HOUSATONIC COMMUNITY COLLEGE

CHEMICAL HYGIENE PLAN

CHEMICAL LABORATORY

Revised September 2010 by Elizabeth Steeves, HCC Professor of Chemistry

I. Purpose and scope.

To protect all personnel who enter the chemistry laboratory form health hazards associated with hazardous chemicals used or handled in the laboratory and to keep exposures below the limits specified in 29 CFR part 1910, subpart Z (2), sections (e) (l) (i), (e) (l) (ii), and (c) respectively. Further, to indicate specific measures that are to be taken to ensure laboratory employee protection, (2) section (e) (3).

II. Personnel

A. The Chemical Hygiene Officer is the Facilities Director.

B. The Chemical Hygiene Officer's representative for the chemistry laboratories is the Laboratory Supervisor

C. Laboratory employees shall include: Educational Assistants, Student Workers, maintenance and custodial workers, security officers and all instructors (full or part-time).

D. Students.

E. Visitors.

III. Standard operating procedures.

A. Use of personal protective equipment.

1. Approved safety glasses must be worn whenever chemicals or apparatus are in use in the laboratory. Such eyewear must be able to protect against chemical splash as well as against flying glass.

2. The wearing of contact lenses is discouraged but if it cannot be avoided, the individual must wear full goggles meeting ANSl Z87 specifications and be reminded to rinse contact lenses upon leaving the laboratory.

3. Students are to purchase and maintain personal eyewear. Other eyewear will be sterilized and cleaned after each use.

4. Instructors shall wear appropriate personal protective equipment and clothing as necessary.

5. Aprons (plastic or rubberized) are to be worn when handling larger quantities of chemicals as when preparing student's supplies. Larger containers must be carried to and from storage rooms in the plastic secondary containers provided. Only qualified instructors will carry out

such transfers. Students will only use the small containers prepared for their use.

6. It is recommended that students provide themselves with suitable aprons for their personal use.

7. Heavy-duty neoprene gloves are to be used when handling larger quantities of corrosives and toxic materials. Distribution of such substances into the small student-use containers will be performed in a fume hood.

8. Light duty latex or plastic gloves are available for student use upon their request. Students are to be informed of the availability of these items. Students will be required to wear such gloves if a potentially toxic substance has to be used even in small amounts.

9. Suitable tongs are available for the transfer or handling of hot objects and are to be used when such materials have to be manipulated.

10. It shall be the responsibility of the laboratory instructor to ensure that personal protective devices, furnished by the college be kept clean and in good condition.

B. Work practices.

1. Precautionary information.

   Students in a community college chemistry course are to be protected from any hazard or harm that pre-planning can anticipate. It must be kept in mind that they are young, inexperienced and frequently lack the discipline to avoid accidents unless they are carefully supervised and informed. The safest approach is to assume the worst scenario and strive to forestall it. Accordingly, students will not be allowed to handle large quantities of any chemical, they will be supervised at all times, and they will be informed of all safety requirements and practices at the time of need.

2. Only those chemicals needed for a particular experiment are to be available in the laboratory proper. All other chemicals are to remain in the storeroom. Chemicals are to be diluted when possible and, in any event, dispensed in small quantities (dropper bottles whenever possible for liquids) rather than in bulk. The laboratory ventilation system is to be in operation during laboratory periods.

3. Chemicals left after a laboratory experiment is over are to be returned to storage by the instructor. Waste will be collected in suitably marked containers and will be disposed of as described in such texts as:

Prudent Practices for Disposal of
Chemicals from Laboratories
National Academy Press
Washington, D.C.

and outlined in the HCC Math/Science Department Policy and Procedures for Chemical Waste Management (Appendix A)

4. In general, the handling of chemicals shall follow the suggestion in such texts as:

Prudent Practices for Handling
Hazardous Chemicals in Laboratories
National Academy Press
Washington, D.C.

