



Renovation & Construction in Schools Controlling Health and Safety Hazards



Public Employees
Occupational Safety and
Health Program

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Background

New Jersey's *Educational Facilities Construction and Financing Act*, which was enacted on July 18, 2000, provides extensive funding to restore and rebuild schools that are old and deteriorating in the State. Because of this legislation, New Jersey will experience an unprecedented amount of school construction and renovation in the next decade. The increased activity, often conducted while a building is occupied, may create safety and health risks for school employees. This document provides information on potential health and safety hazards associated with school renovation and construction and what precautions to take in order to prevent or control them.



What are some of the potential health hazards associated with school renovation and construction?

- Dust and debris
- Asbestos
- Lead
- Air pollutants from paints, sealers, glues, varnishes, urethanes and roofing materials
- Air pollutants from new furnishings and equipment (copiers, carpeting, new particleboard or plywood)
- Diesel exhaust, carbon monoxide
- Mold
- Accumulated bird droppings
- Noise

- Dizziness
- Headaches
- Irritability
- Stress

What are some of the main areas of concern associated with school renovation/construction?

Construction and Demolition Work

Construction and demolition work usually creates nuisance dust. The greatest amount of dust may be generated during dry dusting and sweeping. These practices should be avoided because they may lead to excessive dust in the work area, which may cause health-related complaints from building occupants.

Demolition and construction can cause excessive noise. There may also be airborne exposure to welding fumes as well as carbon monoxide and fuel exhaust.

Safety-related problems may include: dangerous traffic patterns; open construction areas; falling objects; unattended construction equipment; blocked exits; and disabled fire alarms, detection systems and emergency lights.

What are some of the health symptoms associated with these hazards?

- Eye, nose and throat irritation
- Nasal congestion, sneezing and coughing
- Rashes and skin irritation
- Asthma-like symptoms such as wheezing, tightness in the chest, shortness of breath
- Nausea

Asbestos

Asbestos is present in many schools in building materials such as pipe and boiler insulation, sprayed-on or troweled-on fire-resistant surfacing materials, roofing products and siding, acoustical products, and floor and ceiling tiles. Asbestos-containing materials (ACM) are considered relatively safe if the fibers within the building material are firmly bonded or compacted. When asbestos becomes loose or crumbles (called “friable”), microscopic fibers can be released into the air and cause a health risk when breathed in or swallowed. Potential health problems, which take years to develop, include scarring of the lung (asbestosis) and cancer. Exposures to asbestos are most likely to occur during removal of ACM or disturbing ACM during renovation activities.

All New Jersey schools must have an ***Asbestos Hazard Emergency Response Act (AHERA) Management Plan*** that should be made available to employees upon request. The location of asbestos and its condition (e.g., intact or friable) must be identified in the Plan.

PEOSH standards regulating asbestos include:

- ***General Asbestos Standard, 29 CFR 1910.1001*** - covers routine custodial/housekeeping operations in facilities where ACM are present;
- ***Asbestos Standard for Construction, 29 CFR 1926.1101*** - applies to demolition and renovation of buildings where asbestos is present. It also includes removal and encapsulation of ACM, emergency clean up of asbestos spills, as well as transporting, disposing, storing, containing, and housekeeping activities involving ACM on a construction site.

Both asbestos standards set a maximum exposure limit and include provisions for engineering controls such as isolation, enclosure, local exhaust ventilation and dust collection. The standards mandate respirator training, protective clothing, exposure monitoring, hygiene facilities and practices, warning signs, labeling, recordkeeping and medical exams for workers in areas in excess of the Permissible Exposure Limit (PEL) and the Excursion Limit (EL) for airborne asbestos.

The regulations prohibit the following work practices:

- Dry sweeping, shoveling or other dry clean-up of dust and debris;
- Using compressed air for dust clean-up;
- Sanding of asbestos-containing flooring.

For more information on asbestos, contact the PEOSH Program. (See Resource List on page 8.) Copies of the asbestos standards, 29 CFR 1910.1001, and 29 CFR 1926.1101, can be accessed from www.osha.gov.

