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Interim Recommendations for cleanup of buildings

Interim Recommendations for Cleanup of Commercial and Residential Buildings
Following *Bacillus anthracis* Spore Release

1. Introduction

This document provides interim recommendations for clean up after a release of *Bacillus anthracis* (*B.anthraxis*). The U.S. Environmental Protection Agency (EPA) has primary authority in matters concerning environmental hazards and cleanup. EPA reviewed and commented on this guidance document.

The issues involved in cleanup of a workplace, residence or other type of structure contaminated by *B. anthracis* spores vary significantly from place to place. These differences preclude the development of universal recommendations. Decisions regarding a strategy for cleanup must be based on each situation. Consult with the EPA, state or local health departments, the manufacturers of building contents, building owners or managers and others, as needed. This document provides information and guidance regarding issues that must be considered for cleanup of a contaminated building. The key issues covered here include: the conduct of a site assessment, development of a cleanup plan, selection of cleaning materials and disinfectants, selection of personal protective equipment, and disposal of contaminated solid waste and liquids.

2. Site Assessment and Cleanup Plan

2.1 Site Assessment

The site assessment includes an evaluation of the extent of the problem and confirmation of the presence of *B. anthracis*. Protection of personnel performing the assessment is a primary concern (<http://www.cdc.gov/niosh/unp-anthrax-ppe.html>). The site assessment includes a qualitative overview:

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- 1 • How the *B. anthracis* was brought into the facility or dwelling (e.g., through a mail
2 package, air handler, or other mechanism).
- 3 • Possible pathways by which *B. anthracis* could have spread.
- 4 • The type of environmental surfaces (e.g., ceiling tiles, walls, counters, floor
5 covers, air ducts, furnishings, etc.) involved.
- 6 • The location and extent of contamination, evidence for spread of contamination,
7 and potential for re-distribution.
- 8 • The need for and appropriateness of occupying uncontaminated areas during
9 cleanup.

10
11 Part of the site assessment includes the collection of environmental samples to confirm
12 the presence of *B. anthracis*. Strategy and methods for conducting environmental sample
13 collection are specified in the following CDC publications: Guidelines for Developing an
14 Environmental Sampling Strategy for *Bacillus anthracis* in Mail-Processing Facilities and
15 Procedures for Collecting Surface Environmental Samples for Culturing *Bacillus*
16 *anthracis* (<http://www.bt.cdc.gov/DocumentsApp/Anthrax/11132001/final42.asp>).
17 Procedures to package samples for transport to testing laboratories are specified in CDC
18 publication: Packaging Critical Biologic Agents
19 (<http://www.bt.cdc.gov/LabIssues/PackagingInfo.pdf>).

20
21 If *B. anthracis* contamination is confirmed and occupancy necessary, a professional
22 remediator, in consultation with local public health and law enforcement authorities and
23 building managers or owners, should develop a comprehensive remediation plan that
24 meets environmental and occupational health objectives. The site remediation plan must
25 include safety and infection control procedures that protect cleanup workers inside and
26 outside the area, and includes site and task-specific work plans for post-remediation
27 sampling, contaminated area isolation, recovery of critical items, remediation and
28 verification sampling. These interim recommendations describe administrative,

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1 engineering, housekeeping controls, and personal protective equipment (PPE) issues
2 essential to building cleanup procedures that should be addressed within a site
3 remediation plan.

4
5 **2.2 Cleanup Procedures**

6
7 **2.2.1 General guidance**

8
9 Overall approaches to cleanup vary depending on whether contamination is localized
10 or occurs throughout the building. There is no single procedure or guideline for
11 disinfection of spaces and materials contaminated with *B. anthracis*. Judgment based
12 on a thorough understanding of the extent of the original contamination is used to
13 define the degree of cleaning required. It is likely that a single cleaning approach will
14 not be suitable for all local and building-wide *B. anthracis* contamination scenarios.

15
16 The selection of cleanup option(s) should be based and prioritized on:

- 17
- 18 • Biocidal performance on non-porous and porous vertical and horizontal surfaces
 - 19 • Compatibility with the contaminated material to minimize the creation of
 - 20 additional hazardous conditions
 - 21 • Ability to minimize generation of hazardous waste
 - 22 • Minimization of post-cleanup adverse health effects
 - 23 • Effectiveness of cleanup options
- 24

25 All cleanup strategies should be developed by a team of qualified experts with
26 experience in biological and or infectious disease control with input from the building
27 owner/operator, architect, employees and other knowledgeable persons most familiar

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- 1 with the design, layout, and operation of the building structure and processes. The
- 2 strategy for cleanup should be reviewed and approved by local public health and
- 3 safety authorities.

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1 **2.2.2 Administrative Controls**

2
3 Worker safety and health during the cleanup of a site contaminated with *B. anthracis* is
4 covered under a number of regulations that should be followed by the employer. A key
5 standard is **29 CFR**. Hazardous Waste Operations and Emergency Response
6 (HAZWOPER –1910.0120 http://www.osha-lc.gov/OshStd_data/1910_0120.html).