C. Personal Hygiene Practices

1. Wash before leaving the laboratory

2. There is no smoking allowed in laboratory, stock room or preparation areas.

3. No consumption of food or drink is permitted in any laboratory, storage room or preparation rooms.

4. No application of cosmetics is permitted in the laboratory, storage or preparation rooms.

5. No loose, floppy clothing, open toed shoes, dangling jewelry or unconfined long hair is permitted in the laboratory, storage or preparation areas.

IV. Special Procedures

A. Flammable Chemicals

Storage is to be in original containers in the cabinets provided. Said cabinets to be vented and grounded as required by current codes.

Purchase of flammables is to be restricted to small containers to ensure rapid use and to avoid potential hazards such as peroxide formation in ethers.

For student use, all such chemicals shall be dispensed in the smallest possible bottle for a particular experiment. Dropper bottles are to be used when practicable to minimize spills. These bottles are to be labeled with the name of their contents and a prominent **FLAMMABLE** label is to be affixed.

Open flames are to be avoided when such chemicals are in use and the laboratory ventilation is to be on.

B. Corrosive and Contact Hazard Chemicals

Storage is to be in original containers which will be kept in dedicated cabinets.

Distribution for laboratory use by students will involve placement into dropper bottles when practicable in small containers in any event. Such containers shall be properly labeled and a **CORROSIVE** label is to be affixed when such containers are to be used by students.

All containers are to be returned to storage by the laboratory instructor upon completion of the experiment.

C. Reactive Chemicals

Such chemicals are to be stored in their original containers with manufacturer's warning labels affixed.

Minimal quantities of these substances will be kept on hand in the stock room.

Small quantities will be dispensed for student use in the laboratory and such dispensing will be in containers clearly marked with the nature of the chemical as well as warnings of incompatible substances.

Clear directions regarding the use of such substances will be provided to students.

Return of unused materials will be made following the end of an experiment.

D. Toxic Chemicals

Storage of the smallest quantities available for yearly use will be in the inner stockroom and that room is to be locked when not in use. Distribution of keys to this room is limited to the Chemical Hygiene Officer, the Laboratory Supervisor, the full-time chemistry faculty and Security.

Use by students is to be avoided when possible, kept to an absolute minimum when it is not possible to substitute and supervised closely by the laboratory instructor.

Bottles shall be clearly labeled with their contents and a **POISON** label is to be affixed.

None of these substances are to remain in the laboratory after use but are to be returned, by instructor, to the inner storage room.

E. Chemicals whose hazardous characteristics are not known.

Such chemicals are to be treated as potentially hazardous. It is better to err on the side of caution that to regret a potentially serious mistake.

It is recommended that such chemicals not be used and disposed of by a state-approved facility.

V. Potential Carcinogens

Their use is to be avoided whenever possible. For example, if a non-polar solvent is needed, hexane will substitute for benzene. If an aromatic is necessary, toluene replaces benzene, etc.

Where it is not possible to substitute or to avoid use then use will be kept to an absolute minimum, hoods will be used, gloves will be worn and no chemicals of this nature will be kept in the laboratory proper.

Containers will be properly labeled and **POISON** stickers will be applied.

Appropriate warnings will be given to students and supervision will be strict.

Disposal will follow the directions given in such sources as:

Potentially Carcinogenic Chemicals
Information and Disposal Guide
Armour, Brown, McKenzie, et al.
University of Alberta and the
Cross Cancer Institute
Edmonton, Alberta Canada

VI. Control Measures

A. Use of available information

1. Labels

All substances are to be stored in their original containers with vendor labels prominently affixed.

Distribution for student use will be in the smallest possible quantity for a particular exercise.

Dropper bottles are to be used for liquids whenever practicable.

All containers for student use shall be labeled with the name of the chemical and an appropriate warning label shall be prominently displayed. These labels include: **FLAMMABLE, CORROSIVE, AND POISON**.

