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TOXICS MANAGEMENT

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FACILITIES ENGINEERING ENVIRONMENTAL

TOXICS MANAGEMENT

1. Purpose

a. This Public Works Technical Bulletin (PWTB) provides guidance to address specific toxic and hazardous materials that are associated with buildings and some structures that are owned, leased, or otherwise controlled by the Department of the Army. While published through the PWTB program, the proponent of this document is the Office of the Assistant Chief of Staff for Army Installation Management (see item 5a).

b. This bulletin does not remove or transfer responsibility for the safe handling of the toxic materials in buildings or structures that are otherwise covered by lease agreement or other contract mechanism. It does provide basic guidance on how to detect, evaluate, control or remove the subject toxic materials. This document is not meant to be comprehensive. Many U.S. states, U.S. territories, and foreign countries require additional information, controls, handling, and documentation that apply to Army installations within their borders. Local authorities and local regulations must be included in any program that is devised to address these hazardous materials.

c. All PWTBs are available electronically at the National Institute of Building Sciences’ Whole Building Design Guide webpage, which is accessible through this link:

http://www.wbdg.org/ccb/browse_cat.php?o=31&c=215

2. Applicability

This PWTB applies to installation Directorate of Public Works (DPW) and other engineering activities that operate and maintain Active Army, Army National Guard, and U.S. Army Reserve facilities, unless otherwise stated.

3. References

Principal Army regulatory references are:

a. Army Regulation (AR) 40-5, "Preventive Medicine," revised 25 May 2007.

b. AR 385-10, "The Army Safety Program," revised 27 November 2013.

c. AR 420-1, "Army Facilities Management," revised 24 August 2012.

d. AR 200-1, "Environmental Protection and Enhancement," revised 13 December 2007.

4. Discussion

a. AR 40-5 establishes practical measures for preserving and promoting health and preventing disease and injury for all elements of the Army. It specifies use of the Army's composite risk management process to minimize the total health threat and risk to Army personnel.

b. Federal regulations from the Occupational Safety and Health Administration (OSHA) control indoor radon levels in the workplace. Federal guidance from the U.S. Environmental Protection Agency provides direction for control of radon in residences, daycare centers, etc. AR 350-10 implements OSHA requirements and provides policy on Army safety management procedures "with special emphasis on responsibilities and organizational concepts."

c. AR 420-1 (Chapter 5, "Buildings and Structures") contains policy for toxic and hazardous building materials (lead-based paint [LBP] and asbestos).

d. AR 200-1 (Chapter 9, paragraph 9-2c) contains policy for polychlorinated biphenyls (PCBs) and requires Army installations to meet OSHA requirements for radon monitoring and abatement.

e. Other toxics (e.g., mercury) are rarely considered a concern Army-wide and if there are installation-specific issues, a local plan may be required by the installation's commander. A local plan would include requirements for development of a Toxics Management Plan (TMP) covering each of the four toxics (LBP, asbestos, PCBs, and radon) as appropriate.

f. This bulletin communicates on two levels. Appendix A is directed at the garrison leadership and the senior managers of the DPW on topics of their concern. Appendices B–E relate to technicians, supervisors, and persons doing the actual daily work (i.e., Appendices B-E deliver on a "how to" level).

g. Appendix A gives details for organizing a toxics management team (TMT). The most effective way for an installation commander to comply with federal, state, and local toxics management regulations is to appoint an installation-level Toxics Management Coordinator and to establish an installation-level TMT. The team can be established as a standing installation team, an ad hoc or process action team, a subcommittee of the Installation Environmental Quality Control Committee, or any other method determined by the installation commander.

h. Each of appendices B–E covers one of the four toxics addressed by this PWTB, because each toxic presents a unique challenge to the installation TMT. These appendices provide management and workers with more specific details on these challenges, as summarized below.

i. *Appendix B, Asbestos Control*. Asbestos is a naturally occurring mineral long used as insulation or as a binding material for products exposed to high temperatures. Asbestos has functioned effectively in its intended uses and is seldom a health hazard when the asbestos-containing material (ACM) is intact and in good condition. ACM does present a potential health hazard when it is damaged during maintenance or removal activities. Although ACM comes in various forms, building materials most frequently utilized chrysotile and amosite. The various forms differ in their reaction during abatement and their behavior in the human body. Asbestos is referred to as friable or non-friable, depending on whether it can be crumbled, pulverized, or reduced to powder by hand pressure. Non-friable asbestos may be viewed as regulated ACM (RACM) or non-regulated, depending on how it reacts when disturbed by construction, renovation, or maintenance activities. In designing an asbestos hazard control plan, all potential sources of asbestos must be considered. The overtly used material such as fire-retardant wall board, incidental asbestos use such as a binder in mastics and concrete products, and the contaminated product such as vermiculite used for insulation can all contribute to the time and cost of managing asbestos in a building. In addition to building components, there are some nonbuilding materials which also contain asbestos, such as brake pads and high-temperature insulation for mobile equipment; these sources also could contribute to asbestos exposure or contaminate a building.

j. *Appendix C, Lead Control*. Lead is a heavy metal that has been known and used since antiquity for its ability to be easily refined, melted, and reformed. In modern times, it has been used to manufacture many different products including paint, batteries, pipes, solder, pottery, and gasoline. Through the 1940s, paint manufacturers frequently used lead as a primary ingredient in many oil-based interior and exterior house paints. The negative aspect of lead is that it is toxic to human and most animal life, and it is especially toxic to children. Existing lead contamination must be identified, quantified, and controlled. New sources of lead releases must also be identified and controlled.

k. *Appendix D, Polychlorinated Biphenyl Control*. PCBs belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. PCBs were domestically manufactured from 1929 until their manufacture was banned in 1979. PCBs were used in hundreds of industrial and commercial applications. For example, it was common to find PCBs as an additive to oil in electrical transformers and capacitors prior to the 1980s. PCBs have been demonstrated to cause cancer and a variety of other adverse health effects. PCBs do not readily break down, which means they may remain for long periods of time.

l. *Appendix E, Radon Control*. Radon is a naturally occurring, chemically inert, and water-soluble radioactive gas that is undetectable by human senses. It is formed by the radioactive decay of thorium and uranium. These source elements are found in low (but varying) concentrations in soils and rocks. Radon, being a gas, escapes from rock and water and gets into the air where it may be inhaled. The health hazard associated with radon is from its decay products, not the radon gas. Radon decays in several steps to form nongaseous radioactive isotopes with short half-lives. These radon decay products can enter the body via inhalation, where they remain in the lungs and undergo radioactive decay. The radiation released during this processes damages lung tissue and may lead to lung cancer.

m. *Appendix F, Reference List*. This appendix contains a consolidated list of the references cited in this PWTB.

n. *Appendix G, Notations.* The appendix contains the meanings of abbreviations and a glossary of certain terms used in this PWTB. Regarding terminology, the environmental community of practice is currently undergoing a period of rapid change, and its practitioners should pay particular attention to changing terminology.

5. Points of Contact

a. The U.S. Army Assistant Chief of Staff Installation Management (ACSIM) is the proponent for this document. The point of contact (POC) at ACSIM is Liisa White (DAIM-ODF), 571-256-9775, or email: lisa.m.white.civ@mail.mil.

b. Questions and/or comments regarding this subject should be directed to the proponent's POC as given in 5a.

FOR THE COMMANDER:

FOR JAMES C. DALTON, P.E., SES
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Assistant Chief of Staff for Installation Management

Guidance for

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APPENDIX A:
INSTALLATION TOXICS MANAGEMENT

Coordinator and Team

The most effective way for an installation commander to comply with federal, state, and local toxics management regulations is to appoint an installation Toxics Management Coordinator and establish an installation Toxics Management Team (TMT). The team can be established as a standing installation team, an ad hoc or process action team, a subcommittee of the Installation Environmental Quality Control Committee, or any other method determined by the installation commander.

The TMT's duties would include the tasks listed below.

- The team will develop the installation TMP including project documentation and programming for funds.

- The team will develop public awareness and worker education programs to communicate the risks associated with exposure to toxics, ways to prevent or control exposures, and corrective actions to prevent, manage, and abate hazards.

- Team membership should include representatives from command, engineering, environmental, housing, medical, safety, legal, and public affairs. Membership can also include community health, child development, contracting, labor union, community services, and U.S. Army Corps of Engineers (USACE) representatives. When establishing the team, the garrison commander should consider who is core to the effort (i.e., is involved in managing all toxics). The commander should also consider which skill-specific supplementary members may be required to augment the core team. (For example, radon-specific supplementary membership would normally be expected to include a radiation safety officer, the installation or hospital radiation safety officer, a health physicist, the environmental science officer, or an occupational medicine physician.) The team coordinator may obtain the services of the installation Public Affairs Officer or a trained Health Risk Communicator to assist in preparing fact sheets and other documents for public release. An example of the TMT membership is represented in Figure A-1.

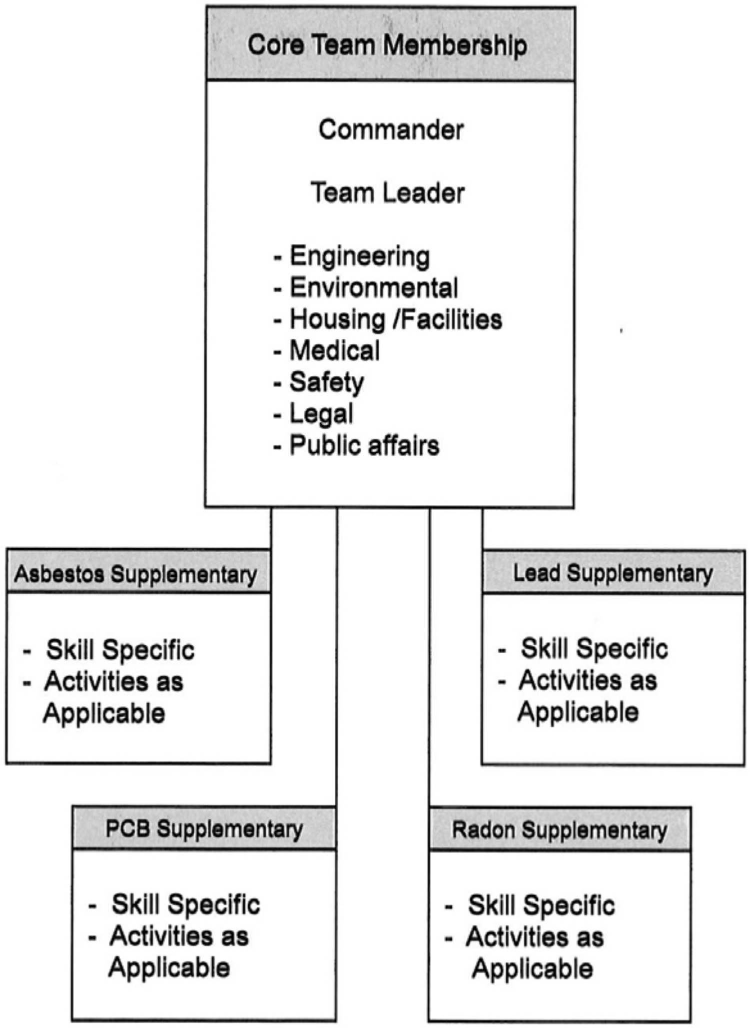

Figure A-1. Example of TMT core membership and toxic-specific supplementary membership.

Building Deconstruction and Demolition

The installation, through the Toxics Management Coordinator, will ensure that all regulated toxics-containing contaminated materials are removed from buildings before deconstruction and demolition begins. Metal, wood, glass, and other recyclables cannot be removed by recycling contractors until all of the hazardous building materials are removed. Materials such as mercury-containing florescent tube lights and switches; PCB-containing ballasts, transformers, and capacitors; hydraulic fluid; and paint and caulk containing more than 50 ppm (parts per million) of PCBs must be identified and removed before value items such as stainless steel, brass, copper, wood, and glass can be removed.

Recordkeeping/1

Recordkeeping is required for each of these toxics, but it is an evolving process. Recordkeeping requires implementing procedures to identify, store, protect, retrieve, retain, and dispose of existing paper or electronic records. A building information management (BIM)[1] system now offers one method of capturing information about toxics in buildings. The BIM will permanently maintain this data for recent and future base realignment and closure (BRAC) reorganizations or closures, MILCON projects, and other new construction projects. The Army's real property records are expected to eventually migrate to an emerging enterprise resource planning (ERP) system called General Fund Enterprise Business System (GFEBS). GFEBS may become a useful tool for recording toxics location and condition data in the future. Other recordkeeping possibilities include using "smart management systems" such as the existing Army-owned Builder™ program.

Managing Installation Toxics

A common factor in addressing a facility's health and safety is the investigation, identification, and control of the hazardous materials that are inherent in its structure. Poor management of toxics can lead to hazardous conditions for those living or working in a structure. A systematic approach that is based on sound risk assessment must be developed to rank and manage hazards. Budgets must include the cost of life-cycle management of toxics to adequately minimize and control hazards throughout the entire life cycle of the building or structure (including planning, design, construction, operation, and demolition). For example, deeds for transfer of real property to the local community or industry must address radon testing of buildings to the extent that a test was or was not done. An installation should develop a proposal and contract language ensuring that asbestos, lead, or PCBs (overseas garrisons) do not remain in facility structures, components, and materials.[2]

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[1] BIM was implemented in Jan 2008 as an Army-wide requirement for new buildings. Buildings constructed prior to that date are highly unlikely to have a BIM, although it is possible to create a BIM from a CAD file for prior-built structures. Coordination with the installations' Engineering Division or the USACE District would be necessary to have information on any remaining toxic material incorporated into a BIM.

[2] Contract standards should prevent banned materials from being used in new construction or renovation projects. However, enforcement of these standards for materials is not consistent. The existing standards must be enforced, however, to ensure that overseas-sourced materials do not contain banned toxics or hazards and that counterfeit materials do not enter the supply chain.

Toxics Management Plan Elements

The following list provides the general elements that may be appropriate for a TMP.

- *Format.* The installation needs to have its TMP in writing. Installations are free to structure their plan and processes to best suit their situation. The garrison commander or delegated official needs to review and approve the installation TMP. Whether it is titled a plan, operation plans (OPLAN), standard operating procedures (SOP), or by some other name is less important than its overall success in demonstrating that the installation has the situation in hand, knows its strengths & weaknesses and is actively striving to improve.

- *Define the Team.* Installations should define their team(s). A good approach is the use of a core team to coordinate overall management with sub-teams of specialists trained to manage specific toxics. Do not include sub-teams for toxics that do not exist on the installation. In the Installation Plan, document the reason that a sub-plan or sub-team is not needed for certain toxics. Substantiate this reason with scientifically based documentation.

- *Inventory.* Inventory of toxics begins with the installation’s real property inventory. In the near-term, installations will rely heavily on local lists and databases to inventory where toxics exist and what is being done. In the mid-term, look forward to more detailed guidance as environmental liability programs and other initiatives such as Building Information Schedule (BIS) or the Army’s new enterprise resource planning system, GFEBS, come on line and mature. Update inventories periodically in light of newly identified toxic materials, building or material aging, renovation, or abatement. An update of survey data on a two-year cycle is suggested.

- *Risk Analysis.* Use of risk analysis and risk management techniques is important. Installations should integrate the lessons of DA PAM 385-30, “Mishap Risk Management,” (U.S. Army 2007a) into their toxics planning.

- *Project List (prioritized).* This element is one of the more complex plan elements. Installations should make use of standard program and project management products that are based on business practices of the prospective component to integrate toxics management-related projects into the overall planning and programming effort. Examples of these products include the U.S. Army Installation Management Command (IMCOM) Project Prioritization System (PPS); Military Construction, Army (MCA) ProjDoc; or Planning Resources for Infrastructure Development and Evaluation (PRIDE). Proper project development for any type of project requires time, effort, and good staff work——toxics management projects are no exception.

- *Communication with Community and Workers*. Installation toxics managers should be as aware of their audiences and imperatives as is garrison leadership. By law, some specific information must be communicated to occupants of buildings (e.g., lead hazards). Garrisons may also wish to involve the Public Affairs Office (PAO) in their planning and information dissemination. Communicating with workers/technicians may be handled through bulletins, tool box safety meetings, or staff meetings. Installations have many different needs and may use a different mix of communications to meet their needs. Documentation of information delivery is highly recommended.

- *Disposal.* Disposal of obsolete or excess facilities is a routine part of any facility’s life cycle. Ensure that toxics management planning is incorporated into and supports the facility’s life cycle. This plan should support the efforts of the Installation Real Property Master Planner and provide sound advice on what is needed to prepare any given facility for demolition or other disposal. The installation’s Environmental Office should also be involved to assist with disposal of regulated building materials or contaminated soil issues. The installation TMP should play a major role in the planning and programming of facilities.

- *Review.* The TMP and its components should be reviewed and updated as necessary but not less frequently then every other year. Many states have limitations on how old toxics surveys can be, and a regular review will assist in identifying facilities that need updated surveys.

- *Monitor.* The TMP and all its components must be constantly monitored. The plan should define responsibilities. Care must be given to ensure that elements are updated (e.g., demolition/renovation lists) and are passed to the TMT for inclusion in the installation TMP when elements of the TMP have undergone change. Regular meetings of the TMT should review and update the toxics management planning documentation.

Training Requirements

Some toxics identified in this document, such as asbestos and lead, have very precise, mandatory training requirements. Other identified toxics, such as PCBs and radon, have no or few training requirements. Training requirements may vary from state to state.

Training can be divided into two categories:

1. *Technical Training*. Required training that provides technical expertise to personnel assigned to toxics management duties.

    - Table A-1 is intended to assist the TMT in indentifying recommended key organizational positions, agencies, and activities that should be involved in toxics management functions and the related technical training required for each function.

2. *Awareness Training*. Training that should be given to individuals who may be impacted by the presence of any of the toxics addressed in this document.

    - *Specific training* requirements for each toxin can be found on state and federal websites and/or in the following areas of this document:

        - Asbestos: Appendix B, page B-6
        - Lead: Appendix C, page C-6
        - PCBs: Appendix D, page D-3
        - Radon: Appendix E, page E-6

The installation TMT will develop a training plan that will identify personnel who need to be trained and the type of training required. Care needs to be taken to ensure that mandated refresher training courses are incorporated into the training plan.

Table A-1. General training requirements.

Key Organizational Positions, Agencies, and Activities	Required Technical Training							
	Asbestos/Lead Inspector	Asbestos Management Planner/ Lead Risk Assessor	Asbestos/Lead Project Designer	Supervision of Asbestos/ Lead/ PCB/ Radon Abatement Projects	Asbestos/Lead Abatement Worker	Toxics Management Policy Training	Asbestos Project Monitor	Radon Mitigation and Control
Garrison Commander						X		
Director of Public Works						X		
Housing Chief						X		
Public Affairs						X		
Legal Office						X		
Occupational Health						X		X
Environmental Office	X	X		X		X		X
Safety Office						X		X
Industrial Hygiene	X	X		X		X	X	X
Specifier/Designer			X			X		X
Building Inspector	X	X		X				
Contracting QA (on site)				X			X	
Team Leader/Foreman	X			X				
Worker					X	X		

APPENDIX B: ASBESTOS CONTROL

Introduction to Asbestos

General

This appendix provides succinct information and general guidance on the handling and control of building materials that contain asbestos. Various website links are provided so that the reader can obtain more detailed information on asbestos. It is recommended that the reader who is new to asbestos control refer to these links for more detailed background information.

