# Department of Forest Products

## Chemical Hygiene and Safety Plan

**February 29, 2008**

## INTRODUCTION

**The primary purpose of this safety plan[1] is to establish operating guidelines that will provide the employees in Department of Forest Products a safe and healthy working environment. Much of the contents of this plan are based on the OSHA Laboratory Standard 29 CFR 1910.1450 (Appendix A). Also:** OSHA Laboratory Standard 29 CFR 1910.1450. **The requirements of the Laboratory Standard are directed primarily toward good chemical hygiene practices for university laboratories and state research facilities[1]. The requirements of the OSHA Laboratory Standard are directed primarily toward good chemical hygiene practices for university laboratories and state research facilities[2]. Detailed steps of how to achieve the safety standards as required by OSHA are not spelled out in the document, but are left to each laboratory. Using the guidelines, each laboratory is expected to develop and enact a chemical hygiene plan that is tailored to meet the specific requirements of the laboratory's activities. Since laboratory activities change, provisions are also made for the review and update of the chemical hygiene plan.**

[1]**This document is a continued revision of the original 1992 Forest Products Laboratory Chemical Hygiene and Safety Plan. This plan will be reviewed and updated every three years by the FPD Safety Committee or as requested by the Department Head.**

[2]**Mississippi universities and state research facilities are not currently mandated to follow OSHA requirements. However, MSU is required to follow EPA hazardous waste disposal procedures.**

## RESPONSIBILITIES

**The Mississippi State University (MSU) Hazardous Waste Office is responsible for the disposal of hazardous waste. The FPD Chemical Hygiene Officer is responsible for coordinating those activities with project leaders, researchers and the MSU Hazardous Waste Office. The MSU guidelines for disposal of hazardous waste can be found at the MSU Office of Regulatory Compliance web site (http://www.orc.msstate.edu/hazardous/). Each person who works with materials that are discarded as hazardous waste must have an annual training course that meets the MSU regulatory requirements.**

**Likewise, purchasing, use and disposal of radioactive waste from the FPD fall under the guidelines of the Mississippi State Health Department and the MSU Radiological Safety Officer (http://www.orc.msstate.edu/radiological/policies.php).**

**Department Head. The Department Head has ultimate responsibility for chemical hygiene within the FPD and must with other administrators provide continuing support for the chemical hygiene plan throughout the entire FPD.**

**Chemical Hygiene Officer.** **The chemical hygiene officer is appointed by the Department Head and must work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices. Other responsibilities are as follows:**

**Monitor procurement, use and disposal of chemicals used within the FPD.**

**See that appropriate audits are maintained.**

**Help principal investigators develop precautionary measures and adequate facilities.**

**Know the current legal requirements concerning regulated substances.**

**Seek ways to improve the chemical hygiene plan.**

**Project Leader/Laboratory Supervisor.** **The project leader, or principal investigator, is responsible for all project activities, including safety: Some specific responsibilities are:**

**Assure that workers know and follow the chemical hygiene rules, that protective equipment is available and in working order and that appropriate training has been provided.**

**Provide regular, formal chemical hygiene and housekeeping inspections including routine inspections of emergency equipment. Ensure that all hazardous waste generated on their projects is properly discarded.**

**Know the current legal requirements concerning regulated substances used on their projects.**

**Determine the required levels of protective apparel and equipment.**

**Ensure that facilities and training for any material being ordered are adequate.**

**Laboratory Worker.** **Laboratory Workers include Research Associates, Technicians, Graduate Students, Student Workers and other paid or volunteer employees. Laboratory workers are responsible for conducting each laboratory procedure in accordance with good chemical hygiene practices and developing good personal chemical hygiene habits. Laboratory workers must be able to perform their job without endangering themselves, co-workers, equipment, or facilities.**

## THE SAFETY PROGRAM

**The ongoing safety program consists of different monthly and quarterly tasks that are assigned to the employees of the FPD. The tasks are oriented toward the goal of assuring the required elements of the Laboratory Standard are in place and functioning for all laboratory activities.**

**It must be emphasized that the Laboratory Standard is oriented toward the operation of chemical research laboratories and does not include wood shop or larger pilot-scale activities. The following areas: (1) treating cylinder operations, (2) resin preparation and application, (3) hot press operation, and (4) bio-oil production may need additional safety guidelines. Woodshop Safety is covered in a separate document (FPD K drive K:\Safety Committee\woodshop safety and the operation of MSU vehicles is covered in a MSU policy (FPD K drive K:\Safety Committee\Vehicles).**

1. **The Safety Committee will perform semi-annual inspections of chemical laboratories, chemical storage areas and shop areas using the appropriate check lists. Copies of these forms (Appendix B) will be distributed to the Department Head and to the faculty member responsible for the respective area. It is the responsibility of the faculty members to assure that necessary corrective actions are taken. Copies of these forms will be kept in the departmental files.**
2. **Yearly fire extinguisher inspections will be performed by a contractual agency. Currently, Mr. Charles Burkhardt is responsible for coordinating these inspections. Fire extinguishers, hoods, safety showers, and eye wash stations will be inspected monthly by assigned FPD personnel. Mr. George Miller is currently responsible for this inspection. A copy of the monthly check list (Appendix C) will be kept on file by the Department Head.**
3. **It is the responsibility of the faculty supervisor to investigate all accidents associated with their projects and complete the appropriate accident report investigation. The completed form will then be submitted to the chemical hygiene officer and to the Department Head. A copy of the report will be kept on file.**
4. **Employee training will consist of the following:**

    **a.) Videos will be used to inform employees of the use of Material Safety Data Sheets (MSDS), Right to Know**

requirements, use of personal protection equipment, understanding chemical hazardous, and spill cleanup procedures.

b.) All hazardous waste generated by the FPD will be discarded through the University Hazardous Waste Officer. It is mandatory that anyone who conducts laboratory activities that generates hazardous waste must have a yearly training course on the handling and disposal of hazardous waste.

c.) Use of unsealed radioactive isotopes in the FPD must be approved by the Department Head and the Radiological Safety Officer. See: http://www.orc.msstate.edu/radiological/

d.) Mississippi Cooperative Extension personnel administer First Aid and CPR certification courses. It is recommended that at least 10% of the full-time employees should have certifications up to date.

e.) FPD employees who work with restricted use pesticides must have a current pesticide application license.

5. An updated inventory of all chemicals in this laboratory will be maintained. This inventory is available to anyone who needs it. The chemical storage shed inventory will be updated monthly as specified in the guidelines contained in Appendix D.

6. Prior to the purchase of large quantities of chemicals, the inventory should be checked by FPD purchasing personnel to be sure those chemicals are not already in stock.

