

DAVENPORT
COMMUNITY
SCHOOLS

**CHEMICAL
HYGIENE PLAN**

<http://www.davenportschools.com>

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PREFACE

This document has been prepared by a Task Force¹ created by the Committee on Chemical Safety, a standing committee of the American Chemical Society, to be in accord with standards specified in the Occupational Safety and Health Act (OSHA) Laboratory Standard and modified by the Davenport Community Schools.

Four documents provided the basis for this Chemical Hygiene Plan.² While they will be cited in the bibliographic appendix, it is appropriate to recognize the work that others have produced, and from which we have appropriate ideas and, in some cases, exactly worded segments. They are cited in the footnotes at the end of this document.

The law and regulations derived from it are intended to help make the workplace safe for employees. This is to be accomplished by establishing procedures and guidelines that will help both the employer and the employee in the laboratory develop safe practices. Students are an important part of the operation of the school science laboratory. While students aren't specifically covered by the regulations found in the OSHA Laboratory Standard, it is most appropriate that they be considered part of the process and that in practice, students be included. For instance, certain training programs are required for laboratory workers. Such training is to be provided by the employer. The school district needs to implement appropriate safety training for students as well.

SECTION 1

Introduction

A. Purpose of this document

The Chemical Hygiene Plan is a document designed to express the policies and procedures adopted by the Davenport Community Schools, and relating to the safe operation of the school instructional laboratories. The document is derived from the Laboratory Standard³, a set of codes developed and presented in the Occupational Safety and Health Act. The Laboratory Standard addresses the goal of providing a safe laboratory workplace by including the requirements of the Occupational Safety and Health Act Standard on Occupational Exposure to Hazardous Chemicals.

The OSHA Laboratory Standard requires that employers protect workers through the development and implementation of a Chemical Hygiene Plan tailored to the individual laboratory workplace. The purpose of the Laboratory Standard and of this Chemical Hygiene Plan is to protect the employee from harm due to exposure to hazardous chemicals while working in the laboratory. The Davenport Community Schools will identify appropriate guidelines within this chemical hygiene plan for students.

Many policies and practices may not be part of the Chemical Hygiene Plan as such, and yet they are crucial to the planning process that must be part of maintaining a safe environment for employees and students. Such items as the number of students per class or the amount of physical space available to each student are examples of policies and practices that impact establishment of a safe environment, but which are not required by OSHA to be part of the Chemical Hygiene Plan.

B. Application of the OSHA Laboratory Standard⁴

The Occupational Safety and Health Act is administered as part of the US Department of Labor, and its full text is found in the Code of Federal Regulations (CFR) under Title 29, section 1910 (cited as "29 CFR 1910.1450").

One requirement of the Laboratory Standard is that the school district must have a Chemical Hygiene Plan and a Chemical Hygiene Officer.

1. What Is Covered by the Laboratory Standard?

Laboratories are defined as facilities where the "laboratory use of hazardous chemicals" occurs. "Laboratory use of hazardous chemicals" refers to the handling or use of such chemicals in which all of the following conditions are met:

"Hazardous Chemicals" are those which pose a health hazard, defined by OSHA as any substance for which there is statistically significant evidence, based on at least one scientific study, showing that acute or chronic harm may result from exposure to that chemical. Health hazards include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants and corrosives.

"Employees" who are addressed by this document are those individuals employed in the laboratory workplace who may be exposed to hazardous chemicals in the course of the individual's assignment. This includes employees who actually work in the laboratory (instructors and aides) and those who simply must be in the laboratory to perform their assigned responsibilities (maintenance and custodial personnel, etc.)

“Laboratory scale” means work with substances in which the containers used for reactions, transfers and other handling of substances are designed to be easily and safely manipulated by one person.

2. What Is **NOT** Covered by the Laboratory Standard?

The Laboratory Standard does not apply to:

- [a] Students. Because students are not employees, they are not formally covered by provisions of the Chemical Hygiene Plan. However, there are recommendations in this document that suggest appropriate student rights and responsibilities related to issues of chemical safety. The Davenport Community Schools has identified those guidelines appropriate for students in this document.
- [b] Uses of hazardous chemicals which do not meet the definition of “laboratory use” even if such use occurs in a laboratory. The Davenport Community Schools has clearly identified the appropriate chemicals and equipment to be used in the classroom/laboratory.
- [c] Laboratory uses of hazardous chemicals which provide no potential for employee exposure, such as procedures using chemically impregnated test media.
- [d] Commercially prepared kits such as those used in performing nitrogen tests in which all of the reagents needed to conduct the test are contained in the kit.

The occasional visitor to the laboratory, such as a guest or administrator, who, because he/she is not included in the definition of employee does not need to be addressed in the Chemical Hygiene Plan. It is recommended that such persons be offered the same protection offered to students, and they conform to the same expectations as students in the laboratory. The Davenport Community Schools requires all visitors to follow designated safety protocol outlined in this Chemical Hygiene Plan.

C. Summary of the Chemical Hygiene Plan

In compliance with the Laboratory Standard, the district has prepared and implemented the Chemical Hygiene Plan. Adherence to the Plan will assure that employees, students, and visitors will be:

1. protected from health hazards associated with hazardous chemicals in the laboratory.
2. exposed to regulated substances at a level that will not exceed the permissible exposure limits.

The Chemical Hygiene Plan is organized into the following sections:

1. This Introduction, which states the goal and basis for the Chemical Hygiene Plan.
2. General Principles, which outline the guidelines for working with laboratory chemicals.
3. Standard Operating Procedures for Laboratories, the implementation of which will help the Chemical Hygiene Officer and all employees in meeting the goal of the Chemical Hygiene Plan.
4. A District Organization responsible for various aspects of the Chemical Hygiene Plan and its implementation.

5. Requirements for Records, record keeping, and procedures for reporting items related to laboratory health and safety.
6. Laboratory Safety Procedures.
7. Procedures for Inspections of laboratories and reviewing of the Chemical Hygiene Plan.
8. A description of the situations where Specific Exposure Control Measures must be used by employees.
9. Information regarding Training Opportunities for employees.
10. A description of Emergency Prevention and Response Procedures.
11. Appendices which provide a variety of reference materials and other useful information that may be referenced in the test of the Chemical Hygiene Plan.

SECTION 2

General Principles

The following statements and explanations are general principles for the use of those handling chemicals. While the list is not complete, these items provide the fundamental underpinning for laboratory work in the Davenport Community Schools.

A. Minimize Exposure to Chemicals

It is prudent to minimize all chemical exposures because most laboratory chemicals present hazards of one type or another. Employees will follow general precautions for handling all laboratory chemicals.

B. Consider the Risk

Employees should not underestimate risk, and exposure to hazardous substances should be minimized. The decision to use a particular substance will be based on the best available knowledge of each chemical's particular hazard and the availability of proper handling facilities and equipment. Substitutions, either of chemicals or experiments, will be made where possible to reduce hazards without sacrificing instructional objectives. **When the risk outweighs the benefit and no substitute is available, then the experiment, procedure or chemical will be eliminated.**

C. Provide Adequate Ventilation

The best way to prevent exposure to airborne substances is to prevent their escape into the room atmosphere. Devices such as hoods should be kept in good working condition in order to provide employees with a safe working area. The later section on Inspections in the laboratory establishes procedures for assuring that equipment is working properly.

D. Use the Chemical Hygiene Plan

The Chemical Hygiene Plan provides specific laboratory practices designed to minimize employee and student exposure to hazardous substances. **Employees and students shall follow the practices specified in the Chemical Hygiene Plan in order to minimize their health and safety risks.**

E. Observe PEL's and TLV's

The Permissible Exposure Limits (PEL's) and Threshold Limit Values (TLV's) of chemicals typically used in the laboratory are available on the Material Safety Data Sheet for that chemical. Employee and student exposure to hazardous chemicals should not exceed those limits.

F. Use Material Safety Data Sheets

The district should not accept a chemical from a supplier unless it is accompanied by the corresponding Material Safety Data Sheet (MSDS). The MSDS should be accessible to the employee at all times. The employee will be trained to read and use the information found on the MSDS.

G. Be Prepared

The School District will train employees in how to find and use information from the MSDS, this Chemical Hygiene Plan, and other safety publications. Employees should familiarize themselves with the hazards associated with the chemicals they expect to use, and should take appropriate steps to minimize exposure to themselves and their students for those chemicals.

SECTION 3

Standard Operating Procedures

The goal of the Chemical Hygiene Plan is to protect employees and students who work in the laboratory, others who may be exposed, and the environment from injury due to hazardous chemicals. This section is written in several parts and is meant as a guide for the district and its employees. Other specific safety rules for a particular laboratory may be added by the District as needed.

These same standards shall be communicated to students, expected of students, and be promoted by the school and laboratory personnel.

