

Introduction

Environmental sampling is done whenever there is a need to investigate contaminants in water, air or soil. Typical situations include the testing of hazardous waste sites, runoff into lakes, streams and rivers, and air emissions from industry. The Environmental Protection Agency (EPA) has regulations and procedures regarding the sampling, analysis, procedures and equipment used in testing for possible contaminants.

The EPA has listings of chemicals and methods that must be used to extract and analyze the chemicals from samples for determination of contents and concentrations. These methods are found in 40 CFR part 136, Appendix A.

There are five lists of approved test procedures.

- Biological Test Procedures
- Inorganic Test Procedures
- Non-Pesticide Organic Compounds Test
- Pesticides Test
- Radiological Test Procedures

Each list breaks down the individual chemicals in a group that can be tested, and gives the method that should be used for the tests. These lists can be found in the 40 CFR 100-149, 136.3, Identification of Test Procedures.

EPA Methods for the Analysis of Pollutants

Each of the five test procedures typically uses the same methods for analyzing pollutants. The test procedures contain some or all of the following 16 steps.

1. Scope and Application

Lists the chemicals that can be determined by this method. Specifies the type of test that is required for the determination (i.e. gas chromatograph (GC), flame ionization detector (FID) or mass spectrometer (MS)). Tells where to find method detection limit (MDL).

2. Summary of Method

Gives a description of the process used for the analysis, along with detailed specifications on how to perform the analysis.

3. Contamination & Interference

Covers possible reasons for interference, such as impurities in the purge gas, and methods of

cleaning equipment or special equipment to use so contamination is reduced.

4. Safety

Identifies precautions to be taken with the chemical being tested and the reagents involved in the analysis. Also covers the possible hazards associated with the chemicals involved.

5. Apparatus & Materials

Specifies the type of equipment to be used in the capture of samples. Also covers the type of equipment to use in the procedure.

6. Reagents & Standards

Lists chemicals, measurements, formulas and instructions on the use and preparation of reagents for the procedure.

7. Calibration

Gives specific calibration instructions for the equipment being used on the tests in the methods. Also covers preparation of the calibration standards.

8. Quality Assurance/Quality Control

Gives the EPA's minimum standards for quality control required in laboratories for most methods. Also gives instructions for the specific program. Quality Assurance/Quality Control must be an ongoing process with written documentation.

9. Sample Collection, Preservation and Handling

Identifies containers and tools needed for collection. Explains storage requirements and storage time limits for collected samples.

10. Procedures

Lists procedures to follow, along with measurements and time limits to use when extracting samples.

11. Performance Tests

Performance tests must be run on the testing equipment before each 8-hour shift or at the beginning of the work day. Only after these tests have been run according to the specific method can samples and blanks be analyzed.

12. Sample Purging and Gas Chromatograph

Gives procedures for purging samples from test equipment.

13. Cleanup and Separation

Explains suggestions for cleanup and separation procedures.

14. Gas Chromatograph/Flame Ionization Detector Chromatography/High Performance Liquid Chromatography

Summarizes recommended operating conditions, retention times and MDL for when gas apparatus are to be used.

15. Calculations

Gives the calculation to be used for the method. Includes factors and equations to be used.

16. Method of Performance

Explains the Method Detection Limit (MDL) (Defined as the minimum concentration of substance that can be measured and reported with 99% confidence that the value is above zero) along with test procedures, and how the EPA arrived at the MDL. Tables with the MDLs of specific chemicals are shown for reference.

When sampling soil, water and air, many different types of equipment are used. A typical tool used for taking soil samples is a hand-operated auger with a handle that bores into the area tested and brings up a sample of the soil from up to 15 feet deep. Soil samplers can also be driven into the ground with the soil being collected in liners that can be capped and sent directly to a laboratory for analysis. For direct reading of contaminated soil, there are soil tubes connected to a hand pump that draws an air sample into the tube creating a reaction that discolors the tube and gives a qualitative result.

The tools used in water sampling are bailers, coliwesas, dippers and samplers.

- A **bailer** is an enclosed tube with a flowcheck device on one end. When lowered to take a sample, the flowcheck device—typically a ball—lets the sample in when lifted. The ball closes off the end of the tube, capturing the sample.
- A **coliwasa** is an open tube made from either soda lime glass, Teflon or other plastics. A coliwasa may have a manually operated stopper for trapping samples, or the operator can put a finger or other object over the end to create a vacuum to trap the sample. The sample can then be released into a container to hold for analysis. Coliwesas can be found in lengths up to 20 feet.

- **Dippers** have an extension handle with a beaker on the end. These are used in areas that are accessible, such as streams, lakes, tanks, industrial holding ponds, etc. The operator dips the beaker into a stream and transfers the sample to a container.

- **Samplers** are similar to the dippers, but they have sample bottles attached to the extension handle that can be enclosed and sent for analysis. These bottles can be Teflon, plastic or glass. The bottles come in different sampling sizes and the extension handles can also be purchased in various lengths.

Sources for More Information

40 CFR 100–149.

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