7 Employer responsibilities include, but are not limited to, the following key items:

- 8 • Develop a comprehensive site-specific health and safety plan in consultation with
9 local public safety and health authorities prior to implementing any remediation
10 activities.
- 11 • Develop a medical surveillance program
- 12 • Develop a personal protective equipment program
 - 13 ▪ Ensure that all remediation workers who will be wearing respirators have a
14 current respirator fit test (**29 CFR**. Respiratory Protection. - 1910.134
15 http://www.osha-slc.gov/OshStd_data/1910_0134.html).
- 16 • Ensure that remediation workers have received appropriate safety and infection
17 control training and in-service education. All designated decontamination team
18 members should have the following minimum training experience:
 - 19 ▪ 40 hour hazardous waste operations training.
 - 20 ▪ Basic hazard communication training concerning *B. anthracis* and
21 the specific decontamination chemicals to be used on the site.
- 22 • Develop strategies for security and emergency response in consultation with local
23 public safety and public health officials prior to beginning cleanup activities.

24
25 Other recommended administrative controls:

- 26 • Develop strategies to restrict the number of persons entering, working or adjacent
27 to contaminated sites to limit exposure to aerosolized particles generated during
28 cleanup and disposal operations.

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- 1
2 • Due to the possibility of breaches of personal protective equipment and exposure
3 of workers, CDC recommends that decontamination/cleanup workers receive
4 antimicrobial prophylaxis. Prophylaxis will entail the use of standard regimens
5 starting in conjunction with or prior to the time of first entry into a contaminated
6 site and continuing for 60 days after final opportunity for exposure. The current
7 recommended regimens (for adults) are as follows:

8 Ciprofloxacin, 500 mg by mouth every 12 hours, or

9 Doxycycline, 100 mg by mouth every 12 hours

10 A medical protocol should be developed to implement prophylaxis, and the
11 program should be under the supervision of an experienced physician. These
12 recommendations may be modified as additional information becomes available
13 (Centers for Disease Control and Prevention. (2001) Antimicrobial Prophylaxis to
14 Prevent Anthrax Among Decontamination/Cleanup Workers Responding to an
15 Intentional Distribution of *B. anthracis*).

- 16
17 • For workers who may have prolonged or repeated employment on sites potentially
18 contaminated with *B. anthracis*, CDC recommends routine vaccination with
19 anthrax vaccine adsorbed (AVA). Consultation with an experienced physician
20 should be made before receiving the vaccine. Immunization consists of three
21 subcutaneous injections given 2 weeks apart, followed by three additional
22 subcutaneous injections at 6,12, and 18 months.

- 23 ○ (Centers for Disease Control and Prevention: FAQ's about Anthrax:

24 <http://www.bt.cdc.gov/DocumentsApp/faqanthrax.asp - topic9;>

- 25 ○ Centers for Disease Control and Prevention (2000)

26 <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4915a1.htm>)

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1 **2.2.3 Engineering Controls**

2 Develop strategies to minimize the aerosolization of *B. anthracis* to reduce the risk
3 of inhalation anthrax, the most severe form of the disease. Engineering controls
4 must be in place to prevent operating machinery and air-conditioning (HVAC)
5 systems from spreading spores, and to prevent the redistribution of spores by
6 personnel and equipment, removal of PPE, as well as waste collection, storage,
7 transport and disposal activities.
8

9 **2.3.4 Personal Protective Equipment**

10 Personnel entering the area to conduct sampling or cleanup activities will wear the
11 level and type of personal protective equipment (PPE) appropriate to the expected
12 hazard. Protective clothing (including chemical protective coveralls, shoe covers,
13 and gloves) prevents skin exposure to spores or to disinfectant, and prevents
14 contamination of street clothes. Eye protection must be used to prevent splash
15 exposure to disinfectants (a full-facepiece respirator provides splash protection).
16 Respiratory protection must be selected in accordance with the level of respiratory
17 exposure hazard (biological & chemical). The Permissible Exposure Limit (PEL),
18 Recommended Exposure Limit (REL) and the Immediately Dangerous to Life and
19 Health values for selected fumigants are noted in Appendix A. Refer to the
20 following standards and recommendations for additional guidance:

- 21 ■ **29 CFR.** Hazardous Waste Operations and Emergency Response
22 (HAZWOPER) –1910.0120 [http://www.osha-](http://www.osha-slc.gov/OshStd_data/1910_0120.html)
23 [slc.gov/OshStd_data/1910_0120.html](http://www.osha-slc.gov/OshStd_data/1910_0120.html))
- 24 ■ **29 CFR.** General Requirements - Personal Protective Equipment
25 http://www.osha-slc.gov/OshStd_data/1910_0132.html;
- 26 ■ **29 CFR.** Respiratory Protection. - 1910.134 [http://www.osha-](http://www.osha-slc.gov/OshStd_data/1910_0134.html)
27 [slc.gov/OshStd_data/1910_0134.html](http://www.osha-slc.gov/OshStd_data/1910_0134.html);

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- 1 ▪ **29 CFR.** Hand Protection. - 1910.138 [http://www.osha-](http://www.osha-slc.gov/OshStd_data/1910_0138.html)
- 2 [slc.gov/OshStd_data/1910_0138.html](http://www.osha-slc.gov/OshStd_data/1910_0138.html);
- 3 ▪ Protecting Investigators Performing Environmental Sampling for *Bacillus*
- 4 *anthracis*: Personal Protective Equipment. [http://www.cdc.gov/niosh/unp-](http://www.cdc.gov/niosh/unp-anthrax-ppe.html)
- 5 [anthrax-ppe.html](http://www.cdc.gov/niosh/unp-anthrax-ppe.html)).
- 6 ▪ Eye Safety: Emergency Response & Disaster Recovery
- 7 <http://www.cdc.gov/niosh/eyesafe.html>
- 8 ▪ Interim Recommendations for the Selection and Use of Protective Clothing
- 9 and Respirators Against Biological Agents
- 10 <http://www.bt.cdc.gov/DocumentsApp/Anthrax/Protective/Protective.asp>

11

12 As personnel leave the contaminated area, they must remove their protective
13 clothing in a manner that will not spread *B. anthracis* spores that may be on their
14 protective clothing and equipment. PPE can be cleaned with a 1:9 household
15 bleach and water. For disposal of dirty cleaning solutions, cleaning supplies and
16 PPE see Section 4:Disposal of Waste Materials/Wastewater.