One exception to the labeling requirement is the provision of "unknowns" to be provided to students for identification as part of their training. Such unknowns shall be non-hazardous whenever possible. An announcement to all students of the possible existence of a potential hazard to be included as an "unknown" will be made and clear directions for protection will be made.

"Unknowns" will be distributed in the smallest possible container and identified by a clearly displayed letter or number. A record of the true identity of the substances shall be kept by the instructor. Names of substances will be listed next to the identifying letter or number.

Upon completion of an assignment substances will be returned to their original containers or disposed of in an approved manner.

2. Material Safety Data Sheets (MSDS)

All incoming chemicals shall be accompanied by MSDS provided by the vendor.

The MSDS will be kept in binders and remain in the office of the Laboratory Supervisor for ready access and perusal in accordance with the right-to-know regulations.

These sheets are to provide basic information for identifying hazardous substances as well as potential problems attendant to their use.

In addition, the sheets serve as sources of information regarding care in case of injuries as well as proper disposal information.

Maintenance of the file shall be the responsibility of the Chemical Hygiene Officer's representative in the chemistry laboratory.

Because a complete file of all MSDS is so voluminous, a sub-file of MSDS for the chemicals used in a particular experiment is placed in a folder and included with the substances used for that experiment. The sub-file is easily and quickly perused by laboratory instructors and appropriate safety warnings or other directions are promptly given to students. The folder is accessible by students which meets the intent of the right-to-know laws.

3. Other sources

A variety of texts, manuals, articles from the various chemical journals, and information gleaned from seminars and workshops is available in the chemistry laboratory office. These materials provide information not normally found on labels.

These include:

a. Improving safety in the Chemical Laboratory
   A Practical Guide
   Second Edition
   Edited by Jay A. Young
   John Wiley & Sons, Inc.

b. Safe Storage of Laboratory Chemicals
   Second Edition
   Edited by David A. Pipitone
   John Wiley & Sons, Inc.

c. Guidelines for Laboratory Design
   Health and Safety Considerations
   Louis DiBerardinis et al.
   John Wiley & Sons, Inc.

d. Prudent Practices for Handling Hazardous Chemicals in Laboratories
   Committee on Hazardous Substances in the Laboratory
   Assembly of Mathematical and Physical Sciences
   National Research Council
   National Academy Press, Washington, D.C.

e. Prudent Practices for Disposal of Chemicals from Laboratories
   Committee on Hazardous Substances in the Laboratory
   Assembly of Mathematical and Physical Sciences
   National Research Council
   National Academy Press, Washington, D.C.

f. Hazardous Chemicals
   Information and Disposal Guide

M.A. Armour, L.M. Browne, G.L. Weir
Second Edition
University of Alberta Press
Edmonton, Canada T6G 2G2

g. Potentially Carcinogenic Chemicals
Information and Disposal Guide
M.A. Armour, L.M. Browne, P.A. McKenzie,
D.M. Renecker of the Department of
Chemistry at the University of Alberta
And
Rosemary A. Bacovsky
Cross Cancer Institure, Edmonton, Alberta
University of Alberta Press
Edmonton, Alberta, Canada T6G 2G2

h. The Merck Index
Merck and Co., Inc.
Rahway, NJ

i. Aldrich Catalog Handbook of Fine Chemicals
Aldrich Chemical Co.
Milwaukee, WI

j. School Science Laboratories
A Guide to Some Hazardous Substances
U.S. Consumer Product Safety Commission
Washington, D.C.

B. Storage

1. Chemicals are grouped by class such as oxidizing agents, reducing agents, water reactive substances, acids, bases, etc. and each class stored separately from the others.

   Flammables are stored in dedicated flammable storage cabinets that are vented according to local code as well as properly grounded.

   Acids are stored in dedicated acid cabinets and kept separate from bases, which are stored in dedicated corrosives cabinets.

2. Purchase of chemicals is generally restricted to smaller-sized containers to avoid the possibility of deterioration. Quantities should not exceed a two-

year supply whenever practicable. Disposal of small quantities will follow the practices and procedures in previously cited works. Larger quantities will be disposed of by utilizing the current contract disposal firm empowered by the state to deal with its institutions.