This appendix does not provide a definitive treatment plan for asbestos. It attempts to highlight certain aspects of asbestos and to direct the reader to areas where more information or assistance can be found. Multiple agencies at the federal, state, and Department of Defense (DOD) can assist installation personnel in understanding and complying with specific asbestos hazard requirements.

Regulatory Guidance

Various agencies have promulgated regulations and guidance for asbestos. Key regulation and guidance are found in the documents listed below.

- As part of setting the National Emission Standards for Hazardous Air Pollutants (NESHAP), the U.S. Environmental Protection Agency (EPA) set a National Emissions Standards for Asbestos (U.S. EPA 1984) as was required by the Clean Air Act (U.S. Congress 1970 [1977]).

- Toxic Substances Control Act (TSCA) asbestos rules:

    - 5 U.S.C. II, Title 15 - Commerce and Trade, Chapter 53 - Toxic Substances Control, Subchapter II - Asbestos Hazard Emergency Response (http://www.gpo.gov/fdsys/pkg/USCODE-2009-title15/html/USCODE-2009-title15-chap53-subchapII.htm).

    - Also known as The Asbestos Hazard Emergency Response Act (AHERA), these regulations require public school districts and nonprofit schools (including charter schools and schools affiliated with religious institutions) to inspect their schools for asbestos-containing building material, to prepare management plans, and to take action to prevent or reduce asbestos hazards.

- Occupational Safety and Health Administration (OSHA) asbestos-related standards:
    - 29 CFR (Code of Federal Regulation) 1910.1001 (general industry), "Occupational Safety and Health Standards: Toxic and Hazardous Substances: Asbestos"
    - 29 CFR 1926.1101 (construction), "Safety and Health Regulations for Construction – Toxic and Hazardous Substances: Asbestos"
    - 29 CFR 1915.1001 (shipyard), "Occupational Safety and Health Standards for Shipyard Employment – Toxic and Hazardous Substances: Asbestos"
- The U.S. Consumer Product Safety Commission (CPSC) also developed bans on use of asbestos in certain consumer products such as textured paint and wall patching compounds. (For more detailed information, contact the CPSC Hotline at 1-800-638-2772.)
- Federal regulations are available on the Web at http://www.epa.gov/asbestos/pubs/asbreg.html.
- States, local governments, large metropolitan cities (in some cases), territories, and foreign countries have also promulgated asbestos regulations in addition to federal requirements. In preparing an installation or site Asbestos Control Plan, all sources of regulations must be incorporated. Most state and local governments do not publicly announce changes to their regulations. Therefore, these regulations should be reviewed at least annually to ensure program compliance. Links to various state asbestos regulations have been included in the section of this appendix titled, "State and Federally Managed Asbestos Programs" (page B-20). However, this list is a tool and may not be inclusive of all regulations for all sites.

Description

Asbestos is a naturally occurring mineral that has been used for centuries to insulate or to bind material for products exposed to high temperatures and fire. Asbestos can be specifically added to a material to increase its resistance to heat, to perform as an inert binder, or it may be an incidental contaminant to a product.

Historically, asbestos has been inexpensive and readily available and was added into non-heat-related products as a bulker or binder. These types of asbestos-containing materials (ACMs) are the most difficult to identify and control. For more information on products that contain asbestos see http://www.epa.gov/asbestos/pubs/general.html.

Common forms and classifications of asbestos are listed below.

- Although ACM comes in various forms, building materials most frequently utilize chrysotile and amosite.

- Other common forms of asbestos include crocidolite, tremolite, actinolite, and anthophyllite.

- Asbestos forms are divided into two major classifications: (1) serpentine, which tend to have long, flexible, curved fibers; and (2) amphibole, which tend to have a thin, needle-like appearance. Chrysotile is a member of the serpentine class, while the major forms of amphiboles include crocidolite, tremolite, actinolite, and anthophyllite.

- Asbestos is referred to as friable or non-friable and as RACM or non-regulated ACM.

Asbestos Bans and Phaseouts

On July 12, 1989, the EPA issued a final rule banning most asbestos-containing products. In 1991, this regulation was overturned by the Fifth Circuit Court of Appeals in New Orleans. As a result of the court's decision, the following specific asbestos-containing products remain banned: flooring felt, rollboard, and corrugated commercial or specialty paper. In addition, the EPA regulation also continues to ban the use of asbestos in products that have not historically contained asbestos, otherwise referred to as “new uses” of asbestos.

Many erroneously believe that all asbestos is banned in building materials. It is not. Asbestos is still being used as a binder in mastics, glues, and pastes where it is considered non-friable. It is very difficult to declare a new building asbestos-free. Most contractors will not do so, even though they are very diligent in trying to prevent the use of ACM in building materials. Items that are manufactured and assembled off-site may contain glues, mastics, and insulation boards that contain asbestos. In addition, some materials' technical information sheets do not use the term "asbestos." Instead, terms such as amphibole, rock or mineral wool, or the parent mineral names may be used. These materials may contain varying levels of asbestos, some greater than 1%. It is better to require the contractor to certify major building systems rather than accepting an unsubstantiated general statement. The following are example requirements to include in the contract.

- All thermal insulation systems (TIS) are non-asbestos.
- All roofing components are non-asbestos.
- All flooring systems are non-asbestos.
- All drywall systems are non-asbestos.
- All decorative systems are non-asbestos.

Products that are not banned and no longer subject to the EPA's 1989 TSCA ban include those listed below.

- asbestos-cement corrugated sheet
- asbestos-cement flat sheet
- asbestos clothing
- pipeline wrap
- roofing felt
- vinyl-asbestos floor tile
- asbestos-cement shingle
- millboard

- asbestos-cement pipe
- automatic transmission components
- clutch facings
- friction materials
- disc brake pads and drums
- brake linings
- brake blocks
- gaskets
- non-roofing coatings
- roof coatings

For more information on banned and allowable asbestos uses, see "EPA Asbestos Materials Bans: Clarification," at http://www.epa.gov/asbestos/pubs/asbbans2.pdf.

Asbestos Health Effects and Medical Monitoring

Health Effects

The health effects from asbestos include asbestosis, a non-cancer pulmonary disease; mesothelioma, a cancer in the chest cavity; lung cancer; and in rare cases, colon cancer. In general, a greater exposure to asbestos will increase the chance of developing harmful health effects and smoking increases the risk greatly. Disease symptoms may take 10-30 years to develop following exposure. Though there is evidence that certain types of asbestos are more likely to cause disease, all types are carcinogenic and harmful.

As stated above, ACMs come in various forms, and those forms differ in how they react during abatement and in how they behave in the human body. Laboratory reports should always identify the specific form of asbestos.

See the following websites for more details on asbestos health hazards:

- National Cancer Institute: http://www.cancer.gov/cancertopics/factsheet/Risk/asbestos
- Agency for Toxic Substances and Disease Registry: http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=30&tid=4
- The National Institute of Occupational Safety and Health (NIOSH) is currently investigating the health effects of other minerals that are loosely grouped and titled as elongated mineral particles (EMP), as addressed in their June 2008 draft document, “Asbestos Fibers and EMP: State of the Science and Roadmap for Research.” As a result of these studies, there may be changes to definitions and exposure considerations for asbestos.

Medical Monitoring

Military personnel and civilian employees (including contract employees) whose regular duties involve working with asbestos or around damaged friable asbestos shall be included in medical monitoring program as described in Department of the Army (DA) Pamphlet (Pam) 40-11, “Preventive Medicine” (U.S. Army 2009) and DA Pam 40-513, “Occupational and Environmental Health Guidelines for the Evaluation and Control of Asbestos Exposure” (U.S. Army 2013).

Personnel Training and Qualifications

The Asbestos School Hazard Abatement Reauthorization Act (ASHARA) (U.S. Congress 1990) requires accreditation of personnel working on asbestos activities in schools and public and commercial buildings. Specifically, the Asbestos Model Accreditation Plan (40 CFR Part 763, Appendix C) requires the use of accredited inspectors, workers, supervisors, project designers, and management planners (schools only) when conducting asbestos activities at schools and at public and commercial buildings. More information on asbestos and school buildings can be found at http://www2.epa.gov/asbestos/school-buildings.

In addition to the training requirements outlined in the above paragraph, OSHA in their asbestos standards (29 CFR 1910.1001, and 29 CFR 1915.1101) outlines specific training and accreditation requirements for workers, supervisors, and persons who are potentially exposed to asbestos. The specific requirements are based on the type of asbestos-related work that is being performed and the expected level of exposure to asbestos.

Although the training requirements given above were developed for AHERA (U.S. Congress 1986) and ASHARA (U.S. Congress 1990), the requirements apply to all asbestos work whether in schools or other buildings.

Training requirements range from simple 2-hr awareness instruction to in-depth removal and hazard control training. EPA originally issued the EPA Asbestos Model Accreditation Plan (MAP) (U.S. EPA 1994: Appendix C in Subpart E) to clarify training types, duration, and frequency. The MAP established five required training disciplines (worker, contractor or supervisor, inspector, management planner, and project designer) and one recommended discipline (project monitor). Some states have also added training by occupation such as special training for power generation plant workers. It is important to know both the federal and the state training requirements. ASHARA amended AHERA in 1994 to increase the amount of training hours required in the various MAP course disciplines.

Military personnel and civilian employees (including contract employees) whose regular duties involve working with asbestos or around damaged friable asbestos shall be included in the MAP training program.

At no time will military personnel be used to cut, repair, or remove ACMs. This restriction includes volunteer work as well as general unit maintenance or self-help work.

EPA determined that, according to the MAP, annual refresher training requirements can also be satisfied through online training in addition to in-person training, because the MAP does not require that the annual refresher training be hands-on or in-person. EPA provided states with guidelines for evaluating online annual refresher training courses. Accrediting states must approve all online courses.

The National Directory of AHERA Accredited Courses (NDAAC) contains information about training providers and approved courses nationwide. The NDAAC is updated annually by a contractor for EPA, and information is available at http://www.epa.gov/asbestos/pubs/ndaac.html.

Table B-1 identifies the required courses for personnel involved in asbestos activities under EPA and OSHA regulations. There are a number of vendors who can provide the MAP training (see NDAAC link above). However, only MAP-accredited vendors can provide training for: asbestos inspector, management planner, designer, supervision of asbestos abatement projects, and abatement worker. Operations and maintenance (O&M) workers are not required to be trained by a MAP-accredited vendor, but trainers should be MAP-certified.

Table B-1. Asbestos training requirements.

EPA-REQUIRED COURSES		
Course Name	**For**	**Length**
1. Asbestos Inspector* Ref. EPA 40 CFR 763.92	Building Inspectors	3 days initial; ½-day annual refresher
2. Asbestos Management Planner* Ref. EPA 40 CFR 763.92	Personnel managing asbestos in buildings	2 days initial; 1-day annual refresher (½-day inspector training and ½-day for management planners)
3. Asbestos Project Design* Ref. EPA 40 CFR 763.92	Project Designers	3 days initial; 1-day annual refresher
4. Supervision of Asbestos Abatement Projects* Ref. EPA 40 CFR 763.92	Abatement supervisors	3 days initial; ½-day annual refresher
5. Asbestos Abatement Worker* Ref. EPA 40 CFR 763.92	Abatement workers	4 days initial; 1-day annual refresher
6. O&M Worker Ref. EPA 40 CFR 763.92(a)(2)	Repair and maintenance workers likely to disturb ACM	16 hr initial; 2-hr annual refresher
7. O&M Worker Ref. EPA 40 CFR 763.92(a)(1)	Maintenance and custodial workers around ACM but not likely to disturb ACM	2 hr initial; 2-hr annual refresher
*Based on EPA MAP requirements; EPA-agreed State requirements may be more stringent and should be followed.		
OSHA-REQUIRED COURSES		
Course Name	**For**	**Length**
8. OSHA Asbestos Abatement for Class I Workers Ref. OSHA 29 CFR 1926.1101 (K)(9)(iii)	Personnel removing thermal system insulation (TSI) and surfacing ACM where critical barriers and/or negative pressure enclosures are required	4 days initial; annual refresher

EPA-REQUIRED COURSES		
Course Name	**For**	**Length**
9. OSHA Asbestos Abatement for Class II Workers Ref. OSHA 29 CFR 1926.1101 (K)(9)(iii)	Personnel removing ACM (not TSI materials) and surfacing ACM where critical barriers and/or negative pressure enclosures are required	4 days initial; annual refresher
10. OSHA Asbestos Abatement for Class II Workers Ref. OSHA 29 CFR 1926.1101 (K)(9)(iv)(A)	Personnel working with ACM roofing material, flooring material, siding material, ceiling tiles, or transite panels where critical barriers and/or negative pressure enclosures are not required	8 hr initial; annual refresher
11. OSHA Operation and Maintenance Training for Class III Workers Ref. OSHA 29 CFR 1926.1101 (K)(9)(v)	Repair and maintenance workers likely to disturb ACM	16 hr initial; annual refresher
12. OSHA Operation and Maintenance Training for Class IV Workers Ref. OSHA 29 CFR 1926.1101 (K)(9)(vi)	Maintenance and custodial personnel around ACM	2 hr initial; annual refresher

Some states also have specific training requirements such as passing an exam, having a photo identification card, or adding a unique training number on the class certificate. Before selecting a training vendor, ensure that all state requirements will be met. The EPA-mandated training is universal training across state boundaries. However, states and host nations may require licenses or certifications in addition to the EPA courses. Most states charge a fee. Most states do not have reciprocity across state lines. If asbestos management responsibilities cover multiple states, multiple state licenses and/or certifications will be needed.

Asbestos Management Plan

General

The asbestos management portion of the TMP is developed to identify, control, and (when necessary) remove ACM. The primary goals of asbestos management are given below.

- Compliance with federal, state, and local (including overseas installations) regulations.

- Anticipation of where asbestos hazards may arise from uniquely military activities. In preparing the asbestos management portion of the TMP, all potential sources of asbestos must be considered. The overtly used material such as fire retardant wall board; the incidental asbestos used such as a binder in mastics and concrete products; and asbestos-contaminated products such as vermiculite used for insulation can all contribute to the time and cost of managing asbestos in a building. All ACM, not just ACM regulated by federal or other agencies, must be identified. Since a minimum of 60% by weight of all demolition materials must be diverted from landfills by 2015 (U.S. DoD 2013), any nonfriable asbestos must be identified so that these materials do not become ground, chipped, or rubberized and release asbestos fibers into the air.

Data Collection

Managing the control plan involves the collection and updating of large quantities of data. Like other hazardous material tracking systems, the asbestos database must be consistent and relevant.

While buildings are usually renovated or converted every 10–20 yr, buildings containing asbestos can be as old as 70–80 years. Many historic buildings incorporated asbestos in their construction materials; therefore, a facility may never be asbestos-free. Plan managers must budget for technological renewal and data upgrades, or costly data will be lost. The plan must also be able to track removals associated with re-roofing, energy upgrades, and façade improvements.

Each building or structure should have a unique identifying number (e.g., a structure might be identified as A4722).

Asbestos-containing subsurface utilities can also be given a number or may share a portion of a building's or structure's number (e.g., a subsurface steam utility line specifically associated with building A4722 could be identified as A4722-SU-1), and its length would only include that portion of the line associated with the specific structure's grounds. Steam lines that are assigned a stand-alone number would include the entire length of the line and associated pits without regard to the buildings to which they connect. Whatever method is chosen, that method must be used consistently throughout the facility.

Since where possible, any ACM in good condition should be managed in place rather than removed, abatement that ends at walls should be noted in the information tracking system to account for the interstitial asbestos. This information is valuable to Master Planners when determining the cost ofrenovations and demolition.

As stated in Appendix A, current and future data collection tools for toxics can include the options listed below.

- BIMs now offer a method of capturing information on toxics in buildings.
- The Army's real property records may soon migrate to an emerging ERP system called GFEBS. This could become a more important and powerful tool for inventory record keeping in the future.

Contents of the TMP

See Toxics Management Plan Elements, page A-4.

Survey and Assessment

Procedural guidance

The primary information source on how to survey, sample, analyze, and report asbestos can be found in the AHERA (U.S. Congress 1986). This document not only addresses asbestos in schools, grades K-12, but it is the basis for most asbestos-related activities. More information on AHERA is available from the EPA's website: http://www2.epa.gov/asbestos/asbestos-laws-and-regulations.

Identification and testing methods for ACM

To be considered an ACM, a product must contain a minimum of 1% asbestos as determined by polarized light microscopy (PLM). More accurate analysis of materials having asbestos in a tightly bound matrix yield, however, results from using a method called transmission electron microscopy (TEM). Although TEM is not required by law for bulk sampling and is more expensive and time consuming than PLM, it may be needed for areas where dust and fiber control is essential to site operations (e.g., electronics) or where encapsulation methods have previously been used to control ACM fiber release.

Mobile ACM

Although this PWTB primarily addresses building components, some non-building materials can involve what is known as mobile asbestos (e.g., brake pads and high-temperature insulation for mobile equipment). These sources could contribute to asbestos exposure or contaminate a building. If maintenance of mobile ACM occurs within a facility, it should be noted in the building's asbestos report.

Inspector accreditation and laboratory certification

- All surveys are to be performed by MAP-accredited inspectors.
- All samples are to be analyzed by a National Voluntary Laboratory Accreditation Program (NVLAP)-certified laboratory.
  - Laboratories shall be certified in bulk asbestos analysis by using PLM under EPA method 600/R-93/116 (U.S. EPA 1993) (with gravimetric prep) — standard (bulk), 400 point count, and 1,000 point count.
  - A TEM bulk analysis using EPA Test Method 600/R-93/116 or the Chatfield method may also be needed for analysis of some suspect ACM materials.
  - Laboratories shall also be participants in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) program with a passing grade in the last three rounds.

Inspection report requirements

A sample survey inspection report is reproduced as Figure B-2. Although this particular format is not required, each building or structure that is inspected must include, at minimum, the information that is in the sample report. In addition, photos and drawings of the ACM sampling locations and homogeneous materials locations should be included. A single format should be used for the entire installation or facility to ensure uniformity of information and to facilitate data entry and cost estimating.

Risk management

Environmental liabilities are reported on Army financial statements. Documents from the Federal Accounting Standards Advisory Board (FASAB) and the DOD address environmental liability associated with ACM (FASAB 2006; U.S. DOD 2008 [and revisions]). Technical Bulletin 2006-1 clarifies the required reporting of liabilities arising from asbestos-related cleanup, closure, and/or disposal costs. Both RACM and non-RACM in real property and other property, plant and equipment (PP&E) assets are included (FASAB 2006).

Environmental liabilities associated with facilities-related ACM are centrally estimated at Headquarters, Department of the Army, by using information from the real property inventory and are reported on the financial statement balance sheet. Installation managers should ensure the real property inventory remains up to date.

