

## 1. INTRODUCTION

Industrial hygiene (IH) is the practice of measuring and controlling employee exposure to potentially harmful agents in the occupational environment. An effective IH program must protect employees from exposure to agents with immediate, acute health effects, as well as substances that cause diseases long after exposure. An effective IH program can result in a safer, more productive workplace and decreased liability for the college. To successfully manage IH concerns, facilities need to develop and implement appropriate programs and procedures.

This Work Plan has been developed to assist in identifying and preventing exposures to potentially harmful agents at the Eckerd College facility located in St. Petersburg, Florida. The intent of the work plan is to assist the Chemical Hygiene Officer (CHO) and laboratory supervisors to recognize, evaluate, and control occupational risks. The Eckerd College Chemical Hygiene Plan (CHP ) is an integral component of this Industrial Hygiene Plan.

### **Key Concepts**

The overall goal of an IH plan is to take all reasonable measures to protect the health and safety of employees in the performance of their assigned work. The goal is achieved by eliminating or limiting to the lowest practicable levels the adverse human health effects of chemical, physical and biological agents in Eckerd College laboratories.

The Industrial Hygiene Work Plan is a tool:

- To assess potential employee exposure to chemical, physical and biological health hazards;
- To organize and perform employee exposure monitoring in order to determine baseline data and to regularly ensure effectiveness of control measures where necessary;
- To ensure employees are properly trained as to the potential health hazards in their work areas and the use of appropriate control measures; and
- To ensure and demonstrate compliance with applicable regulations and guidelines.

These topics are addressed in the various sections and appendices of the Work Plan.

The Industrial Hygiene Plan is subject to periodic review. Such reviews should be done annually, whenever facility modifications have been made or whenever there are indications that laboratory conditions have changed.

## 2. Organization

This Work Plan is divided into four parts, which are organized in accordance with accepted industrial hygiene practice.

- Part I - Recognize potential chemical, physical and biological hazards in the workplace.
- Part II - Evaluate exposure to these hazards where deemed necessary using approved methods, qualified personnel and proper quality control procedures.
- Part III - Control exposure based on engineering, personal protective equipment or administrative procedures.
- Part IV - Assessment to ensure that all systems are in place to meet regulatory and company requirements.
- Appendices - Industrial hygiene resources and copies of relevant laws.

### 3. Regulations and Standards

#### Objective

The purpose of this section of the Work Plan is to provide an overview of the health and safety regulatory requirements that apply to the laboratories.

#### 3.1 OSHA's Purpose

In 1970, the Occupational Safety and Health Act (OSH Act, Public Law 91-596 as amended by P.L. 101-552, Nov. 5, 1980, 29 USC 561) of 1970 was passed "to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources." Under the Act, the Occupational Safety and Health Administration (OSHA) was created within the Department of Labor to:

- Encourage employers and employees to reduce workplace hazards and to implement new or improve existing safety and health programs
- Provide for research in occupational safety and health to develop innovative ways of dealing with occupational safety and health problems
- Establish "separate but dependent responsibilities and rights" for employers and employees for the achievement of better safety and health conditions."
- Maintain a reporting and record keeping system to monitor job-related injuries and illnesses
- Establish training programs to increase the number and competence of occupational safety and health personnel
- Develop mandatory job safety and health standards and enforce them effectively and
- Provide for the development, analysis, evaluation and approval of state occupational safety and health programs.

#### 3.2 OSH Act's Coverage

In general, coverage of the Act extends to all employers and their employees in the 50 states, the District of Columbia, Puerto Rico, and all other territories under Federal Government jurisdiction. Coverage is provided either directly by federal OSHA or through an OSHA-approved state program. States administering their own occupational safety and health programs through plans approved under the OSH Act must adopt standards and enforce requirements that are at least as effective as Federal requirements. In Florida, coverage is provided directly by federal OSHA.

OSHA is responsible for promulgating legally enforceable standards. It is the responsibility of employers to become familiar with standards applicable to their establishments and to ensure that employees have and use personal protective equipment when required for safety. Employees must comply with all rules and regulations which are applicable to their own actions and conduct. Where OSHA has not promulgated specific standards, employers are responsible for following the Act's General Duty Clause that states that each employer "shall furnish...a place

of employment which is free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.”

### 3.3 OSHA Standards

OSHA standards fall into four major categories including General Industry, Maritime, Construction, and Agriculture. OSHA’s regulations are collected in Title 29 of the Code of Federal Regulations, Part 1900-1999. Title 29 of the CFR, Part 1910, provides General Industry standards.

Health standards are promulgated under the OSH Act by the Department of Labor with technical advised from the National Institute of Occupational Safety and Health (NIOSH). Most of the safety and health standards now in force under OSH Act for general industry were promulgated 30 days after the law went into effect on April 28, 1971. The standards represented a compilation of material authorized by the act from existing federal, state, and consensus standards (ANSI and NFPA). It is of special interest that the 1968 American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for exposures to toxic materials and harmful agents have been adopted in the regulations and have the effect of law.

For reference purposes, the indices of OSHA Health Standards 1910, Subpart G-Occupational Health and Environmental Control, and Subpart Z-Toxic and Hazardous Substances, are provided in the following table. The primary standard applicable to Eckerd College laboratories is 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories.

#### Part 1910-Occupational Safety and Health Standards

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##### *Subpart G – Occupational Health and Environmental Control*

1910.94	Ventilation
1910.95	Occupational noise exposure
1910.96	Ionizing Radiation
1910.97	Nonionizing Radiation
1910.98	Additional delay in effective date
1910.99	Sources of standards
1910.100	Standards organizations

##### *Subpart Z – Toxic and Hazardous Substances*

1910.1000	Air contaminants
1910.1001	Asbestos
1910.1002	Coal tar pitch volatiles; interpretation of term
1910.1003	13 Carcinogens (4-Nitrobiphenyl, etc.)
1910.1004	alpha-Naphthylamine
1910.1005	Reserved
1910.1006	Methyl chloromethyl ether
1910.1007	3,4-Dichlorobenzidine (and its salts)
1910.1008	bis-Chloromethyl ether

1910.1009	beta-Naphthylamine
1910.1010	Benzidine
1910.1011	4-Aminodiphenyl
1910.1012	Ethyleneimine
1910.1013	beta-Propiolactone
1910.1014	2-Acetylaminofluorene
1910.1015	4-Dimethylaminoazobenzene
1910.1016	N-Nitrosodimethylamine
1910.1017	Vinyl chloride
1910.1018	Inorganic arsenic
1910.1020	Access to employee exposure and medical records
1910.1025	Lead
1910.1027	Cadmium
1910.1028	Benzene
1910.1029	Coke oven emissions
1910.1030	Bloodborne pathogens
1910.1043	Cotton dust
1910.1045	Acrylonitrile
1910.1047	Ethylene oxide
1910.1048	Formaldehyde
1910.1050	Methylenedianiline
1910.1051	1,3-Butadiene
1910.1052	Methylene Chloride
1910.1096	Ionizing Radiation
1910.1200	Hazard Communication

## 4. Identification and Initial Assessment of Potential Concerns

### Objective

The purpose of this section of the Work Plan is to document the fundamental site information used to create an industrial hygiene database on exposure. In order to achieve this purpose, various methods are used to collect historical and subjective information to focus follow-up activities in Part II (Evaluation) and Part III (Control).

#### 4.1 Historical Assessment

Historical assessments provide information regarding potential IH concerns at the facility. The intent of reviewing historical assessments is to identify concerns that have not been effectively addressed, and which should be evaluated and managed in the IH program.

A review of historical assessments also allows facility personnel to review and organize the plant's historical records.

The following tasks were utilized to complete the historical assessment.

- All past industrial hygiene reports, surveys, data, correspondence, etc. for the laboratories were assembled.
- The data was reviewed and key findings summarized in Form 4.1.
- The information was placed in the Documents and Information Section at the end of this Work Plan.

#### 4.2 Walk Through Survey

On at least an annual basis, an industrial hygienist will perform a walk-through survey of the Eckerd College laboratories included in the CHP. The industrial hygienist will assess the potential for employee exposures to potentially harmful agents.

#### 4.3 Workplace Organization

The CHP includes laboratory-specific sections with drawings that identify:

- The location of fume hoods.
- Chemical storage cabinets.

- Evacuation routes.
- First aid stations.
- Emergency eyewash/shower locations.

Copies of industrial hygiene reports are included in the laboratory specific sections of the CHP.

#### **4.4 Inventory of Chemicals**

Eckerd College has designated a person to maintain current records of the chemicals stored and used in the various laboratories. An evaluation of by-products, intermediates and wastes generated by the laboratories which could result in employee exposure was performed during the development of waste management procedures.