A. General Rules

1. The instructor (and aide, if any) are to review laboratory instructions, safety procedures, and reagents prior to each laboratory activity. The instructor (aide) should be aware of the following:
 - [a] The chemical hazards for each chemical, as determined from the MSDS or other appropriate reference.
 - [b] Appropriate safeguards for using each chemical, including personal protective equipment.
 - [c] The location and proper use of emergency equipment.
 - [d] How and where to properly store the chemical when it is not in use.
 - [e] Proper personal hygiene practices.
 - [f] Proper methods for transporting chemicals within the laboratory facility.
 - [g] Proper procedures for emergencies, including evacuation routes, spill cleanup procedures and fire control.
 - [h] Proper procedures for the disposal of hazardous substances.
 - [i] Procedures by which supervisory persons will be notified (documentation) in case of an accident or injury.
 - [j] Procedures by which emergency help may be contacted.
2. The employee should try to avoid working alone with hazardous chemicals unless other employees are in the vicinity and are aware that someone is in the laboratory, in which case periodic checks should be made. **No student should ever work alone in a laboratory or chemical storage area.**
3. **Whenever chemicals are in the laboratory (out of locked cabinets or storerooms) the laboratory will be locked when unattended.**

B. Personal Protective Equipment and Clothing

The employee and student are to use appropriate protective clothing and equipment.

1. Laboratory aprons or coats, eye protection, and non-permeable gloves are considered standard equipment for school laboratory programs and are readily available to employees and students.

2. Eye Protection

- [a] All persons in the laboratory (including visitors) will wear eye protection whenever near chemicals or equipment potentially hazardous to eyes.

[b] Eye goggles provide splash and impact protection and conform to ANSI Standard Z87.1-1989. Eyeglasses, even with side shields, are not acceptable protection against chemical splashes.

- [c] Whenever two or more persons use the same goggles, equipment will be provided to clean and sterilize goggles. In such cases it is recommended that a sterilization cabinet be available. There should be a procedure in place to verify that sterilization is complete. **The Davenport Community Schools requires all students to purchase individual goggles.**

- [d] Approved standing shields or face shields are to be used when there is potential for explosions, implosions or splashing, or when corrosive liquids are used.⁵ Goggles should be worn when using standing or face shields.

- [e] The Davenport Community Schools recommends that students refrain from wearing contact lenses when working with chemicals in the laboratory.

3. Clothing

REQUIRED:

- [a] Clothing worn in the laboratory should offer protection from splashes and spills, should be easy to remove in case of an accident, and should be fire-resistant.

- [b] Nonflammable, non-porous aprons (rubber or plastic) offer the least expensive protection. They should be long enough to cover from the neck area to the knees.

- [c] Shoes should have low heels with fully covered "uppers". Shoes are not to have open toes; shoes constructed of woven material are not recommended.

- [d] Long hair and loose clothing must be confined.

RECOMMENDED:

- [e] Shorts, cutoffs and short skirts should be discouraged in the laboratory because they do not provide the protection of longer clothing.

- [f] Laboratory coats, jackets, aprons or clothes on which chemicals have been spilled should be washed separately from personal laundry.

- [g] Clean chemical and fire resistant laboratory coats may be worn. They should be long-sleeved and cover at least to the knees. Snap fasteners or velcro closures are better than buttons because the laboratory coat is more easily removed in an emergency.

[h] Jewelry such as rings, bracelets or watches should not be worn in order to prevent chemical seepage under the jewelry, contact with electric sources, catching on equipment or damage to the jewelry itself.

[i] Be aware of flammable products. (i.e. acrylic fingernails, hair styling products, colognes and perfumes)

6. Gloves

[a] No gloves are good for all situations. Corrosive resistant gloves should be worn when working with concentrated corrosive liquids.

[b] Gloves that resist permeation by chemicals that are allergenic, sensitizing or toxic should be worn when appropriate.

[c] The appropriate type of glove should be selected for use with various solvents and corrosives. The MSDS should be consulted for information regarding the proper type of gloves to be used.

[d] Gloves should be removed before leaving the laboratory.

[e] Gloves should be checked before each use to ensure the absence of cracks and for small holes.

[f] Some people are allergic to latex gloves. Alternatives should be available.

C. Planning

1. The employee should not rely solely on the textbook, laboratory manual, or other instructional material for an indication of safety precautions required for a particular experiment. The MSDS for chemicals and safety references for equipment should be consulted, particularly when the anticipated experiment is a new one.
2. **The instructor will review potential hazards in classroom activities and specifically describe them to all classes and all students.**
3. The scale of the procedure should be reduced to a minimum consistent with effective education in order to reduce generation of chemical wastes.
4. Only those chemicals for which the quality of the ventilation system is appropriate should be used. The District should provide ventilation adequate for the District approved curriculum.

D. Personal Behavior

1. **Horseplay, pranks or other acts of mischief will not be tolerated in chemical work areas and laboratories.** Concern for safety must prevail over concerns for educational opportunities.
2. Students will not perform activities using unauthorized chemicals.
3. The laboratory should generally not be left unattended while an experiment is in progress. It is recognized that some experimental procedures, such as evaporation of a large quantity of solvent, crystallization, incubation, etc. are a normal part of some experiments and that such procedures may safely be left while they are in progress. The employee should use the best available information when deciding whether a particular experiment may be left unattended.

4. The Davenport Community Schools recommends that students found in violation of personal behavior guidelines not be allowed to work in the laboratory setting.

E. Personal Hygiene

All employees, students and visitors are to use appropriate personal hygiene practices. These include the following:

1. Wash promptly whenever a chemical being used for an experiment has contacted the skin.
2. Avoid inhalation of chemicals used for an experiment, including gases, vapors and aerosols. "Wafting" to test chemical odors should only be done with caution and instructor's permission.
3. After working with hazardous materials, wash well with soap and water before leaving the laboratory, even if gloves have been worn. Never wash with organic solvents.
4. Smoking is not permitted on School District Property. Employees and students should be aware that tobacco products in opened packages can absorb chemical vapors and therefore should not be carried when working with hazardous materials.
5. Should not apply cosmetics in any laboratory.
6. Seek immediate and appropriate medical treatment whenever signs or symptoms of exposure to a hazardous chemical are manifested or suspected.
7. Never pipette by mouth. The District will provide alternative equipment.

F. Housekeeping

1. Work areas are to be kept clean and free from obstructions. Cleanup should follow the completion of each operation and at the end of each period. Unnecessary hazards should be avoided by keeping drawers and cabinets closed when not in use. ***When stools and chairs are potential safety hazards, they should not be present.***
2. Wastes are to be placed in appropriate receptacles for disposal, each of which should be correctly labeled. Wastes must be disposed of by methods consistent with state and federal requirements and within mandatory state timelines. The Davenport Community Schools has outlined the chemical disposal guidelines to be followed. See Appendix K for guidelines.
3. Both equipment and chemicals are to be stored properly. Chemicals should not be stored in aisles, on the floor, in stairwells, on desks or laboratory tables.
4. Access to emergency equipment, showers, eyewashes, and exits are not to be blocked by anything, not even a temporarily parked cart.
5. All containers with chemicals are to be labeled with the identity of the contents and the hazards those contents present to users. All labels should be consistent with state and federal requirements. See Appendix K for requirements.

6. All working surfaces and floors are to be cleaned regularly. Slipping hazards should be avoided by keeping the floor clear of ice, spilled liquids, stoppers, glass beads or rods, and other small items. Backpacks should be stored in locations where they do not block emergency movement.
7. All chemical spills are to be promptly cleaned up. The chemicals and clean-up materials should be disposed of in a proper manner. **All spills involving chemicals must be documented.** See Appendix L for documentation.

G. Food Handling

1. No food or beverages are permitted to be stored, handled, prepared or consumed in areas where chemicals are used or stored. In a classroom/laboratory setting, no food or beverages are permitted on lab days.
2. No hazardous chemicals are to be brought into areas that are designated for food consumption.
3. Glassware or utensils that have been used for laboratory operations are never be used to prepare or consume food. Laboratory refrigerators, ice chests, microwave ovens, cold rooms, etc., should not be used for food storage or preparation. Equipment and materials to be used for human consumption should be protected from contamination by segregated, locked storage.

H. Glassware

1. Careful storage and handling procedures are to be used to avoid glassware breakage.
2. Adequate hand protection and lubricant are to be used when inserting glass tubing into rubber stoppers or corks or when placing rubber tubing on glass hose connections. Hand protection may be in the form of heavy gloves or heavy cloth towels. Safety stoppers⁶ should be used whenever possible.
3. Tubing is to be fire polished.
4. When inserting glass tubing into a stopper, the glass should be lubricated, and the hands should be held close together to limit movement of glass should breakage occur.
5. Protection for the hands are to be worn when picking up broken glass. Small pieces should be swept up with a brush and pan.
6. Broken glass is to be placed in a special disposable container marked for "BROKEN GLASS," thereby separating it from other waste. The disposable container with broken glass will be discarded intact without transferring contents to other containers.