7. Whenever experiments with OSHA regulated materials are done outside of an operating fume hood, air levels must be measured to verify that the permissible exposure limits are not exceeded.

The faculty supervisor is responsible for assuring that these measurements are done.

8. Written laboratory procedures approved by the faculty supervisor should be available to FPD employees for all laboratory experiments.
9. MSDS for all chemicals used in the FPD will be available in the laboratory where these chemicals are used. Either hardcopy or electronic format is acceptable.
10. Safety information centers will be located at selected areas within the Laboratory. Suggested information is as follows: A copy of this document, chemical inventory of associated labs, MSDS file, laboratory procedures, safety recommendations and other related information.

## STANDARD OPERATING PROCEDURES

General Rules:

1. NEVER work alone in a laboratory or chemical storage area.
2. Wear appropriate eye protection in wet chemistry laboratories at all times.
3. When working with flammable chemicals, be certain that there are no sources of ignition near enough to cause a fire or explosion in the event of a vapor release or liquid spill.

4. **Use a well secured shield for protection whenever an explosion or implosion might occur.**

**All employees should know and constantly be aware of the following:**

1. **Hazardous properties of each chemical, as determined from the MSDS and other appropriate references.**
2. **Appropriate safeguards for using each chemical, including personal protective equipment.**
3. **The location and proper use of emergency equipment.**
4. **How and where to properly store the chemical when it is not in use.**
5. **Proper personal hygiene practices.**
6. **The proper methods of transporting chemicals within the facility.**
7. **Appropriate procedures for emergencies, including evacuation routes, spill cleanup procedures and proper waste disposal.**

## PERSONAL HYGIENE

1. **Eye protection worn when working with chemicals should meet the thickness; impact resistance and flammability test requirements of the American National Standards Institute (ANSI) Z87.1. Goggles should be worn when there is a danger of splashing or flying particles. When working with more than 10mL of corrosive liquid, a face shield large enough to protect the chin, neck, and ears should be worn.**

2. **When working with corrosive liquids, also wear gloves made of material known to be resistant to permeation by the corrosive chemical and tested by air inflation (do not inflate) for the absence of pin-hole leaks.**
3. **When working with allergenic, sensitizing, or toxic chemicals, wear gloves made of material known to be or tested and found to be resistant to permeation by the chemical and tested for the absence of pin holes.**
4. **Always wear low-heeled shoes with fully covering "uppers"; do not wear shoes with open toes or with uppers constructed of woven material.**
5. **Whenever exposure by inhalation is likely to exceed the threshold limits described in the MSDS, use a hood; if this is not possible, a proper respirator must be worn. Consult your supervisor before doing any such work.**
6. **Carefully inspect all protective equipment before using. Do not use defective protective equipment.**
7. **General protection from small amounts of chemical exposure to the skin may be enhanced by showering after the work day and frequent handwashing, particularly before eating.**
8. **Launder clothing contaminated with toxic chemicals according to recommended guidelines.**

## HOUSEKEEPING

1. **Access to emergency equipment, showers, eyewashes, and exits should never be blocked by anything, not even temporarily parked chemical cart.**
2. **All chemical containers must be labeled with at least the identity of the contents and the hazards those contents present to users. Transfer containers should have the name of the chemical and the laboratory worker on the label.**
3. **Keep all work areas, especially laboratory benches and hoods, clear of clutter.**
4. **Keep all aisles, hallways, and stairwells clear.**
5. **All chemicals should be placed in their assigned storage areas at the end of each workday.**
6. **At the end of each workday, all chemical containers should be correctly labeled or discarded.**
7. **Wastes should be properly labeled and kept in their proper containers.**
8. **Promptly clean up all spills; refer to the MSDS and properly dispose of the spilled chemical and clean-up materials.**
9. **All working surfaces and floors should be cleaned regularly.**
10. **No chemicals are to be stored in aisles or stairwells, on desks or laboratory benches, on floors or in hallways, or overnight on shelves over the workbenches.**

## PRIOR APPROVAL

**Employees must obtain prior approval to proceed with a laboratory task from his or her supervisor whenever:**

1. **A new laboratory procedure or test is to be carried out. The supervisor should review all laboratory procedures with laboratory workers including specific hazards.**
2. **It is likely that toxic limit concentrations could be exceeded or that other harm is likely;**
3. **There is a change in a productive or test, even if it is very similar to prior practices; "Change in a procedure or test" means:**
   - **a.) A 10% or greater increase or decrease in the amount of one or more chemicals used.**
   - **b.) A substitution or deletion of any of the chemicals in a procedure.**
   - **c.) Any change in temperature or other conditions under which the procedure is to be conducted.**
4. **There is a failure of any of the equipment used in the process, especially of safeguards such as fume hood or clamped apparatus;**
5. **There are unexpected results; or**

6. **Members of the laboratory staff become ill, suspect that they or others have been exposed, or otherwise suspect a failure of any safeguards.**

## PROCEDURE-SPECIFIC SAFETY PROCEDURES

**All laboratory procedures must contain a written description of specific safety practices incorporating the applicable precautions. Employees should read and understand these practices, or consult with his or her supervisor, before beginning experiments.**

## PROCEDURES FOR TOXIC CHEMICALS

**The MSDS for most of the chemicals used in the laboratory will state recommended maximum acceptable air concentrations. Typical limits are threshold limit values (TLV), permissible exposure limits (PEL), and action levels. When such limits are stated, they will be used to assist the chemical hygiene officer in determining the safety precautions, control measures, and safety apparel that apply when working with toxic chemicals.**

1. **When a TLV or PEL value is less than 50 ppm or 100 mg/$m^3$, the user of the chemical must use it in an operating fume hood, glove box, vacuum line, or similar device, which is equipped with appropriate traps and/or scrubbers. <u>If none are available, no</u>**

**work should be performed using that chemical unless appropriate respiratory equipment is worn.**

2. **If a TVL, PEL, or comparable value is not available for that substance, the animal or human median inhalation lethal concentration information, $LC_{50}$, will be assessed. If that value is less than 200 ppm or 2000 mg/$m^3$ (when administered continuously for one hour or less), then the chemical must be used in an operating fume hood, glove box, vacuum line, or similar device, which is equipped with appropriate traps and/or scrubbers. If none are available, no work should be performed using that chemical unless appropriate respiratory equipment is worn.**

3. **Whenever handling toxic substances with moderate or greater vapor pressures that will be likely to exceed air concentration limits, laboratory work with such liquids and solids will be conducted in a fume hood, glove box, vacuum line, or similar device, which is equipped with appropriate traps and/or scrubbers. If none are available, no work should be performed using that chemical unless appropriate respiratory equipment is worn.**

