



Exposure Monitoring Facilitator Guide

Acknowledgments

The Midwest Consortium developed this course for Hazardous Waste Workers and Emergency Responders under cooperative agreement number U45 ES 06184 from the National Institute of Environmental Health Sciences (NIEHS).

We encourage you to comment on these materials.

Warning

The Midwest Consortium has copyrighted this material for workers who must use personal protective equipment to reduce exposure to hazardous materials. A recipient of the material, other than the Federal Government, may not reproduce it without permission of the copyright owner.

The material was prepared for use by facilitators experienced in the training of persons who are or who anticipate being employed at a worksite requiring use of personal protective equipment. Authors of this material have prepared it for the training of this category of workers as of the date specified on the title page. Users are cautioned that the subject is constantly evolving. Therefore, the material may require additions, deletions, or modifications to incorporate the effects of that evolution occurring after the date of this material preparation.

Disclaimer

The Occupational Safety and Health Administration (OSHA) rules help ensure worker health and safety at work sites and during a range of emergency response activities that may require monitoring devices or the results of monitoring. This program is intended to increase skills of those using monitoring equipment.

Additional training is necessary to perform many activities. These activities include trouble shooting equipment, analysis laboratory requirements, and safety on water or during field soil collection. Participants should seek guidance on these activities by consulting health and safety personnel, laboratory customer service and SOPs for sample collection.

These materials were updated January 31, 2024; all web links are active as of that date. If you find an inactive web link, please notify your Program Director.

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Overview

This program was developed in response to the need for workers served by the MWC to gain in-depth skills regarding the range of air, water and soil sampling devices used for exposure assessment; by following the outline format and activities in this guide, you will be better able to enhance learning, stimulate class discussion, and maintain the training objectives.

The program is designed to be tailored for the needs of participants. It is expected that a 4-hour program might be useful, as well as a full 8-hour program. Breaks and lunch are not part of the training hours. For each agenda, it is the responsibility of the training center staff to develop the following:

- Agenda (retain in program file) NOTE: agenda must show 4 or 8 hours of contact time, not including breaks or lunch. Duration of the program is tailored to participant needs.
- Supplemental Exercises (if used more than once, the exercise must be sent to UC to be made part of the Exercise Manual for all centers.)
- Sufficient monitoring device resources to illustrate the points in the program and facilitate development of needed skills among participants.

The Midwest Consortium for Hazardous Waste Worker Training is devoted to professional facilitator freedom while maintaining consistency of training.

It is recommended that a minimum of two experienced facilitators team-teach this course. Additional experienced station leaders may be required to "pull off" more complex exercises or a lab session effectively. If Level A or B is used, the medical clearance is needed prior to the program, and participant to facilitator ratio must be no more than 5:1. (See the NIEHS Minimum Criteria here: <http://tools.niehs.nih.gov/wetp/>) To maximize learning and skill development limit the class to no more than 24 participants.

Facilitator Preparation

The program incorporates a variety of teaching methods to meet varied learning styles. Material presentation, discussion, small-group activities, exercises, demonstrations, and labs are used to present material. These varied formats are designed to meet the different types of learners who might be present in your courses. The Facilitator Guide provides step-by-step instructions for presenting the material. Where facility-specific material is developed, please note:

- Develop lesson plan and retain in program file
- Retain handouts in the program file; if used at multiple locations or for multiple customers, send exercises to UC for inclusion in consortium-wide materials.
NOTE: changing the chemical or another 'tweak' does not constitute a new exercise.

Ensure/document consistency with overall goals of the monitoring session
Each session is covered in the Facilitator Guide and includes information such as time requirements, teaching methods, required materials, suggested facilitator preparation, minimum content requirements, issues which may arise, and reference materials. Every facilitator should be familiar with the material in the Participant Guide, the Facilitator Guide, the Exercises and the content he/she is teaching. In addition, facilitators should be familiar with the OSHA Standard, 29 CFR 1910.120 and chemical-specific standards that may be relevant to the participants (e.g., lead, 29 CFR 1910.1025):

- Guidance on groundwater sampling
http://www.epa.gov/sites/production/files/2015-06/documents/gw_sampling_guide.pdf
- Guidance for soil sampling <http://www.epa.gov/sites/production/files/2015-06/documents/Soil-Sampling.pdf>
- Guidance for surface sampling
<https://www.osha.gov/SLTC/hazardouswaste/surface2.html>

Carefully review the Facilitator Guide before planning your session. Lesson outline forms may be helpful when drafting your presentation outline. Examples of lesson outline forms are shown on the following two pages.