I. Flammability Hazards

1. No open flame should be in the proximity of a flammable liquid.
2. Quantities larger than 500mL of flammable materials are to be stored in a flammable liquid storage cabinet.
3. Cabinets for storage of flammable liquids and containers should be properly grounded to prevent accidental ignition of flammable vapors and liquids from static electricity or other sources of ignition.

Electrical grounding is especially important during the transfer of liquids from one container to another.

4. Before lighting a flame, all flammable substances are to be removed from the immediate area of the flame. All containers of flammable substances in the area should be checked to ensure that they are tightly closed.
5. Large quantities of flammable chemicals stored outside cabinets are to be in flame-proof storage cans which conform to NFPA guidelines.⁷

J. Electrical Hazards

1. All electrical outlets are to have a grounding connection requiring a three-prong plug. All electrical equipment should be wired with a 3-prong plug. Should a grounding post ever be removed from a cord or appliance, a new three-prong plug should be promptly installed.
2. Some equipment is designed for use with 2-prong plugs. If the appliance comes with that type of plug, there is no need to change; it will work in a 3-prong socket.
3. GFI protection will be provided for electrical outlets near grounded plumbing fixtures.
4. All laboratories should have an electrical emergency "shut-off."
5. Laboratory lighting should be on a separate circuit from electrical outlets in case electric service must be cut off during an emergency.
6. If electrical equipment shows evidence of undue heating, it is to be immediately unplugged and tagged for repair or discard.
7. All electrical outlets and electrical equipment will be checked yearly and proper documentation will be completed.

K. Compressed Gases

If compressed gas cylinders are used in the laboratory, procedures for their use are to be in accordance with guidelines established by the Compressed Gas Association⁸.

1. No cylinder should be moved from one location to another until the protective cap is securely in place.
2. Both full and empty cylinders should only be stored where they are securely restrained by straps, chains, or a suitable stand.
3. All cylinders should be used with a correct gauge and/or regulator, and should be fitted with delivery tubes that do not leak, and which are tightly fastened to the cylinder.
4. A cylinder should be considered to be "empty" when there is still a slight positive pressure.
5. An empty cylinder should be returned to the supplier as soon as possible after having been emptied, or when no longer needed.

6. Cylinders should not be exposed to temperatures above 50°C.
7. All cylinders should be clearly identified with their contents.

L. Prior Approval

Teachers, instructors, and aides must obtain prior approval from the Lab Evaluation Committee whenever a non-district approved laboratory experiment or demonstration is to be carried out with one or more students, it has not been performed at a prior time, and the potential for harm is high or unknown. The potential for harm may be affected by a change in the amounts of materials being used, the conditions under when the experiment is to be conducted or the substitution, deletion or addition of some chemical is anticipated. Prior approval should be sought in any of the following cases: (See Appendix M for Alternative Laboratory Request Form)

1. When there exists the:
 - [a] Potential for a rapid rise in temperature.
 - [b] Potential for a rapid increase in pressure.
 - [c] Substitution of a flammable solvent.
 - [d] Potential for chemical explosion.
 - [e] Potential for spontaneous combustion.
 - [f] Potential for the emission of gas(es) that could produce concentrations in the air that exceed toxic limits.
 - [g] There is a change in a procedure, even if it is very similar to prior practices, such as an increase in the amount of chemicals used by a factor of 10% or more.
 - [h] There is an increase in waste produced by the lab.
2. When there is a failure of any of the equipment needed for the process, especially of safeguards such as fume hoods.

SECTION 4

District Organization

A. District Level

The Superintendent, as Chief Executive Officer, has the ultimate responsibility for chemical hygiene within the school district. The Superintendent should, with other administrators, provide continuing support for district-wide chemical hygiene programs.

The Maintenance Supervisor, Food Service Supervisor, and Custodial Supervisor will be responsible for yearly training to operations employees and recommendations regarding documented areas of non-compliance across the district. The Maintenance Supervisor, Food Service Supervisor, and Custodial Supervisor will also work with other safety personnel within the district to obtain and maintain compliance. The responsibilities of this position require the Maintenance Supervisor, Food Service Supervisor, and Custodial Supervisor to:

- [a] Assure that inspections of equipment and space in the laboratory are performed when appropriate and that records of inspections are maintained.

- [b] Implement appropriate training with regard to chemical hygiene for all district employees whose normal work locations include laboratory areas, or desire to work with potentially hazardous chemicals in their classrooms, those administrators responsible for supervising such employees, and those employees responsible for maintaining the laboratories.

The Curriculum and Instruction Specialist will be responsible for annual review of the Chemical Hygiene Plan, yearly training to instructional employees, and recommendations regarding documented areas of non-compliance across the district. The Curriculum and Instruction Specialist will also work with other safety personnel within the district to obtain and maintain compliance. The responsibilities of this position require the Curriculum and Instruction Specialist to:

- [a] Maintain a list of employees assigned to work in laboratories, or who choose to use potentially hazardous chemicals for instruction.

- [b] Work with employees to monitor procurement, use, and disposal of chemicals used in the schools' instructional programs.

- [c] Assure that inspections of equipment and space in the laboratory are performed when appropriate and that records of inspections are maintained.

- [d] Make decisions regarding possible use of requested chemicals identified as explosive, carcinogenic, mutagenic, highly toxic, or otherwise potentially hazardous.

- [e] Determine the need for personal protective equipment.

- [f] Implement appropriate training with regard to chemical hygiene for all district employees whose normal work locations include laboratory areas, or desire to work with potentially hazardous chemicals in their classrooms, those administrators responsible for supervising such employees, and those employees responsible for maintaining the laboratories.

The Lab Evaluation Committee will be the final authority on experiments conducted in the Davenport Community Schools. In the committee's review of experiments, the following areas will be examined, but not limited to: potential hazards to instructor and/or student, the types and amounts of chemicals

needed, the cost of the chemicals, the types of waste produced, and the match to District standards and benchmarks.

B. Building Level

The Principal is responsible for chemical hygiene programs in the local school. The principal is to monitor, support, and require school employees' compliance with the Chemical Hygiene Plan. Furthermore, it is the principal's responsible to communicate building level chemical hygiene programs in the building with Department Heads, Food Service Staff, and Custodial Staff.

To assist in achieving compliance with the Chemical Hygiene Plan in the building, a designated Chemical Manager will be identified in each building. The Chemical Manager must have up-to-date training in chemical management and facility maintenance. The responsibilities of this position require the Chemical Manager to:

- [a] Maintain a list of employees assigned to work in laboratories, or who choose to use potentially hazardous chemicals for instruction.
- [b] Work with employees to monitor procurement, use, and disposal of chemicals used in the schools' instructional programs.
- [c] Assure that inspections of equipment and space in the laboratory are performed when appropriate and that records of inspections are maintained.
- [d] Determine the need for personal protective equipment.

C. Project Director

Some situations may require a "Project Director", who may be a science department head, science supervisor, science teacher, or someone from outside the normal school structure who has a particular responsibility related to the laboratory, but which is not part of the regular teaching or instructional responsibilities.

The Project Director has specific responsibilities requiring work in the laboratory, such as advisor to a chemistry club, instructor of Kollege for Kids or Community Education, or supervisor of a student research project, which is not done as part of a regular class, but for which credit may be awarded.

The Project Director has the primary responsibility for chemical hygiene procedures for that project. To reduce liability, the District will not allow untrained people access to or use of laboratory facilities, whether for laboratory use, or for any other purpose. Certificate of training regarding the chemical hygiene plan must be obtained before use of the facilities will be granted.

D. Employer Responsibilities

The following items indicate responsibilities of the Davenport Community Schools, who is the employer of record:

1. Appoint a Chemical Hygiene Officer. Assign the Chemical Hygiene Officer the various responsibilities outlined in Section F, below.
2. Make manufacturer's Material Safety Data Sheets accessible to employees.
3. Provide employees with training and information regarding chemical and physical hazards.

4. Post "designated areas" if any select carcinogens, reproductive toxins or acute toxins are used in the laboratory.
5. Measure the concentration of hazardous chemical(s) if it is believed that the action level has been exceeded.
6. Keep records of employee exposure to hazardous chemicals for a period of 30 years beyond the time of exposure. These records should be filed by the employee, in writing, within two weeks of the exposure.
7. Provide medical consultations and examinations required as a result of exposure to hazardous chemical(s).
8. Provide respirators when necessary.⁹ In general, it is the policy of this District to employ outside expert services if respirators are necessary.

E. Employee Responsibilities

The school employee, whose normal work locations include a laboratory area, is responsible for:

1. Maintaining awareness of health and safety hazards.
2. Participating in training programs provided by the district within contracted times.
3. Consulting reference materials related to chemical safety whenever appropriate.
4. Planning and conducting each operation in accordance with the district's chemical hygiene procedures.
5. Using good personal chemical hygiene habits.
6. Conducting and submitting routine safety inspections of their assigned laboratory.
7. Reporting accidents, injuries, **unsafe practices and unsafe conditions** to appropriate safety personnel, such as the Principal, Instructional Curriculum Specialist, or Chemical Manager.