For information on asbestos removal procedures and contractors, contact the NJDHSS Consumer and Environmental Health Services, Indoor Environments Program, at (609) 588-3120.

Lead

Lead exposures occur when lead-containing coatings or paint are disturbed or removed from surfaces during building renovation and demolition. As with asbestos, lead-based paint that is in good repair and is not flaking poses a minimal risk. The paint becomes a threat when it is damaged due to abrasion (e.g., sanding), poor maintenance, water damage, or during renovation and construction.

Lead can be absorbed into the body by inhalation or ingestion. Adverse health effects associated with lead dust include damage to the nervous system and kidneys. Low-level exposure can cause a range of physical and mental problems including loss of appetite, nausea, vomiting, fatigue, moodiness, headaches, anxiety, insomnia, and high blood pressure.

The PEOSH standard that regulates lead is:

Lead in Construction, 29 CFR 1926.62. This standard requires employers to use, when feasible, engineering, work practice and administrative controls to reduce and maintain employee lead exposure to or below the Permissible Exposure Limit (PEL).

For more information on lead, contact the PEOSH Program. (See Resource List on page 8.) A copy of the Lead Standard, ***29 CFR 1926.62***, can be accessed from www.osha.gov.

For information on training and certification requirements for lead abatement contractors, contact the NJDHSS Lead Abatement Program at (609) 588-7456.

Mold

There is a potential for exposure to mold spores and other biological materials from existing contaminated building materials during renovation and construction activities. This can happen when workers have to repair or remove water-damaged building materials, such as sheet rock, ceiling tiles and carpeting that have become contaminated. Mold spores can become airborne when work is being done on a heating, ventilation and air conditioning (HVAC) system that has areas of microbial growth (e.g., contaminated insulation inside the ductwork). Mold spores can also be pulled into the school via the ventilation system from outside sources (e.g., excavation).

Airborne microorganisms or particles (e.g., mold spores) are present in our environment and usually pose no problems. Some mold spores however, when breathed in, can cause asthma, rhinitis, sinus infections, pneumonia and other respiratory infections. It is important to note that dead mold can still cause allergic reactions and other health effects in sensitive individuals.

For more information on mold, contact the PEOSH Program. (See the Resource List on page 8.)

Bird Droppings

There are health risks associated with airborne exposure to contaminated dust from accumulated bird droppings. Fresh bird droppings on surfaces have not been shown to present a health risk. However, there is a health risk associated with accumulated bird droppings (e.g., several inches of pigeon manure from roosting pigeons in an undisturbed location, i.e., attics, roofs and stairwells). Among the fungal diseases associated with bird droppings, the two most common are histoplasmosis and cryptococcosis. For more information, see the Resource List on page 8.

Roofing

Roofing work often involves the use of tar or other pollutant-producing chemicals that cause indoor air problems if airborne contaminants enter the building. Therefore, it is important to identify, and close off when appropriate, outside air intakes located on the roof prior to beginning roof repairs. If the building is occupied, an alternative source of outside air should be provided to the affected areas.



There are many different types of roofing operations. While older methods include applying coal-tar pitch and asphalt, newer roofing technologies use rubber or other synthetic membranes as roofing materials. Roof removal operations may release coal-tar pitch dust that is a confirmed human carcinogen. Rubber or synthetic applications use organic solvents in adhesives, primers, sealants and hardening agents that may be toxic. Short-term exposure to solvents can affect the central nervous system in the body and prolonged exposure can cause a range of chronic health effects. During the application of polyurethane roofing, isocyanates and organic vapors may be released which can cause adverse health symptoms.

Flooring

Installation of flooring materials has the potential to impact indoor air quality (IAQ); therefore, selection of flooring materials is an important consideration during the renovation process. Potential pollutants from flooring materials include volatile organic compounds (VOC's) that may be emitted into the air (called "off-gassing"). Floor adhesives, varnish and sealers contain VOC's that can cause adverse health effects usually through inhalation.