The exercises are only found in the Facilitator Guide to allow tailoring to ensure relevancy to the participants; for example, if all participants work at a facility where ammonia is the primary hazard, exercises could be focused on ammonia-related monitoring. Similarly, if training is done on-site, the available monitoring devices would be used in exercises. See the alternative exercise that is used for a program to increase skills in using a specific instrument such as the 4-gas monitor.

Lesson Plan Form 1

<p>Teaching Methods for This Lesson Plan</p>	<p>Audiovisual Requirements</p>
<p> <input type="checkbox"/> Presentation <input type="checkbox"/> Discussion <input type="checkbox"/> Question and answer <input type="checkbox"/> Hands-on simulation <input type="checkbox"/> Team teaching <input type="checkbox"/> Small-group exercises <input type="checkbox"/> Case study <input type="checkbox"/> Other (describe): </p>	<p> <input type="checkbox"/> Training guides <input type="checkbox"/> Supplemental handbook material <input type="checkbox"/> Websites: <input type="checkbox"/> Whiteboard <input type="checkbox"/> Hands-on simulation <input type="checkbox"/> Other (describe): </p>
<p>Reference Materials</p>	<p>Special Space or Facility Requirements</p>
	<p>List any room size or special facility regulations here, such as set-up areas, equipment storage concerns, etc.</p>
<p>Suggested Discussion Questions</p>	<p>Suggested Facilitator Preparation</p>

Lesson Plan Form 2

Subject Area or Element	Detail	Reference Number or Citation
Major subject heading or Roman numeral item from outline format.	Detailed breakdown of subject area or element. This area will necessarily occupy more space than the column to the left.	e.g., page number in training notebook, section number of regulation, or audiovisual material.

Instructional Resources

The instructional resources listed below will be useful in preparation and during the program. Many publications are available free from the U.S. Government Printing Office; other resources are available for a minimal cost. Many resources are also available on the internet.

1. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*. October 1985. NIOSH/OSHA/USCG/DHHS (NIOSH) Publications No. 85-115, <https://www.cdc.gov/niosh/docs/85-115/default.html>
2. *NIOSH Pocket Guide to Chemical Hazards*. NIOSH, <http://www.cdc.gov/niosh/npg/>
3. SDS Dictionary
4. Groundwater sampling http://www.epa.gov/sites/production/files/2015-06/documents/gw_sampling_guide.pdf
5. Soil sampling <http://www.epa.gov/sites/production/files/2015-06/documents/Soil-Sampling.pdf>
6. Surface sampling <https://www.osha.gov/SLTC/hazardouswaste/surface2.html>
7. Relevant exercises presented at the 2012 National Trainers Exchange: http://tools.niehs.nih.gov/wetp/1/12TrainersExchange/42_Air_Monitoring_Exercise.pdf and associated exercise description http://tools.niehs.nih.gov/wetp/1/12TrainersExchange/42_PCP_Air_Monitoring_Exercise.pdf

Presentation of Material

Graphics and Audiovisuals

Graphics are available and should be used to assist with in-class instruction. Graphics appear throughout the Participant Guide to illustrate chemical properties, monitoring instruments, respiratory protective equipment, and protective clothing. Refer participants to these illustrations as you discuss the material.

Photographs, sketches, charts, posters, short videos, and PowerPoint slides are also useful training tools and may be introduced in the lesson where appropriate. PowerPoint slides should be limited to those which support lesson presentation. Avoid using one-word slides, slides with term definitions, and slides as lecture outlines. These types of slides are not effective at keeping participant attention. Effective slides contain color graphics and short review lists.

Resources

You may want to provide the following on each table:

- 29 CFR1910
- Hard copy of specific standards
- An SDS dictionary or glossary
- NIOSH Pocket Guide

If available, provide an iPad or other device to access these resources on-line as well.