F. Chemical Hygiene Officer

1. District Chemical Hygiene Officer. The District Chemical Hygiene Officer is appointed by the District. ***The District Chemical Hygiene Officer should be a knowledgeable and experienced chemist who has chemical hygiene training or is an industrial hygienist.***
2. The responsibilities of this position require the District Hygiene Officer to:
 - [a] Assist in the development of and review of the Chemical Hygiene Plan and safety program for the district, including training, reporting and other functions noted here.
 - [b] Work with administrators and teachers to develop the safety program.
 - [c] Provide technical assistance to schools and employees on the Chemical Hygiene Plan.

- [d] Assure that the Chemical Hygiene Plan is reviewed annually, and revised as needed to assure that it is in compliance with current legal requirements.

G. Students

Students are not specifically covered by the Laboratory Standard. However, as adults they will work with hazardous substances in their daily lives and as a part of their jobs. Therefore good personal chemical hygiene habits will be taught to all students at every reasonable opportunity, particularly to those who use the laboratory while enrolled in science courses.

It is the District's policy to include the protection and responsibilities of students in the District Hygiene Plan. **Students will not be allowed to use school laboratories unless they first obtain permission for specific laboratory activities from the laboratory supervisor and are directly supervised by that supervisor during their work.**

The student, who is assigned to a class in a laboratory or undertakes an independent study project involving hazardous materials, is responsible for:

1. Maintaining awareness of health and safety hazards.
2. Learning correct procedures and practices, especially those provided by the course instructor and the assigned textbooks.
3. Obtaining permission of the laboratory supervisor before undertaking or modifying any laboratory procedure.
4. Planning and conducting each laboratory operation in accordance with the District's chemical hygiene procedures.
5. Using good personal chemical hygiene habits. This especially includes:
 - [a] correctly using approved eye protection when working with hazardous materials and in hazardous situations.
 - [b] not eating, drinking, placing anything in one's mouth, or applying cosmetics, creams or lotions while in the laboratory.
 - [c] never engaging in horseplay or activities that might distract others while in the laboratory.
 - [d] dressing appropriately for the hazards present.
 - [e] washing hands after working in the laboratory.
6. Reporting accidents, injuries, unsafe practices, and unsafe conditions to the laboratory supervisor.

SECTION 5

Record Keeping Procedures

The District should maintain specific records to verify safety practices.

A. Air Concentration Monitoring

The District requires that records of air concentration monitoring results be maintained for at least 30 years and they are accessible to employees or their representatives. Such monitoring should be done following the procedures established by the District.

Regular instrumental monitoring of airborne concentration is not usually justified or practical in laboratories. It may be appropriate when toxic materials are used or stored or ventilation devices are tested or redesigned. It is also required after each reported incident of exposure to toxic chemicals.

B. Training Records

The District will maintain records of employee training for at least 30 years and will make those records available to employees or their representatives when requested.

C. Material Safety Data Sheets

A file of manufacturer's Material Safety Data Sheets accessible to employees shall be maintained in the laboratory. If an MSDS is not available when a new chemical is received by the receiving personnel, that chemical should not be used until an MSDS is obtained.

D. Exposure Testing Records

1. Records of exposure assessments shall be maintained for at least 30 years, and shall be made accessible to employees or their representatives upon request.
2. Exposure testing procedures and results of that testing shall be sent to the District Human Resources, who maintains these records.
3. The employee exposed shall be notified of any monitoring results within fifteen working days after receipt of the results individually, in writing.
4. An accurate record of any measurements taken to monitor employee exposures shall be kept, transferred as necessary, and made available to each employee.
5. An accurate record of any medical consultations or medical examinations shall be kept by the District Human Resources. Records will be made available to the employee upon request.

E. Medical Records

The District requires the records of medical consultations, medical examinations and all reports derived from such consultations and examinations be maintained for at least 30 years, and that they be accessible to employees or their representatives upon request.

F. Prior Approval

Laboratory employees shall be informed of those laboratory procedures and operations which require prior approval from the Curriculum and Instruction Specialist to ensure that these activities are carefully monitored for adherence to the Chemical Hygiene Plan. Requests for approval must be made in writing, using the form in Appendix M.

G. Accident Reports

Each incidence of an accident or injury should be reported to both the Principal and the District's Safety Department, in writing, within 24 hours of the accident. If staff or students were witnesses to the accident/injury, they should also complete the appropriate forms, all of which are found in electronically on the district's website or in Appendix H. The District shall keep records, for 30 years from the time of the lost work, in the event of lost work resulting from an exposure to a hazardous chemical or a job related accident.

H. Chemical Inventory Records

Each school should maintain a Chemical Inventory List, which will be updated quarterly. Copies of the Chemical Inventory List should be kept both in the laboratory and by the Chemical Manager. If this is done via a computer based inventory program backup copies should be maintained in a separate location. **The Science and Curriculum and Instruction Specialist and District Safety Department will receive an updated Chemical Inventory List at the end of each school year.**

I. Records of Waste Disposal

The District shall maintain records of waste chemicals, chemicals and products from reactions or processes that are transferred to an authorized and/or certified chemical disposal agent, and chemicals that are transported to a new site. These records should conform to requirements of the Environmental Protection Agency and Department of Transportation, either of which may have jurisdiction involved in these types of transfers. **Each building is responsible for maintaining waste disposal records and sending a copy of these records to the District Safety Department.**

J. Safety Suggestions

The District shall receive safety suggestions, in writing, from employees and should keep a record of those suggestions, including the dates they were submitted, the name of the person submitting the suggestion, the disposition of the suggestion and the reasons for that particular action.

K. Equipment Inspection Records

1. The Building and Curriculum and Instruction Specialist shall keep records of the regular laboratory safety inspections conducted by each laboratory supervisor, including the date of the inspection and the person conducting the inspection.
2. The District Maintenance Department shall keep records of permanent safety equipment, showing the dates of inspection and the result of any inspection. This will include fire extinguishers, drench showers, eyewash fountains, safety fire blankets, etc. **Operation and flow rate of each drench shower and each eye wash should be checked weekly by instructional employees.**

3. The District Maintenance Department shall maintain records showing periods of repair and maintenance for control systems such as fire prevention alarms and ventilation.

SECTION 6

Laboratory Safety Procedures

A. Employee Exposure Protection and Monitoring

If there is reason to believe that exposure levels for a regulated substance routinely or incidentally exceed the action level or PEL, the Curriculum and Instruction Specialist and the District Safety Department shall be notified. The District Safety Department shall arrange with the Principal for the measurement of exposure to that substance or estimate of exposure if it was a single incident.

1. Initial Exposure Determination

Factors which may raise the possibility of overexposure and therefore warrant an initial measurement of employee or student exposure include:

- [a] The manner in which the chemical procedures or operations involving the particular substance are conducted.
- [b] The existence of historical monitoring data which shows elevated exposures to the particular substance for similar operations.
- [c] The use of a procedure which involves significant quantities or is performed over an extended period of time.
- [d] Signs or symptoms of exposure (e.g., skin or eye irritation, shortness of breath, nausea, headache, etc.) which are experienced by the employee or student(s).

2. Exposure Monitoring

If the initial exposure determination described above diagnoses employee or student exposure over the action level for a particular substance, the school district is to immediately comply with the exposure monitoring requirements for that substance.

Monitoring airborne concentrations of individual hazardous chemicals should be conducted in the following circumstances:

- [a] In testing or redesigning the hoods and other local ventilation devices in the laboratory.
- [b] When a specific substance that is highly toxic is regularly and continuously used.
- [c] When requested by a laboratory employee because of a documented health concern or suspicion that a PEL may be exceeded.

B. Laboratory Facilities

The work conducted in a laboratory and its scale is to be appropriate to the physical facilities available and to the quality of the ventilation system. A laboratory should include, where appropriate:

1. ***An adequate general ventilation system with air intakes and exhausts located so as to avoid intake of contaminated air. The ventilation should occur whenever any employee or student is in a laboratory.***

2. Well ventilated stockrooms and storerooms.
3. Proper chemical storage for specific hazardous materials (e.g., flammable, corrosives, carcinogens, highly toxic chemicals, etc.).
4. Laboratory hoods and sinks adequate for the courses taught in the facility.
5. Emergency equipment, including proper fire extinguishers, spill kits, alarms, access to a telephone with an outside line, eyewash, drench safety shower, etc.
6. First aid equipment including first aid kits. All employees and students should know that a fire blanket should not be wrapped around the victim, but should be used only to smother the flames.
7. Arrangement for proper waste storage and disposal.