17

18 **2.3.5 Housekeeping Controls**

19

20 The following housekeeping controls should be considered for effective cleanup:

- 21 • Develop a cleanup strategy, or combination of cleanup strategies to address the
- 22 surface type to be cleaned (e.g. hard surface, porous material, or fabric).
- 23 • Select disinfectants based upon the proven effectiveness against the spore form of
- 24 the *B. anthracis*. The microbial and sporicidal effectiveness of disinfectants are
- 25 dependent upon the use of the appropriate concentration, contact time,
- 26 temperature, and pH range.
- 27 • Select cleanup strategies on the effectiveness of the disinfectant(s) to kill or
- 28 inactivate *B. anthracis* spores on various surfaces (see above). Consideration of

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1 secondary effects, such as chemical/thermolytic reactions, staining and fading, out-
2 gassing and odor, corrosion of metals, and electronics compatibility, should
3 receive lower priority than the effectiveness of the disinfectant(s).

- 4 • Clean with gentle motions. *Do not* clean surfaces using compressed air or methods
5 that can generate dust and re-aerosolize spores.
- 6 • Clean contaminated areas with wet techniques. *Avoid* dry sweeping and dusting.
- 7 • Dispose of nonessential materials prior to cleanup to improve effectiveness of
8 building cleanup. See Section 4.
- 9 • Handle all contaminated waste materials consistent with local medical waste
10 regulations. See Section 4.
- 11 • Wash hands thoroughly with soap and water as soon as possible after removing
12 PPE, and before eating.
- 13 • Analyze and interpret results of post-cleanup environmental sampling to evaluate
14 the effectiveness of the cleanup procedure. Local authorities using the pre-cleaning
15 criteria should conduct this step.

16
17 **2.2.6 Specific Housekeeping Procedures**

18
19 2.2.6.1 Separating "clean" and "dirty" areas

20
21 Depending upon the size of the contaminated area, the types of surfaces, and
22 the extent of contamination, it may be necessary to isolate or seal-off the
23 contaminated area to prevent the spread of spores by the movement of people
24 or equipment. Based on the recent results demonstrating the ability of *B.*
25 *anthracis* spores to be re-aerosolized during normal office activities, cordoning
26 off a contaminated area is not recommended.

27 To isolate or seal-off the contaminated area the following is recommended:

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- 1 • Use impervious plastic (e.g., 6 mil - polypropylene) sheeting to devise
2 temporary barriers.
- 3 • Maintain, using tape, tight seals at the full perimeter of temporary walls and
4 at ceiling height in the same way that areas are sealed off for asbestos
5 abatement and dust control during building renovation (**29 CFR**. Asbestos
6 - 1926.1101, Section G, Part 4. [http://www.osha-](http://www.osha-slc.gov/OshStd_data/1926_1101.html)
7 [slc.gov/OshStd_data/1926_1101.html](http://www.osha-slc.gov/OshStd_data/1926_1101.html) for temporary barrier construction
8 guidance).
- 9 • Seal windows and air vents serving the area using plastic sheeting and tape
10 to control the risk of dust dispersal and recirculation
- 11 • Keep the area under negative air pressure to prevent the outward flow of air
12 to produce a higher level of isolation. Portable high-efficiency particulate
13 air (HEPA)-filtered negative air units can be used to produce negative
14 pressure environment. This equipment may be leased or purchased.

15
16 2.2.6.2 Pre-cleaning

17
18 Standard institutional cleaning practices recommend that surfaces be cleaned prior
19 to disinfection. Any dirt or other material on the surface to be cleaned will
20 decrease the efficacy of disinfectant solutions.

21
22 Use the following procedures to pre-clean most surfaces:

- 23 • Wet wipe surfaces with a cleaning solution of detergent and water to
24 remove existing organic load.
- 25 • Focus on walls and horizontal surfaces. Avoid aggressive pre-cleaning (use
26 gentle actions) to prevent the re-aerosolization of dust that may contain
27 spores.

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For a grossly contaminated area (visible powder) use the following procedures:

- Gently flood the contaminated area with a solution of 1 part household bleach in 9 parts water
- Let the solution stand for 30 minutes minimum
- Clean with the detergent and water solution.

For disposal of dirty cleaning solutions, cleaning supplies and PPE see Section 4:
Disposal of Waste Materials/Wastewater.