Exercises and Labs

Small-Group Activities and Exercises

Small-group activities and exercises are incorporated throughout this training course. Exercises are collected in an appendix to this Facilitator Guide; the discussion during activities is limited to instructions for presentation. The purpose of these activities and exercises is to experientially involve participants in clarifying information, identifying options, and applying skills.

Participants may complete the activities or exercises on their own and share their results in class, or as small groups.

Class activities and exercises enhance the learning process; therefore, it is strongly recommended that you make activities and discussions comfortable so that everyone can participate. Assume that every class will have participants with a wide range of communication skills. Some participants will have no problems participating in group discussion, while others may have a hard time talking in front of the group.

Suggestions for facilitating group activities and discussions include:

- Allow participants to freely express their values, attitudes, and opinions.
- Do not judge participant's responses.
- Facilitate discussion by paraphrasing and clarifying. It is seldom appropriate for the facilitator to give opinions.
- Avoid putting people on the spot. Instead of asking individuals for answers, have voluntary group spokesperson present findings to the entire group.
- Keep the groups focused on the task at hand. Because small-group exercises can draw heavily on the participants' personal experience, sometimes conversation can drift.
- Be alert to the potential for one person to dominate work in small groups. If you see this happening, facilitate participation by other members of the group.
- Keep the participants alert and interested by encouraging participation. If the groups are not participating or giving only cursory answers, ask them probing questions linked to previous work or life experiences.

Labs/Workshops

Labs are designed to provide the opportunity for participants to observe demonstrations and receive hands-on experience using equipment while reinforcing theoretical aspects learned in class. Most labs are set up with rotating stations with an assistant facilitator at each station. Performance checklists are completed by the participant during the lab exercises. At the end of each station exercise and before a rotation is made, performance checklists must be signed by the facilitator, collected, and retained by the training center as part of the participant's permanent records.

Evaluation

The exercises throughout the program document activities of the participants and it is expected that everyone (with your help) will demonstrate mastery of each skill. During the skills, some participants may require extra time with you to be successful; your patience to assist each participant is most appreciated.

Successful Completion

Successful completion of this course is defined as: Attendance, 100% on all Performance Checklists

Introduction

Time Requirement: 20 minutes

Number of Facilitators: 1 or more, consistent with ratio shown in Minimum Criteria

Materials

- Participant Guide
- Whiteboard or equivalent; markers
- Open-space room which will allow groups mobility with sampling devices

Objectives

When completed, participants will be better able to:

- Illustrate hazards that can be detected and measured through monitoring, including those that may result in adverse health or environmental effects
- Identify several types of monitoring that may be performed
- Describe the procedures to be followed when using selected monitoring devices
- Conduct monitoring with a specific instrument (optional)

If the optional objective is selected, development of appropriate exercises and checklists are the responsibility of program personnel.

Teaching Methods

The introduction combines presentation with discussion. It is important as a facilitator to gauge the level of knowledge of the participants. You may do this during the introduction.

Suggested Facilitator Preparation

- Review the Participant Guide
- Identify needs of participants
- Prepare an outline for notes
- Review OSHA standard 1910.1020, Access to employee exposure and medical records
- Tailor Minimum Content (below) to identified needs.

Minimum Content Requirements

- Reasons to monitor
- 29 CFR 1910.120
- 29 CFR 1910.1020
- Other standards/guidelines relevant to the participants
- Basic principles for using monitoring equipment

Questions You May be Asked

1. Participants might remark, "We did not do any monitoring at my job. So what are we supposed to do?" This question gives you the opportunity to emphasize that monitoring will be done for many reasons (confined space, emergency, routine exposure assessment); discuss reasons why a participant might not know about monitoring (short time of employment, none of the usual needs to monitor, little awareness of emergency response team capabilities) and facilitate listing 'who to ask' as follow up when back at work.
2. "What do I do when my employer does not give me the results of monitoring?" Be prepared to facilitate a discussion on 29 CFR 1910.1020. Underscore that if he/she must ask for them; if requested, they must be provided.
3. "Why doesn't everyone eliminate hazards?" This is done when possible, but sometimes there are no engineering controls that are useable. One example is during response to an emergency—it may not occur near the fume hood!