C. Laboratory Ventilation

Laboratory fume hoods are not meant for either storage or disposal of chemicals. **If a hood must be used for storage**, in order to provide adequate ventilation for flammable chemicals, for instance, then it must not be used for laboratory experiments or transfer of chemicals. In that event, **it must be used only for storage**.

The general laboratory ventilation system should provide a source of air for breathing and for input to local ventilation devices, ensure that laboratory air is continually circulated, and direct air flow into the laboratory from non-laboratory areas and out to the exterior of the building.

General laboratory ventilation should not be relied on for protection from exposure to hazardous chemicals. A rate of 8-12 room air changes per hour should be the accepted standard when local exhaust systems such as hoods are used as the primary method of control. Laboratory air flow should not be turbulent and should flow continuously throughout the laboratory. ASHRAE recommends 15-20 cubic feet per minute per person in school classrooms and higher rates for hazardous areas such as laboratories.¹⁰

A laboratory hood with a minimum of 2-3 linear feet of hood space per person should be provided for every two students if they spend most of their time working with hazardous chemicals. Airflow into and within the hood should not be excessively turbulent, which may be produced when a hood face velocity exceeds 100 linear feet per minute. Fume hoods should provide adequate air flow at about 60-100 linear feet per minute. This should be measured by the *Maintenance Department periodically*.

Stockrooms should be continuously well ventilated.

The quality and quantity of ventilation shall be evaluated when installed, regularly monitored and reevaluated whenever a change in ventilation devices is made.

D. Medical Consultations and Medical Examinations

Employees who work with hazardous chemicals will be provided with an opportunity to receive medical attention when overexposure to a hazardous chemical is suspected.

1. Cause for Consultation or Examination

In relation to the exposure of hazardous chemicals, medical attention should be provided to an employee under the following circumstances:

- [a] Whenever an employee develops signs or symptoms of exposure to a hazardous chemical to which the employee may have been exposed in the laboratory, the employee should be provided with the opportunity to receive an appropriate medical examination.
- [b] When exposure monitoring reveals an exposure level routinely above the action level (or PEL) for an OSHA-regulated substance, medical observations should be conducted in a manner prescribed by the particular local standard.
- [c] Whenever an event takes place in a laboratory which results in the likelihood of exposure to a hazardous substance, such as a spill, leak, or explosion, the affected employee should be provided with the opportunity for medical consultation to determine the need for a medical examination.

2. Type of Medical Attention

All medical examinations and consultations should be performed under the direct supervision of a licensed physician and should be provided without cost to the employee, without loss of pay and at a reasonable time and place. All questions regarding medical consultations and examinations should be directed to the District Safety Department, who should arrange for consultation with the district's medical consultant.

3. Information for the Physician

The following information should be provided to the physician conducting medical consultations and examinations:

- [a] The identity of hazardous chemical(s) to which the employee may have been exposed.
- [b] A description of the conditions under which the exposure occurred, including quantitative exposure data, if available.
- [c] A description of the signs and symptoms of exposure that the employee is experiencing, if any.

4. Physician's Report

A written opinion from the examining physician for any consultations or examinations performed under this Procedure should include:

- [a] any recommendation for further medical attention.
- [b] the results of the medical examination and any associated tests.
- [c] any medical condition revealed during the examination which might compromise employee safety during, or as a result of, exposure to hazardous chemicals found in the workplace.
- [d] a statement that the employee has been informed by the physician of the results of the consultation or examination and any medical condition that may require further examination or treatment.

The written opinion should not reveal specific diagnoses unrelated to occupational exposure, except as noted above.

E. Chemical Procurement, Storage and Disposal

To minimize hazards the purchase and storage of chemicals is to be minimized.

1. Chemical Purchase and Procurement

- [a] Hazardous chemicals are to be ordered in quantities that are likely to be consumed within two school years.
- [b] Chemicals are to be purchased only when needed for specific experiments or research projects. The chemicals should be purchased only in the quantity sufficient for the declared use.
- [c] All chemicals are to be contained in tightly closed, sturdy, and appropriate containers.
- [d] A chemical should not be accepted without being accompanied by the MSDS.
- [e] The container is to be marked with the date when it is received. A chemical that reacts after opening, such as $\text{Ca}(\text{OH})_2$, should also be marked with the date it is opened.
- [f] Chemicals are **NOT** to be accepted if it has been compromised in some way.
- [g] The Chemical Inventory List should be updated each time a chemical is received.
- [h] **Donated chemicals are NOT be accepted.**

2. Storage and Distribution

- [a] All chemicals are to be contained in tightly closed, sturdy, and appropriate containers, provided that chemicals that might produce gas under pressure (such as hydrogen peroxide) shall only be stored in containers with pressure relief closures.¹¹
- [b] If the chemical has been transferred to a secondary container, the new container is to be appropriately labeled as indicated in the appropriate section.
- [c] Chemicals are to be stored based on the reactivity nature of the chemical. Storage patterns should not be based solely on the alphabetical arrangement of chemicals.
- [d] The classification system used for the storage of chemicals is to be displayed in the principle storage area.
- [e] Large containers and containers with reactive chemicals, such as acids and bases, should be on low shelves. No hazardous chemical should be stored on top of a storage shelf or cabinet. Chemicals which are highly toxic shall be stored in unbreakable secondary containers. The container storage area must have a containment system with sufficient capacity to contain 10% of the volume of containers or the volume of the largest container, whichever is greater. Secondary containment must be provided for all corrosives and flammable liquids.
- [f] All shelves on which chemicals are stored should have a lip of approximately 3/4" or greater in order to prevent bottles from sliding off the shelf. The shelves themselves should be protected against collapse.
- [g] Class I flammable or Class II combustible chemicals in excess of 1 gallon are to be stored in approved storage cans or approved flammable chemical storage cabinets. These cans and

cabinets should be kept tightly closed at all times when not using the chemicals themselves. Combustible packaging material should not be stored near flammable chemical storage cabinets.

- [h] **All storage areas are to be kept securely locked when not in use.** Storage and preparation areas are to be accessible only to those persons authorized to use the chemicals and with proper training in the handling and use of the chemicals.
- [i] Those chemicals classified as acute poisons are to be kept in a separate, locked location, which has been labeled as to its purpose.
- [j] Fire-hazard chemicals are to be stored in quantities less than 500 mL.
- [k] Hazardous chemicals are not be distributed to other persons or to other areas of the school without prior approval of the Principal and Curriculum and Instruction Specialist. They should not be transferred to another location without the simultaneous transfer of a copy of the appropriate MSDS, nor should they be transferred without the person receiving the chemicals having had appropriate training in their use, storage and disposal.

3. Inventory

- [a] A Chemical Inventory List should be updated each time a chemical is received.
- [b] The Chemical Inventory List should contain the following information about each chemical found in storage:
 - i. Chemical name
 - ii. Amount in storage (amount present)
 - iii. Chemical Abstract Registry (CAS) Number
 - iv. Disposal information
- [c] Every area in which chemicals are used or stored should have an up-to-date inventory.
- [d] The Principal and the Chemical Managers and Curriculum and Instruction Specialist should maintain a printed copy of the most recent inventory.
- [e] The Chemical Inventory List is to be updated on an annual basis. A copy of the updated Chemical Inventory List is to be sent to the District Safety Department at the end of each school year.

4. Hazard Identification and Labels

- [a] Laboratory chemicals are to be properly labeled to identify any hazard(s).
- [b] If a chemical is stored in its original bottle it should contain the manufacturer's original label, identifying potential hazard(s), the date of purchase, and, if the chemical has a shelf life, the date opened.
- [c] If a chemical has been transferred to a secondary container, the new container is to be appropriately labeled with the chemical name or formula, concentration (if in solution), solvent (if non-aqueous), handling hazards, and name or initials of the person responsible for preparation.
- [d] Labels on incoming containers must not be removed or defaced. Unlabeled bottles are not to be accepted or opened and should be returned to the supplier.
- [e] Unlabeled containers in storage are to be disposed of promptly, as outlined in the section on disposal procedures.

5. Material Safety Data Sheets

- [a] The Material Safety Data Sheets for each chemical used in the laboratory should express recommended limits or OSHA-mandated limits, or both, as guidelines to exposure limits. Typical limits are expressed as threshold limit values (TLV), Permissible Exposure Limits (PEL), or action levels. When such limits are stated, that limit, along with any other information of hazardous characteristics that the chemical presents, should be used to set laboratory guidelines. Those laboratory guidelines may be used by the Science and Curriculum Specialist and Chemical Managers in determining the safety precautions, control measures, and safety apparel that apply when working with that chemical.
- [b] The MSDS received with incoming shipments of chemicals are to be maintained and made readily available to laboratory employees and students. This is most easily accomplished with a 3-ring binder.
- [c] An MSDS for each compound on the Chemical Inventory List is to be available in the department. Chemical manufacturers and suppliers are required to supply one copy of an MSDS the first time the chemical is purchased by the school.
- [d] All laboratory employees will be trained to read and understand the MSDS sheets.