3. The chemical storage area is served by an automatic system that provides venting of storage area air to outside air on a continuous basis.

   Maintenance of the storage area is the responsibility of the Chemical Hygiene Officer's Representative and custodial and maintenance workers will perform their functions, in this space, under his supervision.

4. Most chemicals are stored in an inner storeroom. This room opens into a preparation area, which, in turn, opens into the laboratory proper. The preparation area doors are equipped with locks having very limited distribution. In addition, the laboratory proper is secured by locked doors leading into the hallways of the department.

C. Housekeeping

1. Criteria

   Bench tops shall be kept clean, dry and free of extraneous materials.

   Aisles shall be kept clear of any impediments. Stools are not permitted for use by students.

   Storage areas shall be kept clean and tidy. No chemicals are to be stored on the floor.

   Doors to halls open inwards and must be kept free of any encumbrance.

2. No unlabeled containers shall be permitted. No double labeling is allowed. If a container is used for another substance or for a different concentration of the same substance the container must be washed, dried and all old labeling removed before new labels are affixed.

3. Spill cleanup procedures

   The laboratory instructor must be notified of any spills. Containers are provided throughout the laboratory as well as the preparation and stockrooms. These are filled with absorbent material and are labeled for general spill cleanup. Special containers contain acid spill cleanup materials and others contain cleanup materials for handling alkaline spills

Neutralization of acid spills is indicated by cessation of bubbling of the calcium carbonate contained in the absorbent. Alkaline spill cleanup materials contain tartaric acid and proper neutralization will be tested by a suitable indicator such as litmus.

Following absorbance and neutralization, materials are to be place in plastic bags and secured prior to placing in the waste container for proper disposal.

DO NOT add water to spills – this merely increases the volume to be treated and has no significant benefit.

A mercury spill kit is provided for the proper handling of this substance. Mercury thermometers are being replaced by non-mercury types as requirements permit.

4. Handling of wastes shall follow the practices outlined in the HCC Math/Science Department Policy and Procedures for Chemical Waste Management as suggested in Prudent Practices for Disposal of Chemicals from Laboratories.

   Where in-house disposal is not practicable or safe, the services of the current state approved disposal service will be engaged for proper disposition.

5. Broken glass shall be placed in the special containers provided and **NOT** in the regular trash containers

D. Inventory

A complete inventory of all laboratory chemicals has been taken and forms part of the appendices to this plan. (Appendix B)

The inventory lists chemicals by name and includes a variety of synonyms as appropriate. It is organized by shelf, with chemicals in a shelf being listed alphabetically. Shelves contain chemicals of a similar and compatible group.

The inventory sheet also lists the unit sizes, chemical grades, shelf or cabinet and the amounts on hand.

The inventory shall be updated yearly using a simple manual count.

The Laboratory Supervisor shall be responsible for the inventory.

VII. Training and Information

1. Chemistry Instructors shall be familiar with the substances in use, their hazards and incompatibilities, proper disposal thereof, etc. A listing of common chemical incompatibilities will be furnished to each instructor. (Appendix C) Instructors will also be given a copy of the Housatonic Community College Math/Science Department Policy and Procedures for Chemical Waste Management.

2. Basic training in laboratory safety may be satisfied by attendance at formal courses, taking a self-paced course or by reading some of the texts referenced in section VI. A. 3. above such as Improving Safety in the Chemical Laboratory; a Practical Guide, 2nd Edition.

3. Instructors shall be familiar with the operation of basic safety devices such as hoods, fire extinguishers, fire blankets, eyewash fountains, and safety showers. They shall also be familiar with the location of and operation of the main gas shut-off valve. Instructors will be provided with Room Layout Diagrams highlighting the safety features of their particular laboratory. (Appendix D.)