Abatement

Asbestos abatement is the control of the asbestos hazard. Asbestos can be controlled by repair, removal, encapsulation, or enclosure. All asbestos abatement shall be completed in a method that is compliant with NESHAP.

Contract considerations

Abatement contracts and statements of work (SOWs) must identify the method of asbestos abatement to be used and to specifically forbid methods that are not desirable. ACM encapsulation or enclosure is not a betterment when removal is required.

Contracts and SOWs must specify that abatement activities must be conducted by MAP-trained and MAP-certified personnel, and that all required state licenses are included as submittal items.

The SOW or contract will also require submission of items required by OSHA. These required items include, but are not limited to: proof of medical surveillance, ability to wear respirators, risk assessment during abatement, calculations for determining negative air pressure, decontamination, and waste disposal information. This information, often referred to as the Asbestos Hazard Control Plan, should be site-specific and be consolidated by the abatement contractor for review and acceptance by the installation POC prior to receiving a notice to proceed.

Monitoring

Monitoring of asbestos fibers in the air must be conducted—sampling is required pre-abatement, during abatement, and post-abatement. Note the following points related to monitoring.

- Some states require that an independent air monitoring company, (that is to say, one that is not under the pay of the abatement firm) will conduct air sampling.

- The installation may require the prime contractor to hire the air monitoring personnel, or they may perform the monitoring themselves using in-house personnel or contractors.

- The air monitor must also be MAP-certified and may also be required to have a state license.

- All results should be reported in actual fiber counts as well as fibers per air quantity sampled. The sampling time and rate are chosen to give a fiber density is 100–1,300 fibers/mm on the filter. OSHA's permissible exposure limit (PEL) time-weighted average (TWA) is 0.1 fiber/cc, and the 30-min. excursion limit is 1.0 fiber/cc.

- Phase contrast microscopy (PCM) is the most common method of analysis. It is quick, inexpensive, only counts fibers, and has significant historical support for accuracy. Onsite analysis by PCM can be done in minutes; however 8-hr and 24-hr analysis is more common and economical. PCM's primary disadvantage is that it cannot differentiate between asbestos fibers and non-asbestos fibers such as glass wool, fiberglass, and other mineral fibers. Fibers can also be obscured by overloading the sampling cassette, either with fibers or with debris such as dirt and drywall dusts. PCM is also not supportive of very fine fibers less than 0.2 μm in diameter. Clearance sampling of abated areas is usually performed by PCM unless the area is very dirty or the abatement takes place in a school (AHERA, U.S. Congress 1986). In such cases, analysis must be performed by TEM. Some states have identified other areas that require TEM for clearances.

Waste disposal

Disposal of waste materials is usually in a designated landfill. Sending the waste to a bulking facility is not recommended. Other considerations to note for disposal include those listed below.

- Contracts must require copies of landfill receipts (with quantities listed) within a designated number of days from removal, depending on the landfill's distance from the abatement site.

- A copy of the landfill's letter of asbestos acceptance should be included in all pre-work submittals.

Personnel restrictions

Military personnel and civilian employees (including contract employees) whose regular duties involve working with asbestos or around damaged friable asbestos shall be included in medical monitoring program as described in DA Pam 40-11 (U.S. Army 2009) and DA Pam 40-513 (U.S. Army 2013) as well as being included in the MAP training program.

At no time will military personnel be used to cut, repair, or remove ACMs. This prohibition includes volunteer work as well as general unit maintenance or self-help work. All insulation, lagging, concrete siding, vinyl floor tiles, and roofing materials are assumed to contain asbestos; therefore, use of military personnel to cut, repair, or remove these materials is prohibited unless the materials are verified to contain less than 1% asbestos by volume.

Buildings scheduled for renovation or demolition cannot be used for urban warfare activities, whether those activities are for training or spontaneous practice, until the asbestos and other toxic building materials have been removed. Such buildings shall have the following information prominently posted on every entrance door:

- The following warnings:
  - AUTHORIZED ENTRY ONLY
  - BUILDING MAY CONTAIN HAZARDOUS BUILDING MATERIALS
- A list of the toxics concerned, (e.g., asbestos, mercury, lead, PCB)
- A POC for further details or information

Nonprofit salvage agencies and for-profit recycling companies who deconstruct buildings for their salvageable components will not be permitted to do so until the ACMs (and preferably, all hazardous building materials) have been removed from the building.

- If the building is scheduled for demolition or renovation and has been turned over to the prime contractor, salvagers must seek permission from the prime contractor to perform salvage operations. It is the prime contractor’s responsibility to ensure that the abated structure is stable and safe for salvagers.
- If the structure has not been released to a contractor, the installation shall ensure that the building is sound and safe to enter, before and after recovery activities.

Burn considerations

Burning of buildings is not recommended due to the extensive environmental liabilities involved. Other considerations related to burning a building are listed below.

- Buildings and structures that are to be burned for firefighter training purposes cannot be burned until all

ACM (and all other hazardous building materials) have been removed unless poor structural conditions are present (see points below).

- When buildings and structures must be burned in place due to their poor structural condition or accessibility issues, steps or actions must be taken to ensure protection of personnel and other assets must be documented. The installation POC shall ensure that:
  - Only experienced firefighters are involved.
  - Firefighters are aware that hazardous building materials could not be removed.
  - Environmental protection practices (air, water run-off, personal protective measures, etc.) are prepared and accepted by the installation POC.
- Post-destruction sampling of debris, surrounding soil, and run-off water must be done to determine if the area contains hazardous by-products and asbestos fibers.

Asbestos-specific considerations for the TMT

The TMT should include representative personnel from activities with potential sources of asbestos hazards and personnel with expertise in the management of ACMs. Figure B-1 provides an example of a core TMT membership, augmented by skill-specific supplementary members.

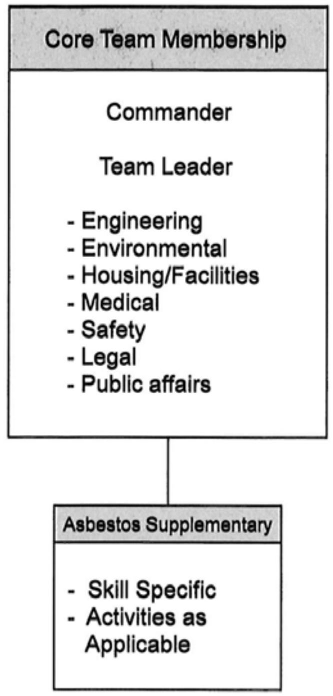


Figure B-1. Example of TMT core membership and asbestos-specific supplemental membership.

The TMT should include personnel capable of the actions listed below. (See the previous section in this appendix titled “Personnel Training and Qualifications” for specific personnel training qualifications.)

- Identifying ACMs and preparing a risk assessment strategy. (Also see the previous subsections in this appendix titled “Contents of the TMP” and “Survey and Assessment.”

- Ensuring that day-to-day costs of asbestos management are anticipated and included in operating budgets (e.g., training and data maintenance). Day-to-day costs are considered an expense and do not become an environmental liability.

- Maintaining an ACM tracking and recordkeeping program that provides the following information and capabilities:

    - An ACM information storage program (ACMISP) including how data will be made available to all users, occupants, waste managers, contractors, and other entities that may be involved with ACM.

    o Review of the ACMISP every 2 yr to ensure that the software and system that operates it are still relevant, data is retrievable, and it is compatible with current and known future installation management programs.

- Identifying, preparing, and disseminating educational and informational materials to facility users that may come in contact with ACM.

- Ensuring that activities that involve or impact ACM (operations, maintenance, renovation, demolition, etc.) are identified and that the results of these activities are documented and tracked so that the ACM information remains current.

- Ensuring that requirements are met for training in asbestos hazards, controls and abatement in accordance with federal, state, and local regulations and best management practices. For additional information, see above section titled “Personnel Training and Qualifications.”

- Ensuring that asbestos-related work-safety practices are addressed in engineering controls and SOPs.

State and Federally Managed Asbestos Programs

Table B-2 provides links to those states with state-managed asbestos programs, as well as indicating those states that follow federal EPA regulations.

Information on the federal program is available online at http://www2.epa.gov/asbestos/asbestos-laws-and-regulations.

Table B-2. Links showing state-managed asbestos programs and states that follow EPA regulations.

State	Website
Alabama	http://www.epa.gov/asbestos/pubs/asbreg.html
Alaska	http://www.epa.gov/asbestos/pubs/asbreg.html
Arizona	http://www.epa.gov/asbestos/pubs/asbreg.html
Arkansas	http://www.adeq.state.ar.us/air/asbestos/asbestos.htm
California	http://www.dir.ca.gov/title8/5208.html
Colorado	http://www.epa.gov/asbestos/pubs/asbreg.html
Connecticut	http://www.ct.gov/dph/cwp/view.asp?a=3140&q=417040&dphNav_GID=1889&dphNav=|
Delaware	http://www.epa.gov/asbestos/pubs/asbreg.html
District of Columbia	http://www.epa.gov/asbestos/pubs/asbreg.html
Florida	http://www.epa.gov/asbestos/pubs/asbreg.html
Georgia	http://www.epa.gov/asbestos/pubs/asbreg.html
Hawaii	http://www.epa.gov/asbestos/pubs/asbreg.html

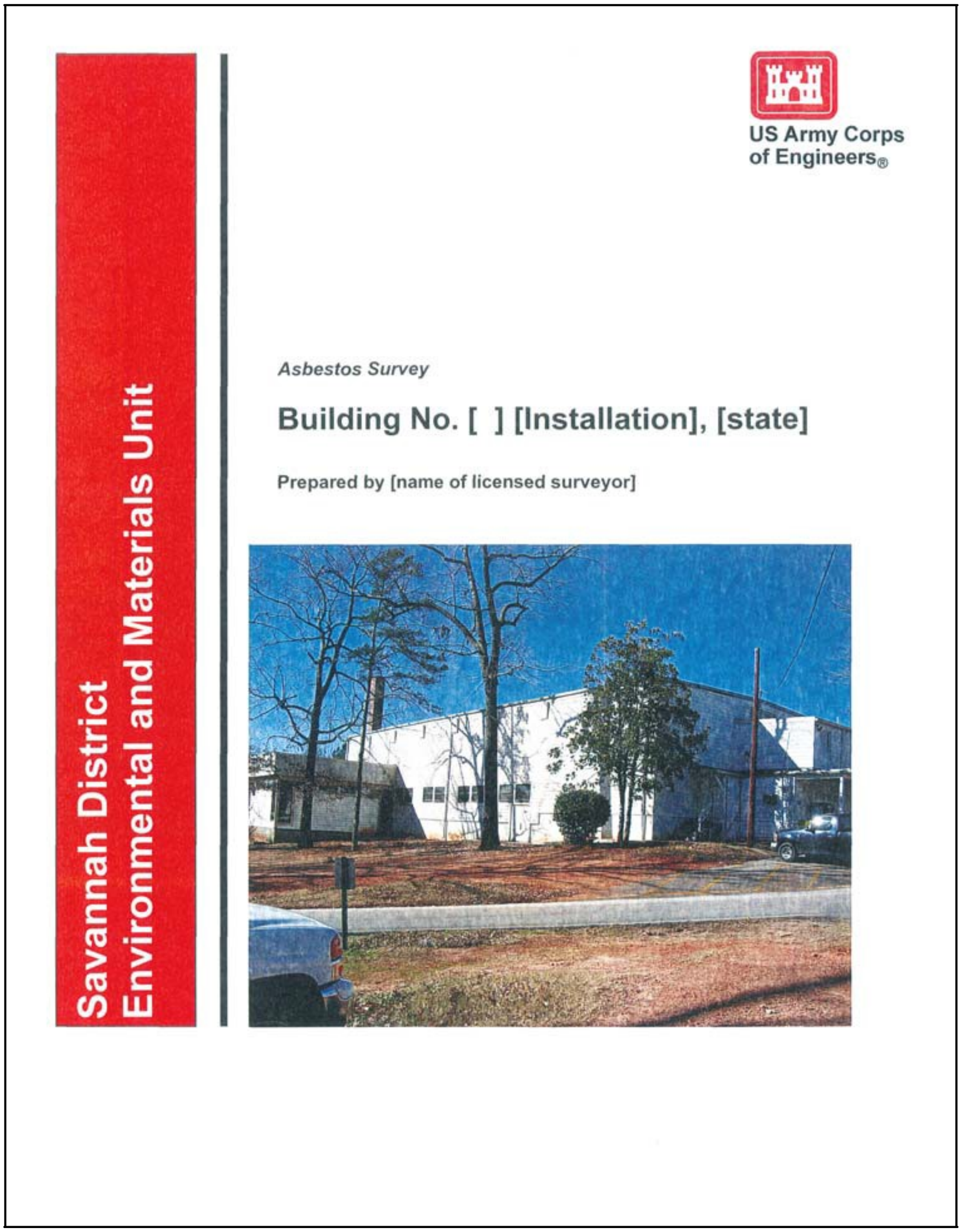
State	Website
Idaho	http://www.epa.gov/asbestos/pubs/asbreg.html
Illinois	http://www.epa.gov/asbestos/pubs/asbreg.html
Indiana	http://www.epa.gov/asbestos/pubs/asbreg.html
Iowa	http://www.epa.gov/asbestos/pubs/asbreg.html
Kansas	http://www.kdheks.gov/radiation/indexasb.html
Kentucky	http://www.epa.gov/asbestos/pubs/asbreg.html
Louisiana	http://www.epa.gov/asbestos/pubs/asbreg.html
Maine	http://www.maine.gov/dep/rwm/asbestos/index.htm
Massachusetts	http://www.mass.gov/dep/air/asbguid.htm#Regulations
Michigan	http://www.epa.gov/asbestos/pubs/asbreg.html
Minnesota	http://www.health.state.mn.us/divs/eh/asbestos/rules.html
Mississippi	http://www.deq.state.ms.us/MDEQ.nsf/page/Air_AsbestosDemolitionandRenovationOperations?OpenDocument
Missouri	http://dnr.mo.gov/env/apcp/asbestos.htm

State	Website
Montana	http://deq.mt.gov/asbestos/default.mcpx
Nebraska	http://dhhs.ne.gov/publichealth/Pages/enh_asbestos_index.aspx
Nevada	http://www.epa.gov/asbestos/pubs/asbreg.html
New Hampshire	http://www.epa.gov/asbestos/pubs/asbreg.html
New Jersey	http://www.epa.gov/asbestos/pubs/asbreg.html
New Mexico	http://www.epa.gov/asbestos/pubs/asbreg.html
New York	http://www.epa.gov/asbestos/pubs/asbreg.html
North Carolina	http://www.epi.state.nc.us/epi/asbestos/ahmp.html
North Dakota	http://www.epa.gov/asbestos/pubs/asbreg.html
Ohio	http://www.epa.ohio.gov/dapc/atu/asbestos.aspx
Oklahoma	http://www.epa.gov/asbestos/pubs/asbreg.html
Oregon	http://www.deq.state.or.us/aq/asbestos/
Rhode Island	http://www.health.ri.gov/healthrisks/poisoning/asbestos/

State	Website
South Carolina	https://www.scdhec.gov/HomeAndEnvironment/YourHomeEnvironmentalandSafetyConcerns/AsbestosInfoforHomeowners/
South Dakota	http://denr.sd.gov/des/wm/asb/asbhomepage.aspx
Tennessee	http://www.epa.gov/asbestos/pubs/asbreg.html
Texas	http://www.epa.gov/asbestos/pubs/asbreg.html
Utah	http://www.airquality.utah.gov/HAPs/ASBESTOS/index.htm
Vermont	http://www.epa.gov/asbestos/pubs/asbreg.html
Virginia	http://www.epa.gov/asbestos/pubs/asbreg.html
Washington	http://www.epa.gov/asbestos/pubs/asbreg.html
West Virginia	http://www.epa.gov/asbestos/pubs/asbreg.html
Wisconsin	https://www.dhs.wisconsin.gov/asbestos/index.htm
Wyoming	http://www.epa.gov/asbestos/pubs/asbreg.html

Sample Survey Report

Figure B-2 reproduces pages of a sample survey report. See the subsection labeled “Inspection report requirements” for more information. The example report shown in Figure B-2 is adaptable to all toxics addressed in this PWTB.


US Army Corps of Engineers®

Savannah District
Environmental and Materials Unit

Asbestos Survey

Building No. [ ] [Installation], [state]

Prepared by [name of licensed surveyor]

Figure B-2. Sample asbestos survey report.

The contents of this report are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official endorsement or approval of the use of such commercial products.

The findings of this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

Figure B-2. Sample survey report, inside front cover.

Table of Contents

Figure B-2–continued. Sample survey report, table of contents.

Asbestos Survey Report [Month 200x

Building No. [ ] [Installation], [state]
by [Surveyor's name]

Final report

Prepared for **[US Army Corps of Engineers]**
[Savannah District]

Figure B-2–continued. Sample survey report, title page.

Asbestos Inspection Report

Introduction

Scope of the Investigation

This report documents the asbestos inspection and survey of Building No. [ ] at [installation], [state] conducted on [date] 200X and [Date] 200X by [District office, company, etc.] employees [names]. The survey was conducted in general accordance with the regulatory guidelines in the Asbestos Hazard Emergency Response Act (AHERA) (40 CFR Part 763 Subpart E Sections 763.80-763.88) and "Guidance for Controlling Asbestos-Containing Materials in Buildings" (Purple Book) (EPA publication number 560/5-85-024). Although not required by the AHERA guidelines, roof and other exterior miscellaneous materials were also inspected and sampled.

Background

Building No.[Number] is a [wood frame structure of] [age/unknown vintage]. The *floor systems* are [concrete slab on grade topped with vinyl and ceramic floor tiles, wood or carpet]. *Original interior walls* are [wood frame covered generally with gypsum drywall or asbestos cement board]. [Miscellaneous descriptions: (Some *newer walls* have been added and are constructed of wood framing with gypsum wallboard covering). *Ceilings* vary from [suspended ceiling tile to gypsum wallboard to asbestos cement board] depending on area. The *roof system* is [wood joists topped with wood decking and covered with either a multi-layer built up roof membrane or a single layer rubber membrane]. The building appears to originally been designed [as a theatre, barracks, admin, repair shop etc.] but through renovations has been converted into a [physical fitness center with gymnasium, offices, barracks, classrooms].

Description of study

Investigation

All accessible areas of Building No. [ ] were visually inspected for suspected asbestos containing materials (ACM) by an accredited inspector. [List any inaccessible areas or unusual conditions]A copy of the inspector's accreditation certificate is included in Appendix C.. Bulk samples of all suspect ACM's were collected. This report details ACM as identified at the time of inspection only. Whether other asbestos inspection reports are available or not, the material quantities quoted in this report are assumed complete and are the quantities to be used for abatement/demolition project purposes.

1

Figure B-2–continued. Sample survey report, page 1.

Asbestos bulk samples were analyzed by [lab name] Analytical Laboratories; Inc. [lab name] Analytical Laboratory is accredited by the National Voluntary Laboratory Accredited Program (NVLAP Accreditation sponsored by the National Institute of Standards and Technology (NIST)). Copies of their accreditation certificates are included in Appendix C. The samples were analyzed by the accepted method of polarized light microscopy (PLM) using EPA's "Method For the Determination of Asbestos In Bulk Building Materials", EPA/600/R-93/116. The laboratories' analytical reports are included in Appendix A.