## PROCEDURES FOR 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) are considered "fire-hazard chemicals."**
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. In all work with fire-hazard chemicals, follow the requirements of 29 CFR, subparts H and L; NFPA Manual 30, "Flammable and Combustible Liquids Code"; and NFPA Manual 45, "Fire Protection for Laboratories Using Chemicals".**
3. **Fire-hazard chemicals should be stored in a flammable-solvent storage area or in storage cabinets designed for flammable materials.**
4. **Fire-hazard chemicals should be used only in vented hoods and away from sources of ignition.**

## PROCEDURES FOR REACTIVE CHEMICALS

**The most complete and reliable reference on chemical reactivity is found in the current edition of "Handbook of Reactive Chemical Hazards"**

**by L. Bretherick, published by Butterworths. Reactivity information is sometimes given in manufacturer's MSDS and on labels.**

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**[1]Guidelines on which chemicals are reactive can be found in regulations promulgated by the Department of Transportation (DOT) in 49 CFR and by the Environmental Protection Agency (EPA) in 40 CFR. Also see NFPA Manual 325M, "Fire Hazard Properties of Flammable Liquids, Gases, Volatile Solids"; Manual 49, "Hazardous Chemicals Data"; and Manual 491M, 'Manual of Hazardous Chemical Reactions."**

1. **A reactive chemical is one that:**

   a.) **is described as such in Bretherick or the MSDS;**

   b.) **is ranked by the NFPA as 3 or 4 for reactivity;**

   c.) **is identified by the DOT as:**
   - **an oxidizer,**
   - **an organic peroxide, or**
   - **an explosive, Class A, B, or C,**

   d.) **fits the EPA definition of reactive in 40 CFR 261.23;**

   e.) **fits the OSHA definition of unstable in 29 CFR 1910.1450; or**

   f.) **is known or found to be reactive with other substances.**

2. **Handle reactive chemicals with all proper safety precautions, Including segregation in storage and prohibition on mixing small quantities without prior approval and appropriate personal protection and precautions.**

## PROCEDURES FOR CORROSIVE CHEMICALS AND CONTACT-HAZARD CHEMICALS

**Corrosivity, allergenic, and sensitizer information is sometimes given in manufacturer's MSDS and on labels. Also, guidelines on which chemicals are corrosive can be found in other OSHA standards and in regulations promulgated by DOT in 49 CFR and the EPA in 40 CFR.**

1. **A corrosive chemical is one that:**
   - a.) **fits the OSHA definition of corrosive in Appendix A of 29 CFR 1910.1200;**
   - b.) **fits the EPA definition of corrosive in 40 CFR 261.22 (has a pH greater than 12 or less than 2.5); or**
   - c.) **is known or found to be corrosive to living tissue.**
2. **A counter-hazard chemical is an allergen or sensitizer that:**
   - a.) **is so identified or described in the MSDS or on the label;**
   - b.) **is so identified or described in the medical or industrial hygiene literature; or**
   - c.) **is known or found to be an allergen or sensitizer.**
3. **Handle corrosive chemicals with all proper safety precautions, including wearing both safety goggles and face shield, gloves tested for absence of pin holes and known to be resistant to permeation or penetration, and a laboratory apron or laboratory coat.**

## CONTROL MEASURES AND EQUIPMENT

**Chemical safety is achieved by constant awareness of hazards and keeping the chemical under control. Appropriate precautions must be used, including physical or engineering safeguards such as hoods or scatter shields. Laboratory personnel must be familiar with the precautions to be taken, including the use of engineering and other safeguards. Laboratory supervisors should be alert to detect the malfunction of engineering and other safeguards. All engineering safeguards and controls must be properly maintained, inspected on a regular basis, and never overloaded beyond their design limits.**

1. **Laboratory ventilation should not be less than eight air changes per hour (calculated). This flow is not necessarily sufficient to prevent accumulation of chemical vapors. Work with toxic chemicals that have low air concentration limits, or that have high vapor pressures, should always be done in a hood.**
2. **Fume hoods should provide a minimum of 70 to 90 linear feet per minute of air flow.**
3. **Laboratory employees should understand and comply with the following:**
   - **a.) A fume hood is a safety backup for condensers, traps, or other devices that collect vapors and fumes. It is not to "dispose" of chemicals by evaporation unless the vapors are trapped and recovered for proper waste disposal.**

b.) The apparatus inside the hood should be placed on the floor of the hood at least six inches away from the front edge.

c.) Fume hood windows should be lowered (closed) at all times except when necessary to raise (open) them to set up or adjust the apparatus that is inside the hood.

d.) The hood fan should be kept "on" whenever a volatile chemical is inside the hood, whether or not any work is being done in the hood.

e.) Personnel should be aware of the steps to be taken in the event of power failure or other hood failure.

f.) Inspect hood vent ducts and fans at frequent intervals to be sure they are both clean and clear of obstructions. (Depending on local circumstances, this maintenance is performed by laboratory employees or by maintenance/repair personnel.)

g.) Hoods should never be used as storage areas for chemicals, apparatus, or other materials.

## FLAMMABLE-LIQUID STORAGE

1. Fire-hazard chemicals in quantities greater than 500ml should be kept in metal safety cans in appropriate cabinets. The cans should be used only as recommended by the manufacturer, including the following safety practices:

a.) Never disable the spring-loaded closure.

b.) Always keep the flame-arrestor screen in place; replace if punctured or damaged.

2. Cabinets designed for the storage of flammable materials should be properly used and maintained. Read and follow the manufacturer's information and also follow these safety practices:

a.) Store only compatible materials inside a cabinet.

b.) Do not store paper or cardboard or other combustible packaging material in a flammable-liquid storage cabinet.

c.) The manufacturer establishes quantity limits for various sizes of flammable-liquid storage cabinets; do not overload a cabinet.

## EYEWASH FOUNTAINS AND SAFETY SHOWERS

1. Equip all laboratories with eyewashes and safety showers. These must be located so they can be reached from any point in the laboratory, as specified in ANSI Z358.1.

2. Check the functioning of eyewash fountains and safety showers and measure the water flow quarterly/monthly[2]. Promptly repair any facility that does not meet the water flow requirements of ANSI Z358.1.

3. Be sure that access to eyewash fountains and safety showers is not restricted or blocked by temporary storage of objects or in any other way.

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[2]Safety showers should have a minimum flow of 30 gallons per minute. Eyewash fountains should be 4 gallons per minute and eye/face wash fountains should be 3 gallons per minute.

