

Sampling to Measure Exposure

Time Requirement: 1.5 – 4 hours depending on what is to be measured

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

Materials

- Participant Guide and worksheet
- Whiteboard or equivalent; markers
- Resource for sampling and analytical methods
- Instruments/tools for each group to use and any needed supplies
- User Manual for the instrument/tool
- Log book showing maintenance, calibration data etc. for device to be used
- Contaminant source if instrument is direct-read
- An assortment of PPE for use (depends on scenario)

Objectives

When completed, participants will be better able to:

- Demonstrate preparation of a sampling device for use
- Demonstrate use to collect sample
- Demonstrate required after-use actions
- Identify any personal protective equipment necessary during use

Teaching Methods

- Presentation/discussion
- Small-group activity

Suggested Instructor Preparation

- Review the Participant Guide for this refresher module and ‘before you sample’ guidance for different sampling approaches (appended to this guide).
- Review OSHA standard 29CFR1910.120, especially paragraphs (c), (h) and (q).
- Test web links prior to the session and if any are inoperative please notify your Program Director
- Review the Monitoring chapter in the long program completed by participants.
- Review OSHA standard 1910.1000, Air Contaminants, where PELs are listed.
 - Link to OSHA 1910.1000: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1000>
 - Link to table Z1: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1000TABLEZ1>
 - Link to table Z2: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1000TABLEZ2>
 - Link to table Z3: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1000TABLEZ3>
 - Link to OSHA Standard Interpretation Letters for OSHA 1910.1000: <https://www.osha.gov/laws-regs/standardinterpretations/standardnumber/1910/1910.1000%20-%20Index/result>
 - Link to OSHA 1910.1000 and all tables from Cornell University: <https://www.law.cornell.edu/cfr/text/29/1910.1000>
- Review OSHA standard 1910.1020, Access to employee exposure and medical records.
 - Link to OSHA 1910.1020: <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1020>

- Link to OSHA 1910.1020 Standard Interpretation Letters:
<https://www.osha.gov/laws-regs/standardinterpretations/standardnumber/1910/1910.1020%20-%20Index/result>
- Conduct reconnaissance: learn what equipment is available to participants, obtain operating guidelines for the instruments, obtain the company sampling procedures. If these resources are not available, select a sampling instrument/tool, obtain operating guidelines and use a published sampling procedure from NIOSH, EPA or OSHA. SOPs/SOGs may be needed and should be obtained from the company SOP (a for-training-only SOG can be found in the key element lists in the long program completed by participants).
- Obtain or create a 'for training only' log book for each group.
- Ensure you are familiar with the sampling equipment to be used and can trouble-shoot problems should they arise.
- Prepare a scenario for the sampling, based on reconnaissance.
- Assemble PPE that may be needed by participants.
- Copy Worksheets for the exercise.
- Prepare agenda and class notes for this part of the refresher; place a copy in the program file.
- Assemble all supplies needed for the calibration and sampling, including a log book.

Minimum Content Requirements

- Review objectives
- Prepare for measurement or sample collection (if lab analysis required)
- Wearing appropriate PPE, collect a sample and document required information
- Prepare instrument to be used again

Questions You May Be Asked

1. You should be prepared to discuss safe confined-space entry (CSE) procedures. Be prepared to describe the actions an employee may take if directed to enter a space which she/he feels is unsafe. For contract programs, the CSE program should be reviewed prior to presenting this module if applicable. For open enrollment, general approaches of working through union or company health and safety officers should be discussed. You must be aware of the consequences of refusal to work.
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 employer's monitoring program and equipment.
3. Access to monitoring information may not be routine at many facilities. How to request this information and what to do with it (keep it with personal medical records, provide it to private or union occupational medical doctor) should be discussed.

Presentation of the Session

This session can be presented as follows:

Review objectives

Overall Guidance

This section is a review and can be done by reference to the handout. Page 2 shows sampling considerations to be considered for most approaches.

Sampling Plan or Protocol

Ask: Why do you need a sampling plan?

Ask: What information is needed to document the procedures used and interpret any results?

Ask: Why is calibration and maintenance important?

Before you sample...

Describe type of sampling that will be conducted by the groups during this exercise. Distribute the appropriate 'Before you sample...' review sheet (appended to this guide) and discuss.

Exercise - Use a specific Instrument or Tool to sample

Have participants work in small groups.

Provide the exposure scenario that you have developed. Ensure that each group has a cheat sheet for use of the instrument, a sampling procedure and log book. (Note: Cheat sheet may be attached to monitor or as a separate page. Laminate for repeated use.)

Activity 1: Planning for Exposure Measurement

Distribute the Worksheet.

Each group should check out the instrument and prepare for sampling

Activity 2: Sampling for Exposure Measurement

Select the Worksheet for the participants that matches the scenario you have developed and the training program - general industry or emergency response. Distribute the Worksheet.

Once the sampling and after use actions have been completed, facilitate a discussion including any possible changes to the plan that was used.

Summary

Review the objectives.