2.2.6.3 HEPA-filtered Vacuuming Equipment for Surface Cleaning

If vacuum equipment is used in remediation, select heavy-duty industrial type vacuums manufactured for hazardous dust abatement activities, with sufficient vacuum strength and durability, and equipped and maintained with effective high efficiency particulate (HEPA) filters. HEPA vacuuming has been proposed for dust reduction for fabric-covered furniture, carpets, electronic equipment, artifacts and other fixed surfaces; however, the efficacy of this method is not proven in *B. anthracis* remediation activities or laboratory settings. Central, one pass, HEPA vacuum system might be preferable to portable vacuum units since exhaust air will not blow more dust into the air or re-distribute dust into previously cleaned areas. Engineering controls, such as isolation tents, must be in place to minimize the generation of dust when changing pre-filters and HEPA filter materials contained in the vacuums.

Note: HEPA vacuuming alone, whether done once or repeated several times, may not be sufficient to clean up porous, portable or fixed surfaces. See Section 3: Disinfection Methods. Vacuuming of carpet may prove to be particularly problematic and both time and labor intensive. Filter materials should be collected,

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1 stored, and disposed in compliance with applicable hazardous solid waste
2 regulations see Section 4.

3
4 **3. Disinfection Methods**

5
6 Several methods exist for cleanup. The following options can be considered by public
7 health authorities to determine the cleanup method necessary for a safe and acceptable
8 environment.

9
10 **3.1 Simple Cleaning**

11 The steps described for pre-cleaning may remove much of the *B. anthracis* load
12 from the contaminated surfaces, but is unlikely to result in adequate surface
13 cleaning.

14
15 **3.2 Sodium hypochlorite solution**

16 To make a solution of sodium hypochlorite mix 1 part household bleach to 9 parts
17 water. This solution will be used to flood non-porous surfaces. Using the bleach
18 solution further reduces viable spore load. Porous surfaces, such as carpets, fabric
19 drapes, acoustical ceiling tile and wallpaper, can be treated with the bleach
20 solution but must be removed and properly discarded after treatment. See details in
21 Appendix B.

22
23 **Note:** Exposure to sodium hypochlorite solution may cause a number of health
24 effects:

- 25 • Inhalation: Irritation to the respiratory tract (nose and throat);
26 symptoms may include coughing and sore throat
- 27 • Ingestion: Nausea, vomiting
- 28 • Skin contact: Skin irritation

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- Eye contact: Severe irritation and damage, particularly at high concentration
- Aggravation of pre-existing conditions: Persons with chronic respiratory disease such as asthma, chronic bronchitis/obstructive lung disease, or heart disease may be more susceptible.

Note: Some common institutional cleaning agents should never be used together with bleach solutions. For example, bleach forms toxic gases when mixed with certain products such as ammonia.

3.3 Disinfecting with Gaseous Formaldehyde using Paraformaldehyde crystals

Gaseous formaldehyde is used to disinfect large contaminated spaces (such as rooms or buildings). See Appendix C for detailed procedures.

Note: Formaldehyde is a potential carcinogen, so this method should be used only if no other option is practical or realistic. OSHA standards for Formaldehyde should be followed (**CFR 29** – 1910.1048 http://www.osha-slc.gov/OshStd_data/1910_1048.html).

3.4 Other Options for Disinfecting Building Areas

Consideration should be given to innovative technologies when current technologies and strategies have shown limited success, could create significant financial hardships or unacceptable disruptions of vital services. The selection and use of these alternative agents and methods should be undertaken in consultation with appropriate public health authorities.

Other potentially feasible disinfecting methods and techniques are currently under

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1 investigation. The use of ozone, ionizing and non-ionizing radiation, ultraviolet
2 light, gas fumigants, and other than formaldehyde and other alternative
3 disinfecting agents not addressed in this document are not currently recommended
4 by the CDC due to unknown or unproven microbial and or sporicidal
5 effectiveness, and the feasibility of these agents or application methods on
6 environmental surfaces in buildings. This determination may change in the future
7 as additional information becomes available.

8
9 **4.0 Disposal of Contaminated Solid and Liquid Wastes**

10 All *B. anthracis*-contaminated solid waste and liquids must be handled in a manner no
11 less stringent than specified medical waste regulations. Biological wastes, including *B.*
12 *anthracis*-contaminated materials, are governed under Resource Conservation and
13 Recovery Act (RCRA) <http://www.epa.gov/rcraonline/>); and, State, Territory and Tribal
14 environmental agencies are also authorized to control the location and method of disposal
15 of *B. anthracis*-contaminated materials. For information on disposal of medical waste by
16 state, contact the RCRA, Superfund & EPCRA Call Center at 1-800-424-9346. In addition,
17 the release of *B. anthracis* into the environment as a result of a bio-terrorist event triggers
18 reportable quantity notifications established under CERCLA and, therefore, must be
19 reported to the National Response Center (1-800-424-8802).

20
21
22 **5.0 Special considerations**

23 5.1 Special Needs for Equipment

24
25 Some objects with internal cooling ventilation fans (e.g., desktop computers) draw
26 cooling air into the case and may include filters or electrostatic methods to control
27 dust intake. These filters or the equipment chassis may be reservoirs of contamination.
28 If contamination is a concern, store the equipment in a sealed plastic bag prior to

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1 environmental cleanup, and consult the equipment's manufacturer for disinfectant
2 compatibility issues.

3
4 5.2 Heating, Ventilation, and Air Conditioning Systems

5
6 Some *B. anthracis* incidents, particularly those involving spores that are particularly
7 likely to become airborne, may contaminate air ducts and other parts of heating,
8 ventilation, and HVAC systems, including filters. Filters for HVAC systems serving
9 contaminated areas should be removed and replaced. The filters should be bagged and
10 labeled appropriately for incineration. Personnel performing these operations should
11 wear personal protective equipment specified for cleanup.