Monitoring for Workplace Hazards

Emphasize that monitoring can be done to detect or measure a potential hazard.

Ask participants to describe prior experience - this will provide valuable insights to you as the program proceeds.

Ask participants for examples of monitoring equipment that is available at their workplaces. List where all can see.

Review the reasons to sample, as shown in the Participant Guide.

Use the graphic to distinguish between detect and measure.

Refer back to the list of available equipment and identify which can be used to detect and which to measure.

Exposure Records

Discuss the general requirements of 29 CFR 1910.1020. Facilitate participant discussion about records.

Basic Principles

Discuss the listing in the Participant Guide, and keep it posted where all can see for reference as the program is conducted.

OCCUPATIONAL EXPOSURE LIMITS

Time Requirement: 30 minutes

Number of Facilitators: 1 or more, consistent with ratio in Minimum Criteria

Materials

- Participant Guide and worksheets
- Whiteboard or equivalent; markers
- NIOSH Pocket Guide and worksheets

Objectives

When completed, participants will be better able to:

- Describe measurement of air quality
- Contrast the enforceable and recommended exposure limits
- Demonstrate use of the NIOSH Pocket Guide to find Occupational Exposure Limits

Teaching Methods

- Presentation/discussion
- Small-group activity

Suggested Facilitator Preparation

- Review the Participant Guide
- Review this section
- Review OSHA standard 1910.1000, Air Contaminants, where PELs are listed
- Review background reading materials
- Review facility SOPs for monitoring; these might be part of other programs, such as confined-space entry. (contract programs only). The OSHA Technical Manual provides additional guidance on sample collection https://www.osha.gov/dts/osta/otm/otm_toc.html.
- Prepare class notes
- Prepare worksheets for exercise

Minimum Content Requirements

- Describe exposure levels
- NIOSH Pocket Guide proficiency

Questions You May Be Asked

1. You should be prepared to discuss the differences between OSHA, NIOSH, and ACGIH.
2. Participants may question whether adequate monitoring is done on a routine and emergency basis. For contract programs, reconnaissance will provide you with information about the facility's monitoring program and equipment.

Presentation of the Session

This session can be presented as follows:

Measures of Concentration

Review the examples of measures of concentration given in the Participant Guide.

- Emphasize that 1 ppm, 1 mg/m³ or 1 f/cc are very dilute concentrations. Some chemicals are hazardous even at these low concentrations.
- Percentages are used for higher concentrations. A concentration of 1% is 10,000 ppm.

IDLH/PEL/TLV/REL/STEL/C

Emphasize there are several occupational exposure levels published, but only PELs are legally-enforceable.

PELs are often not the most protective exposure limits.

Short-term exposures should be compared to the STEL or C, if one exists.

Time-Weighted Averages (TWAs)

Many limits are expressed as an 8-hour time-weighted average.

Even though an exposure may be high for a short period of time, the PEL may not be exceeded.

Biological Exposure Standards and Indices

Few exposures are measured by biological samples.

Measurements of chemicals in blood, breath or urine may be used to assess exposure to lead, carbon monoxide, n-hexane, Parathion or trichloroethylene.

OSHA requires biological monitoring for workers exposed to some chemicals, including lead and cadmium.

Exercise – Using the NIOSH Pocket Guide to find Occupational Exposure Limits

Number of Facilitators Required: 1 or more, consistent with ratio in Minimum Criteria

Time Requirement: approximately 20 minutes

Materials:

- NIOSH Pocket Guide and worksheet

Procedure:

Ask participants to look up the information listed on the worksheet in Exercises for a given chemical. A chemical from the list generated at the beginning of class may be a good choice. If participants are working in groups, have each group look up a different chemical and have them select a representative from each group to report to the entire class (if time allows). The worksheet in the Exercises is for organizing their information and for future reference.

Some relevant points:

- The lower the exposure limits, the more toxic or hazardous the chemical is.
- If a chemical is classified as a carcinogen, “Ca” will appear in the REL and IDLH areas in the NPG.
 - For carcinogens, there may be no safe level of exposure.
- The TLV is not found in the NPG. It is found in most SDSs, if it exists.