Ask: Based on this exercise, what takeaways do you have as you go back to work?

List them on the board.

Answer any remaining questions.

Follow-up

Make this exercise better:

Forward suggestions to your Program Director

Are there other 'Questions you may be asked' that should be included?

Organize the listing of 'takeaways' and forward to your Program Director. These are very important impacts to report to NIEHS.

Exercise - Planning for Exposure Measurement

This activity is designed to provide practice in preparing for sample collection.

Complete the checklist below, in teams or individually.

Pre-sampling Checklist

Step	Yes	No	Not Applicable (NA); Notes
1. Inspected			
Clean			
Battery Charged			
2. Talked with lab/analyst			
3. Assembled all supplies			
4. Calibrate instrument			
5. Bump test			
6. Complete log book/data form entries			
7. Obtained needed PPE			

Also:

Activity	Yes	No	Not Applicable (NA); Notes
1. Completed training to do this sampling			
2. Reviewed relevant SOPs/SOGs List _____ List _____ List _____			
3. Communicated with			
Supervisors			
Workers			

Exercise - Use an Instrument for Routine Activity

This activity is designed to provide participants with practice in using an instrument or tools to collect a sample(s) to measure potential exposure during a routine scenario. Complete the skills checklist below, in teams or individually.

Step	Yes	No	Not Applicable (NA); Notes
1. <u>Circle</u> media sampled--air, soil, water, surface			
2. What hazardous chemical(s) did you monitor/sample? _____ _____ _____			
3. What hazardous chemicals did you detect/measure? _____ _____ _____			
4. Did you follow a sampling SOP/SOG?			
5. Did you complete the logging/reporting documentation for all direct reading results?			
6. Did you complete the documentation/chain of custody needed for any samples to be sent to a laboratory?			
7. Make note of any indications that the PPE was <u>not</u> protective?			
8. Did you return equipment to charging dock or storage location?			
9. Did you report any defect or damage?			
10. Is documentation needed?			

Exercise - Use an Instrument during Emergency

This activity is designed to provide participants with practice in using an instrument or tools to collect a sample(s) to measure exposure during a simulated emergency. Complete the checklist below, in teams or individually.

Step	Yes	No	Not Applicable (NA); Notes
1. <u>Circle</u> media sampled--air, soil, water, surface			
2. Did you participate in a briefing?			
3. Did you set up zones?			
4. Did you obtain a background reading?			
5. What hazardous chemical(s) did you monitor/sample? a. _____ b. _____ c. _____ d. _____			
6. What hazardous chemicals did you detect/measure? a. _____ b. _____ c. _____ d. _____			
7. Did you communicate results to Command?			
8. Did you complete the following steps? Ventilate Clearance monitoring Site Transfer Equipment checkout			
9. Did you participate in a Debriefing?			

Appendix

Before you sample...using direct-reading instruments

1. Calibrate

Check with the safety officer to be sure that it has been properly calibrated. Calibration involves exposing the instrument to a known concentration of a compound and testing for the proper response. It is important that all instruments be calibrated on a regular basis. Some direct-reading instruments are compatible with a docking station interface (consult manufacturer's data for more information).

2. Be conservative

If the instrument gives an unexpectedly high response, assume that it is correct. If the reading is suspiciously low, assume that there may be an instrument problem.

3. A zero reading does not mean clean air

Always remember that a reading of zero does not mean that the air is clean. Some highly toxic materials are not detected by common direct-reading instruments. A reading of "zero" may mean contaminants are present but at levels below the detection capability of the instrument.

4. Even a small response should be investigated

Any response, even a small one, on a direct-reading instrument should be interpreted as indicating a potentially dangerous situation. It is far safer to assume that if the instrument can detect a chemical, the concentration may be high enough to pose a health threat.

5. Use multiple instrument types

Whenever possible, use more than one type of direct-reading instrument. Remember that each type of instrument has different capabilities, so a reading of zero on one instrument could turn out to be a high reading on another instrument.

6. Have maintenance guidelines been followed?

All equipment is supplied with a recommended maintenance schedule. Follow it. Should any indication of malfunction be noted during routine checks or usage report them to the safety officer.

7. Discuss interference /cross sensitivities

Before you sample...for personal exposure

1. Calibrate (pumps and alarms)

Check with the safety officer to be sure that it has been properly calibrated. If a personal pump is to be used, this will assure that the amount of air flow through the sampling media matches the method being used. Calibration will also be conducted after sample collection to determine the total volume (duration x flow rate). If the flow rate has changed by more than 5%, resampling may be required. Consult the method cited in the sampling plan. If a personal alarm is to be used, this will assure that the monitor responds according to manufacturer specifications.

2. Sampling lines

If you will use tubing to connect a pump and a collection filter/tube, ensure that you have different lengths of tubing (for different heights of workers) and methods to keep the tubing close to the wearer's clothing (tape or pins). Sampling lines can separate from the pump and may result in loss of a sample. Loose or floppy tubing can be a safety hazard to the wearer.