In compliance with the AHERA regulations, material is considered an Asbestos Containing Material (ACM) when it contains greater than one percent asbestos. Likewise, in this report, any material containing concentrations greater than one percent asbestos will be considered "positive". Occasionally, materials containing less than one percent asbestos, or not sampled, are assumed to be a "positive" asbestos containing material at the discretion of the inspectors. A narrative discussion of the AHERA ACM types (i.e., thermal systems insulation, miscellaneous and surfacing materials) found in Building No. [Building number] is included in this report where relevant. Bulk sample information appears on Table 1. Estimated quantities of individual asbestos containing materials appear on Table 2. Material characterization of asbestos containing materials appears on Table 3. The approximate location where each bulk sample was obtained is shown on the building floor plans, which appear as Figures. Positive ACM samples are indicated on the floor plan Figures with their numbers enclosed in squares and, where possible, locations of positive ACM are identified. Samples testing negative for asbestos are indicated on the floor plan Figures with their numbers enclosed in circles. It is reasonable to assume that all materials similar to those testing positive also contain positive amounts of asbestos and should be treated as such.

Conclusions

Thermal Systems Insulation (TSI)

TSI is insulation material applied to pipes, fittings, tanks, ducts, or on other interior structural components to prevent heat loss or gain, or water condensation, or for other purposes.

a. No suspect asbestos containing TSI was noted in Building [number]/name].

b. [list verbal description and location]

2

Figure B-2–continued. Sample survey report, page 2.

Miscellaneous Materials

Miscellaneous materials include building material on structural components, structural members or fixtures, such as floor and ceiling tiles, and do not include surfacing or TSI. In the past, there were a great number of miscellaneous building materials that had asbestos fibers added to them during the manufacturing process to increase durability and fireproofing qualities. The following suspect miscellaneous materials at Building No. [Building Number] were found to contain or are assumed to contain asbestos:

a. *Flooring Materials:* [All vinyl floor tiles and associated mastics on the second floor in the Projection Booth and the stairwell landing above the entry foyer contain asbestos.] - (Refer to Tables 1, 2 and 3 for specific information and Figure [figure number] for sample locations).

b. *Asbestos cement board:* [Asbestos cement board used as wall covering and ceiling material contains asbestos. This material was located exposed in areas of the Lobby, Hall Check in Room, Stairwell and Second Floor Projection Booth. It was located covered by gypsum wallboard in portions of the Hall Check in Room, Universal Equipment Exercise Area and Gymnasium/Basketball Court. Small sections of this wall covering material were located in the Men's Toilet area above the suspended ceiling and behind newer wall covering and framing. Similar material was located in the Boiler Room at the boiler exhaust penetration through the exterior wall and at the water heater exhaust opening through the roof. Asbestos cement shingle siding was located on the wall that separates the Exercise Room from the Gymnasium/Basketball Court in the Exercise Room above the suspended ceiling. This siding material appears to have been removed from the remainder of the building prior to installation of newer aluminum siding.] - (Refer to Tables 1, 2 and 3 for specific information, Figure [figure number] for sample locations and Figure [figure number] for homogeneous area locations).

c. *Roofing Materials:* [Built-up roofing membrane debris found on top of suspended ceilings in the Men's Toilet area contains asbestos in both the felts and mastics. A significant amount of this material is lying on the ceiling and in ceiling insulation. This material was noted above the Women's Restroom areas and is suspected to exist above ceilings of all of the older portions of the building. Some of these contaminated ceiling areas are return air plenums. Light grey flashing cement on a small portion of the rooftop parapet wall flashing above the Men's Sauna area (sample R-34) contains asbestos.] - (Refer to Tables 1, 2 and 3 for specific information, Figures [figure numbers] for sample locations and Figure [figure number] for homogeneous area locations).

3

Figure B-2–continued. Sample survey report, page 3.

d. Exterior Wall Sheathing Joint Sealer: [Black tar sealer on the seams between sheets of gypsum wallboard used as exterior sheathing was found to contain asbestos. This material was sampled on the wall between the Exercise Room and the Gymnasium/Basketball Court above the suspended ceiling. This wall was once the exterior building wall prior to the addition of the Exercise Room. This material is assumed to exist on all exterior walls of the original building.] - (Refer to Tables 1, 2 and 3 for specific information, Figure [figure number] for sample locations and Figure [figure number] for homogeneous area locations).

e. [list verbal description and location]

Surfacing Material

Surfacing material is friable material that is sprayed on, troweled on, or otherwise applied to surfaces for decorative or other purposes.

a. No asbestos containing surfacing material was located in Building [Number].

b. [list verbal description and location]

4

Figure B-2–continued. Sample survey report, page 4.

TABLE 1
SUSPECT ACM SAMPLES
[Installation], BUILDING [Number]

FIELD ID	DESCRIPTION	LOCATION	ASBESTOS TYPE & %
[Bldg #]-1-1	Drywall joint compound	Office, on lower side of stairwell	None
[Bldg #]-1-2	Drywall joint compound	Men's restroom, exterior wall	None
[Bldg #]-1-3	Gypsum wallboard	Men's restroom, exterior wall	None
[Bldg #]-1-4	Floor leveling compound	Hall/Check in, under carpet	None
[Bldg #]-1-5	Drywall joint compound	Universal Equipment Exercise Area, interior wall	None
[Bldg #]-2-6	**Cement board**	**Projection Booth wall**	**40% chrysotile**
[Bldg #]--2-7	**Floor tile**	**Landing at top of stairwell**	**Tile 4% chrysotile, mastic 6% chrysotile**
[Bldg #]-2-8	**Floor tile**	**Projection Booth**	**Tile 2% chrysotile, mastic 10% chrysotile**
[Bldg #]-1-9	**Cement board**	**Universal Equipment Exercise Area exterior wall, behind gypsum wallboard**	**30% chrysotile**
[Bldg #]-1-10	Fiberboard	Closet in Universal Equipment Exercise Area, interior wall	None
-1-11	Gypsum wallboard	Gymnasium/Basketball Court, exterior wall	None
-1-12	Drywall joint compound	Gymnasium/Basketball Court, exterior wall	None
-1-13	Drywall joint compound	Exercise Room, interior wall	None
-1-14	Drywall joint compound	Exercise Room, exterior wall	None
-1-15	**Cement board siding**	**Exercise Room, wall at Gymnasium, above suspended ceiling**	**30% chrysotile**
-1-16	Felt paper & tar	Exercise Room, wall at Gymnasium, above suspended ceiling, behind old siding	None
-1-17	Felt paper	Exercise Room, wall at Gymnasium, above suspended ceiling, behind old siding	None
-1-18	Ceiling tile	Exercise Room	None

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Figure B-2–continued. Sample survey report, page 5.

[Bldg #]-1-19	**Gypsum wallboard & mastic**	**Exercise Room, wall at Gymnasium, above suspended ceiling, behind old siding**	**Black mastic 10% chrysotile**
-1-20	Fiberboard	Ramp/Hall, wall above suspended ceiling	None
-1-21	Ceiling tile	Ramp/Hall	None
-E-22	Felt paper	Exterior, near door to Boiler Room, under aluminum siding	None
-M-23	Gypsum wallboard	Boiler Room wall	None
-1-24	Ceiling tile	Women's Locker Room	None
-M-25	**Roofing debris**	**Men's Toilet, above ceiling**	**Felts and mastic 8% chrysotile**
-M-26	**Roofing debris**	**Men's Toilet, above ceiling**	**Mastic 4% chrysotile, felt NAD**
-R-27	Built-up roof membrane	Rear lower roof, above Women's Locker Room	None
-R-28	Roof insulation	Rear lower, above Women's Locker Room, below membrane	None
-R-29	Roof base felt	Rear lower, above Women's Locker Room, below insulation	None
-R-30	Pitch pan filler	Rear lower, above Men's toilet, at piping penetration through roof	None
-R-31	Multi-layer flashing	Rear lower, above Men's toilet, at building wall	None
-R-32	Built-up roof membrane	Intermediate roof, above Men's Lockers	None
-R-33	Roof insulation	Intermediate roof, above Men's Lockers, under membrane	None
-R-34	**Flashing cement**	**Intermediate roof, above Men's Lockers, at corner of parapet wall**	**4% chrysotile**
-R-35	Multi-layer flashing	Intermediate roof, above Men's Sauna, at parapet wall	None
-R-36	Flashing cement	Intermediate roof, above Men's Lockers, at perimeter parapet wall	None
-E-37	Felt paper	Exterior wall, above intermediate roof, behind aluminum siding	None
-R-38	Built-up roof membrane	Front lower roof	None
-R-39	Roof insulation	Front lower roof, under membrane	None
-R-40	Roof base felt	Front lower roof, under insulation	None

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Figure B-2–continued. Sample survey report, page 6.

[Bldg #]-R-41	Pitch pan filler	Front lower roof, at piping penetration through roof	None
[Bldg #]-R-42	Flashing cement	Front lower roof, at seams in flashing felt at building wall	None
-R-43	Multi-layer flashing	Front lower roof, at wall	None
-E-44	Felt paper	Exterior wall, above front lower roof, behind aluminum siding	None
-E-45	Window glazing compound	Exterior of Projection Room windows	None
-E-46	Window glazing compound	Exterior of Projection Room windows	None
-R-48	Built-up roof membrane	Projection Room roof	None
-R-49	Roof insulation	Projection Room roof, under membrane	None
-R-50	Roof base felt	Projection Room roof, under insulation	None
-R-51	Multi-layer flashing	Projection Room roof, at building wall	None

Samples testing positive for asbestos indicated in **BOLD** type

Sample Number 47 was not collected

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Figure B-2–continued. Sample survey report, page 7.

TABLE 2
ACM QUANTITY SUMMARY
[Installation], BUILDING [Number]

Material Description	UNITS	Area Descriptions								
		APPLICIPAL SAMPLE NUMBERS	SECOND FLOOR PROJECTOION BOOTH	STAIRWELL TO SECOND FLOOR, LANDING & LOBBY	EXERCISE ROOM	UNIVERSAL EQUIPMENT EXERCISE AREA & HALL CHECKIN	ABOVE ALL CEILINGS EXCEPT EXERCISE ROOM	INTERMEDIATE ROOF	MEN'S TOILET	TOTALS
Asbestos Cement Wall Board	S.F. ¼" thick	2-6, 1-9	850	325		300			10	1,485
Asbestos Cement Shingle Siding	S.F. ¼" thick	1-15			225					225
Floor Tile & Mastic	S.F.	2-7, 2-8	275	30						305
Black Mastic On Gypsum Board, Exterior sheathing	S.F.	1-19								1,400

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Figure B-2–continued. Sample survey report, page 8.

Flashing Cement	S.F.	R-34						2		2
Roofing Debris	S.F.	M-25 M-26					1,635			1,635

S.F. = Square Foot, L.F. = Linear Foot, C.F. = Cubic Foot, Ea. = Each

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Figure B-2–continued. Sample survey report, page 9.

TABLE 3
MATERIAL CHARACTERIZATION AND ASSESSMENT
[Installation], BUILDING [Number]

MATERIAL		CHARACTERISTICS			ASSESSMENT	
Type	**Description**	**Asbestos Yes/No/Assumed**	**Quantity (If ACM)**	**Friable / Non-friable**	**Condition**	**Disturbance Potential**
Miscellaneous	Asbestos Cement Wallboard	Yes, 30-40%	1,485 S.F.	Non-friable	Good	Low
Miscellaneous	Asbestos Cement Siding	Yes, 30%	225 S.F.	Non-friable	Damaged	Low
Miscellaneous	Floor Tile & Mastic	Yes, 2-10%	305 S.F.	Non-friable	Damaged	Moderate
Miscellaneous	Black Mastic On Gypsum Board Sheathing	Yes, 10%	1,400 S.F.	Non-friable	Good	Low
Miscellaneous	Flashing Cement	Yes, 4%	2 S.F.	Non-friable	Good	Low
Miscellaneous	Roofing Debris	Yes, 4-8%	1,635 S.F.	Friable	Significantly Damaged	High in suspended lay in ceiling areas and ceiling return air plenums

S.F. = Square Foot, L.F. = Linear Foot, C.F. = Cubic Foot

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Figure B-2–continued. Sample survey report, page 10.

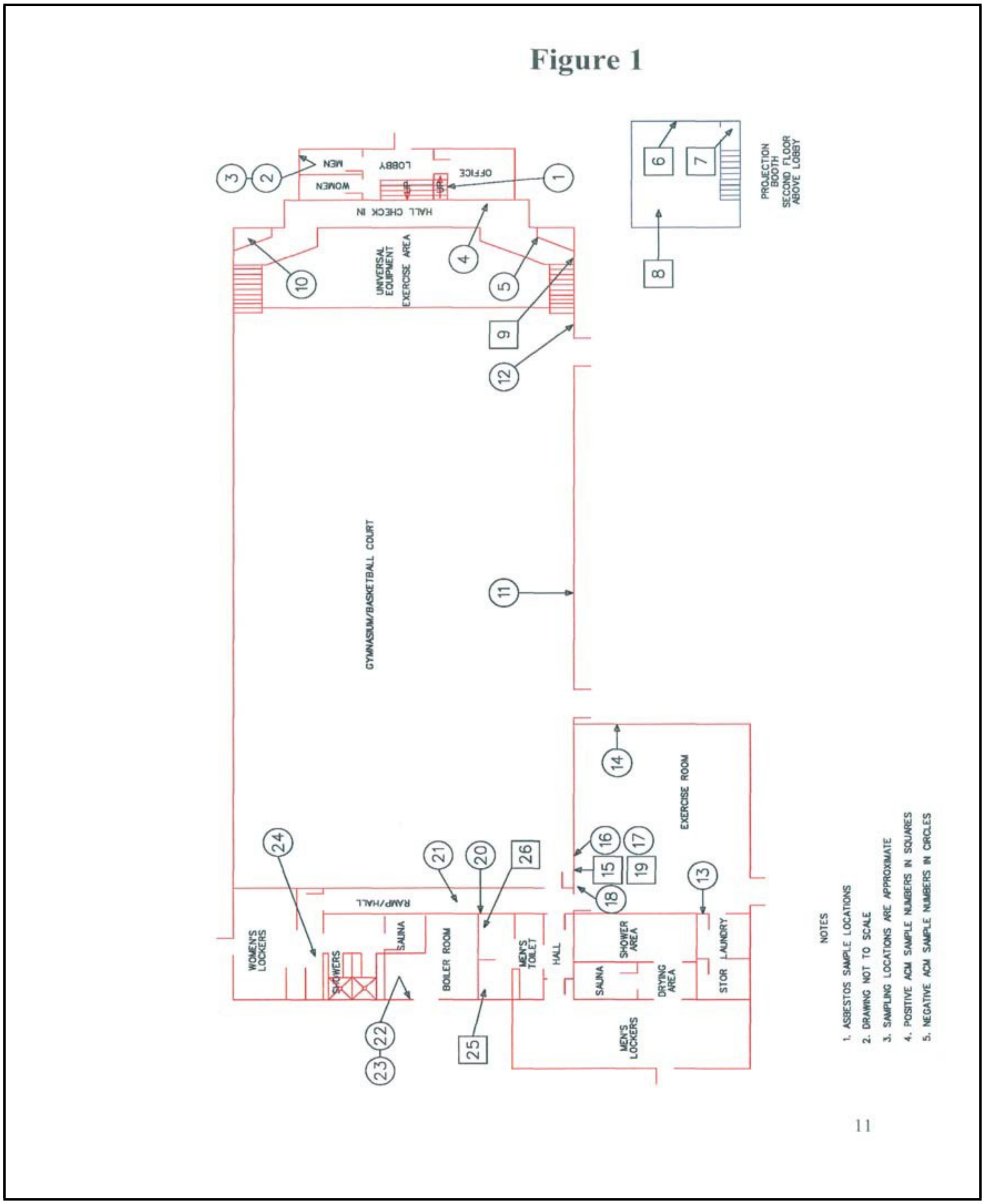

Figure B-2–continued. Sample survey report, page 11.

Appendix A

Laboratory's Analytical Report

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Figure B-2–continued. Sample survey report, page 12.

Lab Intro Letter & Analytical Results

[Insert scanned copies]

13

Figure B-2–continued. Sample survey report, page 13 (here, blank).

14

Figure B-2–continued. Sample survey report, page 14 (here, blank).

Appendix B

Sample Chain of Custody Forms

[Insert scanned copies]

15

Figure B-2–continued. Sample survey report, page 15.

ASBESTOS CHAIN OF CUSTODY

Project:	Job No.:
Sampler:	Analysis:

DATE	FIELD ID	EMU ID	COMPONENTS/NOTES

Relinquished By	Date	Time	Received By	Date	Time

Figure B-2–continued. Sample survey report, page 16.

Appendix C

Certifications and Accreditations

[Insert scanned documents:]

Asbestos in Buildings: Inspector Certificate

Asbestos in Buildings: Inspector Refresher Certificate

State license/ certification letter/ certificate of the Inspector(s)

NVLAP (laboratory) Certificate of Accreditation

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Figure B-2–continued. Sample survey report, page 17.

APPENDIX C: LEAD CONTROL

Introduction

This appendix is intended to assist the DPW and other engineering activities to identify the regulations and good work practices that apply to the use of lead and lead-containing products and waste products.

Lead is persistent in the environment and because it is an element, lead does not degrade into anything less toxic. It can combine with other elements and form new compounds than can be taken up and stored in the body, causing long-term damage (see Lead Health Effects and Medical Monitoring subsection below, page C-6). Lead has been used in industrialized areas for so long that most urban areas, particularly industrial areas, have been contaminated by it. Gaseous and particulate lead has been released into the air by smokestacks, vehicle exhausts, deteriorating painted buildings, and scores of other sources. Lead dusts are easily transported by wind, carried by water, and can contaminate humans and the tools they use.

Existing lead contamination must be identified, quantified, and controlled. New sources of lead releases must also be identified and controlled. In Army environments, the three most common sources of hazardous lead are associated with the areas outlined below.

- **Homes and child-occupied facilities**—lead contaminated paints (LCP) and coatings found in homes and play areas.

- **Target housing and structures**—LCP and lead components associated with buildings and structures.

- **Environmental lead hazards**—environmentally dispersed lead such as found at firing ranges, vehicle and electronics maintenance facilities, large metallic painted structures like water towers, and other industrial-related activities such as welding or painting.

Regulatory Guidance

Each source of lead has specific regulations that must be followed. Many of the regulations overlap each other, and that overlap can cause confusion during control and removal activities. Supplements to this appendix contain more specific information:

- Appendix C, Supplement 1, “Points of Contact and Technical Assistance” lists POCs for policy and technical assistance; and

- Appendix C, Supplement 2, “State-Controlled Lead Hazards Programs” contains a list of state programs and links to state-level lead hazard webpages. This list is not all-inclusive, but it can provide initial assistance in answering general technical questions or providing direction to further assistance.