Collect the worksheets, grade them, and save the results to be returned to the evaluation center.

Exposure Monitoring

Time Requirement: 3-7 hours

Number of Facilitators: 1-2; if Levels A or Bare used, review and comply with NIEHS guidance

Materials

- Participant Guide and worksheets
- Whiteboard or equivalent; markers
- Open-space room which will allow groups mobility with sampling devices

Objectives

When completed, participants will be better able to:

- Describe relevant chemicals that can be monitored in your workplace
- Demonstrate use of instruments and tools for sampling
- Explain reasons for a sampling plan
- Describe use of monitoring during emergencies

If the alternative objective is selected, development of appropriate exercises and checklist is the responsibility of program personnel.

Teaching Methods

Participants should have as much hands-on time with monitoring equipment as possible. Keep lecture on each monitor to a minimum.

Suggested Facilitator Preparation

- Review the Participant Guide
- Identify needs of participants
- Prepare an outline for notes
- Tailor Minimum Content (below) to participant needs
- Gather appropriate monitoring devices (and manufacturer operating guides) based on participant needs

Minimum Content Requirements

- Relevant 'What can be Monitored?'
- Overall guidance
- Demonstrate ability (with selected, relevant instrument(s))

Presentation of the Session

This session can be presented as follows:

Ask: "When would you want to monitor?"

Ask: "How are the results of these (refer to the list) reported?"

What Can Be Monitored in the Air?

Review the following:

1. Oxygen Deficiency/Enrichment

The question in the Participant Guide under this heading gives three different oxygen levels. Issues that may arise for each are:

- a) $O_2 = 19.5\%$ - Oxygen is deficient below this level. A positive-pressure SCBA or positive-pressure air-line respirator equipped with an escape air supply must be used when the oxygen level may be below 19.5%.

- b) $O_2 = 20.5\%$ - Oxygen is within the acceptable range to use an APR, but you should investigate the reason why the oxygen level is below the normal 20.9%. Are toxic gases or asphyxiants replacing the oxygen?
- c) $O_2 = 23.5\%$ - Oxygen is enriched above this level. Special procedures to minimize the risk of explosion will be needed. Discuss these as appropriate.

2. Fire and Explosion Hazards

Combination (LEL/explosivity, combustibility) meters are approved for use in flammable environments where oxygen does not exceed 20.9% unless specifically tested in oxygen-enriched atmospheres. An alternative is to use a sample tube to draw the air to the meter, located in a normal oxygen atmosphere. The length of the tubing will vary based on manufacturer recommendations (30-199 feet), and the tube material must be compatible with the environment (non-reactive/adsorbing). For example, Tygon may absorb gas/vapors including ammonia, chlorine, hydrogen sulfide and benzene; Teflon or EPDM would be preferred—consult the manufacturer. Condensation can also be a problem with tubing; be alert for signs of condensation and use any result with caution.

Distinguish between percent on these meters and ppm for human health. 1% is 10,000 ppm. Normal oxygen in air is present at 209,000 ppm.

LEL catalytic bead sensors respond accurately only in the presence of 8-12% oxygen. In very low oxygen atmospheres (inert tank, for example), a 0 LEL reading will not be correct with this sensor! Evacuation should be considered at 10% LEL.

- 3. Toxic Chemicals
- 4. Corrosivity
- 5. Radiation
- 6. Biological Hazards

What Can Be Monitored in Soil, Water, Surfaces?

Review the following:

- 1. Soil
- 2. Water
- 3. Surface

Overall Guidance

This section provides information on how to sample, the need for a sampling protocol, and preparing for sampling.

Underscore the need for following a written procedure. Call attention to

- Personal monitoring calibration
- Need to know work schedule
- Chain of Custody

Sampling Plan or Protocol

Facilitate a discussion of WHAT a sampling plan is and WHY a plan is needed, and HOW it contributes to valid data. Review the elements of the sampling plan and documentation that should be included.

