Designation: D5088 – 20

Standard Practice for Decontamination of Field Equipment Used at Waste Sites[1]

This standard is issued under the fixed designation D5088; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This practice covers the decontamination of field equipment used in the sampling of soils, soil gas, sludges, surface water, and groundwater at waste sites which are to undergo both physical and chemical analyses.

1.2 This practice is applicable only at sites where chemical (organic and inorganic) wastes are a concern. It is not intended for use at radiological, mixed (chemical and radiological), or biohazard sites. This practice does not address regulatory requirements for the handling, labeling, shipping, or storing of wastes or samples.

1.3 Practices are included for the decontamination of equipment which comes into contact with the sample matrix (sample contacting equipment) and for ancillary equipment that has not contacted the portion of sample to be analyzed (non-sample contacting equipment), but which must be cleaned to avoid spreading of contamination.

1.4 This practice is intended for use when field equipment used for sampling will be decontaminated in the field or returned from the field. Information on the construction of field decontamination facilities and non-sample contacting equipment decontamination is also provided.

1.5 This practice is based on commonly recognized methods by which equipment may be decontaminated. The practices described for sample contacting equipment are commonly prescribed. Background studies are included in the References at the end of this standard (**1-5**). The user is reminded of the importance of proper decontamination planning to minimize the amount of decontamination wastes generated and to reduce or eliminate the use of cleaning agents that are themselves hazardous. Quality Assurance/Quality Control (QA/QC) samples that document decontamination effectiveness can be used to modify or enhance decontamination techniques. Decontamination at radiologically contaminated sites should refer to Practice D5608.

1.6 This practice is applicable to most conventional sampling equipment constructed of metallic and synthetic materials. The manufacturer of a specific sampling apparatus should be contacted or the manufacturer's manuals reviewed if there is concern regarding the reactivity of a decontamination rinsing agent or the temperatures that could affect the equipment. Plastic components and gasket materials could be damaged by some of the stronger reagents or high temperatures.

1.7 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.8 *This practice offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D653 Terminology Relating to Soil, Rock, and Contained Fluids

[1] This practice is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Groundwater and Vadose Zone Investigations.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

D5608 Practices for Decontamination of Sampling and Non Sample Contacting Equipment Used at Low Level Radioactive Waste Sites

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of common technical terms used within this Practice refer to Terminology D653.

3.2 *Definitions Specific to this Practice:*

3.2.1 *equipment rinsate blank*—a sample collected by using analyte-free water rinsed over/through equipment that has been decontaminated, and is analyzed for the parameters of interest.

3.2.2 *field cleaning*—the process of cleaning contaminated used sampling equipment so it can be returned or moved to a final decontamination in a condition that will minimize the potential of contaminant transfer from a site. At a minimum, this should consist of washing with soap and water, and rinsing with tap water.

3.2.3 *sample contacting equipment*—equipment that comes in direct contact with the sample or portion of sample that will undergo chemical analyses or physical testing (for example, a bailer used to sample a groundwater well, split-spoon sampler, soil gas sampling probe, tubing used to bring a groundwater sample to the surface, etc.).

4. Summary of Practice

4.1 When decontaminating equipment, the user will need to evaluate whether the equipment materials are plastics or metals, the types of contaminants (inorganic vs. organic) that will be analyzed for, whether the equipment contacts the sample, the type of exposure (for example, whether exposed to oils, grease, tars, soils, or simply water), and the data-quality objectives. These issues will help to determine the practices to be used to decontaminate the equipment. The decontamination process should use the minimum effort and materials demonstrated to satisfy that the required decontamination has been achieved. The use of hazardous materials should be used only when additional rinses, heat, and other techniques have been found inadequate and the equipment cannot be substituted with disposable or dedicated equipment.

4.2 Two different practices are presented for the decontamination of sample-contacting and non-sample contacting equipment. The practices have been developed based on a review of research studies as well as current state and federal guidelines. In general, sample contacting equipment should be washed with a detergent solution followed by a series of control water and deionized water rinses. Non-sample contacting equipment should be washed with water or without a detergent solution depending on the type and degree of contaminants and rinsed with control water. Although such techniques may be difficult to perform in the field, they may be necessary to most accurately evaluate low concentrations of the chemical constituent(s) of interest. Additional enhancements to the decontamination process include the use of hot water or steam for cleaning and or rinsing the equipment, and in some cases the use air drying or the use of heat near 100°C for a period of time

4.3 Prior to initiating a field program that will involve equipment decontamination, a site specific equipment decontamination protocol should be prepared for distribution to the individuals involved with the particular sampling program. Information to be presented in the protocol should include:

4.3.1 Site location and description,

4.3.2 Statement of the sampling program objectives and desired precision and accuracy, that is, is sampling effort for gross qualitative evaluation or for trace concentration, parameter specific evaluations,

4.3.3 Summary of available information regarding soil types, hydrogeology and anticipated chemistry of the materials to be sampled,

4.3.4 Listing of equipment that will be used for sampling and the materials or equipment that will be needed for decontamination,

4.3.5 An evaluation of the costs of the decontamination process including disposal, personnel time, Personal Protective Equipment (PPE) and other costs versus the use of less hazardous materials, the use of dedicated equipment, or use of disposable equipment.