4. Instructors will provide students with printed sheets outlining safety procedures in the laboratory. (Appendix E.) Instructors will provide instruction during the first laboratory session covering all safety rules and guidelines. This instruction will include the viewing of the 1991 American Chemical Society video "Starting with Safety; an Introduction for the Academic Chemistry Laboratory". The safety features of the individual laboratory; exits, fire extinguishers, fire blankets, safety showers, telephones, hoods, eye-wash fountain, etc. will also be highlighted by the instructor. A quiz on safety items (Appendix F) will be administered to ensure student comprehension of safety procedures.

5. Instructors will be provided with a copy of the Housatonic Community College Science Lab Student Safety Contract (Appendix G) to distribute to students and will collect and maintain for one year the signed student contracts. Students will also be given a copy of this contract for their personal records.

6. Instructors shall be familiar with basic first aid measures. A standard first aid course involving CPR training is strongly urged.

7. Instructors will be provided with and sign receipt of the Housatonic Community College Science Department Laboratory Instructor Safety Rules and Procedures. (Appendix H)

8. Instructors will be provided with a copy of the Inventory of Laboratory Supplies. (Appendix I)

9. Instructors will be provided with a copy of this Chemical Hygiene Plan.

10. The safety responsibilities of instructors and students in the laboratory classroom are outlined in the "HCC Safety Standard" which is included in every College Course Outline for all chemistry courses taught at Housatonic Community College. (See Below)

HCC Safety Standard

Instruction covering all safety rules and guidelines will be provided by the instructor during the first laboratory session. The safety features of the individual laboratory will also be highlighted by the instructor. Students are expected to read and understand the rules of the HCC Science Laboratory Student Safety Contract. The students will then sign this contract signifying that they have been instructed and understand the requirements for safety pertaining to their course. The student and instructor will each keep a copy of this contract. Students must come to the laboratory prepared for the laboratory activity. Students must abide by the safety rules and guidelines which may include wearing personal protection equipment. Failure to do so may result in removal from the laboratory by the instructor.

Proper techniques and safe procedures will form an integral part of all laboratories during a semester.

The Laboratory Supervisor, assisted by the current members of the Math/Science Department Safety Committee, will distribute the above mentioned materials to each new chemistry instructor at the beginning of the their employment or upon revision of these materials.

VIII. Emergencies

A. Procedures for Personal Injuries

1. Minor burns are to be treated by immediate immersion into cold water or by the application of cold, wet towels if immersion is not possible. Keep water cold and replace packs frequently.

   DO NOT APPLY ANY GREASES, OINTMENTS OR SIMILAR SUBSTANCES.

   Direct the individual to the appropriate medical service following preliminary treatment.

2. Minor cuts are to be washed with copious flow of tap water followed by the application of a sterile dressing held in place by suitable means.

3. Serious cuts will be treated with the intent of slowing blood loss while the appropriate medical service (if necessary the emergency services (911) are summoned by the Public Safety/Security office by dialing ** from the Chemistry Laboratory). The individual is to be kept warm and the part elevated if possible. Apply pressure directly to the wound using a suitable pad.

4. Chemical Splash

   a. Eye – Hold eyes open and flush for at least fifteen minutes using eyewash fountain. (if necessary the emergency services (911) are summoned by the Public Safety/Security office by dialing ** from the Chemistry Laboratory).

      Identify chemical if possible for information or physicians.

      Even mild cases should be referred to a nurse or a private physician.

   b. Large scale – use safety shower – remove contaminated clothing while under shower – summon appropriate medical service.

      Identify chemical agent as for eye splash.

5. Toxic or irritant vapor.

   Remove all persons from lab. Close doors after turning off main gas control valve. Summon emergency services if leak is serious. Otherwise allow ample time for thorough venting…and do not allow students to re-enter until vapors have been removed.