Federal Rules

The federal government has several legal authorities that pertain to lead based paint (LBP) and other lead hazards, as summarized below.

- Lead Disclosure Rule, officially known as the Residential Lead-based Paint Hazard Reduction Act of 1992 (U.S. Congress 1992).

- Lead Safe Housing Rule (LSH Rule), administered by the U.S. Department of Housing and Urban Development (HUD 1996).

- Title IV of the TSCA (U.S. Congress 2002a) and regulations promulgated under it, as noted below.

    - The Pre-Renovation Education Rule (PRE Rule) (EPA 1998).

    - The Renovation, Repair and Painting Rule (RRP Rule) was issued by EPA on 22 April 2008 and fully effective on 22 April 2010 (U.S. EPA 2008). Under this rule, contractors performing renovation, repair, and painting projects that disturb LBP in homes, child-care facilities, and schools built before 1978 must be certified and must follow specific work practices to prevent lead contamination.

    - The EPA’s “Lead-based Paint Activities, Certification and Training Rule” (commonly known as the LBP

Activities Rule), Subparts E “Residential Property Renovation” and L “Abatement” (U.S. Congress 2002b)

- The Resource Conservation and Recovery Act (RCRA) Section 7003 addresses lead found in soil, water, and sediment (U.S. Congress 1976).
  - RCRA Subtitle C establishes a system for controlling hazardous waste from the time it is generated until its ultimate disposal. Facilities that generate, treat, store, or dispose of hazardous waste are regulated under Subtitle C. A copy is available at http://www.epa.gov/wastes/inforesources/pubs/orientat/rom35.pdf.
  - The U.S. EPA can initiate judicial action or issue an administrative order to any person who has contributed or is contributing to such handling, storage, treatment, transportation, or disposal and require the person to refrain from those activities or to take any necessary action. This potential applies to actions to contain or control lead hazards generated by ranges (includes bomb drop ranges as well as small arms indoor, shoot houses, and outdoor firing ranges) or other industrial-related activities.
- The full text of EPA requirements (Title 40, Part 745–“Lead-Based Paint Poisoning Prevention in Certain Residential Structures”) is available online at http://www.ecfr.gov/cgi-bin/text-idx?SID=35120fb8e89755e5976a499569efc969&node=40:32.0.1.1.14&rgn=div5.

Generally, the laws and rules cited above establish disclosure obligations and performance standards for activities that disturb LBP, but they do not impose an affirmative obligation to perform LCP or LBP risk-reduction work, and they do not empower federal authorities to demand such work. There are two exceptions, however, as noted below.

- The LSH Rule applies to federally owned or assisted pre-1978 housing. The rule requires disclosure, along with various evaluation and risk-reduction measures, based on the classification of the housing, as determined by: the level of federal assistance, age of the housing, housing ownership, and other factors.

- RCRA Section 7003 empowers EPA to order a responsible person to take action “as may be necessary” to protect human health and the environment when a “solid waste,” including a LBP hazard, presents an “imminent and substantial endangerment.”

State Regulations

Many states have been allowed by the EPA to develop and enforce their own LBP regulations. These regulations must be at least as stringent as the EPA regulations.

Army Policy for Applying Regulations

Army policy is to follow the more stringent of state and federal LBP regulations. In addition, because the definition of LBP is not health based, and because LCP that does not meet the definition of LBP can create significant health hazards, Army policy is to apply the EPA, HUD, or state regulatory requirements for LBP to all LCP in the types of buildings covered by the LBP regulations.

For the purpose of a Lead Control Plan, risk assessments should be performed rather than just LBP inspections, because inspections alone do not identify all lead hazards. If construction, renovation, or repair is required, or it is an industrial facility with LBP on building structures, then sampling of the painted surfaces is required to determine the potential hazard to the workers doing the construction, renovation, or repair.

OSHA Regulations

OSHA regulations for occupational exposures to lead fall under either 29 CFR 1926.62 (for construction) or 29 CFR 1910.1025 (for other exposures including routine maintenance of paint surfaces). Workers (particularly maintenance and construction workers) must be notified of the presence of lead. This information is to be supplied in any contract or agreement for shoot house, painting of potentially lead painted surface, and range services. The installation or contractor is required to meet the safety, training, and medical aspects of all OSHA regulations. State-run OSHA programs may have requirements in addition to the federal requirements. OSHA does not distinguish LBP from LCP for its compliance purposes.

An installation may encounter entities that are not covered by the usual regulatory agency requirements for lead. These entities may fall under less stringent overseas requirements, have opted out of being governed by the standard federal agency (e.g., railroads are not covered by OSHA, but have their own safety and health program), or are not covered by definition exclusion (e.g., most state and local municipalities are not covered by OSHA). It is not unusual to have these entities work on the installation through service access or cost-sharing projects. The requirements under which the installation is operating (federal, state, or installation-instituted procedures) should be included in all contracts or partnering agreements. Sufficient lead hazard controls and documentation must be included in order to prevent uncontrolled lead hazards from joint and partnering activities.

Firing Ranges and Shoot Houses

Lead dusts can be released into the open environment from indoor and outdoor firing ranges and shoot houses. Lead contamination that leaves the range or shoot house by any means——dissolved in surface or ground water, windblown, or as a contaminant on a vehicle——is subject to RCRA regulations. All ranges and shoot houses should be inspected to determine possible lead contamination areas such as building drip zones, weapon cleaning stations, discharge barrels, rain swales, and storm water runoff pathways. Small arms cleaning areas should be separate from eating areas and latrine areas. Ground covers such as plants or gravel, silt fences, or other methods should be used to prevent off-range migration as well as excessive dust production during dry seasons. Shoot house rehabilitation such as the replacement of wooden parts or rubber blocks creates lead hazards due to the accumulated lead dust on surfaces.

Outdoor ranges are subject to lead hazard issues during berm replacement; however, moving lead-contaminated soil when building or reconfiguring berms may or may not become a lead hazardous waste issue. For example, if lead-contaminated soil is being used to build a berm, it is a product and not a waste material. In another example, if the lead-contaminated soil is being removed from a designated range because the contaminated soil is excess, it becomes a solid waste which is subject to a hazardous waste determination. Thus, each soil-moving project should be fully investigated to determine if and when it is designated a hazardous waste.

Lead Health Effects and Medical Monitoring

Health Effects

Adverse health effects from lead include heme biosynthesis and related functions; neurological development and function; reproduction and physical development; and kidney, cardiovascular, and immune system functions. Evidence for these side effects is comprehensively described in EPA's Air Quality Criteria for Lead.

Medical Monitoring

Military personnel and civilian employees (including contract employees) whose regular duties involve LCP surface preparation and repainting shall be included in the medical monitoring program as required by AR 40-5, "Preventive Medicine" (U.S. Army 2007) and described in DA Pam 40-11, "Preventive Medicine" (U.S. Army 2009).

Personnel Training and Qualifications

The following points describe training related to lead.

- Training that complies with EPA, state, and local requirements will be provided for all personnel involved with lead hazard management activities.
- Individuals conducting lead hazard management activities in target housing[3] and child-occupied facilities will be properly trained and certified. Training programs will be accredited by EPA or state authorized program.
- Lead hazard and health training services are defined in "Lead-Based Paint Activities" (U.S. EPA 1996).
- Military personnel and civilian employees (including contract employees) whose regular duties involve LCP surface preparation and repainting shall be included in the mandated training program. (Note: At no time will

[3] See definition of target housing in glossary, Appendix G.

other military personnel be used to sand, scrape, or surface prep any surface that is coated with LCP. This includes volunteer work as well as general unit maintenance and self-help work.)

Table C-1 identifies the courses required for personnel involved in lead activities under EPA or OSHA regulations. There are a number of vendors who can provide training. In some states, the lead training and certification program is still a federal EPA-managed program. In other states (and host nations), the state controls and administers the training requirements and the trainers who provide it. Although the EPA training requirements in 40 CFR 745 (U.S. EPA 1996) are directed at target housing and child-occupied facilities, states and host nations may require similar levels of training for lead exposure control in other structures. It is highly recommended that at least a few members of the TMT have lead training in accordance with 40 CFR 745 (U.S. EPA 1996), 29 CFR 1910.1025, or 29 CFR 1926.62.

Some states also have specific training requirements, such as passing an exam, having a photo identification card, or placing a unique training number on the class certificate. Therefore, before selecting a training vendor ensure that all state requirements will be met. The EPA-mandated training is universal training across state boundaries. However, states and host nations may require additional licenses or certifications in addition to the EPA courses. Most states charge a fee and do not have reciprocity across state lines; therefore, if an installation’s lead management responsibilities cover multiple states, multiple state licenses and/or certifications will be needed.

Table C-1. Lead training requirements.

EPA-REQUIRED COURSES		
Course Name	**For**	**Length**
1. Lead Inspector Ref. EPA 40 CFR 745	Building Inspectors	3 days initial; ½ day refresher every 3 yr
2. Lead Risk Assessor Ref. EPA 40 CFR 745	Building Inspectors	2 days initial; 1-day refresher every 3 yr
3. Lead Project Design Ref. EPA 40 CFR 745	Project Designers	3 days initial; 1-day refresher every 3 years
4. Supervision of Lead Abatement Projects Ref. EPA 40 CFR 745	Abatement Supervisors	5 days initial; 1-day refresher every 3 yr
5. Lead Abatement Worker Ref. EPA 40 CFR 745	Abatement Workers	4 days initial; 1-day refresher every 3 yr
OSHA-REQUIRED COURSES		
COURSE NAME	**FOR**	**LENGTH**
6 Lead Awareness Training Ref. OSHA 29 CFR 1926.62(I); OSHA 29 CFR 1910.1025(I)	Personnel who are subject to exposure to lead at or above the action level, or for whom the possibility of skin or eye irritation exists	8-hr initial; annual refresher

Lead Management Plan

General

The lead management portion of the TMP is developed to identify, control, and remove sources of hazardous lead. The primary goals of lead management are:

- compliance with federal, state and local (including overseas installations) regulations, and

- anticipation of where lead hazards may arise from uniquely military activities.

Childhood Lead Poisoning Prevention

As a part of the lead portion of the TMP, a Childhood Lead Poisoning Prevention (CLPP) Program will be developed on each installation or facility that has child-occupied facilities (housing, child development facilities, playground, play center, or recreation areas that include children; see AR 40-5 (U.S. Army 2007) and DA Pam 40-11 (U.S. Army 2009). The term "child-occupied facility" refers to any facility space constructed prior to 1978 with confirmed LCP and visited at least 2 days per week (for more than 3 hr per day) by the same child under 6 yr of age.

- The CLPP Program membership will include a minimum of one lead-specific member of the TMT.

- The CLPP Program's elements will include a child blood screening program; lead exposure risk questionnaire; clinically indicated screening; elevated blood lead (EBL) case management; and outreach, education, and training. For additional guidance, refer to AR 40-5 (U.S. Army 2007b) and Chapter 7 of DA Pam 40–11 (U.S. Army 2009).

Owners of leased buildings covered by the CLPP Program are required to disclose the LCP status of leased buildings. Leasing contracts will include a section that details responsibilities for LCP documentation (testing, repairs, abatement, reporting, and other actions as appropriate). The lease will require that the information is provided to the TMT:

- in a readily uploaded format, along with certifications and documentation;

- at least annually; and

- whenever a childhood lead concern has occurred (e.g., EBL incident).

Lead Hazards in Targeted Housing

All buildings and structures under repair or renovation that are targeted housing shall adhere to the requirements for lead in EPA's RRP rule (U.S. EPA 2008) and OSHA's Lead in Construction Standard (OSHA 2004). These regulations address the use of safe lead practices and other actions aimed at preventing lead poisoning. The Lead Renovation, Repair, and painting (LRRP) rule protects the building users, while the OSHA standard protects workers.

Under the LRRP rule (beginning April 2010), contractors performing renovation, repair and painting projects that disturb LBP on any Army building or structure are required to show proof of training, have an acceptable lead hazard control plan that includes waste disposal, perform final testing, and adhere to other mandated requirements.

The Toxics Management Coordinator or his/her designee will review the contractor's lead hazard control plan for acceptability. An acceptable contractor's lead hazard control plan includes protection for the building occupants and future users from renovation-based lead dust hazards.

Contents of the TMP

See Toxics Management Plan Elements, page A-4.

Survey and Assessment

Before painted surfaces are refinished or otherwise repaired, they must be surveyed for lead. Painted surfaces may be assumed positive for lead, but they may never be assumed negative. Table C-2 lists sources of lead commonly found in family housing.

Table C-2. Common sources of lead in family housing.

Exterior	Interior
Painted wrought-iron or aluminum railing (including primers).	Painted fixed book shelves, baseboards, steps and wooden rails, chair and crown moldings, doors and window trim.
Anchors for metal railings	Leaded noise-deadening mastic under sinks and tubs
Lead decorative details such as caps on pillars, cornices, etc.	Worn vinyl flooring
Exterior paint and window trim	Window weights
Flashing, gutter liners	Shower pans & liners
Metal rolled roofing weights	Leaded water pipe seals, anchors, and solders; furnishings such as mini-blinds, vinyl baseboards, and vinyl or plastic backsplashes
Terra cotta “shingle” anchors	Poured lead joints in cast iron plumbing drainage, waste, and vent piping.
Door counter weights	
Paint chips under windows, in crawl spaces from current deterioration or past renovations	
Soil	

Paint chip sampling with laboratory analysis must be used to determine lead content. X-ray fluorescence (XRF) analysis (a non-destructive method) or chemical spot test kits can identify LBP but not LCP that contains lower levels of lead. However, positive XRF or chemical spot test results may be used as a screening method to identify the presence of lead without laboratory analysis.

In accordance with the National Technology Transfer and Advancement Act of 1995 (U.S. Congress 1995), ASTM International consensus standards for lead hazards associated with buildings shall be used when feasible for evaluations, sampling, analysis, and planning related to lead hazards from LBP/LCP, except where inconsistent with the requirements of this PWTB.

Proficiency and accreditation standards for testing laboratories include the accreditation and proficiency requirements as listed below.

- EPA's National Lead Laboratory Accreditation Program (NLLAP) was developed to recognize laboratories that demonstrate the ability to accurately analyze paint chip, dust, or soil samples for lead. A fixed-site laboratory, a mobile laboratory, or a testing firm that operates portable equipment are all eligible to obtain EPA recognition through the NLLAP. Where EPA is operating a federal lead program, (and for most state-run programs) any dust samples collected in: a risk assessment, lead hazard screen, or clearance after a lead abatement must be analyzed by a laboratory or testing firm recognized by EPA under the NLLAP (see http://www2.epa.gov/lead/national-lead-laboratory-accreditation-program-nllap).

- Another proficiency under EPA guidance is for laboratories performing airborne analytical analysis for lead dusts to meet the Environmental Lead Proficiency Analytical Testing (ELPAT) for Paint, Soil and Dust. This program is managed by the AIHA (see http://www.aihaaccreditedlabs.org/Pages/default.aspx)

Independent clearance will be performed on all child-occupied facility abatements.

- The term "independent clearance" means clearance of a renovation or repair is to be performed by a certified assessor or certified sampling technician who was not an individual employed by the entity performing the renovation/repair. This need for clearance is applicable to both contractor and in-house work. Work completed in-house in child-occupied facilities shall have a contractor or outside entity complete the clearance. Certification of the assessor or technician is accomplished either by EPA training or by the geographical state's lead training and certification/licensing program.

- Any contractor involved in lead abatement or any renovation/repair that disturbs lead in a child-occupied facility, regardless of the reason for the work, shall provide to both owners and occupants of the covered property, a closeout report describing all the actions that were performed to reduce lead hazards during the work and the results of all tests performed as part of efforts to ensure compliance with all applicable regulations. The written renovation completion report shall be submitted before the project close out for that specific child-occupied facility.

LCP/LBP waste generated from residential lead abatement activities of residence and lodging facilities is classified as a household waste under the RCRA, so it is not a hazardous waste. Examples of residential Army buildings that fall within the RCRA definition of households include bachelor officers' quarters (BOQ), family housing, apartment buildings, guest housing, and military barracks. This exclusion does not apply to LCP or LBP wastes generated from buildings or locations other than residences or to the non-residential portions of combined-function buildings.

For demolition waste, a hazardous waste determination can be done by subjecting a representative sample of the waste to the Toxicity Characteristic Leaching Procedure (TCLP) for lead to determine if the sample exhibits the characteristic of toxicity. If the extract from the sample of waste contains 5 mg/L or greater of lead, then the debris is considered a hazardous waste. This threshold level of lead may vary among state and host nations.

- The objective of the TCLP sampling is to obtain one "composite" sample from each building. The composite sample should include appropriate proportions of all materials within the structure. The focus of the sampling is to identify lead paint-contaminated construction debris. The sampled materials include both painted and unpainted wood, interior paneling and drywall, roofing materials, carpet, and other components.

- In an ideal situation, it would be best to know what percentage of each component comprises each building's total weight and have individual samples combined according to the known percentages. For some structures, this could be a lengthy and complicated procedure; however, percentages are already known for typical wood structures built on military facilities. The following points are based on guidance provided by the U.S. Army Environmental Hygiene Agency (superseded by U.S. Army Public Health Command [USAPHC]), and this list summarizes the strategy and sampling procedures typically used by military installations for demolition debris characterization for lead by the TCLP sampling procedure.

- A composite sample of construction materials shall be collected by using typical sample methods including the use of: coring and drilling devices, saws and other cutting devices, and a hammer drill for block and cement pieces.

- For those structures still in use and/or occupied, special care should be taken in obtaining composite samples so as not to cause post-sampling repairs at the sample point. This care is necessary, as some buildings will most likely remain in service for some time before they are demolished.

- Building components such as glass, screen, and wiring are difficult to sample and comprise only a small percentage of the overall structure. For this reason, these components will not be sampled. In addition, aluminum siding, metal ductwork, light ballast/fixtures, utility equipment, and asbestos insulation are not to be sampled as these items will most likely be removed prior to demolition. The composite sample will consist of target materials according to the percentages shown in Table C-3. A total of 300 grams should be taken in order to have multiple, testable aliquots. Composite samples are to be extracted using EPA Method 1311 (TCLP) and analyzed by EPA Method 6010B (inductively coupled plasma [ICP]). Lead results are to be reported in mg/L. Component percentages are percent by weight of the total composite sample weight. For example, for a composite sample of 300 grams from a wood structure, 42% or 126 grams should be unpainted wood.

Table C-3. Composite samples, estimated percentages of target materials.

Building Components	Wood Structures	Stucco/ Wood/Block Structures	Brick/Wood Structures	Metal Structures
Unpainted Wood (structural framing, flooring, etc)	42%	26%	13%	7%
Interior Paneling/ Drywall	23%	23%	23%	40%
Roofing Components	7%	7%	7%	7%
Interior Floor Coverings (carpet, VFT, all other)	8%	10%	8%	12%
Block/Brick	7%	25%	40%	7%
Ceilings (tile, sheet rock, all others)	7%	7%	7%	25%
Painted Wood (interior)	1%	1%	1%	1%
Painted Wood (exterior)	5%	1%	1%	1%

LCP waste generated from the routine maintenance, renovation, construction, or demolition of public buildings, non-residential structures, such as bridges, water towers, or tanks is subject to a hazardous waste determination. A public building is any building used by the general public, such as schools, stores, or hospitals, which does not fit the definition of a household. A commercial building is any building not intended for use by the public, such as office complexes, industrial buildings, and factories. If the installation (also known as, the generator) of the waste cannot rule out that LCP was used based on their knowledge of the building, then a representative sample must be taken to test the waste for hazardous characteristics. The LBP exclusion does not apply to LBP wastes generated from buildings or locations other than residences, or to the non-residential portions of combined function buildings.