4.3.6 Detailed step by step procedure for equipment decontamination for each piece or type of equipment to be utilized and practices for rinse fluids containment and disposal as appropriate,

4.3.7 Summary of QA/QC procedures and QA/QC samples to be collected to document decontamination completeness including specific type of chemical analyses and their associated detection limit, and

4.3.8 Outline of equipment decontamination verification report.

5. Significance and Use

5.1 An appropriately developed, executed and documented equipment decontamination practice is an integral and essential part of waste site investigations. The benefits of its use include:

5.1.1 Minimizing the spread of contaminants within a study area and from site to site,

5.1.2 Reducing the potential for worker exposure by means of contact with contaminated sampling equipment or hazardous materials,

5.1.3 Improved data quality and reliability.

5.1.4 Minimizing the amount of decontamination fluids or wastes generated.

5.1.5 Reducing personnel exposures to chemicals used in, or released by decontamination.

5.1.6 Minimizing or eliminating the use of hazardous materials in the decontamination process, and

5.1.7 Selecting equipment based on total life-cycle costs including labor, waste containment, disposal, treatment and additional analytical costs, such as using dedicated or disposable equipment rather than decontaminating between uses.

5.2 This practice is not a substitute for a well-documented Quality Assurance/Quality Control (QA/QC) program. Because the ultimate test of a decontamination process is its ability to minimize erroneous data, a reasonable QA/QC program must be implemented.

5.3 This practice may not be applicable to all waste sites. When a sampling effort is completed to determine only the general range of chemical concentrations of interest, then less rigorous decontamination processes can be adequate. Less rigorous decontamination procedures may also be used when cleaning non-porous surfaces, such as metal surfaces as well. Investigators should have the flexibility to modify the decontamination process with due consideration for the sampling objective or if QA/QC documentation supports alternative decontamination methods.

5.4 At sites where the reactivity of sampling equipment to decontamination washes creates concern for the generation of undesirable chemical by-products, or will potentially damage the equipment surfaces, for example, the use of an acid rinse on metal equipment, then use of dedicated sampling equipment should be considered.

5.5 This practice, where applicable, should be used before, between, and after the completion of sampling events.

5.6 This practice is appropriate for use at sites where chemical (organic and inorganic) contamination is known or expected. The application of this practice to other types of sites radiological, mixed (radiological and chemical), or biohazard contaminated sites is not applicable. The application of this practice to these types of sites should be undertaken with care and consideration, along with QA/QC documentation that supports the effectiveness of these decontamination techniques.

6. Reagents

6.1 *Detergent,* non-phosphate detergent solution.[3]

6.2 *Acid Rinse (inorganic desorbing agent),* 10 % nitric or hydrochloric acid solution-made from reagent grade nitric or hydrochloric acid and deionized water (1 % is to be applied to low-carbon steel equipment). These materials are hazardous themselves and use should be minimized or eliminated when possible.

6.3 *Solvent Rinse (organic desorbing agent),* isopropanol, acetone, or methanol; pesticide grade. These materials are hazardous themselves and use should be minimized or eliminated when possible.

6.4 *Control Rinse Water,* preferably from a water system of known chemical composition. In most cases, potable water is suitable for non-contacting equipment.

6.5 *Deionized Water,* water that is organic-free and deionized. Tap water that has been treated by passing through a standard deionizing resin column. As a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds.

6.6 The use of acids, bases, and organic solvents requires that personnel have the appropriate Safety Data Sheets, be properly trained in their handling, have the appropriate PPE including appropriate respiratory protection, and have appropriate first-aid training and response equipment. The shipping and handling of these materials are regulated because of the hazardous nature of these materials. When these materials are used for decontamination, they can generate larger amounts of hazardous wastes that must be collected, properly containerized, stored and labeled, shipped and/or disposed.

7. Apparatus

7.1 *Pressure Washer (Cold Water) or Steam Cleaner (Hot Water)*—Commercially available washers providing low volumes of water at high pressure. The hot water washers may be electrically powered or fueled for remote operation. Most pressure washers have the capability to inject detergents into the system.

NOTE 1—The use of pressure washers should consider the safety and protection of the personnel using them. Manufacturer operating literature or manuals typically contain safety precautions for the use of the equipment. Personnel may be exposed to backsplash, slippery surfaces or other hazards and should be appropriately protected. The use of high temperature water or steam can also result in burns.

7.2 *Ovens or Other Heat Sources*—For some equipment, extended drying (for example, 24 hours) at higher than room temperatures may be needed. Dependent on the equipment size and configuration standard laboratory draft ovens may be used. For field use, commercially available heated air handlers can be used.

NOTE 2—The use of ovens or air handlers should exchange fresh heated air to the equipment and not provide air that contains carbon fuel combustion or other contaminants that will contaminate the equipment being dried. Venting of the heated air should not be into an area occupied by personnel.

7.3 Standpipes, buckets, tubs, portable light-weight sinks, commercially available containers of adequate size for soaking, cleaning and rinsing equipment.