#### **4.5 Job Exposure Profile**

Job Exposure Profiles (JEPs) identify the potentially hazardous agents to which an employee may be exposed to in the workplace. JEPs are completed by the individual laboratory directors under the supervision of the CHO. The JEPs are used to prioritize exposure monitoring.

The JEP review includes both chemical and physical agents. Information gathered from the historical assessment, walk through survey, and chemical inventory are used to complete the JEP. Job Exposure Profiles should be completed as frequently as necessary, recorded, and retained.

**Form 4.1 - Summary of Historical Information**

(This information represents a summary of industrial hygiene surveys which are included in the Documents and Information Section at the end of this Work Plan.

Report Date	Key Finding			Key Control Recommendation		
	Chemical	Physical	Biological	Chemical	Physical	Biological
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**FORM 4.2 - Job Exposure Profile**

<b>Job or Task</b>	<b>Potential Hazardous Agents Associated with the Job</b>	<b>Hazard Code</b>	<b>Probability</b>
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**Hazard Codes**A – Acute  
Cl – CeilingC – Chronic  
S – STELCa – Carcinogen  
L – Lacrimator

T – Teratogen

M – Mutagen

S – Skin Designation

**Laboratory Supervisor Signature:** \_\_\_\_\_**Date:** \_\_\_\_\_

## 5. Exposure Monitoring

The purpose of this section of the Hygiene Plan is to assess actual employee exposure as well as to periodically verify the effectiveness of control measures. Employee exposure assessments should be revised when new laboratory processes are introduced at the facility, or when process modifications have the potential to change employee exposures. The information collected in Section 4 should form a foundation for developing a comprehensive Industrial Hygiene program for the laboratories. The regulated and priority agents identified in Section 4 should be assessed in Section 5.

This section addresses the following aspects of evaluating exposures to agents in the laboratories:

- 1 Assessing Exposures to Chemical Agents;
- 2 Assessing Exposures to Physical Agents;
- 3 Assessing Exposures to Biological Agents; and
- 4 Quality Control (Calibration, etc.).

### 5.1 Exposure to Chemical Agents - Sampling Strategy

Employees may become exposed to chemicals by one of the following 3 routes:

- Inhalation of airborne gases, vapors, and aerosols (particulates);
- Skin contact to chemical liquids and solids which may result in localized reaction or absorption into the body; and
- Ingestion by involuntary intake via food or smoking without proper personal hygiene.

Where exposures to hazardous agents are suspected in a workplace, the evaluation of such exposures through appropriate sampling should be carried out in a systematic and carefully planned manner. The basic strategy is to provide an accurate assessment using the best scientific and statistical methods.

Air sampling may be required for any of the following reasons:

- Compliance with government regulations;
- At the specific request of or following complaints from workers;
- To permit the design or evaluation of control measures;
- For research purposes; and/or
- To support ongoing or continuous monitoring at regular intervals.

The actual air sampling methods and strategies used to evaluate exposures may be dependent upon the original reason for the evaluation. The purpose or reason for the sampling should be recorded.

## Personal Sampling

A personal sample is achieved by attaching the sampling equipment to the worker so that the sampler is with the worker as he/she changes locations. A breathing zone sample requires that the air being sampled be taken directly in the vicinity of the worker's nose/mouth.

Ideally, all workers in the area of concern should be sampled to determine their exposure. In most instances, this is not practical, and only workers at maximum risk are assessed. The identification of maximum risk workers is based upon the following:

- Proximity to the source of the hazardous material;
- Mobility and work habits;
- Air flow patterns; and
- The judgment and experience of the Industrial Hygienist.

If air sampling results indicate that exposures of maximum risk employees are below acceptable limits, it can be assumed that the lower exposures of other workers are below the acceptable limits.

In other situations, it is more appropriate to consider a group as having essentially equal risk of exposure. In these cases a random sample of such workers may be chosen. For such partial population sampling, extreme caution is required. An adequate number of workers should be chosen to ensure statistical validity of the results. For example, in order to ensure with 90% confidence that at least one worker whose exposure falls in the upper 10% of exposures is chosen, all workers should be sampled from an equal risk of group of 7, but only 18 workers need be sampled from a group of 50. See Table 5.1 for a statistical approach to determining the number of samples.

## Area Sampling

Under normal circumstances, the purpose of air sampling is to determine a worker's exposure to a contaminant, and it is more accurate to obtain a personal, breathing zone sample.

In some instances area sampling is conducted. These are samples taken from a specific zone within the work area, not necessarily in proximity to a worker. Such samples give concentrations of the contaminant in the general workroom air and normally do not represent an individual worker's exposure. Occasionally, this information may be required. Periodically, area samples are used in place of personal breathing zone samples, due to limitations in measurement techniques. It should be stressed that extrapolation from area sampling results to personal exposures is difficult and often very inaccurate, as workers are not usually stationary and contaminant levels vary widely throughout their various locations. The probe for the area sampler or monitor should be placed at a height similar to the breathing zone height of employees.

Modifications of area sampling can be used when specific information is required. For example, source sampling is carried out if the source of a contaminant is to be located.

## Sampling for Materials with Ceiling Standards

For some substances, concentrations substantially in excess of time weighted average exposure standards such as ACGIH TLV-TWA may cause irritation to sensitive individuals. For these substances, ceiling standards are established. These standards designate the concentration that should not be exceeded during any part of the work exposure.

For substances -- particularly irritant gases -- that cause immediate irritation from brief exposures, instantaneous monitoring should be used when feasible. For other substances, exposure concentrations may be assessed by sampling through a short duration. Sampling duration should equal the time frame specified in the ceiling standard.

Samples should be taken during expected peak exposures. Grab samples may have to be used to determine peak periods. If the peak exposure period cannot be predicted, use the following random sampling procedure. It will ensure (with 90% confidence) that at least one sample is collected during a peak exposure (upper 10% of concentration levels) period:

- A 15 minute Ceiling standard requires a 16 samples x 15 min per sample;
- A 10 minute Ceiling Standard requires a 17 samples x 10 min per sample; and
- An Instantaneous Ceiling Standard requires a 22 samples x 5 min per sample.

## Sampling Time

Exposures to hazardous materials may be affected by many variables. Seasonal variations should be considered because contaminant concentrations are often higher in the winter months as windows and doors tend to remain closed. As a result of laboratory operations, differences may occur between classes (day and night) and different days of the week. Consideration should also be given to abnormal conditions, such as maintenance shutdowns, turnarounds, or overtime work. It is important to consider carefully the choice of sampling time and its effect on long term exposure patterns.

## Sample Duration

There are two basic categories of sampling times:

1. Full period; or
2. Partial period.

Full period samples are those which are taken during the full working shift and can be either one single sample or several consecutive samples. Partial sampling means that some portion of the work shift is not sampled, and can also be either a single sample or several samples. Partial period samples taken over a very short time interval (normally less than 5 minutes) are considered to be grab samples.

As the purpose of air sampling is normally to determine true worker exposure, full period consecutive or single sampling is most appropriate. Partial period sampling is often utilized. When

overtime conditions exist (greater than 8 hour/40 hour periods), the exposure during the full work period should be represented by the sampling. However, a maximum of 8 hours can be used in the denominator to calculate the OEL.

When partial period sampling is used, assumptions should be made as to the potential exposure during the unsampled period(s). This is often very difficult. The use of grab sampling to determine worker exposure produces considerably varied results.

### **Method of Sampling / Monitoring**

The decision as to which method to utilize for air sampling should be based on:

- The type of information needed;
- The time limitation for sampling;
- The availability of the testing equipment;
- The portability or convenience of the sampling equipment;
- The efficiency of the sampling method;
- Fluctuations in the material being sampled; or
- The reliability of the method.

Air sampling techniques used in occupational hygiene to determine workplace exposures to chemical hazards are broken down into the following classes:

- a) Integrated Sampling Methods including the Collection Media / Matrix using the following:
  - Solid sorbents;
  - Filters; and
  - Absorption or reaction in liquids.
- b) Direct Reading Methods including Colorimetric using the following:
  - Tape reader or detection tubes; and
  - Electronic equipment which uses a variety of chemical / physical characteristics to detect a chemical.

The sampling method to be used should be meet standards established by local regulatory authorities.

### **Unusual Work Schedules**

Application of PELs and TLVs to work schedules significantly different than 8 hours/day and 40 hours/week requires adjustment of these exposure standards in order to provide protection equal to that provided to workers on conventional U.S. work schedules. The Brief and Scala Model is recommended by the ACGIH.