Painting



Chemicals may be introduced into the indoor environment during painting operations. In addition to paints, other products such as strippers, primers and thinners may also be used in painting operations. When solvents evaporate or aerosolize, air quality in the school can be affected. Although water-based paint is often used, most paint still contains some measure of VOC's that can produce health effects that include respiratory irritation, dizziness, nausea and asthma-like symptoms.

New Furnishings

Formaldehyde and other chemicals are found in furniture, new carpeting, particleboard, plywood and many other products associated with renovation. After installation, low levels of these chemicals can be emitted into the air, which can cause irritation of the eyes and respiratory tract.

What can be done to prevent or reduce safety and health hazards?

The key to preventing or controlling health and safety problems during and after renovation and construction in schools is in the planning phase of the operation. In the words of Benjamin Franklin, "An ounce of prevention is worth a pound of cure".

General Planning Activities

Inspect the designated areas in the school

Areas to be renovated should be inspected long before the work begins. This provides time to identify and evaluate potential problems, and incorporate the appropriate language into the contract specification when indicated. Express concerns to the architect and builder and enlist their help in taking measures to assure a safer environment both during and after the project.

Asbestos, lead-based paint, mold-contaminated building materials, and accumulated bird droppings should be identified and removed by trained personnel prior to any renovation and construction that will disturb them.

Check the regulations!

Review the applicable regulations (such as the Asbestos and Lead standards) and find out what is required. Consult your school's AHERA Asbestos Management Plan (AMP). If renovation will disturb any asbestos, hire a competent person to assist with the project.



Do an initial screening of the building using a trained lead paint inspector/risk assessor. Special care should be taken when sanding surfaces to prepare for painting, due to the dust released into the air. The dust may contain lead particles. Use appropriate personnel and precautions when removing and disposing of lead-based paint.

Check with New Jersey Department of Environmental Protection (NJDEP) Hazardous Waste Technical Assistance Hotline at (609) 292-8341 regarding appropriate waste disposal methods for lead and asbestos.

The PEOSH Program enforces the *PEOSH Indoor Air Quality Standard (NJAC 12:100-13)* for public employees in New Jersey. Key provisions of the law include:

- Use local ventilation or other protective devices to ensure the safety of employees when renovation work and/or new construction results in the dispersion of dust, stone, and other small particles, toxic gases or other harmful substances in quantities hazardous to health.
- Isolate renovation in occupied buildings so that dust and debris will be confined to the renovation/construction area.
- Check product labels, or seek and obtain information from manufacturers to determine if the product contains volatile organic compounds such as solvents, formaldehyde or isocyanates that could be emitted during regular use. This is especially important before using paints, adhesives, sealants, or installation of insulation, particleboard, plywood, floor coverings, carpet backing, textiles, or other materials used in the course of renovation/construction.

- Notify employees at least 24 hours in advance, or promptly in emergency situations, of work to be performed in the school that may introduce air contaminants into their work area.

The PEOSH Indoor Air Quality Standard also requires that **visible** mold growth be remediated. If there is a problem with mold in the school, contact the PEOSH Program for guidance on adequate protective measures to ensure both worker and occupant safety. Contact the PEOSH Program for a copy of the PEOSH Indoor Air Quality Standard (see the Resource List on page 8).

Contract Specifications

Contract specifications should state that all applicable regulations must be satisfied. Possible contract specification topics include:

- Notification and communication
- Scheduling to minimize occupant exposure
- Selection of building materials
- Protection of building systems and furnishings, including the ventilation system
- Use of isolation techniques, including barriers and negative pressure
- Ventilation and filtration requirements
- Work practices and housekeeping
- Material storage
- Close-out and commissioning criteria

Notification and Communication

Good communication will help foster an atmosphere of trust and confidence in which people are more willing to work together on solutions to problems that may occur. Avoid withholding information - it usually is counterproductive and affects trust.

Designate a person knowledgeable about indoor air quality issues to oversee the work and answer any questions. Notify employees before planned changes in the building. They should be kept up to date periodically as the work progresses. If the building is to be occupied

during the summer months, notify the occupants prior to renovation and construction activities. Staff should report complaints, concerns, and observations, including health symptoms, to the designated person. The designated person should keep a log of this information including corrective actions that were taken.