There are two ways to address this, as outlined below.

- A total building hazardous waste determination can be done by subjecting a representative sample of the waste stream to the TCLP to determine if it exhibits the characteristic of toxicity. (For lead, this value is 5.0 mg/L). A 1992 EPA ruling indicated that a “homogeneous” sample representative of the building should be obtained and analyzed by TCLP for lead before having the debris disposed of in a landfill. To provide a generic sampling protocol discussed on the previous two pages, USAPHC developed the generic protocol that is still in use today. Although it has never been formally approved, the general approach has been verbally accepted by the EPA.

- Individual paint chip samples may also be taken, and those components with high lead levels either abated or removed from the total debris and disposed of separately.

Some states do not require that demolition debris be tested if the waste stream is placed into a regulated construction and debris landfill. Contact the state POC to determine the regulations that apply. As testing can be costly, state requirements should be consulted before contracts and estimates are made.

Tabulated Data with Supporting Documentation shall consist of Field Site Data and Lab Data.

- The contractor shall also prepare a Design Table that lists location of the sampled source, the material description (e.g., color [blue]; type [office 4 doorframes], location, and material notes [multiple layers]). The table should be prepared using the current version of Microsoft Word.

- The report should contain a brief description of the sampling protocols used, appropriate tables, and drawings. In addition, any areas or items which are suspected of containing or being made of lead will be noted in the report.

Lead-Specific Considerations for the TMT

The TMT should include representative personnel from activities with potential sources of lead hazards and personnel with expertise in the management of lead toxins. Figure C-1, provides an example of a core TMT membership including a lead-specific supplemental membership.

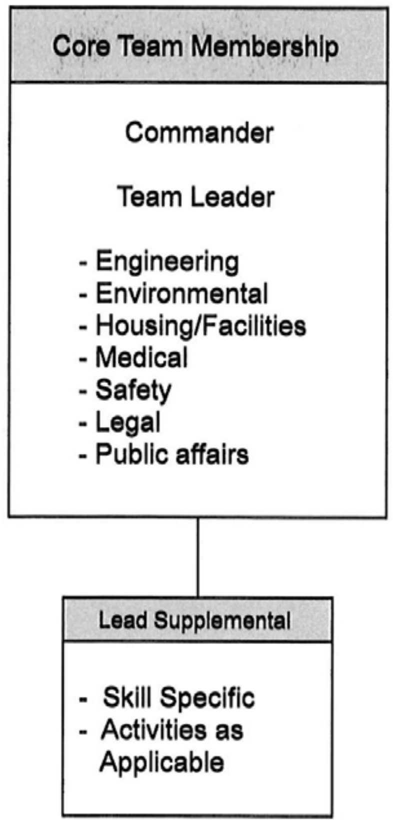

Figure C-1. Example TMT core membership and lead supplemental membership.

The TMT should include personnel capable of the following actions.

- Identifying hazardous lead sources and preparing a risk assessment strategy. Also, see Lead Hazards in Targeted Housing and Contents of the TMP sections above.

- Ensuring that the cost of management of lead hazards is anticipated and that the cost is included in all operating budgets and that training and data maintenance is included in the budget.

- Maintaining a lead hazard tracking and recordkeeping program that provides the following information and capabilities.
    - A lead information storage program (LISP) including how it will be made available to all users, occupants, waste managers, contractors, and other installation entities that may be involved with lead hazards.
    - Review of the LISP every 2 yr to ensure that the program/system that operates it is still relevant, data is retrievable and it is compatible with current and known future installation management programs.
- Preparing and disseminating education materials to lead hazard target personnel.
- Ensuring that activities that involve or generate lead hazards (operations, maintenance, renovation, demolition etc.) are identified, and that the results of their activities are documented and tracked so that lead hazard information remains current.
- Ensuring that requirements are met for training in lead hazards, controls, and abatement in accordance with federal, state, and local regulations and best management practices. For additional information see the preceding section in this appendix, Personnel Training and Qualifications.

Appendix C, Supplement 1: Points of Contact and Technical Assistance

Department of Defense

- Assistant Chief of Staff for Installation Management (ACSIM), Operations Directorate, ATTN: DAIM-ODF.

- ACSIM, Installation Services Directorate, Environmental Division, ATTN: DAIM-ISE.

- U.S. APHC, Industrial Hygiene Field Services Program, ATTN: MCHB-IP-OFS, (410)436-3118 or DSN 584-3118; E-mail: Geoffrey.Braybrooke@us.army.mil.

- USACE, Safety Office, Industrial Hygiene, ATTN: CESO, (202)761-8691; E-mail: Andrea.H.Pouliot@us.army.mil

Federal

- Center for Disease Control (CDC), Lead Poisoning Prevention Program. http://www.cdc.gov/nceh/lead/

- EPA, Lead in Paint, Dust and Soil. http://www.epa.gov/lead/

- EPA, Renovate Right: Important Lead Hazard Information for Families, Child Care Providers, and Schools (EPA-740-F-08-002)

- RCRA, Section 7003 (42 U.S.C. § 6973) http://www2.epa.gov/enforcement/guidance-use-administrative-orders-under-rcra-section-7003 and http://www.epa.gov/epawaste/inforesources/online/index.htm

- HUD, Office of Healthy Homes and Lead Hazard Control. http://www.hud.gov/offices/lead/

- OSHA, Safety and Health Topics - Lead. http://www.osha.gov/SLTC/lead/index.html

Appendix C, Supplement 2: State-Controlled Lead Hazard Programs

For more information on the rules that apply in your state, contact the National Lead Information Center at 1-800-424- LEAD (5323).Information on the federal program is available at: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=3f4752b5883ddb0f3536cc6214da4e73&rgn=div5&view=text&node=40:30.0.1.1.13&idno=40. Table C-4 lists state-managed programs for lead or indicates those states that follow federal EPA-managed programs.

Table C-4. States with state or federally controlled lead hazard program websites.

NOTE: Some counties, regions, and metropolitan areas have more stringent regulations than the state or federal requirements. These areas are denoted by an asterisk (*).

State	Website
Alabama	http://www.adph.org/lead/Default.asp?id=1600 http://adph.org/environmental/assets/LeadReduction.pdf
Alaska	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl
Arizona	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl
Arkansas	http://www.healthy.arkansas.gov/aboutADH/RulesRegs/lead based paint final.pdf
California	http://www.cdph.ca.gov/programs/olppp/Pages/default.aspx **(occupational)** http://www.cdph.ca.gov/programs/CLPPB/Pages/default.aspx **(childhood)**
Colorado	http://www.cdphe.state.co.us/ap/leadhome.html
Connecticut	http://www.ct.gov/dph/site/default.asp

State	Website
Delaware	http://www.dhss.delaware.gov/dph/regs.html#L
District of Columbia	http://ddoe.dc.gov/service/lead-safe-and-healthy-homes
Florida	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl
Georgia	http://www.gaepd.org/Documents/epdforms_lpb.html#la
Hawaii	http://hawaii.gov/health/environmental/noise/asbestoslead/asbestoslea d/asbestoslead/lead.html
Idaho	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl
Illinois	http://www.idph.state.il.us/envhealth/lead.htm
Indiana	http://www.in.gov/isdh/files/A00230.PDF
Iowa	http://www.idph.state.ia.us/eh/lead_poisoning_prevention.asp
Kansas	http://www.kdheks.gov/lead/license_and_certification.htm
Kentucky	http://www.lrc.state.ky.us/kar/902/047/050.htm
Louisiana	http://www.deq.louisiana.gov/portal/tabid/2884/Default.aspx
Maine	http://www.maine.gov/dep/rwm/lead/
Maryland	http://www.epa.gov/lead/ ***Baltimore:** http://www.peoples-law.org/baltimore-city-lead-paint-laws-and-regulations
Massachusetts	http://www.lawlib.state.ma.us/subject/about/lead.html
Michigan	MDCH - Laws, Regulations, and Guidance
Minnesota	http://www.health.state.mn.us/divs/eh/lead/links.html

State	Website
Mississippi	http://www.deq.state.ms.us/MDEQ.nsf/page/Air_Lead-BasedPaint
Missouri	http://www.dhss.mo.gov/Lead/
Montana	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl
Nebraska	http://dhhs.ne.gov/publichealth/Pages/enh_leadpaint_leaddefinitions.aspx
Nevada	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl
New Hampshire	http://www.gencourt.state.nh.us/rules/default.htm
New Jersey	http://www.state.nj.us/dca/divisions/codes/offices/leadhazard_abatement.html
New Mexico	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl
New York	https://www.health.ny.gov/environmental/indoors/asbestos/laws.html ***New York City** http://www1.nyc.gov/site/hpd/owners/Lead-Based-Paint.page
North Carolina	http://www.epi.state.nc.us/epi/lead.html
North Dakota	http://www.ndhealth.gov/aq/iaq/lbp/
Ohio	http://www.odh.ohio.gov/odhPrograms/dspc/lp_prev/law.aspx ***Cleveland** http://caselaw.lp.findlaw.com/clevelandcodes/cco_part2_240.html
Oklahoma	http://www.deq.state.ok.us/AQDnew/lbp/lbpact.htm
Oregon	https://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/Pages/rrp.aspx

State	Website
Pennsylvania	http://www.dli.state.pa.us/landi/lib/landi/laws-regulations/bois/r-23.pdf
Rhode Island	http://www.health.ri.gov/lead/index.php
South Carolina	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl
South Dakota	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl
Tennessee	http://www.state.tn.us/environment/swm/leadpaint/
Texas	http://www.dshs.state.tx.us/elp/rules.shtm
Utah	http://www.rules.utah.gov/publicat/code/r307/r307-840.htm#E5
Vermont	http://healthvermont.gov/regs/VRLCFINAL0912.pdf
Virginia	http://www.dpor.virginia.gov/uploadedFiles/MainSite/Content/Boards/ALHI/A506-33REGS_LEAD.pdf
Washington	http://lni.wa.gov/Safety/Topics/AtoZ/Lead/
West Virginia	http://www.wvdhhr.org/rtia/lead.asp
Wisconsin	https://www.dhs.wisconsin.gov/lead/index.htm ***Milwaukee** http://cctv25.milwaukee.gov/netit-code81/volume1_/ch66/CH66.pdf
Wyoming	http://www.health.wyo.gov/PHSD/lead/index.html http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=3f4752b5883ddb0f3536cc6214da4e73&rgn=div5&view=text&node=40:30.0.1.1.13&idno=40

APPENDIX D:
POLYCHLORINATED BIPHENYLS CONTROL

Introduction

General

This appendix can assist installations and facilities to identify and manage sources of polychlorinated biphenyls (PCBs). For further assistance, see Supplement 1 to this appendix on page D-11.

Regulatory guidance

PCBs are regulated under the TSCA which became law October 11, 1976 (U.S. Congress 1976). The TSCA authorized the EPA to secure information on all new and existing chemical substances, as well as to control any of the substances that were determined to cause unreasonable risk to public health or the environment. Current PCB regulations were published pursuant to this act.

Originally, the cleanup and disposal of PCBs was in the EPA Office of Pollution Prevention and Toxics (OPPTS). Older documents may still include a reference to that office. EPA transferred the management of the PCB cleanup and disposal program to the Office of Solid Waste and Emergency Response (OSWER), effective 9 October 2007; however, there were no changes to the PCB regulations prior to or immediately following the transfer. The management of PCB cleanup and disposal under TSCA will continue to be a federally implemented program and will not be delegated to the states.

Description

PCBs belong to a broad family of manmade organic chemicals known as chlorinated hydrocarbons. PCBs were domestically manufactured from 1929 until their manufacture was banned in 1979. They have a range of toxicity and vary in consistency from thin, light-colored liquids to yellow or black waxy solids. Due to their nonflammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of: industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper; and in many other industrial applications.

Once in the environment, PCBs do not readily break down and, therefore, may cycle between air, water, and soil for long periods of time. PCBs can be carried long distances and have been found in areas far away from where they were released in the environment. PCBs can accumulate in the leaves and above-ground parts of plants and food crops. They are also taken up into the bodies of small organisms and fish.

Although no longer commercially produced in the United States, PCBs may be present in products and materials produced before the 1979 PCB ban. The PCBs used in these products were chemical mixtures made up of a variety of individual chlorinated biphenyl components.

- Most commercial PCB mixtures are known in the United States by their industrial trade names, the most common of which is Aroclor. Supplement 2 to this appendix (page D-16) contains a listing of PCB trade names.

- Types of commercial products that may contain PCBs include:

  - transformers and capacitors;

  - other electrical equipment including voltage regulators, switches, re-closers, bushings, and electromagnets;

  - oil used in motors and hydraulic systems;

  - old electrical devices or appliances containing PCB capacitors;

  - fluorescent light ballasts;

  - cable insulation;

  - thermal insulation material including fiberglass, felt, foam, and cork;

  - adhesives and tapes;

  - oil-based paint;

- caulking;
- plastics; and
- carbonless copy paper.

PCB Health Effects

PCBs have been demonstrated to cause cancer and to cause a variety of other adverse health effects on the immune system, reproductive system, nervous system, and endocrine system.

Personnel Training and Qualifications

There are no specific training requirements for personnel working around PCBs and PCB-containing or PCB-contaminated materials. The primary guidance for training personnel who work around PCBs is derived from the OSHA Hazard Communication Standard (29 CFR 1910.1200). Training should include the hazards of PCBs and current regulatory requirements for testing, labeling, and disposal. Training should also include the identification and location of PCB items on the installation and the system that the TMT has developed to track and control PCBs. The OSHA Hazard Communication Standard requires that training be given to new employees who work around PCBs and also, whenever an employee has a change in duties that will bring that employee into potential exposure situations.

The PCB supplementary members of the TMT need to prepare a brief training session on PCB awareness and the installation’s requirements for identification and control of PCB hazards. The target audience for this training is the installation commander, the DPW, housing personnel, public affairs, and any other group that may be involved in the building maintenance and budgeting, public interface, or the mitigation of PCBs.

Training can be divided into groups of: (a) those personnel needing just general awareness information and (b) those needing more hands-on information such as maintenance personnel, environmental personnel, quality assurance inspectors, etc.

PCB Management Plan

General

Originally, PCB limitations allowed articles containing no more than 500 ppm of PCBs, but now all articles that contain 50 ppm or more of PCBs are banned and must be removed.

Building Deconstruction and Demolition

Through the Toxics Management Coordinator, the installation will ensure that all regulated PCB-containing or PCB-contaminated materials are removed from buildings before deconstruction and demolition begins. Thus, metal, wood, glass, and other recyclables cannot be removed by recycling contractors until all hazardous building materials are removed. In addition, materials containing more than 50 ppm of PCBs such as mercury-containing florescent tube lights and switches; PCB ballasts, transformers and capacitors; hydraulic fluid; and paint and caulk must be identified and removed before value items like stainless steel, brass, copper, wood, glass, etc. can be removed.

Utilities

At one time, utility equipment such as transformers was the largest source of PCBs on installations. Efforts should be made to eliminate all PCB-containing and PCB-contaminated electrical articles.

Installations that lease their utility facilities should require the stipulations outlined below in the lease.

- All changes that affect the PCB article (or PCB-contaminated article) list will be reported annually. This reporting includes replacement in total and flushed articles with reduced PCB concentrations.

- Spills or leaks from PCB electrical equipment will be reported immediately to the installation POC.

Concrete slabs and staging pads for transformers, the soil under the slabs and pads, and the soil under pole-mounted transformers may be contaminated with PCBs. These areas of concern (AOC) need to be investigated and evaluated. Historical documents, photos, and previous area or building uses will assist in determining if PCBs may have been used on the site. Soil and concrete that is contaminated must be removed and disposed of appropriately. Until removed, the current users must be notified of the potential hazard and the suspect site or area must be cordoned off or covered, to prevent exposure to or spreading of the PCBs.

Caulking

Caulk is a flexible material used to seal gaps to make windows, masonry, and joints in buildings and other structures watertight or airtight. PCBs were used as plasticizers to make the caulk more flexible. Figure D-1 shows an example of a masonry repair made with caulk.

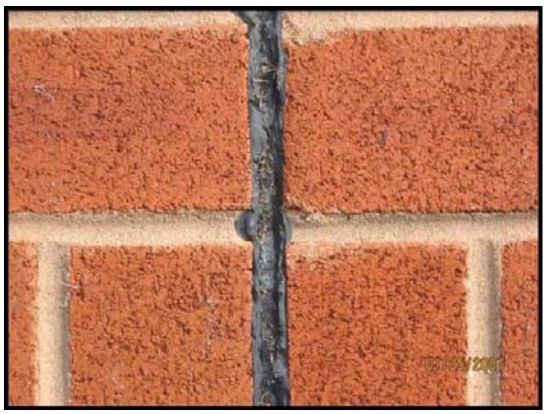

Figure D-1. Example of caulk used to repair mortar.

Caulk that contained PCBs was used in some buildings including schools built in the 1950s through the 1970s. Buildings built after 1980 are less likely to contain caulk that contains PCBs. The EPA does not have information on the extent of the use of PCB-containing caulk nor whether it was primarily used in certain geographic areas. It has been found in buildings in the northeastern United States and in joints in concrete water storage basins in the western United States.

Caulk containing PCBs at levels greater than or equal to 50 ppm is not authorized for use under PCB regulations and must be removed. Caulk containing PCBs at levels less than 50 ppm may remain in place.

Indoor air quality may, to a limited extent, be affected by PCBs from caulk. PCBs can slowly vaporize from caulk and be inhaled. Caulk dust particles can move to other areas of a building through the air-handling system or by person-to-person contact.

PCBs in caulk also are known to contaminate adjacent building material (e.g., masonry, wood, concrete) and soil surrounding the building. Therefore, any surrounding building material that is contaminated by greater than or equal to 50 ppm PCB-containing caulk (such as through leaching of PCBs into porous materials) is considered PCB-remediation waste and must be cleaned up in accordance with 40 CFR § 761.61.

PCB Wastes

For disposal purposes, PCBs that have contaminated soil are considered PCB remediation waste. PCB remediation waste is subject to the cleanup and disposal requirements of 40 CFR 761.61.

Certain PCB bulk product wastes such as PCB-contaminated building components and PCB-containing caulk may be disposed of in nonhazardous waste landfills, if permitted by the state (even if the concentration of PCBs in the caulk is greater than or equal to 50 ppm). (Note that caulk may also include asbestos.) Disposal under this option does not require approval from the EPA, but does require notification to the landfill prior to the first shipment. Although disposal of PCB in landfills is permitted under federal PCB regulations, state or local regulations may not allow disposal of materials containing PCBs at concentrations greater than or equal to 50 ppm. In addition, a landfill which meets the regulatory conditions may choose not to accept materials containing PCBs at concentrations greater than or equal to 50 ppm. You should ensure that the facility is able and willing to accept the waste. Cradle-to-grave tracking must be enacted for all PCB waste.