The following formulas can be used to calculate exposure limits to maintain adequate worker protection when working longer schedules. They may not be used to justify higher exposures for shorter work schedules.

## 5.2 Exposure to Physical Agents

The sampling and monitoring principles used to ensure the collection of high quality data on chemical exposures also apply to monitoring employees' exposures to physical agents. Noise is the most frequently identified physical hazard.

### Noise Monitoring

Area Sampling: Use the floor plan for specific laboratories with noise generating sources to create a noise map. A sound level meter is normally used to create such a map with positions in the map being placed along a grid.

Dosimetry: Based on the data from the noise map, employees who may be deemed to potentially have exposures in excess of 85 dBA should be selected to be tested.

Octave Band Analysis: In order to help understand and determine sources of noise and frequency distribution, an octave band analyzer may be used to determine the frequencies which may cause hearing impairment.

Calibration: All noise monitoring equipment should be calibrated against the standards provided by the manufacturer.

### Thermal Environment

Exposure to extreme air temperatures, humidity and infra-red radiation may result in discomfort and in some cases illness. It should be determined whether there is potential for exposure to extreme temperature conditions. This is best achieved by completing a diagram (similar to the noise map) that identifies the following three measures:

- **Dry bulb temperature (DB)** is the temperature of air registered by an ordinary thermometer or other sensor shielded from direct radiant energy sources.
- **Wet bulb temperature (WB)** is the temperature on a surface that experiences evaporative cooling. The WB can be measured by a sling psychrometer that is whirled by hand to create the required air velocity. Alternatively, the **natural wet bulb temperature (NWB)** is measured with a thermometer that has a wet cotton wick over its mercury bulb. The wet wick should be exposed to normal air currents. The WB or NWB should be less than the DB, except when ambient air is saturated and no evaporation occurs.
- **Globe temperature (GT)** measures radiant heat from sources like sunlight, open flames, and hot metal. Radiant heat has little effect on air temperature, but heats the person or object it falls upon. This thermal radiation can substantially contribute to workers' heat stress. A globe thermometer is used to measure GT. It is a thermometer with a bulb or

sensor at the center of a thin walled, black, 15 cm diameter copper sphere. Other devices may also be available to measure globe temperature.

### 5.3 Exposure to Biological Agents

The primary biological hazard in most workplaces is the transmission of disease by bloodborne pathogens. Control of bloodborne pathogens is achieved through development and implementation of an exposure control plan as described in 29 CFR 1910.1030. Other than exposure to bloodborne pathogens, exposure to biological agents can be a potential concern in occupational health clinics, and microbiological research facilities.

### 5.4 Quality Control

All monitoring equipment should be calibrated to a primary standard in order to maintain accuracy for each specific agent. There are two types of calibration 1) the manufacturer's calibration, and 2) a daily calibration (pre and post monitoring). For equipment with air moving pumps, the flow rate should be calculated using a bubble meter, gas meter, or other equivalent primary and secondary standard before and after each test. Mini-Buck calibrators and rotameters are examples of these types of calibration meters.

#### Manufacturer's Calibration

Some instruments may require periodic calibration and service that is conducted by the equipment manufacturer. For these instruments, a manufacturer's calibration sheet should be retained to ensure calibrations are performed in a timely manner. The manufacturer's calibration log for each of these instruments should indicate:

- the model number;
- the serial number;
- the purchase date;
- the recommended frequency of manufacturer's calibration;
- the company responsible for the calibration; and
- any repair work done to the equipment.

All documentation verifying the calibration of each instrument should be filed with the corresponding calibration sheet.

#### Daily Calibration for Flow

In addition to periodic manufacturer's calibration, many types of equipment should be calibrated before and after each use. The individual responsible for conducting the sampling should calibrate the instruments according to the manufacturer's recommendations. Daily (pre and post monitoring) calibration results should be documented. A record should be retained of each day's calibrations and filed along with the results of the corresponding tests.

If pre and post monitoring calibration records differ by more than 10%, the sampling data should be rejected. If pre and post calibration records consistently differ by more than 10%, the instrument should be serviced or replaced.

#### Laboratory Quality Control

All samples collected should be handled properly to maintain integrity of the agent collected. A chain of custody should be established to ensure proper labeling, treatment, transport and transfer of ownership.

### Table 5.1 - Random Selection of Equal Risk Subgroup

**Objective:** To select a subgroup of adequate size so that there is a high probability that the subgroup will contain at least one worker with a high exposure, if one exists.

**Procedure:** The following steps should be taken to ensure the adequate size of the subgroup:

1. Determine the number of workers to sample (S), using Table 1;
2. Using a random method, identify the individual workers to be sampled; and
3. Sample this subgroup.

<b>Table 1 Size of Partial Sample for Top 10% and Confidence .90</b>	
<b>Size of Group (N)</b>	<b>Number of Workers to Samples (S)</b>
8	7
9	8
10	9
11-12	10
13-14	11
15-17	12
18-20	13
21-24	14
25-29	15
30-37	16
38-49	17
50	18
N = original risk group size S = sample size or subgroup size	

This method ensures with 90% confidence that at least one worker from the highest 10 % exposure group is contained within the subgroup labeled.

## 6 - Biological Monitoring

Certain regulations (1910.1001 – 1910.1052) require specific chemical agents (e.g., benzene, lead, etc.) to be monitored in blood or urine samples. These substance-specific standards (as they are referred to) specify sampling and analytical protocols. Biological monitoring is often triggered by personal exposure.

In addition to when it is required by regulations, biological monitoring can be complementary to air monitoring. It should be conducted when it offers an advantage over the use of air monitoring alone. Biological monitoring should be used to substantiate air monitoring, to test the efficacy of personal protective equipment, to determine the potential for absorption via the skin and gastrointestinal system, or to detect non-occupational exposure. The existence of a Biological Exposure Index (BEI) does not indicate the need for conducting biological monitoring. Industrial hygiene and occupational health personnel must exercise professional judgment in designing monitoring protocols.

The method of collection, handling and analysis of biological samples require stringent controls to maintain the integrity of the samples. Standard procedures are available in the NIOSH Manual of Analytical Guides, and normal values for comparison are available in the ACGIH section on BEI. Biological samples may be considered a medical sample in certain jurisdictions, and a doctor or nurse may need to be involved in the handling of the samples and the reporting of the data in order to maintain confidentiality.

Records obtained from biological monitoring become part of the employee's medical record. Medical records, and exposure records contained in the medical files, are considered confidential. Such information should be maintained in strict confidence and in accordance with applicable laws, regulations, and company standards. Employees must be ensured access to their own medical and exposure records.

## 7. REPORTING PROCEDURES

Management and employees should be informed about the purpose of sampling and monitoring and the need for their cooperation prior to any tests. The information required for the reports and who should be notified will differ according to the initial purpose of the test. To ensure compliance monitoring occurs on a timely basis, laboratories should develop a list of chemical, physical and biological agents that they are required to monitor and include this schedule as part of the IH action plan.

In order to establish control procedures, the findings from any of these studies/surveys should be summarized and discussed with management and key functional experts to develop the appropriate control programs.

Some records, particularly employee medical records and exposure records contained in the medical files, are considered confidential. These records should be maintained in strict confidence and in accordance with applicable laws, regulations, and company standards. Employees must be ensured access to their own medical and exposure records.

### 7.1 The Industrial Hygiene Report

Industrial hygiene monitoring or investigations should result in a written report. The document should function as both an outline of the investigation and a recommendation for future activities. The industrial hygiene report should at a minimum include the following information:

- Plant, building, and work area location;
- Reason for the investigation;
- Date of the investigation;
- Name of the Preparer or Leader of the investigation;
- Details of the operation or process being reviewed;
- Field measurements and observations;
- Monitoring results;
- Comparison to applicable occupational exposure levels; and
- Recommendations.

## 8 - Notifications and Correspondences

### 8.1 Employee Exposure Notification

Sample notification forms are included with this document. Under certain circumstances, an employee might decide not to sign the notification form (acknowledgment of notification). If this occurs, the person making the notification should note this on the form below the employee signature line, and then sign/date the form.

Some forms ask for an employee's signature to confirm that the results have been reviewed with the employee. Some employees may decline to sign these forms. If an employee refuses to sign a form, the individual who reviews the form with the employee should note the employee's refusal on the form.

## 9 - CONTROL IMPLEMENTATION

During the course of an Industrial Hygiene investigation, individual laboratories may discover a potential health hazard. Control implementation to remedy the problem will likely vary from laboratory to laboratory depending on the extent of the problem and the need for control. The purpose of this section of the work plan is to provide a guide to containing or eliminating identified health hazards.