If not already established, a Health and Safety Committee should be created. The Committee should meet regularly with the designated person, construction manager, contractor and project architect and should be involved in the investigation and response to complaints. For more information on Health and Safety Committees, contact the PEOSH Program (see the Resource List on page 8). Providing accurate information will help people understand that steps are being taken to protect their health during a renovation project and allow individuals with special health concerns to prepare for the event.

Changes in the school's evacuation plan should be addressed. Exits that were used pre-renovation may have been eliminated or no longer provide a safe exit from the building. When evaluating the evacuation plan, check both sides of the exit door. An exit may look unchanged from the inside of the building, but on the outside they may exit directly into a construction area or be limited in other ways. Meeting points should also be reviewed to determine if they are still safe. Frequent walk-through inspections should also be done to insure that evacuation routes have not been blocked or altered.

Scheduling to Minimize Occupant Exposure

If possible, begin and end the renovation activity during the summer months or while staff and students are not in school. Even during unoccupied times, ventilation and containment strategies discussed below should be used to prevent the spread of contaminants throughout the school.

It is recommended that employees be relocated if they are sensitive to materials used during renovation activities.

Selection of Building Materials

Before renovation begins, employees should be informed how they can obtain material safety data sheets (MSDSs) and *New Jersey Right to Know Hazardous Substance*

Fact Sheets (HSFSs) for information on products that will be used during the renovation process. The employer can request MSDSs from the contractor or the manufacturer of the product. The HSFS can be obtained by contacting the New Jersey Department of Health and Senior Services, Right to Know Program at (609) 984-2202.

Select low-or-no VOC-emitting paint (e.g., water-based paints instead of oil-based), finishes, glues and adhesives. Schools should avoid using carpets, especially on concrete slabs in contact with the ground, in favor of hard and smooth cleanable flooring such as textured (skid-free) tile. Vapors (including VOC's) given off by carpet components and carpet adhesives, can contribute to indoor air pollution. Carpets can also harbor a variety of biological contaminants such as dust mites, bacteria and mold that can grow in carpets that have been exposed to moisture. Carpeting is also likely to be more difficult to maintain than other flooring alternatives.

However, if a decision is made to use carpeting, the Carpet and Rug Institute (CRI) has a carpet testing and labeling program. If your carpet supplier cannot provide information on any carpets you are considering, contact CRI (800-882-8846) to obtain data on emissions from these carpets. If practical, unwrap and unroll flooring products in a well-ventilated location other than the school, such as a ventilated warehouse, prior to installation.

Protection of building systems and furnishings, including the ventilation system

Construction workers should use work practices that minimize dust creation. They should be discouraged from walking through the occupied areas and tracking dust and dirt through the school. Walk-off mats, the use of removable coveralls, and wiping down equipment before exiting the work area are all effective practices.

In addition, new construction materials should be protected from water and high humidity to guard against mold growth.

Use of isolation techniques, including barriers and negative pressure

The best method to avoid student/staff injuries is to maintain strict control of access to the construction site when appropriate. Items such as fencing posts anchored in the ground, strong fencing materials, limited openings in the fence and securing of the site during non-work hours should be included in the initial contracts.

Plan to isolate students, staff, and other areas of the school from any dust or fumes generated during renovation work. This may include temporarily relocating people away from potential problem areas. 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.

On small jobs (e.g., painting a classroom), use local exhaust (e.g., fans facing outwards in windows) to remove pollutants and help ensure that air does not move from the renovation work area to the rest of the school. Air from the work area should be exhausted directly to the outdoors and the room maintained under negative pressure relative to the surrounding rooms and hallways.

Ventilation and filtration controls

Don't allow the ventilation system to carry construction-related pollutants throughout the building. Whenever possible, exhaust pollutants from work areas directly to the outside. Avoid cutting off an occupied room from its supply of outdoor air. If a room is subdivided, the newly created rooms should have an air supply and exhaust.

Use the ventilation system to dilute odors or pollutants that may inadvertently migrate to occupied staff and student areas. Operate supply fans continuously (24 hours/day, 7 days/week), at the highest possible outdoor air supply setting. (This assumes that measures have been taken to protect the ventilation system itself from construction emissions. See the previous section on isolation techniques.)