12
13 The HVAC ducts, particularly exhaust ducts, serving the contaminated area should be
14 sampled for contamination. HVAC dampers should be sampled if an outside source is
15 suspected. At a minimum, vacuum samples should be collected from HVAC system
16 filters, and wipe samples should be collected from room supply registers and return
17 grills. If HVAC ducts are contaminated, they must be cleaned and disinfected. If
18 mechanical cleaning and disinfection are not possible, gaseous disinfection may be
19 needed. Cleanup of fiberglass-lined duct work with biocides is of concern due to the
20 fact that spores may have been deposited in the organic material built up in the duct
21 work. Organic material interferes with the biocidal activity of fumigants, disinfectants
22 and chemical germicides. In addition, spores may become trapped in the insulating
23 materials, and depending upon the penetration of the fumigant, may or may not be
24 fully killed or inactivated.

25
26 5.3 Shoes, Apparel and Linen

27
28 Contaminated shoes, apparel and linen may be discarded in compliance with local and

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1 State regulations for the disposal of pathological waste, or they may be retained for
2 disinfection. Do NOT launder contaminated clothing at home. If kept for re-use,
3 contaminated clothing should be placed into autoclave bags for autoclaving or
4 disinfecting following infection control guidelines for the collection, transport, and
5 treatment of biohazard materials.

6
7 Dry cleaning cannot be relied on to disinfect clothing contaminated with *B. anthracis*.

8 Although little is known about the effectiveness of dry cleaning in destroying bacteria
9 and other microorganisms, it has been found to be ineffective against some viruses,
10 which are often less hardy than spores. **Draft: Project #138 – FAQs on Handling**
11 **and Cleanup (Anthrax)**

12
13 5.4 Rodent and Insect Vector Control

14
15 Cross contamination by crawling and flying insects and rodents may be possible. A
16 vector control program should be implemented to the extent feasible based on a site-
17 specific vector control assessment. Control programs should be developed in
18 consultation with local licensed pest control authorities and implemented, if possible,
19 prior to any structural fumigation. Any rodents eradicated through this control
20 program should be collected for disposal, sealed in labeled plastic bag, and
21 incinerated. Personnel handling dead rodents should wear appropriate PPE and follow
22 standard infection control precautions.

23
24 5.5 Pets and Other Animals

25 Pets and other animals may be exposed to *B. anthracis* and should be quarantined on-site as
26 promptly as possible. It may be feasible to perform animal cleaning for some species.
27 Animals dying after exposure should not be handled and should be reported to public health
28 authorities. Issues related to disinfection, vaccination, prophylaxis, duration of quarantine,

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1 or the decision to euthanize, animals are beyond the scope of this guideline and should be
2 initiated only in consultation with a knowledgeable veterinarian, and in compliance with
3 local, State and international public health regulations or guidelines such as those contained
4 in WHO Guidelines for the Surveillance and Control of Anthrax in Human and Animals, 3rd
5 edition (<http://www.who.int/emc-documents/zoonoses/whoemczdi986c.html>).

6
7 **5.6 Chemical Sensitive Artifacts, Artwork and Antiquities**

8 If damage to artifacts, artwork and antiques from cleanup is a concern, store the
9 artifacts in an appropriate and secure location in sealed plastic bags (double bag, if
10 possible) or other appropriate protective container, and label with biohazard warning
11 labels prior to environmental cleanup. Consult appropriate equipment manufacturer,
12 art restoration, or other experts for guidance on effect of cleaning and disinfection
13 measures on the integrity of these items.

14
15 **6.0 Public Notifications, Property Transfer and Other Record Keeping**

16 Related to cleanup and waste disposal activities, the property owner or manager may
17 be subject to public notification and health and safety placarding regulations, and
18 hazardous waste manifesting, occupational health/OSHA, or veterinary record keeping
19 requirements. Other local property recording and recordkeeping requirements related
20 to property transfer may be instituted by various other local authorities. Owners or
21 managers should consult legal counsel to determine their responsibilities and to fully
22 understand compliance requirements.

23
24 **7.0. Post-Cleaning Testing, Verification and Notification Prior to Re-entry**

25
26 Wipe samples or vacuum samples will be collected in a representative sample of cleaned
27 areas (see separate guidance document for sampling). Each of these areas should be sampled
28 using the same method by which it was sampled before cleaning. Local authorities should

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1 interpret the results of post-cleaning environmental sampling. If any of these post-cleaning
2 samples show residual contamination, those areas should be cleaned again. Prior to
3 recleaning, areas without contamination should be isolated from the areas with residual
4 contamination as described in Section 2.2.6.1, cleaned and resampled.

5
6 The owner or manager of the building is responsible for notification of local unions,
7 management associations, and employees as soon as possible of the results of post-
8 decontamination sampling.

9
10 Decontamination verification is required prior to re-entry and occupation of the
11 premises. Based on current information, the safety of the public or workers cannot be
12 assured if *B. anthracis*-contamination is present in the building.

13

14 **8.0 Interim Custodial Cleaning Procedures for Non-Contaminated Areas Adjacent to**
15 **Contaminated Spaces**

16

17 These guidelines are for routine cleaning and disposition of trash in areas and facilities
18 adjacent to but not identified as contaminated with *B. anthracis*. The cleaning of areas
19 adjacent to contaminated spaces should be specified in the written site-specific safety and
20 infection control plan previously described.