When available, use the SOP of the company (review in advance to identify gaps). If gaps are identified, be ready to lead a discussion about approaches to remediating the SOP (meet with specified personnel, form a committee, contact the employee representative, etc). The Participant Guide section can be used/modified as an SOG, if needed.

Before you Sample...

Ask: What needs to be done before you begin? List responses on whiteboard.

Compare with the general categories in the Participant Guide. Specific activities will vary depending on the instrument(s) available.

After you Sample...

Ask: What needs to be done after you sample? List responses on whiteboard.

Compare responses with items in Participant Guide. Specific activities will vary depending on the instrument(s) available.

Sampling Instruments and Tools

Discuss the features of several instruments commonly used in hazardous waste site work and demonstrate them and/or pass them around the class. Discuss what to do in cases when an instrument doesn't provide a reading or may have interference.

Some common instruments and tools include:

- pH paper
- Oxygen/Combustible-gas indicator (CGI)/Combination instruments
- Colorimetric detector tubes
- Personal alarms
- Hydrocarbon detectors
 - Photoionization Detectors (PID)
 - Flame Ionization Detectors (FID)
- More Specialized instruments
- Radiation exposure monitoring
- Noise Monitoring

Point out that noise exposure assessment can be accomplished using a sound level meter for area measurements or a noise dosimeter for personal sampling of an individual worker's noise exposure. Note that a smartphone may be useful as a substitute if a Sound Level Meter (SLM) isn't available.

Personal Air Monitoring

Review methods that require a pump and those that do not.

The need for pre-post calibration of pumps, careful chain of custody and shipping should be discussed. If laboratory analysis is to be used, has someone contacted lab personnel to ensure agreement on methods of collection, shipping and the required turn-around time?

Gas and Vapor Sampling

Review the sampling train and other requirements shown in the Participant Guide or the company SOP (contract program).

Particle/Particulate/Fiber/Dust Sampling

Review the requirements shown in the Participant Guide or the company SOP (contract program).

Area Air Monitoring

Identify the instruments on the list or discussed that are area gas and vapor monitors.

Area Monitoring for Particles/Fibers/Dust

Area monitoring is generally done with high-volume sampling pumps, as shown.

Water Sampling

The following resources provide background:

http://www.epa.gov/sites/production/files/2015-06/documents/gw_sampling_guide.pdf

Utilize YouTube videos to demonstrate water sampling, such as:

<https://www.youtube.com/watch?v=x9fri5rmbbl>

https://www.youtube.com/watch?v=7_5RcnaFn_w&list=PLa86V_dhHTNUD4_x2OqyX-Tx711_MfLky

<http://www.youtube.com/watch?v=yfnoQhHBOHg>

Soil Sampling

The following resource provides background:

<http://www.epa.gov/sites/production/files/2015-06/documents/Soil-Sampling.pdf>

Describe the application of the various types of sampling:

- Surface

- Below surface, manual
- Below surface, mechanized

The notes in the Participant Guide shown below each type of sampling assist in determining which application can be used for a specific situation.

Surface Contamination Sampling

There are several reasons to conduct surface sampling at a hazardous waste site. Procedures shown in <https://www.youtube.com/watch?v=FLv8dUUxmfk> can be adapted to non-lead environments.

Monitoring at an Emergency

Pre-planning is essential for emergency response. The Emergency Response Plan (ERP) should contain the monitoring plan for emergency response. Emphasize that conditions can change constantly during an emergency.

CLOSING AND EVALUATION

Time Requirement: 30 minutes

Number of Facilitators: 1

Materials

- Whiteboard or equivalent; markers
- Evaluation forms

Objectives

- Answer questions
- Collect feedback

Teaching Methods

- Discussion

Suggested Facilitator Preparation

- Ensure you have evaluation forms.
- Ensure that any new exercise is documented and the written material sent to your Program Director

Minimum Content Requirements

- Evaluation
- Answer last questions
- Thank participants

Questions You May Be Asked

“How do I get more training?” Most suppliers provide training and resource materials.

Presentation of the Session

Thank participants for attending the program.

Review the goals, and the basics of an Exposure Monitoring program.

