

Introduction – Field Sampling Hazards



- Field inspection and sampling represent one of the largest responsibilities of field personnel. Personnel who perform these activities will be confronted with many different types of work environments, each with its own associated hazards. Although some of these hazards will be unique to a given site, many hazards are common to a particular type of site or to field work in general.

Learning Objectives



- At the end of this module, you will be able to:
 - Identify the hazards associated with different types of inspections and samplings
 - Provide information on how to reduce the **risks** of those hazards.

Hazards of the Sampling Environment



- There are 2 main Hazards of the sampling environment:
- **Everyday Operation Procedures-** Vehicles, Noise, Chemicals and Thermal Hazards.
- **Sampling Location-** Heights, Weather, Remote areas and Natural Hazards.

Test your knowledge

- Hazards created by everyday operating procedures include all BUT which of the following?
 - Thermal Hazards
 - Toxic Materials
 - Significant Height

Hazards of the Sampling Process



- Hazards of the sampling process are those created by:
 - Equipment
 - Procedures
 - Materials used to collect the samples.
- Because hazardous substances can be complex mixtures of semisolids, liquids, or solids, the viscosity, corrosivity, volatility, explosiveness, and flammability can vary greatly.

Sampling Equipment



- Field sampling equipment may have unusual design and operating features, and there may be no established written procedures for safe operation of the equipment.
- Equipment to collect and contain hazardous samples should be:
 - Disposable or easily [decontaminated](#)
 - Inexpensive
 - Easy to operate
 - Nonreactive
 - Safe to use.

Solids and Liquids

- You will use different sampling equipment based on the form of the hazardous substance.
- **Solids**- Grain Sampler, Auger, Corer Trowel or Waste pile sampler.
- **Liquids**- Pumps, Weighted Bottles, Tube Samplers or Balers.

Test your knowledge

- Which piece of equipment would be used to collect solid samples?
- Manual Pump
- Weighted bottle sampler
- Grain Sampler

General Safety Considerations

- Following are some safety considerations for sampling equipment use:
 - The manufacturers of sampling equipment usually provide detailed instructions on procedures for safe setup and operation. Thoroughly read these instructions before attempting to use the equipment
 - Before going into the field, field personnel should familiarize themselves with the operation of sampling equipment and should perform routine checks and calibration, if necessary, to ensure that the equipment is working properly
 - Personnel should also practice with the equipment prior to use, utilizing the designated level of [PPE](#)
 - If significant hazards are associated with a particular instrument, note them on the outside of the equipment and/or carrying cases
 - When choosing sampling equipment, it is essential to know the type of hazardous environment in which it will be used.

General Safety Considerations

- The following are potential hazards that must be evaluated during sampling equipment use.
- Mechanical Hazards
- Lifting Objects
- Weight and Momentum
- Climbing
- Sharp Edges
- Electrical Hazards

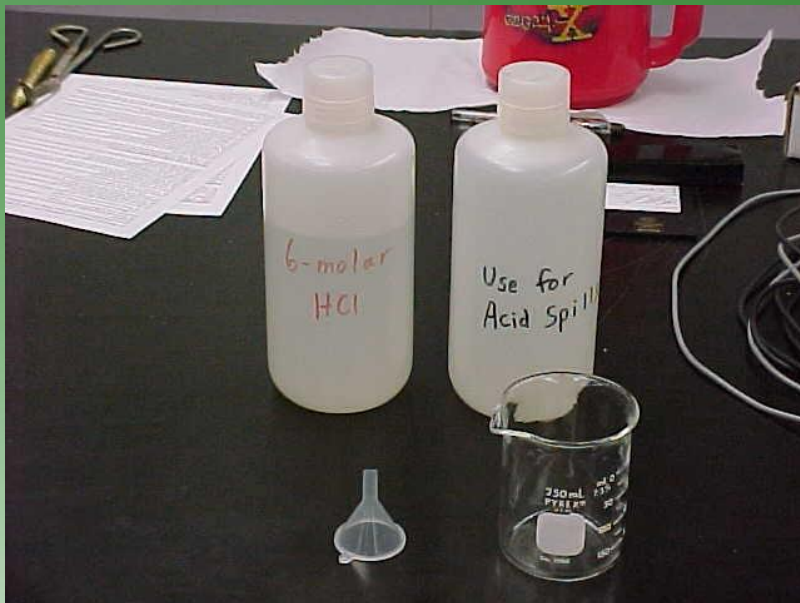
Test your knowledge

- When evaluating mechanical hazards, use the manufacturer's information as your principal guide for safe use of the equipment.