It may be necessary to temporarily block ventilation grills in work areas to avoid having the ventilation system serve as either a reservoir or pathway for pollutants. This is especially important where the return (exhaust) air is recirculated throughout the building.

Use filters with the highest recommended efficiency. They should be checked frequently during the renovation activities and changed as needed. (Consult the ventilation system manufacturer for their recommendations.)

Work practices and housekeeping

During periods of renovation, increased housekeeping may be necessary, not only in the renovation area, but also in the rest of the school.



The school's cleaning schedule should be increased to address the extra dust and dirt created by the renovation work. The following should be done on a daily basis:

- Clean all horizontal surfaces (desks, chair seats, windowsills, etc.) to minimize exposure to dust. Dusting should be done with a damp cloth.
- Damp-mop vinyl, tile and other hard surface flooring.
- Vacuum carpets with a high efficiency particulate air (HEPA) filter vacuum.

This work should ideally be done after construction activities have finished for the evening, or before students arrive in the morning.

Material storage

Seal containers carefully after use. Keep paint containers and other related products in designated storage areas equipped with exhaust ventilation, never in HVAC equipment rooms.

Closeout and commissioning criteria

- Ensure that after the work is completed that all hard surfaces are wet-wiped and vacuumed (high efficiency vacuuming for fine or potentially toxic dusts, such as asbestos, lead or mold).
- Clean building system components, including those in the ventilation system which have been contaminated during the work. This includes the disposal and replacement of filters.
- If the ventilation system were modified, or if areas served by the ventilation system have been altered (e.g., if a partition wall was installed or removed), have the system balanced and tested.
- Ventilate the school before occupancy.
- Investigate on-going employee and student health symptoms.
- Correct remaining problems.

RESOURCE LIST

New Jersey Department of Health
and Senior Services
Public Employees Occupational Safety
and Health Program
PO Box 360, 7th Floor
Trenton, NJ 08625-0360
(609) 984-1863
Fax: (609) 984-2779
e-mail: peosh@doh.state.nj.us
<http://www.state.nj.us/health/eoh/peoshweb>

New Jersey Department of Health
and Senior Services
Consumer and Environmental Health Services
Indoor Environments Program
PO Box 369
Trenton, NJ 08625-0369
(609) 588-3120
<http://www.state.nj.us/health/eoh/tsrp>

U.S. Environmental Protection Agency (EPA).
Indoor Air Quality, Design Tools for Schools,
Draft, July 2002
www.epa.gov/iaq/schooldesign/construction.html
www.epa.gov/iaq/schooldesign/renovation.html
www.epa.gov/iaq/schools/tfs/renovate.html

PEOSH Information Bulletins :

Policy on Building Renovations
Asbestos in Construction
Facts About Lead Paint Hazards for Public Employees
Indoor Air Quality Standard
Bioaerosols
Control of Health Hazards Associated with Bird and Bat Droppings

Also Available:

PEOSH Indoor Air Quality Model Program

New Jersey Department of Labor
Division of Public Safety and Occupational
Safety and Health
PO Box 386
Trenton, NJ 08625-0386
(609) 292-7036
Fax: (609) 292-3749
<http://www.state.nj.us/labor/lasse/lspeosh.html>

New Jersey Department of Environmental Protection
Bureau of Resource Recovery and
Technical Programs
(609) 984-6985
Hazardous Waste Technical Assistance Hotline
(609) 292-8341

Federal OSHA: www.osha.gov

U.S. Environmental Protection Agency (EPA).
Mold Remediation in Schools and Commercial
Buildings
www.epa.gov/iaq/mold

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Education and Training Project*

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**Renovation & Construction in Schools
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Which section did you find most useful?

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Other occupational health topics on which you would like to see the PEOSH Program develop an information bulletin:

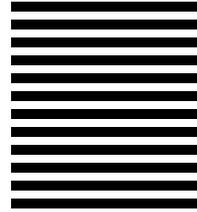
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