6. Waste Disposal

The instructor, Principal, Chemical Managers, and the Curriculum and Instruction Specialist shall ensure that laboratory chemicals are disposed in compliance with appropriate regulations and in a manner which minimizes damage to human health and the environment.

Every process that uses chemicals has the potential for producing hazardous waste. The purchase or production of chemicals should take into consideration the waste that should be produced and the cost of the waste disposal. The product of a reaction or process only becomes “hazardous waste” when:

- [a] it is hazardous material, and
- [b] it is removed from the reaction system and called “waste.” It is not a waste while still considered “in use.”

Treatment of hazardous waste must be done by a licensed facility. If a process generates a hazardous waste, either that waste must be collected for treatment outside the school or the experimental procedure could be altered to avoid production of the waste, or to continue the experimental procedure until the substance is no longer hazardous.

The following are specific guidelines for hazardous waste disposal:

- [a] Purchase and store only those hazardous chemical supplies that will be needed during the current academic year.
- [b] Potential waste materials are surplus, old, and/or unnecessary chemicals. Every attempt must be made to avoid accumulating such chemicals that have no anticipated use.
- [c] Flammable, combustible or water immiscible material shall never be poured down the drain.

- [d] Separate waste containers should be provided for:
 - i Heavy metal compounds,
 - ii Chlorinated hydrocarbons,
 - iii Non-chlorinated hydrocarbons, and
 - iv Reactive compounds.

- [e] Volumes of acids and bases greater than a few mL are to be neutralized before disposal down the drain.

- [f] “Hazardous waste” are never to be placed in the common solid trash container(s).

- [g] Waste chemicals are to be stored in appropriate containers. Liquids should be stored in screw-cap bottles.

- [h] Paper and similar solid waste, such as contaminated filters, may be stored in plastic bags and disposed through hazardous waste disposal processes.

- [i] Other solid waste chemicals are to be stored in bottles, jars, or plastic-lined sealed boxes, all of which should be correctly labeled.

- [j] The product of projects, experiments or other chemical procedures are to be recycled and/or decontaminated whenever possible.

- [k] All waste containers are to have an up-to-date log of the material that is in the container. **Do not mix different types of hazardous materials since this increases disposal costs.**

- [l] When feasible and safe, a large container of a given waste is to be used instead of small containers of the same material.

- [m] Waste materials should not be allowed to accumulate in laboratories or preparation rooms. The sealed containers should be removed to the designated waste storage location prior to a maximum of 180 days of storage time.

- [n] Solutions containing heavy metals may be further reacted by precipitating the heavy metal as its sulfide, carbonate or hydroxide, as appropriate, followed by filtering and drying as long as this process is included and documented as part of the initial experiment. If the aqueous filtrate is suitable it may be disposed in the sewer after adjustment of the pH. The solid precipitate should be properly labeled and saved for “hazardous waste” disposal.

- [o] Waste materials are to be identified using a chemical identification label ensuring sufficient information for the safe transportation, treatment, storage and disposal. (If the information is incomplete, the Building Budget will have to pay for further analysis.)

- [p] The disposal of hazardous wastes is to follow the guidelines established by the appropriate state and federal regulations.

- [q] Disposal of chemical wastes is the responsibility of the building creating the waste. Periodic disposal services are to be arranged through the Waste Commission of Scott County. **Waste disposal levels must be maintained at EPA smaller conditionally exempt small quantity generator status at all times.**

SECTION 7

Procedures for Inspections

The employee should be alert to unsafe conditions and inform the Principal, Curriculum and Instruction Specialist, and District Safety Department, in writing, when an unsafe condition occurs. The employee and School District should do all within their power to correct unsafe conditions.

- A. Each laboratory supervisor will continuously monitor the presence of safety equipment necessary when laboratory activities use any corrosive substances in the laboratory, a check list of which is provided in Appendix F. The following general standards will apply:
1. Room ventilation of at least 8-12 room air changes per hour.
 2. If room ventilation is inadequate for hazard, Hood for each two involved students with: full open face velocity of 60-100 linear feet per minute.
 3. Drench Shower: high flow of tepid, clean water.
 4. Eyewash: 15 minute, continuous, unaided, gentle flow of aerated, tepid, clean water to both eyes
 5. Fire Extinguisher: fully charged.
 6. If individual goggles are not provided, a Goggle Sanitizer: UV bulb and timer operating properly; goggles always remain for sufficient time to be sanitized between users. The Davenport Community Schools requires all students to purchase individual goggles.

Equipment should be tagged following the inspection, showing the date, inspector, and results. The above safety equipment will be inspected and maintained by the building. Written records will be maintained of all inspections with copies forwarded to the District Safety Department. **Work orders are to be processed for any repairs or advanced testing.**

- B. Inspections in the laboratory by the laboratory supervisor will be conducted at least annually. These general inspections will cover all of the emergency equipment identified above, but also the following items:
1. Gas cylinders are firmly secured.
 2. Chemicals are not stored in the hood in which experimentation is done.
 3. Egress routes are clear of any impediment.
 4. Hazardous chemicals are not stored on top of cabinets or on shelves that do not have lips.
 5. Electrical cords are in good condition.
 6. Rubber hoses are not cracked and are otherwise in good condition.
 7. Other items shown on the "Safety Audit" sheet.

A form for conducting these inspections is shown in Appendix F. Inspection records will be forwarded to and kept by the District Safety Department

SECTION 8

Specific Exposure Control Measures

This section addresses criteria that would invoke the use of specific exposure control measures, which are more stringent than those procedures specified as Standard Operating Procedures or General Laboratory Safety Rules. These specific exposure control measures are designed to reduce the exposure of instructors, aides, students and other employees to especially hazardous chemicals.

Employees are to read and understand these practices before commencing a procedure using one or more of these chemicals.

A. Toxic Chemicals

The MSDS and labels for many of the chemicals used in the laboratory recommend specific limits for exposure. Other limitations may be specified by OSHA-mandated limits. Typical limits are threshold limit values (TLV), permissible exposure limits (PEL), and action levels. When such limits are stated, they should be used to assist the Chemical Hygiene Officer and the teacher in determining the safety precautions, control measures, and safety apparel that apply.

1. When a TLV or PEL value is less than 50 ppm or 100mg/m³ the user should use it in an operating fume hood, glove box, vacuum line, or other device equipped with appropriate traps. If none are available, no work should be performed using that chemical.
2. If a TLV, PEL, or comparable value is not available, the animal or human median inhalation lethal concentration information, LC50, should be used as a guideline. If that value is less than 200 ppm or 2000 mg/m³ when administered continuously for one hour or less, then the chemical should be used in an operating fume hood, glove box, vacuum line or similar device, equipped with appropriate traps. If none are available, no work should be performed using that chemical.
3. Whenever laboratory handling of toxic substances with moderate or greater vapor pressures is likely to exceed air concentration limits, work with such liquids and solids should be conducted in a fume hood, glove box, vacuum line, or similar device, equipped with appropriate traps. If none are available, no work should be performed using that chemical.
4. Examples of toxic chemicals are benzene, chloroform, formaldehyde, bromine, carbon disulfide, carbon tetrachloride, cyanide salts and hydrofluoric acid. **Any chemical on the EPA p-list is prohibited in the Davenport Community Schools.**

B. Flammable Chemicals

In general, the flammability of a chemical is determined by its flash point, the lowest temperature at which an ignition source can cause the chemical to ignite momentarily under certain controlled conditions.

1. Chemicals with a flash point below 200°F (93.3°C) should be considered “fire-hazard chemicals”. Any chemical whose MSDS or label states “flammable” is in this category.
2. OSHA standards and the National Fire Protection Association (NFPA) guidelines on when a chemical is considered flammable apply to the use of flammable chemicals in the laboratory. Specific references are found at www.nfpa.org and www.osha.org.

3. Fire-hazard chemicals in excess of 500 mL are to be stored in a flammable solvent storage area, safety cans, or in storage cabinets designed for flammable materials.
4. Only vented hoods should be used when more than a few mL of fire-hazard chemicals are needed.
5. In any case, fire-hazard chemicals should be as far from sources of ignition as possible.
6. Examples of flammable chemicals are ether (diethyl ether), acetone, methanol, ethanol, glacial acetic acid, and petroleum ether (ligroine).

C. Reactive Chemicals

The most complete and reliable reference on chemical reactivity is the current edition of Handbook of Reactive Chemical Hazards, by L. Bretherick, published by Butterworths Publishers. Reactivity information may be given in manufacturers' MSDS and on labels. Other useful references are cited in NOAA's Chemical Reactivity Worksheet. To get to the worksheet, go to NOAA's website (<http://response.restoration.noaa.gov>), under the Catalogs of Software & Data Sets, scroll down to Planning for Environmental Emergencies.