- True

- False

Sampling Materials



- **Hazardous chemicals** are frequently used in field sampling activities. Some chemicals may be used as:
 - Preservatives for samples that will be analyzed in the laboratory (e.g., acids)
 - Analytical **reagents** for field testing (e.g., standards)
 - For cleaning or decontaminating sample containers or sample equipment (e.g., xylene, acetane)
 - Fuels for on-site vehicles and generators.
- Identify the health and safety hazards for all sampling chemicals or solvents before they are taken into the field.

Compressed Gases

- Self-contained breathing apparatus (SCBA) air tanks could be brought to the field. These tanks can present a multitude of hazards:



- Empty tanks can still be heavy and (due to their elongated shape,) easily tipped over
- Never move or transport a cylinder without removing any regulators and ensuring that the protective threaded cap or top is in place
- When transporting the cylinder or when setting the tank up for use, securely chain or fasten the cylinder in an upright position to prevent shifting or falling over
- Accidental damage to the regulator apparatus can cause a pressurized cylinder to rapidly release pressure and become a "missile."

Guidelines When Dealing With SCBAs

- Follow these guidelines when dealing with **SBCAs**:



- Always check cylinders for pitting, corrosion, and rusting
- Never add adaptors or other gear to a regulator to make equipment fit
- Never use oil or petroleum products on fittings
- The direction of the threads on tanks is often reversed from the normal directions used in common equipment
- Always ensure that cylinders are properly labeled and secured prior to shipment
- Ensure that shipping papers are properly completed, placards are provided (if needed), and personnel mobilizing cylinders to the field are DOT trained.

Reagents



- Safety considerations for use of chemical reagents include:
 - Reagent bottles should be packed in absorbent, cushioning material to prevent bumping and leakage
 - Labels for reagents should be made of indelible material and care should be taken to separate incompatible chemicals
 - Standard Operating Procedures outlining test procedures as well as sampling hazards and chemical incompatibilities should be included with testing chemicals
 - **MSDSs** should always be available
 - Shipping papers should be completed
 - Once onsite, reagents should be properly stored (e.g., in flammable storage cabinet).

Test your knowledge

- Sampling chemicals should be hand carried to the site whenever possible.

- True

- False

Sample Collection and Packaging

- Samples are taken to determine the following:



- Compliance with existing regulations
- Presence or absence of a particular compound
- Extent of dispersion
- Effectiveness of decontamination
- Suitability for recovery or recycling
- Adequacy of worker protection
- Potential public health hazard
- Compatibility of the materials in question.

Sample Collection and Packaging



- Determine the specific purpose for collecting the sample because it will dictate many of the subsequent choices of:

- Methodology
- Sampling sites
- Types and numbers of samples required
- Proper sample containers.

Sample Collection and Packaging

- The following factors must also be taken into consideration because they can influence the sampling plan development process:



- Topographic, geologic, and hydrologic characteristics of the site
- Meteorologic conditions
- Flora and fauna of the area
- Geographic and demographic information
- Physical properties and hazardous characteristics of material involved.

Sampling Team (Buddy System)

- The buddy system involves:



- Walking side by side
- Maintaining visual contact
- Periodically checking each other's protective equipment
- Maintaining open communication (e.g., direct verbal, two-way radio)
- Ensuring the safety of your partner.

Collection Methodology



- The collection of representative hazardous or environmental samples can be accomplished by taking one of the following types of samples:

- Grab sample---taking a discrete sample from a unique location
- Composite sample—combining two or more samples in a homogeneous mix to represent the sampling area
- Random sampling—sampling the potential contamination are to determine representative or background levels
- Judgmental sampling—sampling in the vicinity of known or suspected contamination.