This section should also help ensure that hazard controls remain operational. This is accomplished by documenting which control measures exist in the workplace, how they are identified, where they are located, and what they control. Documentation of the control measures allows follow-up for proper operation as well as ensuring that the required controls remain in the desired location.

### 9.1 Control Measures

Although the measures taken to eliminate health hazards may vary, the following control measures are listed in order of preference. If a preferable control measure can be implemented, it should be implemented in order to reduce or eliminate any and all potential health hazards. Control Implementation should follow the following hierarchy:

- Elimination of the toxic substance or health hazard or substitution of a less toxic material;
- Engineering control, such as local exhaust ventilation or vapor condensation;
- Administrative controls, such as rotation of personnel from a noisy area to a "quiet" area or use of confined space entry permits; and
- Use of personal protective equipment such as hearing protection, respirators, chemical gloves and aprons.

### 9.2 Control Oversight

There is no correct method of categorizing control measures. When a problem has been identified and a control measure implemented, the control measure and its type should be documented in the appropriate laboratory-specific tab of the CHP. When exposure monitoring is performed at a laboratory, the exposure levels for areas or contaminants with control measures should be examined. If the exposure levels remain consistent with pre-control measure evaluations, the controls should be evaluated, and a new control measure should be considered.

Annually review and update the description of any and all control measures, equipment, or other information included in this section in order to help ensure consistency and performance.

## 10 - CHEMICAL HAZARDS

The purpose of this section of the Work Plan is to specify the procedures and equipment that coupled with prudent practices will minimize the potential for exposure to hazardous chemicals in Eckerd College laboratories. This section is not an in-depth discussion of the requirements of hazardous chemical management or disposal.

### 10.1 Chemical Inventory

The Chemical inventory is the process of recording every chemical on-site. The inventory includes the identification, recording and labeling of chemicals as well as the repackaging and collection of obsolete chemicals in and around the facility.

The Chemical Inventory is used to:

- Ensure that material safety data sheets (MSDS) files are complete;
- Improve chemical storage and handling, including the proper labeling of containers;
- Improve environmental, health, and safety compliance;
- Raise employee awareness about proper chemical handling procedures and the risks associated with handling chemicals;
- Provide a starting point to reduce chemical use and waste;
- Eliminate unnecessary, obsolete and/or dangerous chemicals; and
- Establish a baseline for developing and maintaining an Approved Chemical List.

### 10.2 Corrective Actions and Control

The following is a list of possible control measures and how they can help reduce employee exposure to hazardous chemicals in Eckerd College laboratories:

#### 1. Elimination / Substitution

Selection of non-toxic or non-hazardous chemicals to replace toxic chemicals can reduce unwanted and unapproved chemicals while reducing the risk of employee exposure.

Before making any material substitutions it is important to evaluate with the laboratory supervisor and functional experts the potential impact of the substitution on waste, data quality, etc.

#### 2. Engineering Controls

Engineering controls are defined as any modification or replacement of equipment or related physical change at the chemical source or along the path where the chemical is used

that reduces the amount of employee exposure to the chemical. Ventilation may be considered to control exposure either by local exhaust or general dilution systems.

### **3. Administrative Controls**

Administrative Controls are changes in the work schedule or operations which reduce employee exposure to hazardous chemicals. Employees may be rotated through the high exposure jobs to reduce the total exposure they receive.

### **4. PPE**

When the risk of employee exposure to hazardous chemicals can not be eliminated by any other method, those employees at risk should be provided with personal protective equipment (PPE) that protects them from the risks posed by the chemicals.

## **10.4 Recording and Posting Controls**

Proper utilization and function of control measures is critical to the protection of employees' exposures to workplace chemical and physical hazards. Documentation allows follow-up for proper operation as well as ensuring required controls remain in the desired location.

It is good practice to post required control measures at the work station. For example, in areas where PPE should be used, post a clearly visible sign that directs employees to wear appropriate PPE. In addition, work instructions or job procedures should include PPE requirements.

## 11 - ASBESTOS EXPOSURE CONTROL

The purpose of this section of the work plan is to specify the procedures and equipment that coupled with prudent practices should minimize the potential for exposure to asbestos in Eckerd College facilities.

### 11.1 Asbestos Inventory

In order to accurately assess the impact of any proposed construction, renovation, or demolition activity, or modification or disposal of any equipment within the facility, it is critical that the facility develop an inventory of all known or presumed asbestos containing material (PACM). Common types of PACM are listed on Table 11.1. Note that the list provided in Table 11.1 is not exclusive. Each significant piece of manufacturing equipment, each process, and the facility itself should be reviewed to determine if PACM is known or suspected to be present. For those areas where PACM is suspected to be present, the material should be analyzed prior to any renovation or modification. This analysis should be done sufficiently far in advance of the anticipated work that contingency plans can be implemented should the material turn out to be PACM.

In many cases, asbestos removal companies may provide a survey of the facility at no or little cost. Past records of abatement may also provide valuable information concerning the presence of PACM at the facility, particularly for insulation, roofing or floor tile.

### 11.2 Asbestos Abatement Procedures

- A. Determine if PACM is present. Refer to your asbestos inventory or test any PACM.
- B. If PACM is discovered, hire an abatement contractor. All abatement work should be done by qualified contractors.
- C. Ensure proper governmental notification where required. If your abatement activity exceeds any relevant regulations, you or your contractor should provide prior notification to the federal, state, and or local agencies. Representatives from the federal or state agency may opt to visit the site during the abatement job. Permits or authorizations may be required.
- D. Ensure PACM receives proper transportation and disposal. Inspect the license/approvals of transporters and landfill before contracting for transport or disposal. This information should be provided to you by the abatement contractor. Keep manifests in the Waste Work Plan.

### 11.3 Working Safely Around Asbestos

- A. In some countries, maintenance personnel who may encounter asbestos in their work are required to be provided with specific training about the health effects of asbestos, and how to work safely with it.
- B. Facilities with ACM or PACM present should develop an Asbestos Management Plan. This plan should address the types, quantities, and location of ACM or PACM; training requirements, required work practices and protective equipment; warning signs; the person (or title) responsible for the Asbestos Management Plan; and other relevant information.
- C. For operations and maintenance procedures that will involve the disturbance of material which is suspected to contain asbestos, work should not begin until the material suspected of containing asbestos has been analyzed and removed from the working surfaces by approved and certified abatement personnel.
- D. If maintenance operations may cause disturbance of PACM in areas close to site operations, work should not proceed until the materials are adequately protected to prevent the release of asbestos fibers into the atmosphere. Disturbance is any physical action which may dislodge asbestos fibers from their static condition in the insulation material and liberate them into the surrounding atmosphere, such as hammering, banging, sawing, drilling, burning, welding, soldering, threading, or otherwise causing excessive movement or vibration of valves, pipes, fittings, equipment, machinery or other devices that are covered with PACM.
- E. Do not drill, scrape, chisel, cut, peel, tear, pull abrade, or otherwise damage any suspect PACM during any installation, replacement, removal, renovation, adjustment or testing operation. Use an expert contractor for removing the PACM prior to installation.
- F. Care should be exercised during maintenance operations so as not to disturb the PACM.
- G. Should an accidental disturbance occur which visibly displaces the PACM material, personnel should **STOP WORK IMMEDIATELY** and report the incident to the CHO.

#### 11.4 Emergency Procedures

As long as asbestos exists in the building, release of asbestos fibers could occur. All workers should report to the laboratory supervisor any indication of damaged substances with PACM, including the presence of debris on the floor, missing pieces of material, obviously damaged insulation, etc. In such cases, access to the areas should be restricted, and the damaged material properly abated, by a qualified outside abatement contractor.

**TABLE 11.1**  
**Sample List of Suspect Asbestos Containing Materials**

- i. Cement Pipes
  - ii. Cement Wallboard
  - iii. Cement Siding
  - iv. Asphalt Floor Tile
  - v. Vinyl Floor Tile
  - vi. Vinyl Sheet Flooring
  - vii. Flooring Backing
  - viii. Construction Mastics
  - ix. Acoustical Plaster
  - x. Decorative Plaster
  - xi. Textured Paints/Coatings
  - xii. Spray-applied Insulation
  - xiii. Blown-in Insulation
  - xiv. Fireproofing Material
  - xv. Taping Compounds
  - xvi. Packing Materials
  - xvii. High Temperature Gaskets
  - xviii. Lab Hoods/Table Tops
  - xix. Laboratory Gloves
  - xx. Fire Blankets
  - xxi. Fire Curtains
  - xxii. Elevator Equipment Panels
-

## TAB 12 - VENTILATION

Ventilation can help reduce chemical agents in the breathing zone of employees. Ventilation control is divided into two basic designs:

- Local Exhaust Systems which are normally used for containing highly toxic material; and
- General Dilution ventilation which dilutes chemicals that are of lower toxicity by the introduction of clean air into the workplace.