## RESPIRATORS

1. Employees should wear respirators whenever it is possible that engineering controls or work practices are ineffective and that employees might be exposed to vapor or particulate concentrations greater than the PEL, action level, TLV, or similar limit, whichever is the lowest.
2. The requirements of 29 CFR 1910.134 should be followed, including in particular:

   a.) Written standard operating procedures governing the selection and use of respirators.

   b.) All employees who are likely to need respirators must be trained in their proper use, inspection, and maintenance. (See "NIOSH Guide to Industrial Respiratory Protection", DHHS Publ. No. 87-0116, NIOSH, Cincinnati, 1987, for details.)

## VAPOR DETECTION

Do not use odor as a means of determining that inhalation exposure limits are not being exceeded. Whenever there is reason to suspect that a toxic chemical inhalation limit might be exceeded, whether or not a suspicious odor is noticed, notify the supervisor. Laboratory workers

**should wear a respirator suitable for protection against the suspect chemical until measurements of the concentration of the suspect vapor in the air show that the limit is not exceeded. Under this circumstance and if there is no reason to anticipate an increase in the concentration of the chemical, and if the supervisor approves, the respirator can be removed and the work may continue.**

## PROCEDURES FOR CARCINOGENS, REPRODUCTIVE TOXINS, SUBSTANCES THAT HAVE A HIGH DEGREE OF ACUTE TOXICITY, AND CHEMICALS OF UNKNOWN TOXICITY

**Follow the procedures described in this section when performing laboratory work with any select carcinogen, reproductive toxin, substance that has a high degree of acute toxicity, or a chemical whose toxic properties are unknown.**

1. **The following definitions will apply:**

   a.) **Select carcinogen: Any substance defined as such in 29 CFR 1910.1450 and any other substance described as such in the applicable MSDS.**

   b.) **Reproductive toxin: Any substance described as such in the applicable MSDS, any substance identified as such in Thomas H. Shepard, "Catalog of Teratogenic Agents", 6th ed., Johns Hopkins.**

   c.) **Substance with a high degree of acute toxicity: Any substance for which the $LD_{50}$ data described as such in Thomas H. Shepard, "Catalog of Teratogenic Agents", 6th ed., Johns Hopkins.**

   d.) **Chemical whose toxic properties are unknown: A chemical for which there is no known statistically significant study conducted in accordance with established scientific principles that establishes its toxicity. NOTE: For the**

**purposes of this CHP, chemicals in the above four categories will be called "inimical" chemicals.**

**e.) Designated area: A hood, glove box, portion of a laboratory, or an entire laboratory room designated as the only area where work quantities of the inimical chemicals in excess of the specified limit shall be conducted.**

**2. Designated areas shall be posted and their boundaries clearly marked. Only those persons trained to work with inimical chemicals will work with those chemicals in a designated area. All such persons will:**

**a.) use the smallest amount of chemical that is consistent with the requirements of the work to be done;**
**b.) use high-efficiency particulate air (HEPA) filters or high-efficiency scrubber systems to protect vacuum lines and pumps;**
**c.) store inimical chemicals or remove them from storage;**
**d.) decontaminate a designated are when work is completed; and**
**e.) prepare wastes from work with inimical chemicals for waste disposal in accordance with specific disposal procedures consistent with the Resource Conservation and Recovery Act (RCRA) and as designated by MSU's hazardous waste officer.**

**3. Store all inimical chemicals in locked and enclosed spaces with a slight negative pressure compared to the rest of the building.**

**4. Because the decontamination of jewelry may be difficult or impossible, do not wear jewelry when working in designated areas.**

**5. Wear long-sleeved disposable clothing and gloves known to resist permeation by the chemicals to be used when working in designated areas.**

## RECORDS AND RECORDKEEPING

**This section reviews the value of documenting an employer's compliance with the Laboratory Standard, which is required by 29 CFR 1910.20. This information is general; it does not include the details necessary for compliance.**

1. **The Laboratory Standard requires that records of air concentration monitoring results, exposure assessments, medical consultations, and examinations be maintained for at least 30 years and that they be accessible to employees or their representatives.**
2. **It is desirable to develop a system that retains documents related to distribution and maintenance of MSDS to the safety training of employees, and to significant employee suggestions for many years, perhaps for the LIFETIME OF THE INSTITUTION. For example, although not required by any regulation at this time, some employers use "MSDS sign-off" records; for each hazardous chemical used or handled by employees, each employee certifies by dated signature that he or she has read that MSDS and understands the content.**
3. **Specific records may be required in the event of lost work time resulting from an exposure or accident on the job. Use OSHA Form 200 to record lost work days that occur. Contact your local OSHA office for details.**

**4. In addition to required records, it is often desirable to keep records internally that document employee exposure complaints and suspected exposures, regardless of the outcome of an exposure assessment. Other incidents also might be documented for future reference.**

**Examples include:**

**a.) Major safety suggestions from employees. To improve laboratory safety, employees should keep these records. A suggestion that is unusable today might be useful tomorrow. Even when a suggestion is clearly nonworkable, it should be taken seriously, examined, and recorded.**

**b.) Near-miss reports. Employees who participate in or witness events that could have caused harm, but fortunately did not, should prepare reports of the incidents. These reports are used to develop changes in procedures that will prevent a future more serious occurrence.**

**c.) Repair and maintenance records for control systems. These are useful; they suggest corrective actions and indicate that equipment was or was not well maintained and kept in working condition.**

**d.) Complaints and employees. It is useful to keep a record of all complaints, investigations, and outcomes. Even when not justified, especially when a complaint correctly or incorrectly involves defects in and difficulties with operating equipment, the record may prove to be invaluable if that equipment develops a defect or malfunction at a later date.**

**5. The EPA and other Federal and State agencies have special recordkeeping requirements. For example, recordkeeping or allegations and the reporting of suspected hazards from the adverse effects of chemical exposure are required under**

**Sections 8(e) of the Toxic Substances Control Act; see 40 CFR 716 and 717.**

## EMPLOYEE INFORMATION AND TRAINING

**You do not need a formal session in a classroom setting to impart information or to train employees, though it is often desirable for this purpose. Informal group or individual discussions with a supervisor, posted notices, or handout booklets can be effective. Commercially prepared "canned" programs can also be effective, especially if supplemented with details that pertain specifically to local conditions.**

**OSHA does not mandate the details of the instructional method to be used. OSHA requires that, if asked by an OSHA inspector, the employees must be able to answer to the issues. Hence, whatever technique or combination of techniques are used to impart information and to train, the effectiveness of the instruction should be evaluated prior to an OSHA inspection.**

**Some laboratory employees may not wish to participate in instructions that they perceive would be boring and repetitive. They believe that their professional or graduate training in chemistry and their accomplishments as a distinguished teacher obviate the need for further instruction. It is, therefore, not necessary for experienced employees to continue to attend repetitive introductory seminars.**