Contents of the TMP

See Toxics Management Plan Elements, page A-4.

Survey and Assessment

Caulking containing PCBs has been used for both interior and exterior applications. All buildings should be evaluated for their potential for PCB-containing caulk, and a risk assessment hazard ranking should be prepared. Schools and family housing are of the highest concern, because children often poke or pick at the rubbery caulk and become exposed to PCBs from the caulk, and they can become exposed from the soil and adjacent building materials that can become contaminated. The following steps may help in conducting PCB surveys and assessments.

- Review building history and target those buildings built in 1980 or earlier for inspection and possible analysis of caulking. Keep in mind that caulking used during construction may have been manufactured and purchased before the 1978 PCB ban and may have been applied to buildings after 1978.

- Evaluate the location, type, and condition of all building caulking. Caulk that is not intact and is peeling, brittle, cracking, or deteriorating visibly in some way will have the highest potential for release of PCBs. New paint over bad caulk does not necessarily prevent exposure to PCBs. Caulk would generally be characterized as being of lesser concern if it appears completely intact and does not have any signs of deterioration. Common locations are listed below.

    - Caulk used to seal windows and expansion joints. Note any areas where caulk has been removed and replaced from a past renovation (Figure D-2).

    - Caulk found inside the building on the floor, window sills, ledges, concrete joints, or other areas.

    - Outdoor areas where any caulk is found on the ground or where peeling caulk is seen. This may be of particular concern if the caulk is on the exterior of the building, where it may have impacted the soils, particularly if there are routinely used areas nearby, such as gardens, play areas, bus stops, and student pick up areas.

    - Indoor halls and common use areas, including school classrooms, particularly if the walls are rough masonry and there appears to be the potential for caulk to peel and fall to the floor or to be touched or peeled away by a child or adult.

Figure D-2. EPA experts like Dan Kraft use a school exterior to point out that PCB exposure may occur when there is contact with the caulk and surrounding porous materials such as brick, concrete, and wood (Kraft 2007).

- Use a human hazard risk table to determine which buildings must be investigated first. Schools built within the target window and with deteriorating caulk would be near the top of the list; administrative buildings built within the target window with intact caulk would be in the middle of the list; and a seldom-entered warehouse building built within the target window with deteriorating caulk may be at the bottom of the list. The key to the ranking is to eliminate as much human exposure as possible. Caulk condition, frequency of human exposure, and duration of human exposure should be factored into the hazard ranking. Supplement 3 to this appendix contains a sample table to assist with this effort (page D-18).

- Buildings at the top of the Hazard Risk List need to be tested by sending samples to a certified chemical analysis laboratory to determine the presence and concentration of PCBs. Analysis of PCBs found to be 50ppm or greater must be removed. Surrounding media (brick, mortar, insulation, etc.) may also be contaminated and should also be analyzed when the caulk itself is 50 ppm or greater.

  - o The PCB regulations provide appropriate methods for analysis, such as method 3500B/3540C from EPA's SW-846, “Test Methods for Evaluating Solid Waste”; or an alternative method validated under subpart Q, for chemical extraction of PCBs. For analyzing extracts, Method 8082 from EPA's SW-846 or a method validated under Subpart Q is appropriate.

  - o Care should be taken to ensure that caulk testing is done in a safe manner and that any debris is immediately cleaned up. PCBs are persistent and materials used to clean up wastes will be considered contaminated. Contact the EPA Regional PCB Coordinator to find a testing laboratory in your area and to discuss the results and what they mean. Regional coordinators are listed in Supplement 1 to this appendix (page D-11).

- Until the caulk can be removed (whether due to the greater than 50 ppm rule or due to deterioration), the area should be isolated from human contact as much as possible. The longer the PCB caulk remains, the more time it has to spread to surrounding material or to release into the air.

- Keep in mind that some caulk may also be mixed with asbestos fibers. Deteriorating caulk that contains asbestos and can be crumbled by hand is considered friable and must be addressed under the EPA or state asbestos regulations as well as PCB regulations.

PCB-Specific Considerations for the TMT

The TMT should include representative personnel from activities with potential sources of PCB hazards and personnel with expertise in the management of PCBs. Figure D-3 provides an example of a core TMT membership augmented by skill-specific supplementary members.

The TMT should include personnel capable of the tasks listed below.

- Collecting and integrating PCB data with the various personnel that may interact with it. Personnel may include, but not be limited to: real property, construction, O&M, engineering, housing, contracting and environmental departments. This task includes the following:

- collecting building and PCB article data;
- maintaining the data in a manner consistent with other building and site hazard information; and
- disseminating data to master planners and users addressing renovations, new uses, or demolition of PCB-containing buildings.

- Making evaluation and test results compatible with a BIM if that type of system is used.
- Ensuring that day-to-day costs of PCB management are anticipated and included in operating budgets (e.g., training and data maintenance). Thus, day-to-day costs of PCB management are considered an expense and do not become an Army Environmental Liability.

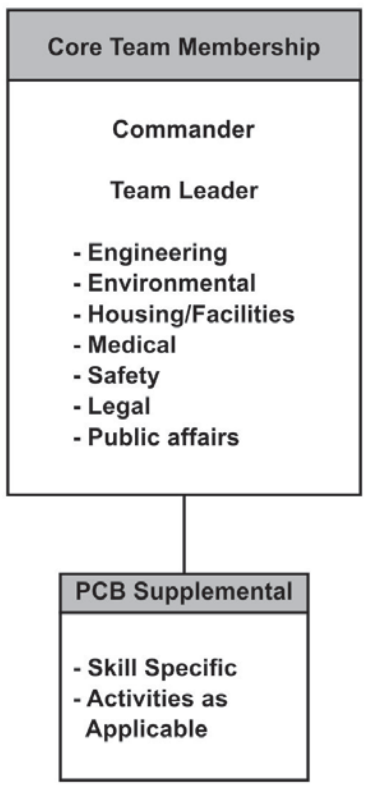

Figure D-3. Example of TMT core membership and PCB-specific supplemental membership.

Appendix D, Supplement 1:
Information Sources and Points of Contact for PCBs

Information Sources

EPA, PCBs
http://www.epa.gov/epawaste/hazard/tsd/pcbs/index.htm

Current Best Practices for PCBs in Caulk - Disposal Options for PCBs in Caulk and PCB-Contaminated Soil and Building Materials
http://www.epa.gov/pcbsincaulk/caulkdisposal.htm

Office of Solid Waste and Emergency Response (OSWER)
Contact: David Hockey (hockey.david@epa.gov) (703) 308-8846

PCB Regulation: Title 40--Protection of Environment Chapter I—EPA Part 761--Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibition
http://www.access.gpo.gov/nara/cfr/waisidx_07/40cfr761_07.html

Testing for PCBs in Caulk EPA website:
http://www.epa.gov/pcbsincaulk/caulktesting.htm

TSCA Approved Disposal Facilities, EPA website:
http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/stordisp.htm

EPA Regional PCB Coordinators

Within each EPA Region, the Regional Administrator has designated Regional PCB Coordinators to oversee the development of PCB efforts. The contact information for these offices is listed below. Source:
http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/coordin.htm

- **Region 1** - Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont; (http://www.epa.gov/region01/)
  - Kim Tisa **(Regional PCB Coordinator)**
    Phone: 617-918-1527
    FAX: (617) 918-0527
  - Marianne Milette **(Enforcement)**
    Phone: (617) 918-1854

- **Region 2** - New Jersey, New York, Puerto Rico, U.S. Virgin Islands; (http://www.epa.gov/Region2/); FAX: (732)-321-6788
  - Jim Haklar **(Regional PCB Coordinator / PCB Disposal)**
    Phone: (732) 906-6817
  - Dan Kraft **(PCB Use)**
    Phone: (732) 906-6177
  - Ann Finnegan **(Enforcement)**
    Phone: (732) 906-6177
  - Vivian Chin
    Phone: (732) 906-6179
  - John Brogard **(Permits)**
    Phone: (212) 637-4162
    FAX: (212) 637-4437
- **Region 3** - Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia; (http://www.epa.gov/region03/); FAX: (215) 814-3114
  - Alizabeth Olhasso **(Regional PCB Coordinator)**
    Phone: (215) 814-2165
  - Scott Rice **(Enforcement)**
    Phone: (304) 231-0501
  - Craig Yussen **(Enforcement)**
    Phone: (215) 814-2151
  - Annie Skidmore **(Enforcement)**
    Phone: (410) 305-2640
  - Demian Ellis **(Enforcement)**
    Phone: (215)814-2088
  - Kyle Chelius **(Enforcement)**
    Phone: (215)814-3178

- **Region 4** - Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee; http://www.epa.gov/region4/
  - Pat Anderson **(Cleanup)**
    Phone: (404) 462-8490
    FAX: (404) 562-8518
  - Raj Aiyar **(Enforcement)**
    Phone: (404)562-8993
    FAX: (404) 562-8972
  - Mary Summers **(Enforcement)**
    Phone: (404)562-8997
    FAX: (404)562-8972
  - Otis Johnson **(Permits)**
    Phone: (404)562-8481
    FAX: (404) 562-9964
- **Region 5** - Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin; http://www.epa.gov/Region5/; FAX: (312) 353-4788
  - Tony Martig **(Regional PCB Coordinator)**
    Phone: (312) 353-2291
  - Jean Greensley **(Permit Writer/Geologist)**
    Phone: (312) 353-1171
  - Steve Johnson **(Permit Writer/Geologist)**
    Phone: (312) 886-1330
- **Region 6** - Arkansas, Louisiana, New Mexico, Oklahoma, Texas; http://www.epa.gov/earth1r6/index.htm; FAX: (214) 665-7446
  - Lou Roberts **(Regional PCB Coordinator)**
    Phone: (214) 665-7579
  - Jim Sales **(Permits)**
    Phone: (214) 665-6796

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Appendix D, Supplement 2: PCB Trade Names

PCBs were manufactured and sold under many different names. Table D-1 on the following page lists trade names in alphabetical order, with notes listed below.

- These names have been used to refer to PCBs or to products containing PCBs.
- Some of these names also may be used for substances or mixtures not containing PCBs.
- Many of these names were used with distinguishing suffixes indicating degree of chlorination, type of formulation, or other properties (e.g., Aroclor 1254; Clophen A60).
- Some of these names may be misspellings of the correct names, but they are included here for completeness.

Table D-1. Alphabetical list of PCB common names and trade names.

PCB Trade Names A-C	PCB Trade Names D-N	PCB Trade Names O-T
Aceclor	Decachlorodiphenyl	Olex-sf-d
Adkarel	Delor	Orophene
ALC	Delorene Diaclor	PCB
Apirolio	Dicolor	PCB's
Apirorlio	Diconal	PCBs
Arochlor	Diphenyl, chlorinated	Pheaoclor
Arochlors	DK	Phenochlor
Aroclor	Duconal	Phenoclor
Aroclors	Dykanol	Plastivar
Arubren	Educarel	Polychlorinated biphenyl
Asbestol	EEC-18	Polychlorinated biphenyls
ASK	Elaol	Polychlorinated diphenyl
Askael	Electrophenyl	Polychlorinated diphenyls
Askarel	Elemex	Polychlorobiphenyl
Auxol	Elinol	Polychlorodiphenyl
Bakola	Eucarel	Prodelec
Biphenyl, chlorinated	Fenchlor	Pydraul
Chlophen	Fenclor	Pyraclor
Chloretol	Fenocloro	Pyralene
Chlorextol	Gilotherm	Pyranol
Chlorinated biphenyl	Hydol	Pyroclor
Chlorinated diphenyl	Hyrol	Pyronol
Chlorinol	Hyvol	Saf-T-Kuhl
Chlorobiphenyl	Inclor	Saf-T-Kohl
Chlorodiphenyl	Inerteen	Santosol
Chlorphen	Inertenn	Santotherm
Chorextol	Kanechlor	Santothern
Chorinol	Kaneclor	Santovac
Clophen	Kennechlor	Solvol
Clophenharz	Kenneclor	Sorol
Cloresil	Leromoll	Soval
Clorinal	Magvar	Sovol
Clorphen	MCS 1489	Sovtol
	Montar	Terphenychlore
	Nepolin	Therminal
	No-Flamol	Therminol
	NoFlamol	Turbinol
	Non-Flamol	

Appendix D, Supplement 3:
Sample Hazard Risk Table

Table D-2. Sample hazard risk table for PCB-containing caulk.

Condition of Caulk	Exposure Rating	Exposure Duration
Severely deteriorating caulk –4–	High exposure –4–	≥ 8 hr –4–
Marked damage condition –3–	Moderate exposure –3–	< 8 ≥ 2 hr –3–
Some damage –2–	Infrequent exposure –2–	< 2 ≥ 1 hr –2–
Intact caulk –1–	Infrequent exposure –1–	< 1 hr –1–

APPENDIX E: RADON CONTROL

Introduction

This appendix describes guidance and procedures for assessing indoor radon levels. This appendix provides a discussion of applicable laws, regulations, and DA standards concerning radon; a summary of the properties of radon; a description of the health risks associated with radon;, and the Army strategy for performing indoor radon measurements and mitigation of Army owned, leased, or otherwise controlled structures.

Regulatory guidance

General

No enforceable federal regulations exist to control indoor radon levels in homes——only guidelines and a national goal. Federal regulations do exist, however, to control indoor radon levels in the workplace.

Administered by EPA, the TSCA deals with the control of toxic substances. Subchapter III of TSCA, the "Indoor Radon Abatement Act," declares a national goal that indoor radon levels be as low as those outdoors. It also requires the head of each federal agency that manages a building to design a study to assess the extent of radon contamination in the building.

The EPA does not regulate indoor radon in homes, schools, offices, or other buildings; however, for residences, EPA has developed a guideline (also called an action level; some details are on page E-3 in the subsection about guidelines for residences). The guideline is commonly known as the "Federal Radon Action Plan" and was formally announced by the EPA on 20 June 2011 in cooperation with other government agencies (U.S. EPA 2011).[4] This plan contains both an array of current federal government actions to reduce radon risks and a series of new commitments for future action. For example, the Federal Radon Action Plan aims to increase radon risk reduction in homes, schools, and daycare facilities, as well as to increase radon-resistant new construction.

It should be noted that Army industrial operations may include the use of radioactive materials, and this possibility may confound any measurements for radon and its decay products.

[4] More information can be found at http://www.epa.gov/radon/action_plan.html

Therefore, a health physicist may be needed to assess the entire work operation separately from a radon reduction program.

Federal Regulations for the Workplace

Occupational Safety & Health Administration

OSHA regulates artificially enhanced concentrations of environmental radon in the workplace.

- The current OSHA Ionizing Radon standard is 100 picocuries per liter (pCi/L), averaged over a 40-hr workweek of 7 consecutive days (29 CFR 1910.1096).

- An employer must conduct surveys to ensure compliance with the provisions in 29 CFR 1910.1096.

- OSHA requires that an employer supply personnel with monitoring equipment and post signage in areas under certain circumstances.[5]

U.S. Nuclear Regulatory Commission

The U.S. Nuclear Regulatory Commission (NRC) regulates various commercial and institutional uses of nuclear energy.

- Under its responsibility to protect public health and safety, the NRC has three principal regulatory functions:

  - establish standards and regulations;

  - issue licenses for nuclear facilities and users of nuclear materials; and

  - inspect facilities and users of nuclear materials to ensure compliance with the requirements.

- The NRC’s radon regulations (10 CFR 20) are only applicable to its licensees.

- The NRC controls radon exposure to workers at NRC-licensed facilities from licensed material (this does not include environmental radon). The derived air concentration (DAC) value for Radon-222 (with decay

[5] Letter dated 23 December 2002 from Richard E. Fairfax, Directorate of Enforcement Programs at OSHA to Connie K. DeWitte, Chief, Safety and Occupational Health Office, Department of the Army, U.S. Army Corps of Engineers. Full text available at https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=24496.

products present) is 30 pCi/L based on a 2,000-hr work year.

- The NRC also controls radon exposure to the general public from any licensed source.

Other Federal Guidance

Federal guidelines for residences

Based on both risk considerations and technical feasibility, the EPA guideline (action level) recommends a maximum annual average radon level of 4 pCi/L in the air for lived-in areas of a home (about 0.4 pCi/L radon is normally found in outside air). This guideline indicates a level that could be used as a target during corrective action.

Army standards/AR 420-1

AR 420-1: “Army Facilities Management,” requires that each installation establish a radon assessment and mitigation program (U.S. Army 2008). It erroneously refers back to AR 200-1 which no longer contains the ARRP (Army 2007c). Since the ARRP is no longer in AR 200-1 nor is it in AR 420-1, this appendix provides guidance to installation personnel.

Description of Radon

Radon is a naturally occurring, chemically inert, and water-soluble radioactive gas that is undetectable by human senses. It is formed by the radioactive decay of thorium and uranium. These source elements are found in low, but varying, concentrations in soils and rocks.

- Radon, being a gas, escapes from rock and water and gets into the air where it may be inhaled.

- Radon-220, derived from thorium, has a half-life of 55 seconds, giving it limited time to enter buildings before it decays to a nongaseous element.

- Radon-222, derived from uranium and having a half-life of 3.8 days, is the primary source of indoor radon. Refer to Agency for Toxic Substances and Disease Registry’s (ATSDR’s) “Toxicological Profile for Radon” (ATSDR 2012) for more detailed information about the chemical properties of radon.

Radon-222 (hereafter referred to as “radon”) typically enters a structure through cracks and other holes in the foundation.

Indoor radon-222 concentrations may vary considerably within the same geographic area. Even adjacent structures can have significantly different indoor radon concentrations. This is due to differences in construction, insulation, soil composition, and an occupant’s lifestyle.

Although radon has always been a component of indoor air, concentrations of it in Army structures have increased over time due to the Army’s effort to create more energy-efficient structures.

Army Radon Reduction Program History

Following is the history of the ARRP:

- Shortly after the passage of the Indoor Radon Abatement Act (U.S. Congress 1988), the DA issued HQDA letter 40-88-3, subject: Army Radon Program (U.S. Army 1988).

- The 1988 policy letter was soon replaced by USAPHC Technical Guide (TG) No. 164, “The DA Radon Program” (USAPHC 1988). In TG No. 164, the DA adopted EPA’s guideline level as its indoor radon standard. The TG also outlined responsibilities for identifying Army-owned and Army-leased continental United States (CONUS) and outside continental United States (OCONUS) structures that had indoor radon levels greater 4.0 pCi/L.

    - The TG dictated how a structure’s radon level would be measured and outlined timeframes in which remedial actions (mitigation) should be completed.

    - In the TG, the Army prioritized its structures as follows:

        - **Priority 1** – day care centers, hospitals, schools, and living areas (including quarters and family housing).

        - **Priority 2** – areas having 24-hr operations (e.g., operations centers and research, development, test, and evaluation facilities).

