.

Canadian Institute of Child Health (CICH)

384 Bank Street, Suite 300
Ottawa, Ontario, K2P 1Y4
Phone: 613-230-8838
E-mail: cich@cich.ca
Web site: www.cich.ca

CICH also has a Canadian Directory of Children's Environmental Health located on this website. This Directory is an introduction to the field of children's health and provides a listing of governmental, university and not-for-profit organizations which conduct a broad range of projects in this area.

Canadian Lung Association

National Office
3 Raymond Street, Suite 300
Ottawa, Ontario, K1R 1A3
Phone: 613-569-6411
Fax: 613-569-8860
E-mail: info@lung.ca
Web site: www.lung.ca/

Canadian Nurses Association

50 The Driveway
Ottawa, Ontario, K2P 1E2
Phone: 613-237-2133
Fax: 613-237-3520
E-mail: edgroup@cna-nurses.ca
Web site: www.cna-nurses.ca

Canadian Public Health Association
Suite 400, 1565 Carling Avenue
Ottawa, Ontario, K1Z 8R1
Phone: 613-725-3769
Fax: 613-725-9826
E-mail: info@cpha
Web site: www.ccah.cpha.ca/

Canadian Society of Safety Engineering
P.O. Box 294, 10435 Islington Avenue
Kleinburg, Ontario, L0J 1C0
Phone: 905-893-1689
Fax: 905-893-2392
E-mail: csseinfo@associationsfirst.com
Web site: www.csse.org/

A professional organization for health and safety practitioners.

College of Family Physicians of Canada
2630 Skylark Avenue
Mississauga, Ontario, L4W 5A4
Phone: 905-629-0900
Fax: 905-629-0893
Web site: www.cfpc.ca

Consumers' Association of Canada
404-267 O'Connor Street
Ottawa, Ontario, K2P 1V3
Phone: 613-238-2533
Fax: 613-563-2254
E-mail: info@consumer.ca
Web site: www.consumer.ca

7. Other Contacts and Programs of Interest

BREEAM (Building Research Establishment's Environmental Assessment Method (Canada))
165 Kenilworth Avenue
Toronto, Ontario, M4L 3S7
Phone: 416-699-6671
Fax: 416-699-9250
E-mail: skopen@interlog.com
Web site: http://www.breeamcanada.ca/

Citizens for a Safe Learning Environment (CASLE)
13 Tremont Drive
Halifax, Nova Scotia, B3M 1X8
Phone: 902-457-3002
E-mail: am077@chebucto.ns.ca
Web site: www.chebucto.ns.ca/Education/CASLE/

Environmental Choice Program
TerraChoice Environmental Services Inc. is the Environmental Choice Program management and delivery agent.
2781 Lancaster Road, Suite # 400
Ottawa, Ontario, K1B 1A7
Phone: 613-247-1900
Fax: 613-247-2228
E-mail: ecoinfo@terrachoice.ca
Web site: www.environmentalchoice.com

Pollution Probe
(Toronto Office)
625 Church Street, Suite 402
Toronto, Ontario, M4Y 2G1
Phone: 416-926-1907
Fax: 416-926-1601
E-mail: pprobe@pollutionprobe.org/
Web site: www.pollutionprobe.org/

CHAPTER 17

Further Readings

Further Readings

1. Indoor Air Quality – General

"Clearing the Air: Asthma and Indoor Air Exposures", by the Committee on the Assessment of Asthma and Indoor Air. Division of Health Promotion and Disease Prevention, U.S. National Academy of Sciences, Institute of Medicine. National Academy Press. Washington, D.C. 2000.

"Indoor Air Quality Handbook", edited by John D. Spengler, John F. McCarthy and Jonathan M. Samet. McGraw-Hill. 2000.

2. Indoor Air Quality – Books, Surveys, Guides and Reviews

"A Review of the Possible Health Effects of Odour: Issues for Public Health Consideration", by Robert Strang. Department of Health Care and Epidemiology, University of British Columbia, Vancouver, B.C. In: *British Columbia Health and Disease Surveillance*, Volume 6, Number 2; Feb. 28, 1997.

"Bioaerosols Handbook", edited by Christopher S. Cox and Christopher M. Wathes. Boca Raton, Florida. CRC Press. 1995.

"Fungal Contamination in Public Buildings: A Guide to Recognition and Management", Federal Provincial Committee on Environmental and Occupational Health. Environmental Health Directorate. Health Canada. Ottawa, Ontario. 1995. http://www.hc-sc.gc.ca/ehp/ehd/catalogue/bch_pubs/fungal.pdf

"Contamination fongique dans les immeubles publics: Guide facilitant la détermination et la gestion des problèmes", Comité fédéral-provincial de l'hygiène du milieu et du travail. Direction de l'hygiène du milieu. Santé Canada. Ottawa, Ontario. 1995. http://www.hc-sc.gc.ca/ehp/dhm/catalogue/dpc_pubs/fongique.pdf

"Guide de prévention et d'intervention sur la qualité de l'air en milieu scolaire", Sylvain Allaire. Centre de santé publique de Québec; Fédération des commission scolaires. 1996.

"Health Effects of Particulate Air Pollution: Time for Reassessment?", by C. Arden Pope III, David V. Bates and Mark E. Raizenne. In: *Environmental Health Perspectives*: Volume 103, Number 5, pages 472-480. May, 1995.