1. **The employer must provide all laboratory employees with information and training concerning the hazards of chemicals in the FPD laboratories.**
2. **The employer must provide such information and training when an employee is initially assigned to a laboratory where hazardous chemicals are present and also prior to assignments involving new hazardous chemicals and/or new laboratory work procedures.**
3. **The employer must be sure that employees are informed of:**

   **a.) the content and requirements of the Laboratory Standard;**

   **b.) the content, availability, location of the Chemical Hygiene Plan;**

   **c.) the PELs, action levels, and other recommended exposures to the hazardous chemicals used in the FPD laboratories;**

   **d.) signs and symptoms associated with exposures to the hazardous chemicals used in the FPD laboratories;**

   **e.) the location and availability of MSDS and other safety reference materials.**

4. **Employee training schedule:**

   **a.) The methods and observations that may be used to detect the presence of release of a hazardous chemical.**

   **b.) The hazards associated with the chemicals used in the FPD laboratories.**

   **c.) The measures employees can use to protect themselves from these hazards, including specific procedures such as appropriate work practices, personal protective equipment to be used, and emergency procedures.**

5. New employees will be given the necessary requirements of chemical hygiene by their supervisor.
6. New employees will be shown the location of MSDS and the Safety Information Center in their work area.

**EMERGENCY PROCEDURE PLAN for the Department of Forest Products**

**FPD EVACUATION PLAN:**

When the fire alarm for the FPD sounds and there is no fire in your work area, leave the building by the nearest route. Make sure everyone in your work area also leaves. Go to the designated meeting area and report to your supervisor:

Building 1: Front Parking Lot

Building 2: Front Parking Lot

Building 3: Middle Parking Lot

Building 4: Middle Parking Lot

Building 5: Log House Parking Lot

Franklin Building: Franklin parking lot

Treating Laboratory/Graduate Offices: Log House Parking Lot

Do not re-enter the building until the all clear is given by security or emergency personnel.

**SMALL FIRES**

**Small fires can usually be extinguished without evacuating the building or calling the fire department. However, even a minor fire can quickly become a serious problem. The first few minutes after discovery of a fire are critical in preventing a larger emergency. The following actions should be taken by laboratory personnel in case of a minor fire:**

1. **Use your best judgment. Alert other personnel in the laboratory and send someone for assistance.**
2. **Attack the fire immediately, but never attempt to fight a fire alone. A fire in a small vessel can often be suffocated by covering the vessel with an inverted beaker or a watch glass. Use the proper extinguisher, directing the discharge of the extinguisher at the base of the flame. To ensure that the proper type of extinguisher is used, compare its use label with the descriptions below.**

   **Class A fires – ordinary combustible solids such as paper, wood, coal, rubber, and textiles;**

   **Class B fires – petroleum hydrocarbons (diesel fuel, motor oil, and grease) and volatile flammable solvents;**

   **Class C fires – electrical equipment;**

   **Class D fires – combustible or reactive metals (such as sodium and potassium), metal hydrides, or organometallics (such as alkylaluminums).**

3. Avoid entrapment in a fire; always fight a fire from a position accessible to an exit. If there is any doubt whether the fire can be controlled by locally available personnel and equipment, the following actions should be taken:

   a.) Activate the emergency alarm system and notify the fire department.

   b.) Confine the emergency (close hood sashes, door between laboratories, and fire doors) to prevent further spread of the fire.

   c.) Assist injured personnel (provide first aid or transportation to medical aid if necessary.)

   d.) Evacuate the building to avoid further danger to personnel. In case of an explosion, immediately turn off burners and other heating devices, stop any reactions in progress, assist in treating victims, and vacate the area until it has been decontaminated.

It is the responsibility of the laboratory supervisor to determine whether unusual hazards exist that requires more stringent safety precautions.

## TORNADOES

When a tornado warning is given, go to the most structurally sound part of the building. If you are outside, enter one of the main buildings as

**soon as possible. Flying glass and debris are sources of major injuries. Suggested areas in the buildings are as follows:**

**Building 1: Coffee Room, Hallway and Entrance to Rest Rooms**

**Building 2: Hallway by restroom.**

**Building 3: Hallway between Old and New Building or east end in the Basement away from the door.**

**Building 4: Basement**

**Building 5: Stairwell**

**Franklin Building: Bottom floor away from windows or glass**

**Treating Laboratory/Bio-oil Laboratory: Office Area**

## SPILLS

**In case of a spill, notify your supervisor.**

**FOR LARGE SPILLS (greater than 500 mls) NOTIFY Linda Sites, Leonard Ingram, and Terry Coggins (MSU Hazardous Waste Office 325-3294). If the spill is a flammable material evacuate the area, call the fire department and notify you supervisor.**

**Experience has shown that the accidental release of hazardous substances is a common enough occurrence to require preplanning for procedures that will minimize exposure of personnel and property. Such procedures may range from having available a sponge mop and bucket to having an emergency spill-response team, complete with protective**

**apparel, safety equipment, and materials to contain, confine, dissipate, and clean up the spill.**

**The preplanning should include consideration of the following factors:**

1. **Potential location of the release (e.g., outdoors versus indoors; in a laboratory, corridor, or storage area, on a table, in a hood, or on the floor).**
2. **The quantities of material that might be released and whether the substance is piped material or a compressed gas.**
3. **Chemical and physical properties of the material (e.g., its physical state, vapor pressure, and air or water reactivity).**
4. **Hazardous properties of the material (its toxicity, corrosivity, and flammability).**
5. **The types of personal protective equipment that might be needed.**

**In any event, there should be supplies and equipment on hand to deal with the spill, consistent with the hazards and quantities of the spilled substance. These cleanup supplies should include neutralizing agents (such as sodium carbonate and sodium bisulfate) and adsorbents (such as vermiticulite and sand). Paper towels and sponges may also be used as adsorbent-type cleanup aids, although this should be done cautiously. For example, paper towels used to clean up a spilled oxidizer may later ignite, and appropriate gloves should be worn when wiping up highly toxic**

materials with paper towels. Also, when a spilled flammable solvent is absorbed in vermiculite or sand, the resultant solid is highly flammable and gives off flammable vapors and, thus must be properly contained or removed to a safe place.

Commercial spill kits are available that have instructions, adsorbents, reactants, and protective equipment. These kits may be located strategically around work areas just as fire extinguishers are.