Collection Methodology

- The locations of sampling sites are influenced by the objectives of the study. Choose exact locations by considering the factors that can influence the concentrations and the dispersion of the material of concern. Occasionally, a sampling scheme incorporating both judgment and random sampling is used.



Collection Methodology



- The appropriate number of samples to be collected at a particular site or incident is dependent upon a variety of factors, including:

- The degree of accuracy desired
- The spatial and temporal variability of the media to be sampled
- The cost of collecting and analyzing the samples
- Laboratory and field QU/QC goals.

Collection Methodology



- The analyses of samples may require the following:
 - Specific sampling handling
 - Preservation procedures
 - Specific sample container types, volumes, and numbers
 - Chain-of-custody documentation is also necessary to ensure proper handling and maintenance of samples between field collection and analysis in the lab.

Collection Methodology



- The following types of samples are commonly taken to maintain an adequate quality assurance program:

- Duplicate samples
- Split samples
- Spiked samples
- Reproductive check
- Blank samples.

Collection Methodology



- The main safety concerns associated with collecting samples includes:

- Splashes
- Containment
- Incompatibilities
- PPE failure
- Broken sample containers.

Collection Methodology



- Other safety concerns relate to the field sampling operation and the site access method such as:

- Excavations or test pits-confined space
- Smoke stack-cherry picker
- Lagoon, rivers, creeks-boats, barges
- Drill rigs-plywood access walkouts.

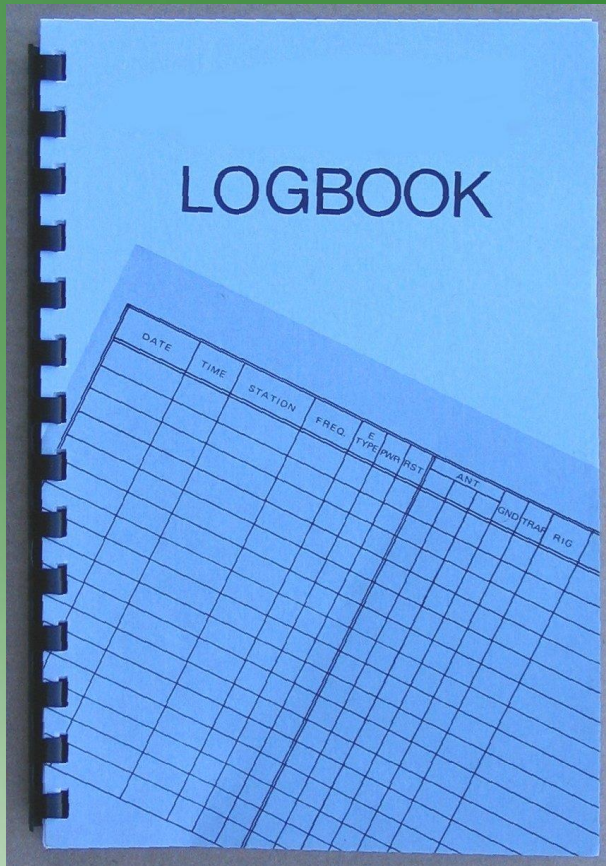
Documentation and Chain-of Custody



- All information pertinent to field activities, including sampling, must be recorded in various forms:

- Logbooks
- Sample tags
- Photographs
- Field notes.

Documentation and Chain-of-Custody



- The purpose of document control is to assure that all documents for a specific project are accounted for when the project is completed. Accountable documents include items such as:

- Logbooks
- Field data records
- Correspondence
- Sample tags
- Graphs
- Chain-of-custody records
- Analytical records
- Photographs.

Sample Packaging Requirements



- A distinction must be made between environmental and **hazardous materials** samples in order to:
 - Determine appropriate procedures for transportation of samples
 - Protect the health and safety of laboratory personnel receiving the samples
 - Comply with DOT labeling and shipping requirements.