A reactive chemical is one that:

1. Is described as such by Bretherick, the MSDS, or the label,
2. Is ranked by the NFPA as "3" or "4" for reactivity,
3. Is identified by the Department of Transportation as an oxidizer, an organic peroxide or an explosive in classes A, B, or C,
4. Fits the EPA definition of reactive in 40 CFR 261.23,
5. Fits the OSHA definition of unstable in 29 CFR 1910.1450, or
6. Is known or found to be very reactive with other substances.

Examples of reactive chemicals are ammonium dichromate, nitric acid, perchloric acid, hydrogen peroxide, and potassium chlorate.

Reactive chemicals should be handled with all proper safety precautions, including segregation in storage and prohibition of mixing even small quantities with other chemicals without prior approval and appropriate personal protection and precautions.

D. Corrosive Chemicals and Contact Hazard Chemicals

Corrosivity, allergenic, and sensitizer information is sometimes provided in manufacturers' MSDSs and on labels. Other guidelines on which chemicals are determined to be corrosive can be found in the publications cited in Appendix C.

A corrosive chemical is one that:

1. Fits the OSHA definition of corrosive in Appendix A of 29 CFR 1910.1200,

2. Fits the EPA definition of corrosive in 40 CFR 261.22 (has a pH greater than 12 or less than 2.5), or
3. Is known to be reactive to living tissue, causing visible destruction of, or irreversible alterations of, tissue at the site of contact.

A contact-hazard chemical is an allergen or sensitizer that:

1. Is so identified or described in the MSDS or on the label,
2. Is so identified or described in medical or industrial hygiene literature,
3. Is known to be an allergen or sensitizer.

Corrosive and contact-hazard chemicals will be handled with all proper safety precautions, including wearing safety goggles, gloves tested for the absence of pin holes and known to be resistant to permeation or penetration by the chemical, and a laboratory apron or laboratory coat.

Examples of corrosive chemicals are hydrochloric, sulfuric, nitric, phosphoric and perchloric acids, sodium hydroxide and potassium hydroxide.

E. Reproductive Toxins

A reproductive toxin is a compound that:

1. Is described as such in the applicable MSDS, or
2. Any substance identified as such by the Oak Ridge Toxicology Information Resource Center (TIRC).¹²
3. Examples of reproductive toxins are organomercurial compounds and ethidium bromide, a reagent used with DNA analysis.

No reproductive toxins are allowed in middle or high school laboratories in the Davenport Community Schools.

F. Select Carcinogens

Examples of select carcinogens are benzene, nickel metal dust, and vinyl chloride.

No select carcinogens are allowed in middle or high school laboratories in the Davenport Community Schools.

G. Exposure Potential

The routes of exposure to chemicals are inhalation, ingestion, contact with skin or eyes, or by injection.

1. Inhalation of chemical vapors, aerosols, gases or dusts can produce poisoning through the mucous membrane or the nose, mouth, throat and lungs. The degree of injury resulting from exposure to these chemicals depends on the toxicity of the material, its solubility in tissue fluids, its concentration, and the duration of exposure.

2. Ingestion is extremely dangerous. The relative acute toxicity can be evaluated by determining the LD50, which is defined as the quantity of chemical that will cause the death of 50% of the test animals when ingested in a single dose. Many chemicals will directly damage the tissue of the mouth, throat, nose, lungs and gastrointestinal tract.
3. Contact with skin and eyes can lead to significant chemical injury, including local irritation. In addition, many chemicals can be absorbed through the skin and may cause systemic poisoning. Alkaline materials, phenols, and strong acids can cause permanent loss of vision.
4. Injection of chemicals can occur through mechanical injection from glass or other materials contaminated with chemicals.

SECTION 9

Training Opportunities

The School District is to provide training for all employees. This training should include the transfer of information about the hazards of chemicals present in the District, hazards students likely will encounter in the home and later in adult life, and about sources of information. In particular, the training should cover information found in manufacturers' Material Safety Data Sheets, this Chemical Hygiene Plan, how to contact the Chemical Hygiene Officer for additional information, and the responsibilities of both the district and the employee.

A. Employee Training

Employees are to be trained on the potential chemical hazards in the employee's work areas and on appropriate sections of the Chemical Hygiene Plan.

B. Who Should be Trained?

There are six groups of employees that need unique Chemical Hygiene training.

1. All employees will receive general instruction about the Chemical Hygiene Plan when they are hired.
2. In addition, detailed training is to be provided to science teachers who actually work in a science laboratories.
3. Other teachers who use chemicals in their classrooms, such as industrial technology, art, and family and consumer sciences.
4. Employees who are responsible for receiving and handling shipments of new chemicals or chemical wastes as well as other employees whose assignments may require that they enter a laboratory where exposure to hazardous chemicals might occur should be informed of the potential hazards and appropriate protective measures.
5. Maintenance and Custodial Staff who are responsible for maintaining the physical plant need training about the unique maintenance requirements of facilities needed for safely working with hazardous materials.
6. Administrators that need to insure that employees comply with government regulations, fund compliance costs, and support needed changes should understand the requirements of Chemical Hygiene regulations.
7. Students should receive training by employees appropriate to their level of chemical handling and potential exposure. The education of students is particularly important, since they are near the beginning of their experience with science, chemicals, and chemical safety. As an educational institution, it is a fundamental responsibility of the School District to train all students about the potential chemical hazards they will likely encounter in their lives, and appropriate protective measures.

C. Record Keeping

As indicated in the earlier section, the training of laboratory personnel is to be documented and kept in the employee's file. The Building is to document the training of students.

D. Training Frequency

Employees should receive information and training at the time of their initial employment, and at their initial assignment to a laboratory and prior to assignments involving new exposure situations. Training to refresh their working knowledge should be provided on an ongoing basis.

E. Information Program

Laboratory employees are to be informed of at least the following information:

1. The contents of appropriate governing standards, www.nfpa.org and www.osha.org.
2. The location and availability of the Chemical Hygiene Plan.
3. The location and availability of known reference materials on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory.
4. The use and location of Material Safety Data Sheets.

F. Employee Training Program

1. Laboratory employees are to be trained on the applicable details of the Chemical Hygiene Plan, including a review of the General Rules for Laboratory Safety.
2. The training program should describe appropriate sections of the Standard Operating Procedures, particularly those procedures that require prior approval of the Curriculum and Instruction Specialist.
3. Employees are to be informed as to their responsibilities within the Chemical Hygiene Plan.
4. Employees are to be familiar with the emergency procedures adopted by the School District, including response to spills, fires, explosions, evacuation, and decontamination.
5. Employees are to be trained in measures they may take to protect themselves from exposure to hazardous chemicals, including the location and proper use of protective apparel and emergency equipment.

G. Training of Students

The District requires that students receive instruction in laboratory safety practices that are appropriate to their potential exposure to hazardous chemicals. Training should vary based on their grade level, courses of study, and other factors.

SECTION 10

Emergency Prevention and Response

Laboratory instructors, aides, and other laboratory employees are to be familiar with emergency procedures in order to prevent and reduce the impact of laboratory accidents.

A. Standard Emergency Procedures

1. Emergency procedures should address a failure in the ventilation systems, evacuation and fire response, or the breakdown of other procedures to limit exposure of employees to hazardous chemicals. These emergency procedures should be established and should be posted in appropriate public places, and will include the following:
 - [a] Routes of egress from the laboratory.
 - [b] Procedures by which to notify appropriate individuals.
 - [c] Telephone numbers of fire, police, ambulance, and school authorities.
 - [d] Procedures for repair or correction of the problem that caused the emergency.
2. There should be a telephone in each laboratory, which should have access to an outside line, for the purpose of emergency response.
3. Specialized equipment such as self-contained breathing apparatus (respirators) require specialized training prior to use.
4. The laboratory should have a plan for everyone to follow if an evacuation is necessary. The employee should be sure that he/she knows the main and alternate routes, as well as the procedure for accounting for each person in the laboratory.
5. The employee should call for assistance if there is any doubt about his/her ability to handle an emergency. The most appropriate response to a serious fire is evacuation and subsequent action by the fire department.
6. Individual items of safety equipment and their proper use should be discussed in District and school procedures.

B. Specific Emergency Response Procedures

The employee is to follow procedures that have been established and practiced.

1. When helping another person, the employee should evaluate the potential danger to himself/herself before taking action. The following actions are recommended:
 - [a] Tell anyone in the area about the nature of the emergency.
 - [b] Do not move any injured persons unless they are in immediate danger from chemical exposure or fire.
 - [c] Keep victims warm.

[d] Report the nature and location of the emergency to the school office.

[e] Follow specific protocols identified for mercury spills to avoid further contamination of school and community. This protocol involves evacuating the area, zoning off the area, contacting Operations who will contact the Davenport Hazardous Materials Division.