If a spill does occur, the following general procedures may be used but should be tailored to individual needs:

1. Attend to any person who may have been contaminated.
2. Notify personnel in the immediate area about the spill.
3. Evacuate all nonessential personnel from the spill area.
4. If the spilled material is flammable, turn off ignition and heat sources.
5. Avoid breathing vapors of the spilled material; if necessary, use a respirator.
6. Leave on or establish exhaust ventilation if it is safe to do so.
7. Secure supplies to expedite cleanup.
8. During cleanup, wear appropriate apparel.
9. Notify the safety coordinator if a regulated substance is involved.

## CLEANUP OF SPILLED LIQUIDS

1. Confine or contain the spill to a small area. Do not let spread.

2. **For small quantities of inorganic acids or bases, use a neutralizing agent or an adsorbent mixture (e.g., soda ash or diatomaceous earth). For small quantities of other materials, absorb the spill with a nonreactive material (such as vermiculite, dry sand, towels).**
3. **For larger amounts of inorganic acids and bases, flush with large amounts of water (provided that the water will not cause additional damage). Flooding is not recommended in storerooms where violent spattering may cause additional hazards or in areas where water-reactive chemicals may be present.**
4. **Mop up the spill, wringing out the mop in a sink or a pail equipped with rollers.**
5. **Carefully pick up and clean any cartons or bottles that have been splashed or immersed.**
6. **Vacuum in area with a vacuum cleaner approved for the material involved, remembering that the exhaust of a vacuum cleaner can create aerosols and, thus, should be vented to a hood or through a filter.**
7. **If the spilled material is extremely volatile, let it evaporate and be exhausted by the mechanical ventilation system (provided that the hood and associated mechanical system is spark-proof).**
8. **Dispose of residues according to safe disposal procedures.**

## CLEAN UP OF SPILLED SOLIDS

**Generally, sweep spilled solids of low toxicity into a dust pan and place them in a solid-waste container for disposal. Additional precautions such as the use of a vacuum cleaner equipped with a HEPA filter may be necessary when cleaning up spills of more highly toxic solids.**

## HAZARDOUS WASTE

**Laboratory waste may be characterized as hazardous waste due to toxicity, flammability, reactivity or corrosivity properties. Each laboratory supervisor is responsible for the proper disposal of expended materials. It is important to distinguish between a hazardous chemical and hazardous waste. As long as a chemical is part of an ongoing laboratory experiment it is not waste. Once experiments are completed and it is desirable to discard a specific chemical then that chemical may potentially be classified as a hazardous waste. For more specific details refer to Supplementary Appendix II of this document.**

**It is helpful to not order or accept materials in quantities that will greatly exceed what will be used in experiments. Also, do not accept chemicals without chemical labels or MSDS.**

1. **The following references will serve as primary guidelines for disposal of hazardous waste from FPD:**
    a.) **MSU Policies and Procedures**

b.) **"Prudent Practices of Disposal of Chemicals from Laboratories" National Academy Press, Washington, D.C., 1983.**

2. **Each project leader will be responsible for chemicals and materials associated with his projects. Transferring chemicals to the appropriate container for pick up by the MSU Hazardous Waste Office (contact: Terry Coggins 325-3295) will be an integral part of each project. The cost of disposal will paid from an account designated by the principal investigator of the project.**
3. **Safety will be a primary consideration. Combining of different chemicals for disposal should not be done unless it is absolutely certain their mixing will not create a safety hazard. Also, the mixing of chemicals must conform to the above listed guidelines for compatibility.**
4. **Hazardous waste containers are available form the MSU Hazardous Waste Office and can be used for accumulating relatively larger quantities of one type material, e.g., acetonitrile or methylene chloride. The tops of these containers should be in place except when materials are being added, and only one container will be stored in a particular area.**
5. **Each container of material to be discarded will be labeled with the following information:**

**Contents**
**Project**

Date
Name

6. These containers or other containers will be picked up by the Hazardous Waste Officer from the FPD Hazardous Waste Satellite Accumulation Areas listed in Appendix E.
7. Large quantities of unused materials such as that used for pilot-scale operations can be returned to the original supplier. However, DOT criteria for appropriate container and labels must be met.
8. An inventory of chemicals and materials will be supplied to the MSU Hazardous Waste Office when requested. Currently, it is the responsibility of the MSU Hazardous Waste Office to maintain records of the waste generated from each unit.
9. Some materials may be disposed of down the sanitary sewer. If you are not sure of the correct procedure, ask your supervisor.

## HANDLING RADIOACTIVE WASTE

See: http://www.orc.msstate.edu/radiological/policies.php

## REFERENCES

Committee on Hazardous Substances in the Laboratory. 1981. Prudent Practices for Handling Hazardous Chemicals in the Laboratory. National Academy Press. Washington, DC.

**American Chemical Society Committee on Chemical Safety. 1985. Safety in Academics Chemistry Laboratories.**

**The Bureau of National Affairs, Inc. 1991. Laboratory Chemical Standards: The Complete OSHA Compliance Manual. The Bureau of National Affairs, Inc., 1231 25th N.W., Washington, DC 20037.**

**Sax, N. I. 1979. Dangerous Properties of Industrial Materials. Van Nostrand Reinhold Coman. New York, NY.**

# APPENDICIES

## APPENDIX A


Regulations (Standards - 29 CFR)

### Occupational exposure to hazardous chemicals in laboratories. - 1910.1450

Regulations (Standards - 29 CFR) - Table of Contents

- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** Z
- **Subpart Title:** Toxic and Hazardous Substances
- **Standard Number:** 1910.1450
- **Title:** Occupational exposure to hazardous chemicals in laboratories.

- **Appendix:** A , B

1910.1450(a)
***Scope and application***.
1910.1450(a)(1)
This section shall apply to all employers engaged in the laboratory use of hazardous chemicals as defined below.
1910.1450(a)(2)
Where this section applies, it shall supersede, for laboratories, the requirements of all other OSHA health standards in 29 CFR part 1910, subpart Z, except as follows:
1910.1450(a)(2)(i)
For any OSHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that particular standard states otherwise or unless the conditions of paragraph (a)(2)(iii) of this section apply.
1910.1450(a)(2)(ii)
Prohibition of eye and skin contact where specified by any OSHA health standard shall be observed.
1910.1450(a)(2)(iii)
Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for an OSHA regulated substance with exposure monitoring and medical surveillance requirements paragraphs (d) and (g)(1)(ii) of this section shall apply.
1910.1450(a)(3)
This section shall not apply to:
1910.1450(a)(3)(i)
Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in 29 CFR part 1910, subpart Z,

even if such use occurs in a laboratory.

1910.1450(a)(3)(ii)

Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:

1910.1450(a)(3)(ii)(A)

Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and

1910.1450(a)(3)(ii)(B)

Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

1910.1450(b)

***Definitions --***

***Action level*** means a concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

***Assistant Secretary*** means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

***Carcinogen*** (***see select carcinogen***).

***Chemical Hygiene Officer*** means an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

***Chemical Hygiene Plan*** means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii) meets the requirements of paragraph (e) of this section.