The choice of a system should be made by a qualified person. Systems should follow the ACGIH Ventilation Guide.

### 12.1 Local Exhaust

The following is a list of the basic requirements for Local Exhaust:

- Containment by the use of a hood, cabinet, enclosure or both;
- Ducts connected to the containment device which leads to a filter and exhaust fan;
- Ducts, fans, and filters should be specified to ensure proper removal of the contaminant from the workplace and filtration to meet local air pollution requirements;
- Sufficient supply of treated make-up air to maintain even pressure in the area;
- Alarms to indicate reduction in flow or malfunction of the fan and filter system;
- Posting of acceptable flow rates and maintenance logs at the face of each control device; and
- Placement of discharge point away from air intakes.

### 12.2 General Exhaust

The following is a list of the basic requirements for General Exhaust:

- An exhaust fan in an appropriate location to maximize movement of the contaminant away from the breathing zones of the employees;
- Fitting of the exhaust system with an appropriate filter to meet local air pollution requirements;
- Treated supply air directed in such a way to maximize movement of the contaminant away from the employee and not result in localized heating or cooling of the employee;

- Inspection to ensure that contaminants are not trapped in “dead zones” because of the placement of the supply and exhaust systems; and
- Alarms to indicate reduction in air movements and posting of a log of the flow rate measurements.

## 13 - RADIATION MANAGEMENT

The purpose of this section of the work plan is to specify the procedures and equipment that coupled with prudent practices should minimize the potential for exposure to radiation in Eckerd College laboratories.

### 13.1 Radiation

Radiation sources are normally divided into two categories, ionizing and non-ionizing. Those sources included in the ionizing radiation category include radioactive materials (thorium, uranium, radon, cesium-137, cobalt-60, krypton-85, polonium-210, etc.) and equipment which when energized generates electron beams or x-rays (scanning electron microscopes (SEMS), cabinet x-rays, x-ray diffraction or spectroscopy equipment, etc.). Ionizing radiation is so named because it is energetic enough to produce ionization in the atoms which absorb the radiation. All other electromagnetic radiation (light, ultraviolet, infrared, radiofrequency, lasers, microwaves, etc.) are considered non-ionizing because of lower energy levels.

### 13.2 Ionizing Radiation Sources (not currently permitted at Eckerd College)

Ionizing Radiation Sources are strictly regulated and controlled. Any use of an ionizing radiation source (either radioactive material or x-ray device) should be communicated to and reviewed by the CHO. All licensing of radioactive material should be done in coordination with the CHO to ensure that the intended use and control will meet licensing requirements and conditions.

In general, devices such as scanning electron microscopes (SEMS) and interlocked cabinet x-rays are safe and should not result in an over exposure to the user, provided that they are not tampered with or intentionally modified. Should you wish to modify the device in any way, the manufacturer and the CHO should be contacted to ensure that you do not inadvertently defeat the device's protection. Analytical x-ray sources (such as x-ray diffraction or spectroscopy equipment), particularly older equipment, may have more easily defeatable safety devices or interlocks. Use or modification of this equipment should only be done by properly trained individuals.

### 13.3 Non-Ionizing Radiation Sources

Non-ionizing radiation sources include all other sources of electromagnetic radiation, most of which do not present a significant hazard in the workplace. Potential non-ionizing radiation sources include ultraviolet (UV) and infrared (IR) light, lasers, microwaves, and radiofrequency sources.

Ultraviolet light may be generated either intentionally from lamps or unintentionally as a by-product of arc-welding or quartz tube heating. Additionally, mercury or metal halide lamps with broken outer glass jackets are a source of significant amounts of UV. Excessive expo-

sure to UV can result in increased risk of skin cancer and possibly cataracts. Processes which can result in exposure to UV should be reviewed to determine if shielding is needed.

Infrared radiation is also known as heat radiation. With the exception of infrared lasers, some heat treating processes, and heating quartz, most heat sources do not present an exposure problem outside of potential heat stress. The infrared light from infrared lasers and heated quartz present an eye hazard. Appropriate shielding should be provided to protect the operators from exposure.

Lasers are divided into the following classes which identify the risk associated with the product.

- Class I-No hazard;
- Class II-No hazard to the eye for <.25 second exposure (the time it takes to blink);
- Class II-Direct beam exposure is hazardous; and
- Class IV-Diffusely reflected beam is hazardous.

Each use of lasers (other than inherently safe Class I devices such as printers, copiers, most bar code readers and CD players) should be evaluated to determine if the planned use of the laser is safe and will not present a risk to the user. Each laboratory using lasers should maintain an inventory of laser devices (other than printers, copiers, bar code readers and CD players).

#### **13.4 Radiofrequency/Microwave Radiation**

Ensure that the use of high powered radiofrequency devices is conducted in accordance with local regulations and manufacturer recommendations. Use of high powered radiofrequency devices should be reviewed with the CHO to determine if additional precautions other than those provided by the manufacturer are needed.

Exposure limits in local regulations are required protection levels for employees. The ACGIH TLVs are recommended as guidelines for measurement.

## 14 - NOISE MANAGEMENT

The purpose of this section of the work plan is to ensure, if necessary, that an effective hearing conservation program (HCP) is established and maintained to provide the best possible protection from the harmful effects of noise.

An excessively loud environment reduces efficiency, causes stress, and can cause irreparable damage to hearing. Hearing loss due to noise exposure is a permanent, disabling condition. Fortunately, noise induced hearing loss is preventable and through the successful application of an occupational HCP, this risk can be reduced or often eliminated.

### 14.1 The Hearing Conservation Program

When noise levels are in excess of 85 dBA, engineering controls should be used to reduce exposure. If engineering controls cannot reduce sound below a level of 85 decibels on an 8 hour time weighted average (TWA), the site should implement a Hearing Conservation Program (HCP). The HCP should include the following components:

- Noise exposure monitoring;
- Audiometric testing;
- Administrative and engineering controls;
- Training;
- Use of hearing protection devices;
- Record keeping; and
- Program evaluation.

### 14.2 Monitoring

A noise exposure monitoring program should be developed and implemented when information indicates that any employee's noise exposure may equal or exceed an 8-hour TWA of 85 decibels. The monitoring strategy should be designed to identify employees to be included in the hearing conservation program and to enable the proper selection of hearing protectors.

Monitoring should be repeated whenever a change in operations, process, or equipment may increase sound level exposure such that additional employees may be exposed at or above the action level or that hearing protection may not meet the regulatory requirements of the country of operation.

Affected employees should be provided with an opportunity to observe any noise measurements conducted for the above monitoring purposes.

All employees who are monitored should be notified of the results.

### 14.3 Audiometric Testing Program

An audiometric testing program should be established for each employee exposed to an 8-hour TWA of 85 decibels or higher. The audiometric testing program should include the following:

1. A baseline audiogram should be established within 6 months of the employee's first exposure at or above the action level, which can be used as a comparison for subsequent audiograms. Where mobile test vans are used to meet the audiometric testing obligation, a valid baseline should be obtained within 1 year of an employee's first exposure at or above the action level.
2. Annual audiograms should be provided for those included in the hearing conservation program. Each audiogram should include the following information:
  - Name;
  - Job Classification;
  - Date of Audiogram;
  - Examiners Name;
  - Last Calibration of Audiometer;
  - Background Test room Noise level; and
  - Most Recent Noise Exposure level.
3. Baseline audiogram testing should be preceded by at least 14 hours without exposure to workplace noise. Hearing protectors may be used as a substitute for the 14 hours without exposure to workplace noise" requirements.
4. An audiogram should be obtained at least annually after the baseline for each employee exposed to an 8 hour TWA of 85 decibels or higher. The results of the annual audiogram shall be compared to the employee's baseline audiogram to determine if a standard threshold shift has occurred.
5. If the annual audiogram indicates that an employee has developed a standard threshold shift, a retest may be obtained within 30 days and the results of the retest may be considered to be the annual audiogram.
6. Annual audiograms indicating a standard threshold shift should be reviewed along with the baseline audiogram and other relevant information by a consulting physician or an audiologist.
7. If a standard threshold shift has occurred, the employee should be informed in writing within 21 days of the determination.
8. If the consulting physician or audiologist determines that the standard threshold shift is work related or aggravated by occupational noise exposure, the following steps should be taken:

- Employees not wearing hearing protection should be fitted with hearing protection;
- Employees should be trained in the use and care of the hearing protection;
- Employees should be required to wear the hearing protection; and
- Employees already wearing hearing protection should be refitted and retrained with hearing protection devices which provide greater attenuation as needed.