"Indoor Air Quality in Office Buildings: A Technical Guide", by Tedd Nathanson/the Federal-Provincial Advisory Committee on Environmental and Occupational Health; Working Group on Indoor Air Quality in the Office Environment. Minister of Supply and Services Canada. Ottawa, Ontario. 1993; Revised 1995. http://www.hc-sc.gc.ca/ehp/ehd/catalogue/bch_pubs/93ehd166.pdf

"Guide technique pour l'évaluation de la qualité de l'air dans les immeubles à bureaux", par Tedd Nathanson/Comité consultatif fédéral-provincial de l'hygiène du milieu et du travail; Groupe de travail fédéral-provincial sur la qualité de l'air à l'intérieur des bureaux. Ministre des Approvisionnements et Services Canada. Ottawa, Ontario. 1993; révisé 1995. http://www.hc-sc.gc.ca/ehp/dhm/catalogue/dpc_pubs/93dhm166.htm

"IAQ for Schools: Managing Asthma in the School Environment", U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Radiation and Indoor Air, Indoor Environments Division. May, 2000. http://www.epa.gov/iaq/schools/asthma/index.html

"Strategy for Studying Air Quality in Office Buildings", by Nicole Goyer and Van Hiep Nguyen /Institut de Recherche en Santé et en Securité du Travail du Quebec. Laboratory Division. (IRRST). Montreal, Quebec. 1989.

"Stratégie d'etude de la qualité de l'air dans les édifices à bureaux", par Nicole Goyer et Van Hiep Nguyen /Institut de Recherche en Santé et en Securité du Travail du Quebec. Laboratory Division. (IRRST). Montreal, Quebec. 1989.

"About Your House" fact sheets by the Canada Mortgage and Housing Corporation (CMHC). Ottawa, Ontario. Visit their website at www.cmhc-schl.gc.ca

La serie "Votre maison" par la Société canadienne d'hypothèques et de logement (SCHL). Ottawa, Ontario. Visitez leur site Web à l'adresse: www.cmhc-schl.gc.ca

"The Healthy School Handbook: Conquering the Sick Building Syndrome and Other Environmental Hazards In and Around Your School", by Norma L. Miller (ed.). NEA Professional Library. National Education Association. Washington, D.C. 1995.

3. Indoor Air Quality – Secondhand Smoke

"The Facts About Tobacco: Smoking and Indoor Air Quality", Health Canada. Ottawa, Ontario. Visit our website at: http://www.hc-sc.gc.ca/hecs-sesc/tobacco/facts/ets.html

"Les faits: Le tabac et la qualité de l'air à l'intérieur des édifices", Santé Canada. Ottawa, Ontario. Visitez notre site Web à l'adresse: http://www.hc-sc.gc.ca/hecs-sesc/tabac/faits/ets.html

4. Indoor Air Quality – Biological Contaminants

"Bioaerosols: Assessment and Control", Janet Macher (ed). American Conference of Governmental Industrial Hygienists, Inc. (ACGIH). Cincinnati, Ohio. 1999.

"Microorganisms in Home and Indoor Work Environments: Diversity, Health Impacts, Investigation and Control", edited by B. Flannigan, R.A. Samson and J.D. Miller. Taylor and Francis. London. 2002.

5. Ventilation/Thermal Comfort

"Air Cleaning Devices for HVAC Supply Systems in Schools", by Arthur Wheeler. December, 1992.

Method of Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter. ASHRAE Standard 52-76. 1976.

Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems. ASHRAE Standard 111-1988.

"Selecting HVAC Systems for Schools", by Arthur Wheeler and Walter Kunz, Jr. Maryland State Department of Education, Division of Business Services, School Facilities Branch, 200 West Baltimore Street. Baltimore, Maryland 21201. October, 1994.

Ventilation for Acceptable Indoor Air Quality. ASHRAE Standard 62-1999.

Thermal Environmental Conditions for Human Occupancy. ASHRAE Standard 55-1992.

6. Other Standards and Guidelines

"Exposure Guidelines for Residential Indoor Air Quality", Health Canada/A Report of the Federal-Provincial Advisory Committee on Environmental and Occupational Health. Minister of Supply and Services Canada. Ottawa, Ontario. 1987; revised 1989. http://www.hc-sc.gc.ca/ehp/ehd/catalogue/bch_pubs/90ehd156.htm

"Directives d'exposition concernant la qualité de l'air des résidences", Santé Canada/Rapport du Comité consultatif fédéral-provincial de l'hygiène du milieu et du travail. Ministre des Approvisionnements et Services Canada. Ottawa, Ontario. 1987; révisé 1989. http://www.hc-sc.gc.ca/ehp/dhm/catalogue/dpc_pubs/90dhm156.htm

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. American Conference of Governmental Industrial Hygienists. 1330 Kemper Meadow Drive, Cincinnati, Ohio 45240-1634. 2002. www.acgih.org

"Office Air: A Worker's Guide to Air Quality in Offices, Schools, and Hospitals", Health Canada/A Report of the Federal-Provincial Advisory Committee on Environmental and Occupational Health. Minister of Supply and Services Canada. Ottawa, Ontario. 1993; revised 1995. http://www.hc-sc.gc.ca/ehp/ehd/catalogue/bch_pubs/93ehd174.pdf

"L'air dans les bureaux: Guide de l'employé concernant la qualité de l'air dans les bureaux, les écoles et les hôpitaux", Santé Canada/Rapport du Comité consultatif fédéral-provincial de l'hygiène du milieu et du travail. Ministre des Approvisionnements et Services Canada. Ottawa, Ontario. 1987; révisé 1989. http://www.hc-sc.gc.ca/ehp/dhm/catalogue/dpc_pubs/93dhm174.pdf