***Combustible liquid*** means any liquid having a flashpoint at or above 100 deg. F (37.8 deg. C), but below 200 deg. F (93.3 deg. C), except any mixture having components with flashpoints of 200 deg. F (93.3 deg. C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

***Compressed gas*** means:

(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or

(ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg C) regardless of the pressure at 70 deg. F (21.1 deg. C); or

(iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 C) as determined by ASTM D-323-72.

***Designated area*** means an area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

***Emergency*** means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

***Employee*** means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

***Explosive*** means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

***Flammable*** means a chemical that falls into one of the following categories:

(i) ***Aerosol, flammable*** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(ii) ***Gas, flammable*** means:

(A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or

(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.

(iii) ***Liquid, flammable*** means any liquid having a flashpoint below 100 deg F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(iv) ***Solid, flammable*** means a solid, other than a blasting agent or explosive as defined in § 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

***Flashpoint*** means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 - 1979 (ASTM D 56-79)) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8 deg. C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester, Z11.7 - 1979 (ASTM D 93-79)) - for liquids with a viscosity equal to or greater than 45 SUS at 100 deg. F (37.8 deg. C ), or that contain suspended solids, or that have a tendency to form a surface film under test; or

(iii) Setaflash Closed Tester (see American National Standard Method of test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

***Hazardous chemical*** means a chemical for which there is statistically significant evidence

based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.

***Laboratory*** means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

***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 safety manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

***Laboratory-type hood*** means a device located in a laboratory, enclosure on five sides with a movable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

***Laboratory use of hazardous chemicals*** means handling or use of such chemicals in which all of the following conditions are met:

(i) Chemical manipulations are carried out on a "laboratory scale;"

(ii) Multiple chemical procedures or chemicals are used;

(iii) The procedures involved are not part of a production process, nor in any way simulate a production process; and

(iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

***Medical consultation*** means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

***Organic peroxide*** means an organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

***Oxidizer*** means a chemical other than a blasting agent or explosive as defined in § 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

***Physical hazard*** means a chemical for which there is scientifically valid evidence tat it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer pyrophoric, unstable (reactive) or water-reactive.

***Protective laboratory practices and equipment*** means those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

***Reproductive toxins*** means chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

***Select carcinogen*** means any substance which meets one of the following criteria:

(i) It is regulated by OSHA as a carcinogen; or

(ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or

(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or

(iv) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m(3);

(B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or

(C) After oral dosages of less than 50 mg/kg of body weight per day.

***Unstable (reactive)*** means a chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

***Water-reactive*** means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

**1910.1450(c)**

***Permissible exposure limits***. For laboratory uses of OSHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in 29 CFR part 1910, subpart Z.

**1910.1450(d)**

***Employee exposure determination --***

**1910.1450(d)(1)**

***Initial monitoring***. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).

**1910.1450(d)(2)**

***Periodic monitoring***. If the initial monitoring prescribed by paragraph (d)(1) of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of the relevant standard.

**1910.1450(d)(3)**

***Termination of monitoring***. Monitoring may be terminated in accordance with the relevant standard.

1910.1450(d)(4)

***Employee notification of monitoring results***. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.

1910.1450(e)

***Chemical hygiene plan -- General***. (Appendix A of this section is non-mandatory but provides guidance to assist employers in the development of the Chemical Hygiene Plan).

1910.1450(e)(1)

Where hazardous chemicals as defined by this standard are used in the workplace, the employer shall develop and carry out the provisions of a written Chemical Hygiene Plan which is:

1910.1450(e)(1)(i)

Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory and

1910.1450(e)(1)(ii)

Capable of keeping exposures below the limits specified in paragraph (c) of this section.

1910.1450(e)(2)

The Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary.

1910.1450(e)(3)

The Chemical Hygiene Plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection;

1910.1450(e)(3)(i)

Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;

1910.1450(e)(3)(ii)

Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;

1910.1450(e)(3)(iii)

A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;

1910.1450(e)(3)(iv)

Provisions for employee information and training as prescribed in paragraph (f) of this section;

1910.1450(e)(3)(v)

The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation;

1910.1450(e)(3)(vi)

Provisions for medical consultation and medical examinations in accordance with paragraph (g) of this section;

1910.1450(e)(3)(vii)

Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer, and, if appropriate, establishment of a Chemical Hygiene Committee; and

1910.1450(e)(3)(viii)

Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:

1910.1450(e)(3)(viii)(A)

Establishment of a designated area;

1910.1450(e)(3)(viii)(B)

Use of containment devices such as fume hoods or glove boxes;

1910.1450(e)(3)(viii)(C)

Procedures for safe removal of contaminated waste; and
1910.1450(e)(3)(viii)(D)
Decontamination procedures.
1910.1450(e)(4)
The employer shall review and evaluate the effectiveness of the Chemical Hygiene Plan at least annually and update it as necessary.
1910.1450(f)
***Employee information and training***.
1910.1450(f)(1)
The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.
1910.1450(f)(2)
Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.
1910.1450(f)(3)
***Information***. Employees shall be informed of:
1910.1450(f)(3)(i)
The contents of this standard and its appendices which shall be made available to employees;
1910.1450(f)(3)(ii)
the location and availability of the employer's Chemical Hygiene Plan;
1910.1450(f)(3)(iii)
The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard;
1910.1450(f)(3)(iv)
Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and
1910.1450(f)(3)(v)
The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.
1910.1450(f)(4)
Training.
1910.1450(f)(4)(i)
Employee training shall include:
1910.1450(f)(4)(i)(A)
Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
1910.1450(f)(4)(i)(B)
The physical and health hazards of chemicals in the work area; and
1910.1450(f)(4)(i)(C)
The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.
1910.1450(f)(4)(ii)
The employee shall be trained on the applicable details of the employer's written Chemical Hygiene Plan.
1910.1450(g)
***Medical consultation and medical examinations***.
1910.1450(g)(1)
The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:
1910.1450(g)(1)(i)
Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.