#### **14.4 Engineering and Administrative Controls.**

Engineering and administrative controls should be used to reduce noise exposure to the point where the harm to hearing is eliminated or at least more manageable. For hearing conservation purposes, engineering controls are defined as any modifications or replacement of equipment, or related physical change at the noise source or along the transmission path (with the exception of hearing protection) that reduces the noise level at the employee's ear. Administrative controls are defined as changes in the work schedule or operations which reduce noise exposure

Typical engineering controls involve:

- Reducing noise at the source;
- Interrupting the noise path;
- Reducing reverberation; and
- Reducing structure-borne vibration.

Common examples of the implementation of such controls are:

- Installing a muffler;
- Erecting acoustical enclosures and barriers;
- Installing sound absorbing material; and
- Installing vibration mounts and providing proper lubrication.

Examples of administrative controls include:

- Operating a noisy machine on the second or third shift when fewer people are exposed;
- Shifting an employee to a less noisy job before a daily noise exposure (dose) has been reached; or
- Providing for quiet areas where employees can gain relief from workplace noise. For example, areas used for work breaks and lunch rooms should be located away from noise. If these areas should be near the production line, they should be acoustically treated to minimize background noise levels.

Engineering, industrial hygiene and safety personnel, as well as employees who operate, service, and maintain equipment should be involved in the noise control plan and the assess-

ments for the applicable engineering controls. An important goal of the control plan is to reduce continuous noise levels to 90 dBA or below and reduce impact noises where feasible. Reduction of continuous noise levels to less than 85 dBA is recommended.

It is especially important to specify low noise levels when purchasing new equipment. Many types of previously noisy equipment are now available in noise-controlled versions. In many cases, a "buy quiet" purchase policy should not require new engineering solutions. Whenever feasible, new machines should operate at or below 79 dBA.

#### **14.5 Training**

Training should be provided initially and annually for all employees included in the hearing conservation program. The training should include:

- The effects of noise on hearing;
- The purpose of hearing protection devices;
- Advantages and disadvantages of various hearing protection types;
- Instruction on fitting, use and care of hearing protection devices; and
- An explanation of audiometric testing purposes and procedures.

#### **14.6 Hearing Protection**

The following is a summary of the requirements for hearing protection:

1. Hearing protection devices should be made available to all employees exposed to an 8-hour TWA of 85 decibels or greater.
2. Employees with an 8-hour TWA greater than 90 decibels should be required to wear hearing protection devices which attenuate employee exposure to an 8-hour TWA of 90 decibels or lower. It is strongly recommended that hearing protection be worn in all areas above 85 decibels regardless of the duration of exposure.
3. Employees with an 8-hour TWA of 85 decibels or greater should be required to wear hearing protection if they have not yet had a baseline audiogram established or if they have experienced a standard threshold shift. Hearing protection devices for employees who have experienced a standard threshold shift should attenuate employee exposure to an 8-hour TWA of 85 decibels or lower.
4. The reduction in harmful noise caused by the hearing protector should be evaluated for the specific noise environments in which the protector is used.
5. A variety of hearing protection devices should be made available for selection by employees. Personal headsets and/or earphone style radios may not be worn or used in the manufacturing area.

6. Management should extend its commitment to hearing protectors by requiring all personnel, including managers and visitors, to wear protectors in designated areas, and by encouraging employees to take them home to use whenever engaging in noisy activities.

### 14.7 Record Keeping

An accurate record of all employee exposure measurements should be maintained. All audiometric test records should be retained in the employee's medical file and should include:

- Employee's name and job classification;
- Date of audiogram;
- Examiner's name;
- Date of last acoustic or exhaustive calibration of the audiometer;
- Employee's most recent noise exposure assessment; and
- Background sound pressure level in audiometric test room.

Records should be retained for the following periods:

- Noise exposure measurement records should be retained for at least two years or as required by local law; and
- Audiometric test records should be retained for the duration of the employee's employment plus an additional 30 years or as required by local law.

### Definitions

The following terms will be used frequently in describing the implementation of a HCP. Familiarity with the terms and the definitions should aid the user in successfully implementing a HCP.

A-Scale:	The most commonly used scale on the sound level meter/dosimeter which accounts for the human ear's response to noise.
Action Level:	For purposes of the HCP, an * hour TWA of 85 decibels measured on the A-scale, slow response, or equivalently, a dose of 50%.
Administrative Controls:	Any procedure that limits daily exposure to noise by control of the work schedule.
Audiogram:	A graph or table obtained from an audiometric examination showing hearing level as a function of frequency.
Baseline:	The audiogram against which future audiograms are compared.

Audiogram:	
Attenuation:	The amount of noise (in decibels) that is reduced by wearing hearing protection.
Decibels:	Are a measure of the intensity or loudness of sound.
Engineering Controls:	Any procedure other than administrative control that reduces the sound level either at the source of the noise or in the hearing zone of the employees.
Hearing Conservation Program	This program includes every employee who is exposed to noise levels of 85 decibels or above as an 8 hour time weighted average (TWA).
Hearing Protection:	Equipment that is worn either in the external ear or over the ear itself to decrease the level of noise.
Hertz:	Unit of measurement of frequency, numerically equal to cycles per seconds.
Prebycusis:	Hearing loss due to the aging process.
Standards Threshold Shift (STS):	For purposes of the HCP, this is a change in hearing threshold relative to the baseline audiogram of an average of 10 decibels (db) or more at 2000, 3000, and 4000 hertz (Hz) in either ear.

## 15 - Heat and Cold Stress

This section is to help reduce the adverse health effects caused by working in a hot or cold environment. Hot or cold environments can have a profound effect on an employee's health. There are several factors which affect an individual's response to temperature extremes:

- Age: older employees are less able to adapt to high temperatures;
- Obesity: the obese are less able to adapt to changing temperatures;
- Physical condition: poor physical condition lessens ability to withstand temperature extremes;
- Underlying disease: heart disease, asthma, diabetes, emphysema, etc.;
- Acclimatization: workers become tolerant of increased temperatures over time; and
- Physical activity of the work: the more strenuous the work, at a given temperature, the less time an individual can work without adverse effects.

Minimizing the temperature extremes should reduce heat and cold stress. The risk of heat and cold stress will vary greatly from laboratory to laboratory.

### 15.1 Heat Stress

Minimize adverse effects of working in hot environments through the following methods:

- Identify and document all areas, environments, or jobs with potential heat exposure hazards on Form 3.2;
- Evaluate all components that contribute to heat stress (e.g., radiant or infrared heat, humidity levels, metabolic load or work rate, air velocity, and air temperature) using Form 4.7;
- Make appropriate heat stress measurements;
- Use appropriate techniques to minimize heat stress (for example, insulate sources, decrease or increase ventilation rates, or use diffusers, dehumidifiers, or reflective surfaces);
- Use administrative controls, such as rest breaks, as appropriate;
- Provide rest areas away from extremely hot environments;
- Provide easy access to cool drinking fluids;
- Provide medical coverage /attention as appropriate;
- Provide training to employees; and
- Provide appropriate clothing as warranted by heat source and heat stress components.

### 15.2 Cold Stress

Minimize the adverse effects of exposure to decreased temperatures through the following methods:

- Identify and document all areas, environments, or jobs with potential cold temperature exposure hazards;
  - Evaluate all components that contribute to cold stress (radiant loss to cold surface, metabolic load or work rate, air velocity, or air temperature);
  - Make appropriate measurements (e.g. air temperatures, velocity, and wind chill);
  - Use administrative controls, such as rest breaks when appropriate;
  - Provide rest areas away from extremely cold environments;
  - Provide easy access to hot drinking fluids;
  - Provide medical coverage/attention as appropriate;
  - Provide training to employees; and
  - Provide appropriate clothing as warranted by exposure.
-

## 16 - Controlling Biological Hazards

### **Bloodborne Pathogens**

The transmission of bloodborne pathogens is a potential concern in medical emergencies. If facility personnel respond to medical emergencies, provisions should be made to protect responders and victims from the transmission of bloodborne pathogens and thereby, the resultant diseases such as hepatitis and acquired immunodeficiency syndrome (AIDS).

### **Exposure Control Program**

An exposure control program should be implemented to provide education and training in the use of engineering and work practice controls, personal protective equipment, housekeeping methods and medical waste disposal in order to reduce occupational exposures to bloodborne pathogens.