21

22 **8.1 Custodial Procedures**

23 • **Optional protective equipment** - Custodians and waste handlers may choose to
24 wear a properly fitted, NIOSH-approved filtering face piece respirator (N-95) and
25 nitrile or vinyl gloves for comfort. PPE should be inspected frequently, and worn
26 out or damaged gloves and respirators can be placed in the trash.

27

28 • **Reducing dust** - Use wet methods or a vacuum cleaner equipped with a high

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1 efficiency particulate (HEPA) filter. For wet mopping or wiping, a 10% bleach
2 solution (1-1/2 cups of household chlorine bleach in 1 gallon of water or 1 part
3 bleach to 9 parts water) can be used. Avoid dry mopping or sweeping.

- 4
- 5 • **Changing vacuum bags** - Keep dust to a minimum when changing vacuum bags.
6 Put the full vacuum bag gently in a plastic bag. Seal the plastic bag and put it in
7 the trash.

- 8
- 9 • **Trash removal** - Put trash into a plastic bag and seal the bag. Incinerate or bury
10 trash in a sanitary landfill. Concern about *B. anthracis* contamination in locations
11 not experiencing a hazardous materials incident does not justify identifying the
12 trash as biohazardous waste unless the waste actually does contain pathological
13 waste as defined in OSHA Bloodborne Pathogens Standard (29 CFR Part
14 1910.1030 [http://www.osha-](http://www.osha-slc.gov/Preamble/Blood_toc/Blood_toc_by_sect.html)
15 [slc.gov/Preamble/Blood_toc/Blood_toc_by_sect.html](http://www.osha-slc.gov/Preamble/Blood_toc/Blood_toc_by_sect.html)).

- 16
- 17 • **Integration of existing safety and disaster plans** - Pre-contamination emergency
18 preparedness and security plans and procedures should be reviewed and revised if
19 needed. In any location experiencing a hazardous materials incident, HAZMAT
20 procedures should be followed.

21

- 22 • **Personal hygiene habits for custodians and trash handlers**

- 23 • Cover any open wounds, cuts, scratches, rashes.
- 24 • Don't eat, drink, smoke, or chew gum while working.
- 25 • Never reach where you can't see. If you are cut or stabbed by a sharp object while
26 handling trash, immediately wash the area with soap and water, and report it as
27 soon as possible to your supervisor. Seek medical treatment.

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- 1 • Wash hands after custodial and trash handling work, and before eating.

2

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**Appendix A. Permissible and Recommended Exposure Limits and
 IDLH¹ values for Selected Chemical Fumigants**

Disinfectant Agent	NIOSH Recommended Exposure Limit (REL)	Immediately Dangerous to Life and Health (IDLH)¹	OSHA Permissible Level (PEL)
Chlorine Dioxide	0.1 ppm TWA ²	5 ppm	0.1 ppm TWA
Ethylene Oxide	<0.1 ppm TWA	800 ppm	1 ppm TWA
Formaldehyde	0.016 ppm TWA 0.1 ppm 15 min	20 ppm	0.75 ppm TWA
Glutaraldehyde	0.2 ppm Ceiling	None established	0.2 ppm Ceiling
Hydrogen peroxide	1.00 ppm TWA	1.00 ppm	75 ppm TWA
Peracetic acid	None established	None established	None established
β-propiolactone§¥	Carcinogen	Carcinogen	Carcinogen
Propylene Oxide	None established	400 ppm	100 ppm TWA
Ozone	0.1 ppm Ceiling	5 ppm	0.1 ppm TWA

¹Immediately Dangerous to Life and Health (IDLH) - The current NIOSH definition for an immediately dangerous to life or health condition, as given in the NIOSH Respirator Decision Logic [NIOSH 1987], is a situation "that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment." It is also stated that the purpose of establishing an IDLH is to "ensure that the worker can escape from a given contaminated environment in the event of failure of the respiratory protection equipment.

²TWA- Time weighted average usually over a 10 hr period.

§ Designated as a carcinogen.

¥ TLV 0.5 ppm; 1.5 mg/m³

Appendix B. Cleanup Procedures

Using Sodium Hypochlorite Solution

1. Cleanup of non-porous surfaces (e.g., work surfaces, computer equipment, file cabinets, vinyl floors, painted walls, and ceilings)

1.1 General Precautions

- Stage materials and equipment as necessary to begin the cleaning effort.
- Begin work only after a personnel decontamination station is installed and personnel are trained.
- Ensure personnel appropriately select, don, use, doff, and maintain their PPE as outlined in the site-specific safety and infection control plan.
- Ensure that medical management plans, including any required prophylaxis and medical monitoring are in place and being implemented.
- Bleach forms toxic gases when mixed with acidic substances such as ammonia, toilet bowl cleaners, drain cleaner, or vinegar. **Do not** mix bleach with other cleaners.
- Turn off electrical devices prior to cleaning. Liquid cleaners and disinfectants should not be used on electrical appliances while they are plugged into an electrical source.