1910.1450(g)(1)(ii)
Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.
1910.1450(g)(1)(iii)
Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.
1910.1450(g)(2)
All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.
1910.1450(g)(3)
***Information provided to the physician***. The employer shall provide the following information to the physician:
1910.1450(g)(3)(i)
The identity of the hazardous chemical(s) to which the employee may have been exposed;
1910.1450(g)(3)(ii)
A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and
1910.1450(g)(3)(iii)
A description of the signs and symptoms of exposure that the employee is experiencing, if any.
1910.1450(g)(4)
***Physician's written opinion***.
1910.1450(g)(4)(i)
For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:
1910.1450(g)(4)(i)(A)
Any recommendation for further medical follow-up;
1910.1450(g)(4)(i)(B)
The results of the medical examination and any associated tests;
1910.1450(g)(4)(i)(C)
Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous workplace; and
1910.1450(g)(4)(i)(D)
A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.
1910.1450(g)(4)(ii)
The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.
1910.1450(h)
***Hazard identification***.
1910.1450(h)(1)
With respect to labels and material safety data sheets:
1910.1450(h)(1)(i)
Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.
1910.1450(h)(1)(ii)
Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.
1910.1450(h)(2)
The following provisions shall apply to chemical substances developed in the laboratory:
1910.1450(h)(2)(i)
If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in paragraph (b) of this section. If the chemical is determined to be hazardous, the

employer shall provide appropriate training as required under paragraph (f) of this section.
1910.1450(h)(2)(ii)
If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement paragraph (e) of this section.
1910.1450(h)(2)(iii)
If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the Hazard Communication Standard (29 CFR 1910.1200) including the requirements for preparation of material safety data sheets and labeling.
1910.1450(i)
***Use of respirators***. Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of 29 CFR 1910.134.
1910.1450(j)
***Recordkeeping***.
1910.1450(j)(1)
The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this standard.
1910.1450(j)(2)
The employer shall assure that such records are kept, transferred, and made available in accordance with 29 CFR 1910.1020.
1910.1450(k)
[Reserved]
1910.1450(l)
***Appendices***. The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

[55 FR 3327, Jan. 31, 1990; 55 FR 7967, March, 6, 1990; 55 FR 12777, March 30, 1990; 61 FR 5507, Feb. 13, 1996; 71 FR 16674, April 3, 2006]

## APPENDIX B LABORATORY SAFETY AND HOUSEKEEPING REPORT

| Item or area | Comments or Notes |
|---|---|
| Labels on containers | _____ |
| Bench tops | _____ |
| Area under sinks (storage of chemicals) | _____ |
| Hoods | _____ |
| Floors | _____ |
| PPE available (face shields, lab coats, etc) | _____ |
| Compressed gas cylinders | _____ |
| Guards on moving equipment | _____ |
| Safety showers (clear of obstructions) | _____ |
| Refrigerators (need cleaning out) | _____ |
| Electrical cords or wiring | _____ |
| Storage of chemicals | _____ |
| Neatness and organization | _____ |
| Ovens | _____ |

Recommendations_____

_____

Signiture_____date_____

Faculty responsible for laboratory_____

## APPENDIX C

**MONTHLY SAFETY CHECK**

**Checked by:**
**Date:**

| Room # | Hood # | Velocity [1] | Eye Wash | Shower | First Aid Kit |
|---|---|---|---|---|---|
| 2000 | | | | | |
| 2104 | 2104-A | | | | |
| 2105 | 2105-A | | | | |
| | 2105-B | | | | |
| 2106 | 2106-A | | | | |
| | | | | | |
| 3101 | 3101-A | | | | Hallway |
| | 3101-B | | | | |
| 3104 | 3104-A | | | | |
| | 3104-B | | | | |
| 3107 | 3107-A | | | | |
| 3118 | 3118-A | | | | |
| | 3118-B | | | | |
| 3119 | 3119-A | | | | |
| | 3119-B | | | | |
| 3201 | 3201-A | | | | Hallway |
| | 3201-B | | | | |
| 3202 | 3202-A | | | | |
| | | | | | |
| 4101 | 4101-A | | | | Hallway |
| 4111 | 4111-A | | | | |
| | | | | | |
| 5001 | | | | | |
| 5008 | 5008-A | | | | |
| 5106 | 5106-A | | | | |
| 5108 | 5108-A | | | | |
| | | | | | |
| Dry Storage | | | | | |
| Pole Building | | | | | |
| Treating Lab | | | | | |
| Flammable Storage | | | | | |
| Wood Shop | | | | | |
| Timtek | | | | | |
| Bio-Oil Building | | | | | |
| | | | | | |
| Franklin #150 | | | | | |
| Franklin #151 | | | | | |
| Franklin #154 | | | | | |
| Franklin #155 | | | | | |
| | | | | | |
| [1] Velocity in feet per minute at 12-in. opening | | | | | |

## APPENDIX D

### CHEMICAL STORAGE BUILDING RULES

**1) All chemicals stored in the Forest Products Department chemical storage building will be labeled with a name that matches the name on the Material Safety Sheet (MSDS). Each container will display the appropriate NFPA hazard symbol and the name of the listed owner will be displayed on each container.**

**2) A copy of the MSDS will be kept on file by FPD administrative staff and a copy of the MSDS will be kept on file in the Chemical Storage Building. A MSDS for each chemical will be provided to the administrative staff by the listed owner.**

**3) An inventory of all chemicals (consisting of the name, amount, manufacturer, owner, and NFPA 4 digit hazard code) will be kept electronically by FPD administrative staff.**

**4) Chemicals with the special code of oxidizer or water reactivity are prohibited from this storage area.**

**5) Hazardous Waste will not be stored in this area.**

**6) Entrance to the storage building will be limited to persons who need routine access. Miller, Prewitt, Sites, Hassan, Lindsey, and Parikh are currently on the list.**

**7) The Department Head will appoint an inventory clerk(s) as necessary to update and maintain the inventory list. (Currently Linda Sites and George Miller are performing these duties.) Inventory personnel will be notified by e-mail when chemicals are added or removed from the storage building. The e-mail should be sent to FPD Chem Storage.**

**8) The inventory will be verified and updated monthly and an electronic copy of the inventory will be forwarded to the respective listed owners.**

**9) All open drums will be stored in a spill retainer and other drums will be stored on a pallet.**

**10) The condition of the chemical storage building and inventory will be reviewed once a year by the MSU Chemical Hygiene Officer.**

OCT 01 2007

## APPENDIX E

**Department of Forest Products**
**Hazardous Waste Satellite Accumulation Areas (SAA)**

| Building Number | Room Number | Contact Person | Telephone |
|---|---|---|---|
| 2 | 2105 | Sangyeob Lee | 325-0835 |
| 3 | 3119 | El Barbary Hassan | 325-9627 |
| 3 | 3101 | Hamid Borazjani | 325-3106 |
| 3 | 3202 | Lynn Prewitt | 325-4083 |
| 4 | 4111 | Linda Sites | 325-3316 |
| 5 | 5108 | Susie Parikh | 325-0029 |
| Treating Laboratory | | Mike Sanders<br>Brian Lindsey | 325-8097<br>325-4028 |
| Pole Building | | Linda Sites | 325-3316 |