7.4 Scrub brushes, metal brushes.

7.5 *Decontamination Pad/Materials Collection*—Impermeable materials that can be placed on the ground to capture decontamination fluids of a size appropriate to the equipment and volumes. These can be polyethylene, HDPE, sheeting or other materials. Pre-formed and seamed liners are commercially available. Equipment to recover the fluids, such as pumps may also be required, along with tools or materials to repair any damage to the liner. For smaller items and volumes, a child swimming pool or equivalent can be used to contain decontamination fluids.

7.6 Materials to soak up spills, kitty litter, absorbent pads, etc.

7.7 Drums or buckets for decontamination fluids.

8. Field Decontamination Pad Construction

8.1 The design and construction of a decontamination pad should factor in the type of equipment, contaminates and amount of use the planned for the pad.

8.1.1 The decontamination pad should be sized to accommodate the equipment to be decontaminated while containing overspray or splashing or windblown particles.

8.1.2 The decontamination pad should not leak. When possible, the floor should be sloped to allow for the collection

[3] Liquinox or Detergent 8 or similar solution has been found suitable for this purpose. Detergent 8 is recommended for spray cleaning.

of fluids. Repair materials should be on hand for repair of the liner should damage occur.

8.1.3 Planning should include racks, stands, or other equipment needed during decontamination. If personnel will be in the pad, raised grates or other methods may be appropriate to prevent personnel slips and falls and to prevent damage to the liner. For heavy equipment, ramps or other means to enter and exit the pad and to rest on while decontamination is in progress while preventing damage to the liner may be needed.

8.1.4 Planning must consider the regular collection of decontamination fluids and sediments from the decontamination pad such as the use of pumps to empty the decontamination pad. In some long-term situations, evaporation of fluids may be permitted dependent on applicable regulations. Decontamination pads that will be in place for extended periods must also be designed to contain rainfall without overflowing.

8.1.5 At the completion of work, the decontamination pad should be cleaned, rinsed and removed. Dependent on regulations, soil sampling below the liner may be required.

9. Practices for Equipment Decontamination

9.1 *Practice for Sample Contacting Equipment:*

9.1.1 At a minimum, sample contacting equipment should be washed with a detergent solution and rinsed with control water. Additional efforts should be employed only as needed to achieve the QA/QC objectives. As an alternate, the equipment can be field cleaned or wrapped to prevent contaminate releases and moved to a central decontamination facility.

9.1.2 For programs requiring more rigorous decontamination to meet the sampling or QA/QC objectives, the following practices are indicated: Table 1 provides applications of various solutions for decontamination of field equipment and

TABLE 1 Applications of Various Solutions for Decontamination of Field Equipment[A,B,C]

Solution	Concentrations	Remarks
Potable Water	Tap water	Used under high pressure or steam to remove heavy mud and dirt, or to rinse off other solutions
Laboratory-grade water	Distilled Deionized Reagent grade distilled and deionized water	
Low sudsing non-phosphate detergents (Liquinox, Detergent 8)	Typical concentrations are 0.5 to 2% solution by volume	General all-purpose cleaner. Detergent 8 is recommended for spray cleaning.
Sodium bicarbonate (baking soda)	5 to 15% aqueous solution	Used to neutralize either acidic or strongly basic contaminants
Sodium carbonate (washing soda)	10 to 20% aqueous solution	Effective for neutralizing inorganic acids, organic acids, heavy metals, metal processing wastes.
Trisodium phosphate (TSP Oakite)	10% aqueous solution	Similar to sodium carbonate. Good rinsing solution for organic compounds (such as toluene, chloroform, TCE, PBBs, and PCBs).
Calcium hypochlorite (HTH)	10% aqueous solution	Disinfectant, bleaching, and oxidizing agent for pesticides, fungicides, chlorinated phenols, dioxins, cyanides, ammonia and other non-acidic inorganic wastes.
Hydrochloric acid, nitric acid	10% nitric 10% to 20% hydrochloric	Used for inorganic bases, alkali and caustic wastes. This material is hazardous and its use should be limited. Care should be taken in both use and disposal of these materials.
Citric, tartaric, oxalic acids or their respective salts	5% solution	Used to clean heavy-metal contaminants
Organic solvents	neat, undiluted	Used to remove organic compounds that have poor solubility in water, such as oil, grease, and tars. Do not use a solvent that is one of the analytes of interest or interferes with analyses. Porous materials such as polymers can absorb these solvents. These materials are hazardous and their use should be limited. Care should be taken in both use and disposal of these materials.

[A]Examples of commonly recommended cleaning solvents include pesticide-grade" isopropanol, acetone, methanol, hexane, heptane, and ethanol. Note that these materials are hazardous themselves and their use will generate hazardous wastes that must be properly contained, handled, shipped and disposed of.
[B]Adapted for Mickam et al. (1989), Moberly (1985), and Richter and Collentine (1983).
[C]Many of the solvents listed are themselves hazardous materials. Care should be taken in both use and disposal of these materials. The Safety Data Sheets should be consulted for the selection of the appropriate PPE, handling, and disposal.