Decontamination of Containers and Equipment

- When it is necessary to re-use sampling containers or equipment, the procedures for cleaning should be provided in the SOP and approved by QU/QC staff. The following general guidelines represent good decontamination procedures, which will aid in precluding cross contamination of samples.
- Washing- Warm soap and water, rinsed with distilled water.
- Drying- Air dried or wiped with dry sterile cloth.
- Solvents- Use organic solvents and eliminate residues.

Test your knowledge

- The main safety concerns associated with collecting samples include splashes, contamination, and PPE failure.

- True

- False

Personal Protective and Emergency Equipment



- Personal protective and emergency equipment should be selected based on hazards that are known or suspected to be one site.

Personal Protective Equipment Selection



- Level A Fully encapsulated SCBA
- Level B Tyvek, neopren gloves with SBCA
- Level C Coveralls with respirator
- Leved D Coverall, latex gloves, goggles

Personal Protective Equipment Selection



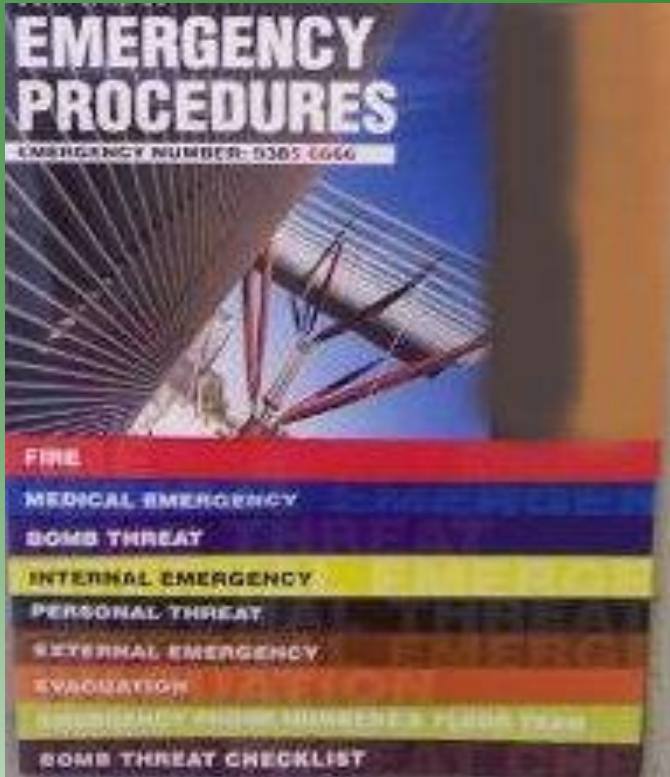
- It is essential that qualified individuals who are familiar with the effects of chemicals on protective equipment be involved in the selection before the actual sampling.
- For more information on personal protective equipment and respiratory protection, refer to the Biological Safety, and Bloodborne Pathogens modules.

Emergency Equipment Selection



- The following are examples of equipment that should be selected:
 - Fire extinguisher
 - First aid/bloodborne pathogen (BBP) kit.

Emergency Procedures



- In the event of an emergency during field activities, follow the directions of the on-site health and safety representative or procedures included in the health and safety plan.
- The Health and Safety Plan is a site-specific document that describes the potential site hazards and provides guidance on safety and emergency procedures.

Test your knowledge

- Sampling personnel typically use Level D protective clothing.

- True

- False

Summary

- Measures you can take when dealing with hazardous substances include:
 - Determine the potential hazards that may be present from everyday operating procedures and created by sampling location
 - Follow the general safety considerations for sampling equipment
 - Be aware of the hazards associated with the sampling materials (e.g., compressed gases, reagents)
 - Use a buddy system when executing a sampling plan
 - Classify all samples as either environmental or hazardous material for proper handling and disposal
 - Properly decontaminate all sampling equipment after each use
 - Use the appropriate personal protective equipment when conducting your sampling (e.g., goggles, gloves, and respirators)
 - Follow the emergency procedures included in the site health and safety plan.

- You have completed the module:
 - Field Sampling