The written exposure control plan should identify employees at risk. Any employees who may have the potential for exposure to blood or other bodily fluids should be covered by the program. Employees who might be at risk include laboratory technicians, CPR-trained employees, first responders to emergencies, and janitorial or housekeeping staff.

### **Training**

Employees who may have an exposure risk should receive annual bloodborne pathogen training. In general, the training should

- Include an explanation of transmission of and potential exposures to bloodborne pathogens;
- Address the use and limitations of methods to prevent exposure, including engineering controls (e.g., hand washing facilities, sharps containers, biohazard bags); work practice controls (e.g., no eating or drinking in potentially contaminated areas, use of sharps containers); and personal protective equipment (e.g., use of gloves, eye protection, one way check valves for mouth to mouth resuscitation);
- Discuss Hepatitis B, and offer Hepatitis B vaccination free of charge;
- Discuss blood spill containment and decontamination procedures; and
- Address actions an employee should take if exposed, and post-exposure follow-up procedures.

Medical and training records should be maintained for the individuals covered in the program.

### **Exposure Control Equipment**

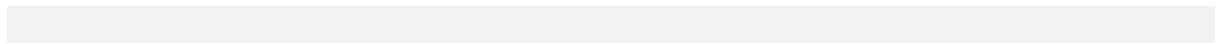
Providing the necessary control measures and personal protective equipment is an important aspect of an exposure control plan. Any laboratory which provides first aid or cardiopulmonary resuscitation should also provide the appropriate engineering and procedural controls as well as personal protective equipment to prevent exposure to blood or other body fluids while responding to an emergency. The necessary control measures and personal protective equipment will be dependent on the range of services provided at the facility. Basic personal protective equipment that a facility should have readily available includes:

- Protective eye wear (glasses, goggles and/or face shield);
- Surgical gloves;
- A protective face mask with a one way check valve for cardiopulmonary resuscitation;
- Disinfectant solution (isopropyl alcohol, hypochlorite solution, household bleach); and
- Biohazard labels and biohazard waste disposal bags.

Additional supplies such as sharps containers and autoclaves may be needed depending on the level of medical services provided at the facility.

### **Potential Exposure Incidents**

Any employee who has had an incident during which the blood or bodily fluids of another individual have come into contact with the employee's eyes, mouth, mucous membranes or non-intact skin should be offered a post-exposure evaluation and follow-up, including any necessary medical tests.



## 17 - Training

The purpose of this section of the work plan is to explain training needs associated with an industrial hygiene program. To meet legal requirements, laboratory personnel with industrial hygiene responsibilities should be properly trained to perform their duties. Adequate records should be kept to document this training. Additionally, all laboratory employees should receive sufficient training to understand the occupational hazards associated with their work area, and the measures that are taken to control these hazards.

### Key Concepts

It is important that laboratory personnel with industrial hygiene responsibilities receive sufficient training in applicable regulatory requirements to be able to understand and properly interpret the relevant laws and regulations. Furthermore, they should be able to communicate these requirements clearly to others in the labs. This training should be obtained through a thorough review of the relevant laws and regulations. It can and often should be supplemented by consultation with qualified technical consultants and/or legal staff.

Industrial hygiene personnel can provide training to other plant personnel in many ways including (but not limited to) formal courses, briefings, short meetings or pamphlets. It is a best practice to integrate regulatory information with Standard Operating Procedures so that compliance will become part of normal operations. This also allows training on industrial hygiene concerns to be provided at the same time training is provided on other operating issues.

**Plant personnel exposed to potential stressors** should receive instruction on:

- The characteristics of the hazards;
- The potential health concerns related to exposure to the harmful agents;
- The proper use of equipment and machinery;
- How to perform their duties in a safely while complying with regulations and best practices;
- The use, effectiveness, and limitations of any personal protective equipment (such as gloves, tyveks suits, and respirators) that they are required to use; and
- Procedures to be taken in the event of an emergency.

New laboratory personnel are required to receive training regarding potential occupational hazards prior to commencing work. If it is not feasible to train new employees prior to their initial assignment, they should work under the supervision of a trained employee until they receive training. When laboratory procedures are modified and if exposures change, employees should be informed of new procedures which are appropriate to protect them from the changed risks.

<b>18 - SELF ASSESSMENT</b>
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The Self Assessment is designed to be a learning tool to enhance employee awareness of the most critical elements of the Industrial Hygiene Program. It also serves as a mechanism for identifying areas where resources can be most effectively applied to continuously improve safety performance.

List any items that do not meet Eckerd College expectations (indicated by a No in the following checklist) in the Action Plan in Section 19. Action planning should allow any deficiencies to be clearly tracked and promptly corrected. It may also help to identify systemic deficiencies, which may be addressed more effectively through a coordinated response.

### A. Industrial Hygiene Program Assessment

Question Number	Question	References or Comments	Response (Y/N/NA)
1.	Have industrial hygiene responsibilities and accountabilities been defined and assigned?		
2.	Has responsibility been assigned for managing the industrial hygiene program at the site?		
3.	Do assigned personnel have sufficient knowledge to complete their responsibilities?		
4.	Has the laboratory supervisor received basic training in industrial hygiene?		
5.	Is there a certified industrial hygienist at or available to the college?		
6.	Are written goals and objectives established for the industrial hygiene program?		
7.	Does the CHO review proposed laboratory process changes and provide input?		
8.	Are job exposure assessments reviewed at least annually?		
9.	Is a procedure in place to evaluate all new or changed tasks/procedures?		
10.	Is a system in place to ensure that the implemented control measures (e.g. work practices, ventilation, PPE, etc.) are and remain effective?		

## B. Chemical Hazard Assessment

Question Number	Question	References or Comments	Response (Y/N/NA)
1.	Are written procedures for safe chemical handling established and implemented at the workplace?		
2.	Are chemical handling procedures included in specific training or job instruction for all appropriate employees?		
3.	Have chemical handling procedures been reviewed by an industrial hygienist?		
4.	Is there an Emergency Action Plan?		
5.	Does the Emergency Action Plan include procedures for treating employees over-exposed to chemicals or other hazardous agents?		
6.	Does the Emergency Action Plan include training for emergency response site personnel regarding chemicals used at the site and their potential hazards?		
7.	Does the Emergency Action Plan include procedures for practice drills for emergency situations?		
8.	Are emergency procedures applied to both new and modified laboratory processes?		
9.	Are procedures in place and implemented to ensure that potentially hazardous substances, and physical agents are identified?		
10.	Has employee exposure for a) hazardous chemical substances and b) physical agents been measured?		
11.	Has the assessment been conducted by qualified persons?		
12.	Have all employees exposed to hazardous chemical substances been identified?		
13.	Are employees given the results of personal monitoring?		
14.	Are records of worker exposure maintained for at least tenure plus 30 years in a file or data system?		
15.	Is the IH plan readily available to: 1) employees; and 2) employee representatives?		
16.	Does the IH Plan include provisions for employee information and training?		
17.	Does the IH Plan include circumstances under which prior approval is required before implementing control procedure?		
18.	Is information and training provided: 1) at the time of each employee's initial assignment to a work area where hazardous chemicals are present; and 2) before assignments involving new exposure situa-		

Question Number	Question	References or Comments	Response (Y/N/NA)
	tions?		
19.	Are employees trained in the applicable details of the IH Plan?		
20.	Is there a written Hazard Communication Program for the site?		
21.	Is a list compiled of all hazardous chemicals produced, imported or used at the site?		
22.	Does a designated person maintain the list of hazardous chemicals and update the list regularly?		
23.	Does the label on each container of hazardous chemicals include the identity of the chemical and the appropriate hazard warnings?		
24.	Does the label on each container include the name and address of the chemical manufacturer, importer, or other responsible party?		
25.	Does each MSDS contain the Permissible Exposure Level (PEL), Threshold Limit Value (TLV), or other exposure limit?		
26.	Is training provided to employees 1) working with ionizing and/or non-ionizing radiation sources; 2) exposed to biological materials; 3) working in confined spaces; and 4) exposed to hazardous material?		
27.	Have all employees been trained in the physical agents in the work area?		
28.	Have all employees been trained in the measures they can take to protect themselves from the physical and health hazards of chemicals in the work area?		
29.	Is training provided to employees working under heat or cold stress?		
30.	Are the following maintained for at least tenure plus 30 years: 1) MSDSs; 2) Biological monitoring results; and 3) Personal monitoring data?		
31.	Are employees informed upon first entering employment and annually thereafter of: 1) the existence, location, and availability of their medical and exposure records; 2) their rights of access; and 3) the name of the person responsible for record maintenance?		