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1 **1.2 Cleanup methods**

- 2
- 3 • Preclean all surfaces of concern
 - 4 • Prepare cleaning solution using liquid household bleach (5.25% to 6.15%
5 solution.)
 - 6 ○ Add 1 part bleach to 9 parts water, resulting in a solution containing 5,250 to
7 6,150 parts per million (ppm) free available chlorine. The final solution
8 should have a pH range between 6 and 8.
 - 9 ○ Prepare solution immediately before use
 - 10 ○ Do not store solution because storage reduces the free available chlorine and
11 the disinfectant ability.
 - 12 • Apply the solution to the contaminated surface. If using a spray applicator, set the
13 spray applicator on “mist” or at a 45 degree or higher spread and spray 6 to 8
14 inches away from the surface. This prevents reaerosolizing the spores.
 - 15 • Leave the solution on the surface for a **minimum of 10 minutes** (contact time).
 - 16 • Rinse (wipe) the cleaned areas with a solution of water and sodium thiosulphate
17 (20 grams thiosulphate to 1-gallon of water) to neutralize the bleach. This will help
18 protect the surfaces and prevent chlorine from interfering with cultures of samples
19 collected after cleaning.
 - 20 • Rinse (wipe) surfaces with clean water to remove any residue.

21

22 **1.3 Post-Cleanup methods**

- 23 ○ Dispose of materials used in the cleanup (bleach, moistened cloths, sponges) as
24 other normal household wastes.
- 25 ○ Remove PPE in reverse order of donning, removing the outer pair of surgical
26 gloves, chemical protective coveralls, shoe covers, and respirator. The last item to
27 be removed is the second pair of surgical gloves. Used clothing should be bagged

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1 and labeled for disposal. See Section 4: Solid Waste Disposal.

- 2 ○ Wash hands immediately with soap and warm water for at least 30 seconds after
3 removing PPE.

4
5 **2. Disposal of items with porous surfaces (e.g., carpeting, cloth-covered furniture)**

6
7 **2.1 General Precautions**

- 8
9 ● Stage materials and equipment as necessary to begin the cleaning effort.
- 10
11 ● Begin work only after a personnel decontamination station is installed and
12 personnel are trained.
- 13
14 ● Ensure personnel appropriately select, don, use, doff, and maintain their PPE as
15 outlined in the site-specific safety and infection control plan.
- 16
17 ● Ensure that medical management plans, including any required prophylaxis and
18 medical monitoring are in place and being implemented.
- 19
20 ● Bleach forms toxic gases when mixed with acidic substances such as ammonia,
21 toilet bowl cleaners, drain cleaner, or vinegar. **Do not** mix bleach with other
22 cleaners.
- 23
24 ● Turn off electrical devices prior to cleaning. Liquid cleaners and disinfectants
25 should not used on electrical appliances while they are plugged into an electrical
26 source.
- 27

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1 **2.2 Cleanup Methods**

- 2 • Treat in place contaminated carpeted and cloth-covered areas or materials by
3 applying the bleach solution until the surface is moist.
4 • Remove and dispose of treated material(s) as solid waste.

5
6 **2.3 Post-Cleanup methods**

- 7 ○ Dispose of materials used in the cleanup (bleach, moistened cloths, sponges) as
8 other normal household wastes.
9 ○ Remove PPE in reverse order of donning, removing the outer pair of surgical
10 gloves, chemical protective coveralls, shoe covers, and respirator. The last item to
11 be removed is the second pair of surgical gloves. Used clothing should be bagged
12 and labeled for disposal. See Section 4:Solid Waste Disposal.
13 ○ Wash hands immediately with soap and warm water for at least 30 seconds after
14 removing PPE.
15 ○ Vacuum carpets outside the contaminated area with an appropriate HEPA-filtered
16 vacuum or shampoo carpet.

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Appendix C.

Cleanup Procedures Using Gaseous Formaldehyde

Commercial devices are available that automate the gaseous formaldehyde cleanup is abstracted from U.S. Army Medical Research Institute for Infectious Diseases Regulation 385-17 and from Class II (Laminar Flow) Biohazard Cabinetry, National Sanitation Foundation International, Standard 49, 1992, Annex G.

Note: Formaldehyde should be handled with caution. Porous materials may out-gas formaldehyde for extended periods. Formaldehyde is a potential carcinogen, so this method should be used only if no other option is practical or feasible. Follow OSHA Regulations as specified **CFR 29** 1910.1048. http://www.osha-slc.gov/OshStd_data/1910_1048.html

1. Pre cleanup Methods

- Pre-clean the area to remove dust and dirt with disinfectant soaked cloth.
- Bag, label and remove all trash for final disposal.
- Remove desk blotters and bag for final disposal.
- Empty and leave all desk drawers open.
- Sterilize with paraformaldehyde essential papers and books, if desired.

2. Room Preparation

- Cover supply and exhaust duct openings with plastic and tape-sealed edges in areas where the ventilation system cannot be shut down because it is being shared with another area, or
- Shut down the system or throttle it back to minimum flow through the system in areas where the ventilation system is not shared with another area
- Label (room number, location, etc.) and place biological indicators (spore strips

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1 containing spores of *Bacillus subtilis*) through out the area being fumigated.

2 ○ Maintain relative humidity at 60%; add water to the fry pans designated for water
3 if it falls below 60%.

4 ○ Maintain room temperature at 25 °C.

5 ○ Pour 1 gallon of liquid disinfectant with proven efficacy against *B. anthracis* or a
6 solution of one part 5% sodium hypochlorite (household bleach) and nine parts
7 water into each floor or sink drain in affected area.