6. Ingestion of a substance

   Give copious quantities of water. **DO NOT INDUCE VOMITING UNLESSIT IS KNOWN FOR CERTAIN THAT THE SUBSTANCE IS NOT CORROSIVE!** Summon appropriate medical services via the Public Safety/Security office by dialing ** from the Chemistry Laboratory). Identify the substance ingested for medical personnel. The U-Conn Poison Control Center is manned 24 hours a day and can be reached at 1-800-343-2722. Laboratory phones cannot call outside. In case of need, such services are contacted by the Public Safety/Security office by dialing ** from the Chemistry Laboratory.

7. In the event of ANY one of the above Personal Injuries, the Instructor is required to complete and submit and HCC Science Department Accident Report (Appendix J) to the Department Chairperson within 24 hours of the accident.

B. Spills

Such events should be minor since no large quantities of chemicals are on hand. Apply absorbent material found in crocks at various locations in the laboratory and storage and preparation areas.

DO NOT ADD WATER – this merely adds to the volume to be treated. Collect absorbed spill and place in one of the containers provided in various locations.

Neutralize or render harmless as discussed in Prudent Practices for Disposal of Chemicals from the Laboratories and dispose of by appropriate method.

C. Fires

1. Very small tabletop fires may be smothered.

2. Larger fires call for immediate evacuation of students who are to be directed to pull the fire alarm located in the hallway outside the laboratory.

   The instructor may use an extinguisher to put out the fire if deemed possible but **ONLY AFTER STUDENTS ARE ON THEIR WAY OUT** and the fire alarm sounded. The Fire Department is automatically summoned by pulling the alarm.

   Shut off electricity, close main gas valve and close doors. Evacuate, await fire department and stand by to offer information regarding the nature of the fire as well as information regarding possible hazards.

D. Security violations

Call Security officers by dialing ** on the laboratory telephone. Describe problem.

E. Power Failures

The laboratory is equipped with emergency lighting that will go on automatically when power is lost.

Close main gas valve by depressing the "Gas Shutoff" button located near the telephone in each chemistry laboratory. Have students leave area and await power restoration or shutdown of college. Lock doors.

F. Testing of emergency equipment

1. Fire extinguishers.

   Inspected monthly by Security

2. Safety showers, eyewash fountain and fire blankets are to be inspected monthly by the Laboratory Supervisor.

3. Hoods shall be tested on a monthly basis using a flow-metering device to assure proper operation by the Laboratory Supervisor.

4. Telephone shall be tested daily by the instructor. Failure shall be reported immediately to the Information Technology Department.

G. Evacuation of the Building

As outlined in the Housatonic Community College's Emergency Preparedness Plan, students are to exit the laboratory immediately as indicated by the public address system or the Fire Alarm. The instructor should ensure that all Bunsen burners are extinguished and the main gas valve is closed prior to exiting the laboratory. Students should follow the Emergency Evacuation Route specified on the display next to the laboratory door.

IX. Laboratory visitors

Casual visitors are not permitted during laboratory periods. Official visitors, supervisors, colleagues, etc. shall be required to wear safety glasses if chemical manipulations are being performed or if the possibility of breaking glass exists.

The laboratory shall be locked when the instructor is not in the room

X. Review

This chemical hygiene plan shall be reviewed annually by the Math/Science Department Safety Committee and revised and updated if necessary.

XI. Appendices

A. HCC Math/Science Department Policy and Procedures for Chemical Waste Management, April 2008.
B. HCC Chemical Inventory
C. Common Incompatible Chemicals
D. Chemistry Laboratory Room Layout Diagram
E. General Laboratory Procedures and Laboratory Safety
F. Chemistry Laboratory Safety Quiz
G. HCC Science Lab Student Safety Contract
H. Housatonic Community College Science Department Laboratory Instructor Safety Rules and Procedures.
I. Inventory of Laboratory Supplies
J. HCC Science Department Accident Report

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Revised by Chemistry Faculty Date

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Reviewed by Math/Science Chairperson Date

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Reviewed by Math/Science Laboratory Supervisor Date

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Received by Chemical Hygiene Officer Date