### C. Air Monitoring Assessment

Question Number	Question	References or Comments	Response (Y/N/NA)
1.	Is airborne monitoring conducted with the frequency specified by substance specific standards and corporate policy?		
2.	Are employee exposure records maintained under the substance specific regulation requirements?		
3.	Are employee exposure records maintained for 30 years and medical records for the duration of employment plus thirty years?		
4.	Do exposure records include the following: 1) the date of the measurement; 2) job operation; 3) sampling and analysis methods; 4) the number, duration, and results of samples; 5) the name of the employee sampled; and calibration documentation?		
5.	Is biological monitoring conducted when specific exposure limits are exceeded or as determined by corporate policy or law?		
6.	Has the monitoring been performed by or conducted under the guidance of an industrial hygienist?		
7.	Did the exposure monitoring use recognized sampling methods?		
8.	Is the analysis of samples conducted by a qualified laboratory?		
9.	Is a system in place to record and retrieve employee exposure data?		
10.	Does airborne sampling represent an employee's eight hour or full shift exposure?		
11.	Is sampling equipment calibration checked before and after sampling tests?		
12.	Are results of airborne monitoring: 1) communicated to the laboratory supervisor; 2) provided to the medical personnel; 3) communicated to the affected employees; and 4) communicated to the CHO?		
13.	Are sampling results included in the medical records of the employee?		
14.	Are procedures in place and implemented that allow exposed employees access to airborne monitoring results?		
15.	Were personal exposures in excess of PELs identified during recent (past 12 months) sampling programs?		

### D. Noise Monitoring and Control

Question Number	Question	References or Comments	Response (Y/N/NA)
1.	Is noise monitoring conducted in the laboratory?		
2.	Is a system in place to include the level of exposure at each work area?		
3.	Have areas been identified where employee noise exposures equal or exceed an eight hour time weighted average sound level of 85 dBA?		
4.	Is a written hearing conservation program in place and implemented for all employees who are exposed to sound levels which are 85 or more decibels?		
5.	Has the hearing conservation program been reviewed by an industrial hygiene group/ person with in-depth knowledge of the standard?		
6.	Does the laboratory perform noise dosimetry when an employee's exposure may equal or exceed an 8 hour TWA of 85 decibels?		
7.	Is sound measurement equipment calibrated before and after use?		
8.	Is monitoring repeated whenever a change occurs in production, process, equipment, or controls where additional employees may be exposed at or above the action level?		
9.	Are affected employees or their representatives provided with an opportunity to observe noise monitoring?		
10.	Are records maintained of all areas where average daily noise levels equal or exceed 85 dBA?		
11.	Are employee noise exposure measurements retained for the required amount of time?		
12.	Are noise exposure records provided upon request to employees, their representatives, and former employees?		
13.	Is audiometric testing performed on employees exposed to an average daily noise level of 85 dba or more?		
14.	Have baseline audiograms been conducted for employees exposed to an average daily noise level of 85 dba or more?		
15.	Are annual audiograms compared to baseline audiograms to determine if a standard threshold shift has occurred?		
16.	If an employee has suffered a standard		

Question Number	Question	References or Comments	Response (Y/N/NA)
	threshold shift, is the employee informed in writing, within 21 days of determination?		
17.	Is hearing protection available at no cost to employees who have experienced a standard threshold shift?		
18.	Are audiometric testing records retained for the duration of the affected employee's employment?		
19.	Is hearing protection available to employees who are exposed to an eight hour time weighted average of 85 decibels or greater?		
20.	Are employees provided a choice of hearing protection?		
21.	Have engineering control feasibility studies been conducted and documented for areas where the noise level exceeds the permissible noise exposure level?		
22.	If shown to be necessary and feasible, have engineering controls been installed to reduce the noise level?		
23.	Does the employer ensure that employees use personal protective equipment in areas where daily noise levels exceed 90 dba?		
24.	Are signs posted in areas where hearing protection is required?		

### E. Radiation Assessment and Control

Question Number	Question	References or Comments	Response (Y/N/NA)
1.	Have sources of radiation located at the laboratory been identified?		
2.	Are all radiation areas posted with cautions and the radiation warning symbols?		
3.	Has a person been assigned responsibility for radiation protection?		
4.	Have all employees who work with/near radiation sources been informed of: 1) the occurrence of radiation/radioactive materials in the radiation area(s); 2) hazard problems associated with exposure to these material; 3) precautions to minimize exposure?		
5.	Are there written procedures in place and implemented for employees working with or exposed to sources of radiation?		
6.	Are there any sources of ionizing radiation at the facility?		
7.	Is there a current inventory of all radioactive materials and ionizing radiation?		
8.	If appropriate, are employees monitored for exposure to radiation via external and internal monitoring techniques?		
9.	Are employees exposed to airborne radioactive material at the facility?		
10.	Does the facility have an evacuation plan specific to radioactive materials?		
11.	Is the evacuation signal unique to the facility and of sufficient duration to ensure that all affected persons hear the signal?		
12.	Are records of radiation exposure maintained and disclosed to each employee on at least an annual basis?		
13.	Are all containers of licensed radioactive material labeled with: 1) the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL"; or 2) the radiation symbol and the words "DANGER RADIOACTIVE MATERIAL"?		
14.	Are there any sources of non-ionizing radiation within the facility?		
15.	Have all non-ionizing radiation significant sources been identified?		
16.	Are the sources and locations of non-ionizing radiation labeled with appropriate hazard information?		
17.	Are lasers located at the facility?		
18.	Are all lasers labeled with the class identification?		

Question Number	Question	References or Comments	Response (Y/N/NA)
19.	Have controlled areas been established for the use of Class II lasers?		
20.	Are periodic tests and inspections of all safety devices conducted per manufacturer's instructions?		

### F. Ventilation Assessment

Question Number	Question	References or Comments	Response (Y/N/NA)
1.	Have exhaust air ventilation systems been inventoried?		
2.	Is each exhaust air ventilation system reviewed by the industrial hygiene department at intervals specified by company policy?		
3.	Do employees check the system regularly and log the data?		
4.	Are exhaust systems inspected periodically for physical damage or deterioration?		
5.	Is the CHO consulted for review when new exhaust systems are installed?		

### G. Asbestos Management Program Assessment

Question Number	Question	References or Comments	Response (Y/N/NA)
1.	Is asbestos involved in any way in the company production process?		
2.	Are substitute materials actively being sought?		
3.	Has asbestos been found in insulation or building products? If yes, is there an Asbestos Management Plan in place?		
4.	Has a listing or map been developed identifying PACM locations?		
5.	Is initial baseline health monitoring conducted for employees that working with asbestos?		
6.	Are affected employees or their designated representatives allowed to observe exposure monitoring?		
7.	Where feasible, have engineering controls and work practices been used to control the exposure to asbestos?		
8.	Is an asbestos information and training pro-		

Question Number	Question	References or Comments	Response (Y/N/NA)
	program provided for employees prior to or at the time of initial assignment, and then annually thereafter?		
9.	Are all employees who are or will be exposed to asbestos given pre-placement, annual, and exit medical examinations?		

### H. Thermal Management Assessment

Question Number	Question	References or Comments	Response (Y/N/NA)
1.	Has the site been inspected for conditions subject to extreme temperatures?		
2.	Have all areas, environments, or jobs with potential thermal exposure been identified?		
3.	Have appropriate techniques been used to minimize heat or cold stress (e.g. insulate sources, use diffusers, or dehumidifiers, etc.)?		
4.	Do employees have access to hot/cool drinking water?		
5.	Have employees at risk to thermal exposure been trained in how to respond to changing or extreme temperatures?		

## 19 - ACTION PLAN

Implementation of this Work Plan may lead to the identification of action items that are needed to correct deviations from regulatory requirements, to reduce any unacceptable risks, and to control employee exposure to potentially harmful agents. This section of the Work Plan prompts facilities to list the action items that have been identified, and to develop a plan to address them.

### 19.1 Instructions

1. List action items that are identified during the implementation of the previous sections of this Work Plan on Form 19.1. Particularly, review the Exposure Assessment and Self-Assessment to identify action items. Any “No” responses in the Self Assessment should be listed as an action item on Form 19.1.
2. Assign a priority to each action item. High priority should be given to the following action items:
  - Potential significant risk to the health of workers and the surrounding community;
  - Potential significant environmental impacts and
  - Non-compliance with regulatory requirements.
3. Develop a program and allocate resources to ensure that unacceptable risks are reduced and that non-compliance is corrected.
4. Assign responsibility and establish a completion date for each action.
5. Document each action item and its correction in the table included on Form 19.1.