8 ○ Post warning signs indicating a formaldehyde hazard on the outside of the doors to
9 the clean change room.

10
11 **3. Preparation of the Paraformaldehyde and Disinfection**

12
13 3.1 Weigh out paraformaldehyde. Calculate the amount of paraformaldehyde
14 required as follows:

15 Multiply the volume of area to be cleaned in feet cubed (ft³) by 0.3 grams
16 (g)/ft³ and divide the answer by the percentage of formaldehyde in the
17 paraformaldehyde to be used for the cleanup.

18 Example: An area with the measurements 10 ft (length) by 15 ft
19 (wide) by 12 ft (height) has a volume of 1,800 ft³. The
20 paraformaldehyde used contains 91% formaldehyde. The amount
21 of paraformaldehyde needed is (1,800 ft³ x 0.3 g/ft³) divided by
22 (0.91) = 594 g.

23
24 3.2 Weigh out ammonium bicarbonate. Calculate the amount of ammonium
25 bicarbonate required as follows:

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1 Multiply the grams of paraformaldehyde determined in Step 3.2 by 1.1.

2
3 Example: In the example in Step 3.1, 594 g of paraformaldehyde is
4 needed. The amount of ammonium bicarbonate needed
5 is $(594 \text{ g}) \times (1.1) = 653 \text{ g}$.

6
7 3.3 Plug electric fry pans into interval timers, and place them in the areas to be
8 cleaned. Turn them to their maximum temperature (420° F), and check that
9 they operate correctly.

10
11 3.4 Put on a full-face respirator equipped with an industrial canister approved by
12 the National Institute for Occupational Safety and Health (NIOSH)/Mine
13 Safety and Health Administrations (MSHA) for use with formaldehyde.

14
15 3.5 Place pre-weighed ammonium bicarbonate into electric fry pans designated
16 for ammonium bicarbonate and pre-weighed paraformaldehyde into electric
17 fry pans designated for paraformaldehyde. Do not place more than 908 g
18 ammonium bicarbonate or paraformaldehyde in any one fry pan.

19
20 3.6 Set the time fry pans containing paraformaldehyde and water are to turn on.

21
22 3.7 Set the timers of the fry pans containing paraformaldehyde and water to turn
23 off 2 hours after the start time (production time). The contact time for the
24 formaldehyde gas is 10 hours.

25
26 3.8 Set the timer of the fry pans containing ammonium bicarbonate to turn on 12 hours
27 after the start of the fumigation (10 hours after the formaldehyde frying pans have
28 turned off); set the timers to turn off the fry pans 1 hour later. The production time

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1 and contact times for ammonium bicarbonate is 1 hour each.

2 **4. Re-entry into Disinfected Area**

3
4 4.1 Enter the disinfected area only under the following conditions:

- 5 • Two hours after the fry pan containing ammonium bicarbonate was set to
- 6 turn on (or one hour after it shut off)
- 7 • Only personnel wearing Level A protection (a vapor protective suit constructed of
- 8 materials resistant to formaldehyde breakthrough for more than 8 hours plus a
- 9 self-contained breathing apparatus) with emergency rescue personnel equipped
- 10 with the same PPE standing by.

11
12 4.2 Take formaldehyde readings using a direct reading meter from several locations.

13
14 If the formaldehyde level is below 0.5 ppm, equipment used during the

15 disinfection process may be removed without respiratory protection. If readings

16 are above 0.5 ppm, respirator protection must be worn inside the disinfected area

17 until after the area is washed down and formaldehyde levels are below 0.5 ppm.

18 Enter the disinfected area only while wearing a NIOSH-approved, full-face

19 respirator equipped with canisters specifically approved for protection against

20 formaldehyde vapor in combination with a particulate filter.

21
22 4.3 Collect spore strips from the area cleaned in addition to post cleanup

23 environmental sampling for *B. anthracis*. Spore strips in addition to a positive

24 control should be incubated for a 72 hr period and read at 24, 48 and 72 hrs. If the

25 results of the spore strips are POSITIVE in other than the positive control then

26 cleanup must be repeated. If spore strips are NEGATIVE in combination with

27 post cleanup environmental sampling the area can be considered biologically

28 cleaned.

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4.4 Wash down the disinfected area to remove formaldehyde residue. PPE worn during wash down should be a NIOSH-approved, full-face respirator equipped with canisters specifically approved for protection against formaldehyde vapor in combination with a particulate filter, long-sleeve shirt, long pants, protective gloves, rubber boots and rubber apron.

4.5 Continue air monitoring during the wash down process for the area with a direct reading meter. Respiratory protection equipment as described in paragraph 4.4 must be worn until formaldehyde levels fall below 0.5 ppm.

4.6 Once the ambient formaldehyde levels fall below 0.5 ppm, and if supply and exhaust ducts have been sealed, they can be uncovered. If the ventilation system had been shut down or throttled back, notify the facility manager to adjust ventilation system to normal operating conditions

4.7 Collect electric fry pans, timers, and other equipment used in the cleanup.

4.8 Monitor the formaldehyde level until it is at levels in compliance with state and federal exposure standards.

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1 Production and Contact Time for Fumigation with Formaldehyde

Fumigant	Production Time	Contact time	Time to Rentry
Formaldehyde	2 hours	10 hours	13 hours after beginning of production time for formaldehyde
Ammonium Bicarbonate	1 hour	1 hour	See above

2