Refer back to the list from the beginning of the course and discuss the use of each of the available instruments (what is sampled, area, personal, direct reading or lab analysis, detect or measure, units of result, where to find the sampling protocol that includes before-during-after actions).

Ask: Has this training helped you identify improvements in current practice? For those willing to share, jot down the ideas and forward it to the Program Director.

This is an opportunity for final questions and to ensure that the list of questions has been addressed during the program.

Evaluation is important to continued program improvement. This should not be rushed. Provide 15 minutes to complete the program evaluation forms and collect them.

Exercises – Directions and Worksheets

NOTE: This section is a constantly expanding resource, as trainers contribute exercises to increase the resources for the MWC.

Exercises used more than once (different company, different group of participants) must be forwarded to MWC with the checklist developed to show mastery of skills. Changing the chemical in an exercise **does not** constitute a new, used-only-once exercise.

Exercise – Using the NIOSH Pocket Guide to Find Occupational Exposure Limits

Complete the following worksheet for the same chemical for which you looked up chemical properties earlier.

Chemical name

NIOSH exposure limits (REL)

OSHA exposure limits (PEL)

IDLH level

Is it a carcinogen? Yes _____ No _____

List four symptoms of exposure:

- | | |
|----|----|
| 1. | 2. |
| 3. | 4. |

What would you do if it got on your skin?

What parts of the body are affected by exposure?

What occupational exposure limit was not listed?

Where would you look to find that occupational exposure limit?

Exercise – Monitoring Lab

During this exercise, participants will have the opportunity to use a combustible-gas indicator, indicator tubes, and an oxygen meter.

Checklists for each station are shown at the end of this exercise.

This section may be challenging for participants who have never used air-monitoring equipment; however, they use equipment regularly to measure characteristics of air, (i.e., pressure in tires and temperature), and they see air quality data as part of the weather report.

Materials

- Combustible gas indicator and instruction manual
- Bottle of rubbing alcohol
- Pan
- Tape measure or ruler
- Checklist
- Clipboard and pens for each participant
- Face shield (for the facilitator)
- Funnel (to recycle alcohol)
- Ammonia
- Indicator tubes
- Brown paper bags
- Oxygen meter
- Safety glasses

Presentation

Station 1: Use of the Combustible-Gas Indicator

- Assemble the equipment and PPE, and make sure the site has no sources of ignition
- Don face shield and prepare pan of solvent
- Review safety precautions
- Answer questions
- Team assembles necessary equipment and develops strategy

- Team approaches “spill” and performs task at three different distances
- Team completes Sampling Lab Data Sheet

Station 2: Use of Indicator Tubes

- Review instructions and assemble PPE
- Review safety precautions
- Answer questions
- Team approaches chemical and takes reading at three distances
- Team completes Sampling Lab Data Sheet

Station 3: Use of Oxygen Meter

- Calibrate instrument
- Review safety precautions
- Answer questions
- Team (individual) performs experiment
- Record results on Sampling Lab Data Sheet Station 3

Name _____

Monitoring Lab Data Sheet
Station 1: _____

Type of equipment:

Brand of equipment:

Purpose of equipment:

Sample number	Reading (units)	Distance (units)

What are the limitations of this equipment?

Date _____ Facilitator's Signature _____

Name _____

Monitoring Lab Data Sheet
Station 2: _____

Type of equipment:

Brand of equipment:

Purpose of equipment:

Sample number	Reading (units)	Distance (units)

What are the limitations of this equipment?

Date _____ Facilitator's Signature _____

Name _____

Monitoring Lab Data Sheet
Station 3: _____

Type of equipment:

Brand of equipment:

Purpose of equipment:

Sample number	Reading (units)	Distance (units)

What are the limitations of this equipment?

Date _____ Facilitator's Signature _____

Exercise – Exposure Monitoring with a Specific Instrument

Detailed knowledge of an instrument design, operation, limitations and recognition of potential malfunction is required for use during many work activities such as confined space entry, rescue or hazard identification. In this exercise you will use equipment available at your worksite in a simulation of possible use.

Because the instrument and application is specific to your work activities, the program facilitator will provide you with several checklists, including at a minimum:

- Preparing for use
- Monitor use for one or more situations
- After use actions