C. First Aid

Suitable first aid equipment is to be available in the laboratory area: a general first aid kit, small bandages for minor cuts and abrasions, and perhaps a blanket.

Personal injury beyond the purely superficial requires professional medical treatment. Such treatment should be obtained by calling the Fire Department at 911.

The school should train laboratory teachers, instructors and aides in first aid so they can render assistance until medical help can be obtained. The training should occur during contracted hours, and at no cost to the employees.

D. Emergency Equipment

The School District, Chemical Hygiene Personnel, and laboratory instructors are to ensure that adequate emergency equipment is available in the laboratory and inspected periodically to ensure that it is functioning properly. Laboratory personnel should be properly trained in the use of each item. Students should also be instructed to use a safety equipment. Safety equipment that should be available in the laboratory include:

1. Eyewash fountain
2. Fire extinguisher of an appropriate type
3. Safety drench shower
4. Telephone with access to outside phone line
5. Identification signs

Refer to the Classroom Safety Audit Form in Appendix F.

E. Fire Response

1. Fire Prevention: The best way to fight a fire is to prevent it. Fires can be prevented or their severity considerably reduced by proper housekeeping and by thoughtful reflection about what is being done. This includes the prompt removal of waste, separation of flammable liquids from combustible material, storage of only limited quantities of flammable material, and the maintenance of unobstructed aisles and exits.
2. Dealing With a Fire: When a fire occurs, the following actions should be followed, *depending on its severity*:
 - [a] A small fire fed by a constant supply of fuel, such as a propane fire, can usually be extinguished by turning off the source of fuel.

- [b] A fire contained in a small vessel should be suffocated by covering the vessel. The vessel should not be picked up, nor covered with dry towels or cloths.
 - [c] Nearby flammable materials should be removed to avoid spread of the fire.
 - [d] If a fire burns over a larger area, all persons should evacuate the area, except those trained and equipped to fight structural fires.
 - [e] For a significant fire, the fire alarm should be activated and the Fire Department called.
 - [f] The fire extinguisher should be used only by trained people, and only from a position from which escape is possible.
 - [g] Firefighters should be informed of what chemicals are involved. A copy of the current Chemical Inventory List should be available outside the work area.
 - [h] Laboratories should be posted with the National Fire Protection Association diamond, which provides much emergency information. The information on the NFPA warning must be current.
 - [i] Fires involving laboratory chemicals increase the possibility of explosions. Special care should be taken to keep fire or excessive heat from volatile solvents, compressed gas cylinders, reactive metals and explosive compounds.
 - [j] As soon as possible, all extinguishers that were used should be recharged or replaced with full extinguishers.
3. Personal Injuries Involving Fires: Persons whose clothing is ablaze should be drenched under the safety shower or “drop and roll.” If the shower is not convenient, the individual may be doused with water, covered with a blanket, or other procedure to quench the fire. After the fire is out, the individual should be kept warm to avoid shock and exposure. Medical attention should be promptly sought.

F. Chemical Spills on Personnel

1. For spills covering small amounts of skin, the area should be washed with flowing water for several minutes.
 - [a] Jewelry should be removed to facilitate cleaning.
 - [b] If there is no visible burn, the area should be washed with water.
 - [c] After washing, the MSDS should be consulted to determine if any delayed effects should be expected.
 - [d] If a burn is visible, medical attention should be sought after the washing has been completed.
2. For larger spills, the same procedures should apply, except that it may be appropriate to use the safety drench shower to assure thorough and complete washing.
3. For spills on clothing and whenever necessary, the clothes should be removed as quickly as possible.
 - [a] Shoes and jewelry should be removed to facilitate washing.

- [b] The safety drench shower should be used for fifteen minutes unless the spill is known to be restricted to less harmful substances.
 - [c] Special care should be taken to prevent chemicals from entering the eyes.
 - [d] Any affected skin should be thoroughly flooded for fifteen minutes, and the washing should be resumed if pain continues.
 - [e] No creams, salves or lotions should be placed on the burn.
 - [f] Medical attention should be sought as soon as possible.
 - [g] Contaminated clothes should be washed separately from other personal clothing.
3. Dealing with Medical Help: Medical personnel should be fully informed as to the chemical involved in the spill, and of the circumstances of the spill.
 4. Splashes in the Eyes: The eye(s) should be immediately flushed with tempered potable water from a gently flowing source for at least fifteen minutes. The eyelids should be held away from the eyeball while the eyeball is moved up, down, and sideways to wash behind the eyelid(s). Contact lenses should be removed if they are not stuck in place. If they are stuck, get immediate expert medical assistance.

First aid should be immediately followed by treatment by qualified medical personnel.

G. Other Accidents Involving Personal Injury

1. Anyone overcome with smoke or fumes should be removed to uncontaminated air and treated for shock. The rescuer should evaluate the possibility for harm before entering or continuing to remain in a toxic environment.
2. If hazardous chemicals are ingested, the first aid treatment shown on the label or in the Material Safety Data Sheet should be undertaken.
3. If an injured person is not breathing, the rescuer should provide mouth-to-mouth resuscitation, using appropriate methods. Special training is required to provide cardiopulmonary resuscitation (CPR).
4. Bleeding should be controlled by compressing the wound with a clean cloth or other appropriate compress. The injury should be elevated above the level of the heart. After bleeding is controlled, the injured person should be covered to avoid shock. Medical attention should be called as soon as possible.
5. If a person is in contact with a live electrical circuit, the power should be shut off at the most convenient switch. The person should not be contacted until the power has been disconnected.
6. Never place anything in the mouth of an unconscious person.

H. General Chemical Spills

1. All spills should be cleaned up promptly. Any individual at risk of involvement should be warned about the spill.

2. Local procedures should be established and followed for determining when evacuation is necessary.
3. In a spill, chemicals often spread increasing the damage, so absorbent material should be used to surround the spill area. After the spill has been contained, it can be cleaned up with appropriate tools, including commercial spill control kits, for example.
4. If the spill is for an acid or base, it may be neutralized by an appropriate solid:
 - [a] Sodium bisulfate will neutralize bases.
 - [b] Sodium bicarbonate will neutralize acids.
5. When dry, the spilled material must be treated as chemical waste.

I. Accident Reports

All accidents and near accidents should be carefully investigated. The results of that investigation and recommendations for the prevention of similar occurrences should be forwarded to the Principal, Curriculum and Instruction Specialist, and District Safety Department. Accident reports should be kept on file, as indicated in the Record keeping section of this document

Footnotes:

- ¹ Task Force members included: Keith Berry (chair, University of Puget Sound), Pat Redden (St. Peters College), Douglas Mandt (Sumner, WA. High School), Ron Perkins (Greenwich High School), and William "Jack" Breazeale (Francis Marion College).
- ² A. "Chemical Hygiene Plan," prepared by the State of Kentucky.
B. Scott Stowell, "Chemical Hygiene Plan," prepared by the Spokane, WA School District.
C. Safety in the Academic Chemical Laboratory, 5th ed., American Chemical Society, Washington, DC, 1990.
D. Jay A. Young, Warren K. Kingsley, George H. Wahl, Jr., Developing a Chemical Hygiene Plan, American Chemical Society, Washington, DC, 1990.
- ³ See Appendix A for the full text of WAC 296-62-400.
- ⁴ Young, Kingsley, and Wahl, Jr., Developing a Chemical Hygiene Plan, American Chemical Society, Washington, DC, 1990, define the chemical laboratory as follows:
A. Chemical manipulations are carried out on a laboratory scale.
B. Multiple chemical procedures are used.
C. Protective laboratory practices and equipment are available and commonly used.
D. The procedures involved are not part of a production process whose function is to produce commercial quantities of materials, nor do the procedures in any way simulate a production process.
- ⁵ See reference (4), section 2.2.4 (page 17) for details
- ⁶ Safety stoppers have internally enlarged holes to reduce the force needed to insert glass tubing. Contact the Chemical Hygiene Officer for purchase source.
- ⁷ NFPA - National Fire Protection Association, Batterymarch Park, Quincy, MA 02269; www.nfpa.org
- ⁸ [CGA P-1 919965), "Safe Handling of Compressed Gases" Compressed Gas Association: www.cganet.com
- ⁹ See sections on training, monitoring, and record keeping for further information on the use of respirators.
- ¹⁰ ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers, is located at 1791 Tullie Circle, NE, Atlanta, GA 30329. www.ashrae.org Its recommendations have been accepted by the ACGIH (American Conference of Governmental Industrial Hygienists.)
- ¹¹ See specifications for labeling in Section 4, which follows.
A. The spring-loaded closure should not be disabled,
B. The flame-arrestor screen should be kept in place,
C. The arrestor screen should be replaced when punctured or damaged, and
D. The arrestor should never be immersed in the liquid.
- ¹² TIRC: www.ornl.gov/TechResources/tirc/hmepg.html, (615) 576-1746.

by D. Trapp

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