        - **Priority 3** – all other routinely occupied structures (e.g., offices and shops).

- The same standard for radon applied in all structures; however, the prioritization aspect focused attention early in the program on Priority 1 structures.

  - In April 1990, AR 200-1, "Environmental Protection and Enhancement," was published. Chapter 11 of AR-200-1, entitled "Army Radon Reduction Program (ARRP)," contained much of the same requirements as had been in the TG, but the program was now decentralized, and the requirement was added for testing all renovated and newly constructed structures. When the AR was revised in 1997, the ARRP remained. However, the ARRP was removed from AR 200-1 when it was revised in December 2007 (U.S. Army 2007).

  - In February 2008, AR 420-1, "Army Facilities Management" was published (U.S. Army 2008). AR 420-1 does the following:

    - defines radon;

    - requires that each installation establish a radon assessment and mitigation program; and

    - erroneously refers to AR 200-1 (which no longer contains the ARRP).

  - Since the ARRP is no longer in AR 200-1 nor is it in AR 420-1, this Appendix provides guidance to installation personnel.

Radon Health Effects and Medical Monitoring

Health effects

The health hazard associated with indoor radon is from its decay products, not from the radon gas itself. Radon decays in several steps to form non-gaseous radioactive isotopes with short half-lives. These radon decay products can enter the body via inhalation, remain in the lungs, and undergo radioactive decay. The radiation released during this decay processes damages lung tissue and may lead to lung cancer.

It is difficult to estimate the risk of lung cancer from radon exposure. In June 2003, the U.S. EPA revised its risk estimates for radon exposure in homes. The EPA estimates that about 21,000 lung cancer deaths each year in the United States are radon related. See EPA 402-K-12-002 for additional information about radon risks (U.S. EPA 2012).

Medical monitoring

If issues of potential adverse health risk or effects from indoor radon exposure for building occupants develop during radon monitoring or mitigation in an installation's buildings, contact the Health Physics Program at USAPHC for technical assistance.[6]

Personnel Training and Qualifications

It should be the responsibility of the radon team to identify the training requirements for their area, and to ensure that those involved with radon measuring and mitigation meet these requirements. At minimum, training for radon should follow Table A-1 found in Appendix A of this document. Target personnel in the environmental office, industrial hygienists, and building inspectors need to be fully knowledgeable in the identification, measurement, and control of radon in buildings.

Commercially available training classes can be found by searching the Internet. Many states have specific training requirements for personnel involved in measuring and managing radon in buildings, and some states require certification.

The EPA's website includes an interactive map to help personnel identify potential areas with high radon levels.[7] The EPA site also provides contact information for the appropriate EPA region and the state office for more assistance. Host nations may have differing requirements.

The radon team also needs to prepare a brief training session on Radon Awareness and the installation's requirements for the control of radon. The target audience for this training is the Garrison Commander, DPW personnel, housing personnel, public affairs personnel, and any other group that may be involved in building maintenance and budgeting, public interface, or mitigation of radon.

[6] U.S. Army Public Health Command, Aberdeen Proving Ground, 5158 Blackhawk Road, MD 21010-5403; online link: http://phc.amedd.army.mil/organization/institute/dohs/pages/hp.aspx ,or by phone: (410) 436-8396 or DSN 584-3502.

[7] http://www.epa.gov/radon/zonemap.html#mapcolors (United States and territories only).

Radon Reduction Programs

General

It is the responsibility of each Army command (ACOM), Army service component command (ASCC), or direct reporting unit (DRU) commander or director to establish and execute a radon reduction program, incorporating at least the points below.

- The cost for establishing and maintaining a radon reduction program shall be included in the operating budget.
- The objective of the radon reduction program is to determine if initial radon tests were performed in installation structures in the early 1990s. If not, such tests should be performed for all Army-owned buildings that are in active inventory.

DA radon level requirements by priority of structure area (see page E-4 for priority list) are listed below.

- Priority 1 structures: the annual average radon level must be less than 4 pCi/L of air.
- Priority 2 and 3 structures:
    - the average radon level must be less than 100 pCi/L in any 40-hr workweek of 7 consecutive days;
    - if a structure is occupied less than 40 hr per workweek, the limit shall be increased proportionately; or
    - if the structure is occupied more than 40 hr per workweek, the limit shall be proportionately decreased.

In addition for budgeting for radon measurements and recordkeeping, funding may be required for radon mitigation techniques and equipment.

Contents of the TMP

See Toxics Management Plan Elements, page A-4.

Survey and Assessment

An installation radon reduction program should meet the following requirements:

- Radon testing in all new buildings within 3 mo. of occupancy.

- Retesting of renovated buildings within 3 mo. of the completion of the renovation work.

- Performance of periodic retesting required as detailed below.

  - If no mitigation is required after initial testing, retest a minimum of 10% of all frequently occupied rooms in contact with the ground once every 5 yr in Priority 1 structures and once every 7 yr in Priority 2 and 3 structures.

  - If mitigation is required, retest the performance of these systems every 5 yr.

    Exceptions to this periodic retesting frequency are:

    - vacant buildings scheduled for demolition or divestiture;

    - buildings scheduled for significant or whole renovation within the next 2 calendar years;

    - housing areas identified as excess by BRAC; and

    - non-ground-contact housing units (second-floor units and above) located in multiple-story buildings.

  - With respect to rooms to test within buildings, this guidance recommends radon testing in:

    - all buildings routinely occupied (> 4 hr/day) in enclosed, ground-contact rooms;

    - all vacant rooms suitable for occupancy; and

    - all common-use areas that meet the occupancy requirements.

There are various measurement devices and strategies available. The choice of measurement strategy depends on the purpose of the radon measurement and the type of building where the measurement is made such as a home, school, or workplace.

- The EPA has provided general guidance on measurement strategy, measurement conditions, device protocols, location selection, and documentation in EPA 402-R-92-004, "Indoor Radon and Radon Decay Product Measurement Device Protocols" (U.S. EPA 1992[8]). This method-specific technological guidance can be used as the basis for SOPs contained in an ACOM, ASCC, or DRU radon reduction program.

- An NRC publication, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM), also contains information about radon testing devices and costs per measurement in the publication's Appendix H, "Description of Field Survey and Laboratory Analysis Equipment" (NRC 2000).

Risk Management

Presently, for the purposes of radiological protection, the assumption is made that radon is a non-threshold carcinogenic agent. Theoretical extrapolations postulate that even the smallest incremental dose of radiation has a small risk associated with it, as in the National Council on Radiation Protection and Measurements (NCRP) Report 136 (NCRP 2001). In other words, it is assumed that any radon exposure carries some risk.

An installation radon reduction program should be designed to minimize, monitor, and control risks from radon exposure. This is accomplished through radon measurements, mitigation of buildings if necessary, and effective communication. Like all hazardous substances, risk of cancer increases with concentration and exposure. Unlike most hazardous substances, there is not an identified level where a "no hazard level" exists for radon. To better understand this, see NCRP Report 136 (NCRP 2001).

[8] Note: EPA no longer updates this information, but it may be useful as a resource.

Mitigation

The EPA recommends the American Society for Testing and Materials International (ASTM) publication E-2121, “Standard Practice for Radon Mitigation Systems in Existing Low-Rise Residential Buildings” (an often-updated American National Standards Institute [ANSI]-approved consensus standard) as the most appropriate guide for reducing radon in homes as far as practicable below the national action level of 4 pCi/L in indoor air.

The EPA previously published guidelines for corrective action in EPA 402-K-12-002, “A Citizen’s Guide to Radon.” Although a timeline is not included in the most recent version of EPA’s guide (U.S. EPA 2012), the timeline in Table E-1 is still useful as the appropriate timeline for corrective action in Priority 1 structures, based on radon concentration levels.

Table E-1. Mitigation timeframes for Priority 1 structures.

Radon Concentration(pCi/L)	Mitigation Required Within
0 to < 4	No action required[1]
4 to < 8	Mitigate within 5 yr[2]
8 to < 20	Mitigate within 1–4 yr
20 to < 200	Mitigate within 6 mo.
≥200	Mitigate within 1 mo. or move the occupant

[1] Determined by a 90-day screen.
[2] Annual average determined by 1-yr measurement. Screening measurements (less than or equal to 90 days) in this range will not be used as the basis for initiating mitigation actions.

In addition to the guidelines above, an installation radon reduction program should meet additional requirements, as noted below.

- In Priority 2 and 3 structures with a radon concentration greater than the DA standard, an occupant’s time in that structure should be reduced or engineering controls introduced to lower the radon concentration.

- Only mitigation methods that prevent radon gas from entering the building or those that dilute the gas by use of supplemental ventilation can be used for mitigation system descriptions and post-mitigation radon testing information ([United Facilities Guide Specification] UFGS-31 21 13, "Radon Mitigation"; U.S. DOD 2006).

- All active soil depressurization mitigation systems will be in accordance with the most current version of ASTM Standard E2121 and UFGS-31 21 13, "Radon Mitigation" (UFGS 2006).

- All mitigation systems will be equipped with a performance indicator and contact information to report system failure.

- After mitigation has been completed, all radon reduction systems should be inspected every 5 calendar years by an individual who has demonstrated proficiency through either the National Radon Proficiency Program or the National Radon Safety Board, or who meets applicable state requirements.

Radon-Resistant New Construction

All newly constructed and substantially altered Army facilities shall incorporate design criteria that will reduce health risks due to indoor radon. Additional information regarding design detail is in Unified Facilities Criteria (UFC) 3-490-04A, "Design: Indoor Radon Prevention and Mitigation," 15 May 2003 (U.S. DOD 2003). EPA also has several publications regarding radon-resistant new construction at http://www.epa.gov/radon/pubs/index.html.

Radon-Specific Considerations for the TMT

The TMT should include representative personnel from activities with potential radon hazards and personnel with expertise in the management of radon. Figure E-1 provides an example of a core TMT membership augmented by skill-specific supplementary members.

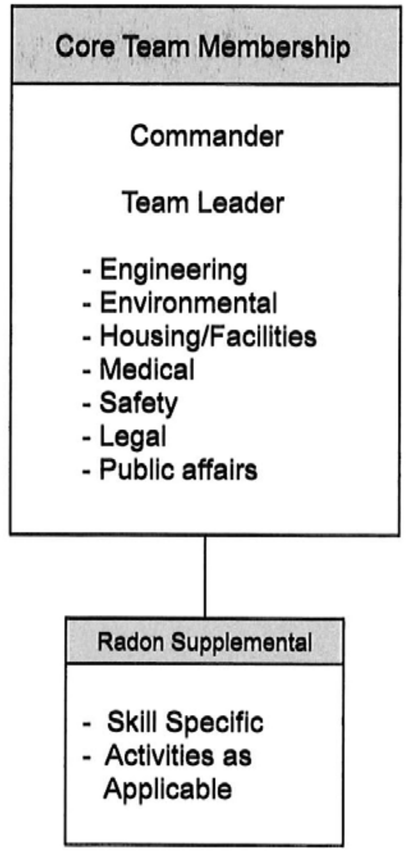

Figure E-1. Example TMT core membership and radon supplemental membership.

The radon-specific TMT should include personnel capable of the tasks listed below.

- Ensuring that day-to-day costs of radon management are anticipated and included in operating budgets (e.g., including training and data maintenance costs). Day-to-day costs are considered an expense and do not become an Army Environmental Liability.

- Having the technical and medical knowledge on the health effects of radon exposure and the expertise to identify the need for a formal health risk assessment for occupants of any installation building with elevated radon measurements. The Installation Medical Authority (IMA) may have one or more of the following qualified experts: occupational or environmental medicine physician (e.g., preventive medicine physician), environmental science officer, or health physicist/radiation safety officer.

- Maintaining a radon tracking and recordkeeping program that provides the following information and capabilities.
    - A radon information storage program, including how data will be made available to all users, occupants, contractors, and other facility entities that may be involved with radon.
    - Review of the radon information storage program every 3 yr to ensure that the program and system that operate it are still relevant, data is retrievable, and it is compatible with current and known future installation management programs.
- Identifying, preparing, and disseminating educational and informational materials to facility users that may come in contact with high levels of radon.
- Ensuring that activities that involve or impact radon management (operations, maintenance, renovation, demolition, etc.) are identified and that the results of their activities are documented and tracked, so that the radon information remains current.
- Ensuring that requirements are met for training in radon management in accordance with regulations and best management practices (BMPs).
- Ensuring that radon-related work-safety practices are addressed in engineering controls and SOPs.

APPENDIX F: REFERENCES

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APPENDIX G: ABBREVIATIONS AND GLOSSARY

Abbreviations

Abbreviation	**Meaning**
ACM	asbestos-containing material
ACMISP	ACM information storage program
ACOM	Army command
ACSIM	Assistant Chief of Staff for Installation Management
AHERA	Asbestos Hazard Emergency Response Act
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
AOC	areas of concern
AR	Army regulation
ARRP	Army Radon Reduction Program
ASCC	Army Service Component Command
ASHARA	Asbestos School Hazard Abatement Reauthorization Act
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
BIM	building information management
BIS	Building Information Schedule
BMP	best management practice
BOQ	bachelor officers' quarters
BRAC	base realignment and closure
CDC	Centers for Disease Control and Prevention
CE	Corps of Engineers (U.S. Army)

Abbreviation	**Meaning**
CESO	Corps of Engineers Safety Office
CECW	Directorate of Civil Works, U. S. Army Corps of Engineers
CEMP	Directorate of Military Programs, U. S. Army Corps of Engineers
CFR	Code of the Federal Regulations
CLPP	Childhood Lead Poisoning Prevention (Program)
CONUS	continental United States
CPSC	Consumer Product Safety Commission
DA	Department of the Army
DAC	derived air concentration
DPW	Directorate of Public Works
DOD	Department of Defense
DRU	direct reporting unit
EBL	elevated blood lead
ELPAT	environmental lead proficiency analytical testing
EMP	elongated mineral particles
EPA	Environmental Protection Agency (U.S.)
ERP	enterprise resource planning
FASAB	Federal Accounting Standards Advisory Board
GFEBS	general fund enterprise business system
HQDA	Headquarters, Department of the Army
HUD	U.S. Department of Housing and Urban Development
ICP	inductively coupled plasma
IMA	Installation Medical Authority

Abbreviation	Meaning
IMCOM	Installation Management Command
LBP	lead-based paint
LCP	lead-contaminated paint
LISP	lead information storage program
LRRP	lead renovation, repair and painting
LSH Rule	Lead Safe Housing Rule
mg/L	milligram per liter
MAP	Model Accreditation Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCA	Military Construction Army
NCRP	National Council on Radiation Protection
NDAAC	National Directory of AHERA Accredited Courses
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute of Occupational Safety and Health
NLLAP	National Lead Laboratory Accreditation Program
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
OCONUS	outside continental United States
O&M	operations and maintenance
OPLAN	operations plan
OPPTS	Office of Pollution Prevention and Toxics
OSHA	Occupational, Safety, and Health Administration

Abbreviation	**Meaning**
OSWER	Office of Solid Waste and Emergency Response
PAM	pamphlet
PAO	Public Affairs Office
PAT	Proficiency Analytical Testing
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
PCM	phase contrast microscopy
PDF	portable document format
P.E.	professional engineer
PEL	Permissible Exposure Limit
PLM	polarized light microscopy
PP&E	property, plant and equipment
ppm	parts per million
POC	point of contact
PPS	Project Prioritization Process
PRE Rule	Pre-Renovation Education Rule
PRIDE	Planning Resources for Infrastructure Development and Evaluation
PWTB	Public Works Technical Bulletin
QA	quality assurance
RACM	regulated ACM
RCRA	Resource Conservation Recovery Act
RRP Rule	Renovation, Repair and Painting Rule
SES	Senior Executive Service
SOP	standard operating procedures
SOW	statement of work

Abbreviation	Meaning
TCLP	Toxicity Characteristic Leaching Procedure
TEM	transmission electron microscopy
TG	Technical Guide
TIS	thermal insulation systems
TMP	Toxics Management Plan
TMT	Toxics Management Team
TSCA	Toxic Substances Control Act
TSI	thermal insulation systems
TWA	time-weighted average
UFC	Unified Facilities Criteria
UFGS	Unified Facilities Guide Specifications
USACE	U.S. Army Corps of Engineers
USAPHC	U.S. Army Public Health Command
WWW	World Wide Web
XRF	x-ray fluorescence

Glossary

Due to the concurrent regulations being developed for many toxic substances, similar terms have been used for differing categories or conditions. It is important to ensure that the term being used applies to the appropriate material and condition of the material. There is an ongoing effort to harmonize terms and descriptions (Harmonization), both within the United States and among various regulatory agencies throughout the world. The completion of this effort will take many years, but the end goal is to reduce the confusion of the various terms.

***activity*.** The number of radioactive nuclear transformations occurring in a material per unit time (See *curie* and *picocurie*).

***alpha particle*.** A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus (i.e., 2 neutrons and 2 protons) with a mass number of 4 and an electrostatic charge of +2.

***child-occupied facilities*.** A building, or portion of a building, constructed prior to 1978, visited regularly by the same child, under 6 yr of age, on at least 2 different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hr and the combined weekly visits last at least 6 hr, and the combined annual visits last at least 60 hr. Child-occupied facilities may include, but are not limited to, day care centers, preschools and kindergarten classrooms. Child-occupied facilities may be located in target housing or in public or commercial buildings. With respect to common areas in public or commercial buildings that contain child-occupied facilities, the child-occupied facility encompasses only those common areas that are routinely used by children under age 6, such as restrooms and cafeterias. Common areas that children under age 6 only pass through such as hallways, stairways, and garages are not included. In addition, with respect to exteriors of public or commercial buildings that contain child-occupied facilities, the child-occupied facility encompasses only the exterior sides of the building that are immediately adjacent to the child-occupied facility or the common areas routinely used by children under age 6.

***curie* (Ci).** A unit of radioactivity. One curie equals that quantity of radioactive materials in which there are 3.7×10^{10}

nuclear transformations per second. The activity of 1 g of radium is approximately 1 Ci.

***decay product, daughter product, progeny*.** A new nuclide formed as a result of radioactive decay. A nuclide resulting from the radioactive transformation of a radionuclide formed either directly or as the result of successive transformations in a radioactive series. A decay product (daughter product or progeny) may be either radioactive or stable.

***decay, radioactive*.** Transformation of the nucleus of an unstable nuclide by spontaneous emission of radiation such as charged particles and/or photons.

***picocurie* (pCi).** One-millionth of a microcurie (3.7×10^{-2} disintegrations per second).

***radiation*.** The emission and propagation of energy through space or through a material medium in the form of waves (e.g., the emission and propagation of electromagnetic waves, or the emission and propagation of sound and elastic waves). The term radiation or radiant energy, when unqualified, usually refers to electromagnetic radiation. Such radiation commonly is classified according to frequency as: microwaves, infrared, visible (light), ultraviolet, and x and gamma rays and, by extension, corpuscular emission such as alpha and beta radiation, neutrons, or rays of mixed or unknown type, as cosmic radiation.

***target housing*.** Any housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any child who is less than 6 yr of age resides or is expected to reside in such housing) or any 0-bedroom dwelling.