3. Know the demands of work and the schedule

Wearing a sampling device is an imposition. If you know the work demands, you can better ensure that it will not interfere with usual activities. For example, fork lift operators will not want a pump positioned in the small of the back. Women often need a belt to hold a pump - so be ready to provide a belt, as needed. Folks who want to leave the workplace at lunch will not wait for you to come when it is time to leave. You may jeopardize sample collection if it is removed and placed on a contaminated work surface.

4. Tell each person what to expect

Go over the reason for sampling, how the equipment works and what will happen after the collection. Ask if the equipment is comfortable (or as much as possible) and if there are any other questions.

5. Let workers know where you will be

Let each person know how to reach you during the shift if he/she has a question or a problem. Most pump protocols require at least hourly observation, so you will be on site for the entire shift.

6. Have maintenance guidelines been followed?

All equipment is supplied with a recommended maintenance schedule. Follow it. Should any indication of malfunction be noted during routine checks or usage, report them to the safety officer.

Before you sample... for water for contamination

1. Discuss collection with the laboratory/analysts

For some contaminants, special sample collection containers may be needed. There may be special requirements for storage or preservation (e.g., temperature, away from light sources, added reagent) and shipping (e.g., temperature, time in transit).

2. Do not contaminate the sample. Prior to sample collection, ensure that all tools are clean.

Wash hands before collection, wear gloves and decontaminate between samples.

3. Use appropriate PPE

On surface water, obey water safety rules regarding speed and use of life vest. If sampling from land or a wharf/bridge near open water, take precautions to prevent a fall and wear a life vest.

Additional PPE may be required to prevent contact with the contaminant; this will be specific for the hazard.

4. Decontaminate

Taking care of equipment is important. Decontaminate after use and alert the appropriate personnel of any required maintenance.

5. Other safety concerns

You may be walking through brush or tall grass so be alert for snakes and other hazards. Wear long sleeves, long pants and boots. Take precautions against insect bites and check for ticks during the warmer months. Avoid sun burns by using sun screen. Follow employer work practice guidance to prevent heat stress and cold stress. If using electric-powered pumps, inspect all cords and extension cords before use and replace/repair as needed.

Before you sample...soil for contamination

Soil samples may be collected from the surface or below the surface.

1. Discuss collection with the laboratory/analysts

For some contaminants, special sample collection containers may be needed. Wide mouth containers will be easier to use when transferring the sample for labeling and shipment. There may be special requirements for storage or preservation (e.g., temperature, away from light sources, added reagent) and shipping (e.g., temperature, time in transit).

2. Do not contaminate the sample

Many collection devices are of sturdy construction and used for years; ensure that all tools are clean prior to sample collection. Wash hands before collection. Wear gloves and decontaminate between samples.

3. Use appropriate PPE

Soil may be collected on inclines and where the soil is not stable. Wear appropriate boots to prevent slips and fall. Some sample collection tools require foot or hand operations, requiring sturdy boots and gloves.

Additional PPE may be required to prevent contact with the contaminant; this will be specific for the hazard.

4. Decontaminate

Taking care of equipment is important. Decontaminate after use and alert the appropriate personnel of any required maintenance.

5. Other safety concerns

You may be walking through brush or tall grass so be alert for snakes and other hazards. Wear long sleeves, long pants and boots. Take precautions against insect bites and check for ticks during the warmer months. Avoid sun burns by using sun screen. Follow employer work practice guidance to prevent heat stress and cold stress. If using electric-powered pumps, inspect all cords and extension cords before use and replace/repair as needed. Gas-powered tools may generate carbon monoxide; follow site-specific SOP/SOG if working in/near heavy equipment; and if operating heavy equipment, on the job training may be required.

Before you sample...a surface for contamination

1. Discuss collection with the laboratory/analysts

While there are some published guidelines and some commercial kits, it is very useful to discuss the sampling situation with a laboratory where the swipe will be analyzed. The analyst will provide input on the collection media for the surface you are to sample from, loading and shipping. For some contaminants, special sample collection containers may be needed. There may be special requirements for storage or preservation (e.g., temperature, away from light sources, added reagent) and shipping (e.g., temperature, time in transit). A bulk sample may also be needed.

2. Do not contaminate the sample

Ensure that any template used has been cleaned prior to collection of the first sample. Wash hands before collection. Wear gloves and decontaminate between samples.

3. Use appropriate PPE

Wipe sample collection may be done on surfaces such as floors or PPE, but may also include rafters and machinery with sharp-edged parts. Wear PPE appropriate to the work area and the surface to be sampled.

Additional PPE may be required to prevent contact with the contaminant; this will be specific for the hazard.

4. Decontaminate

Taking care of tools is important. Decontaminate after each use. Alert the appropriate personnel of any need for new tools or supplies.

5. Other safety concerns

Make sure supervisors and workers in the area know you are collecting samples and arrange a schedule that does not disrupt usual operations. Follow employer work practice guidance to prevent injury during sample collection (e.g., lock out/tag out, use of ladders).