From: Mason, Steve
Sent: Sunday, September 10, 2017 5:58 AM
To: Mason, Steve
Subject: TCEQ / EPA and other Fact Sheets
Attachments: CND Landfills.pdf; EPA--Carbon Monoxide Fact Sheet.pdf; EPA--Disinfecting Drinking Water--Spanish.pdf; EPA--Flood Cleanups Avoiding Indoor Air Quality Problems.pdf; EPA--Mold Homeowners and Renters Guide to Cleanup after Disasters.pdf; EPA--Mold in Schools Fact Sheet.pdf; EPA--Post-Disaster Renovations & Lead-based Paint.pdf; EPA--Private Wells--What to do After the Flood.pdf; EPA--Proper Medicine Disposal.pdf; EPA--Septic Systems--What to do After the Flood.pdf; flood_cleanup_and_the_air_in_your_home._poster.pdf; Hurricane Flyer4_9.6.17.pdf; moldremediation.pdf; OSHA Asbestos Fact Sheet.pdf; TCEQ--Disaster Debris.pdf; TCEQ--Disinfecting Your Private Well.pdf

To Our Preparedness Partners:

TCEQ, EPA, and other agencies have several fact sheets that may be useful to residents within the communities that were impacted by Hurricane Harvey. I am attaching the fact sheets.

While many of you are not in the impacted areas, please feel free to distribute them to any distribution lists you may have within your community or county, or friends, relatives, and company associates that may have been impacted.

As always, thanks in advance. And of course, call me if there is anything I can help you with from an EPA standpoint.

With Regards, Steve

Stephen Mason
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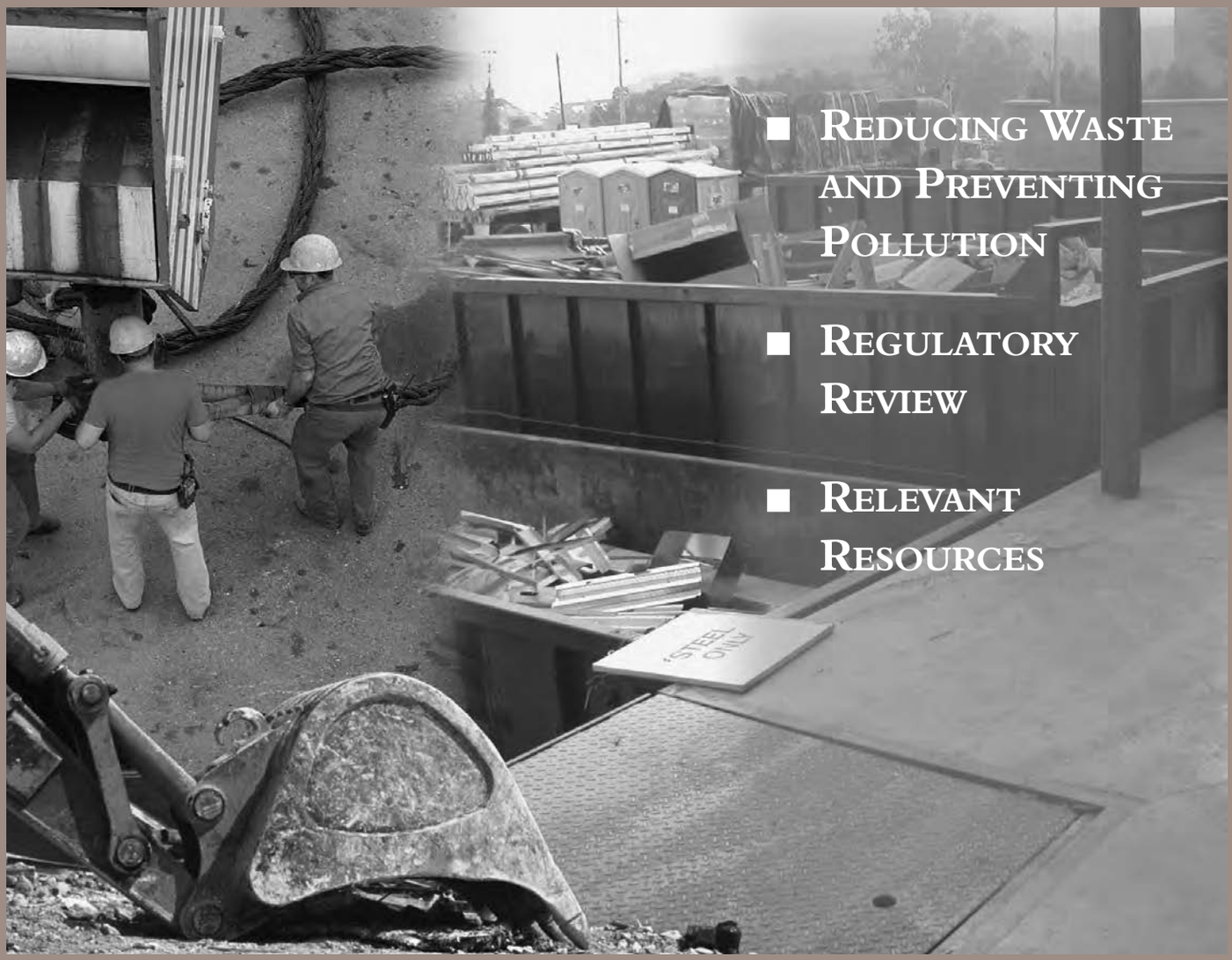
"Frequently, my thoughts get bored and walk down to my mouth. Often, this is a bad thing."

7031754

RCRA INFOCUS

CONSTRUCTION, DEMOLITION, AND RENOVATION



- Reducing Waste and Preventing Pollution
- Regulatory Review
- Relevant Resources

EPA

United States Environmental Protection Agency

Solid Waste and Emergency Response (5305W)

EPA-530-K-04-005
September 2004
www.epa.gov/osw

FOR MORE INFORMATION VISIT THE CONSTRUCTION INDUSTRY COMPLIANCE ASSISTANCE CENTER (CICA) AT <WWW.CICACENTER.ORG>
OR CONTACT YOUR STATE ENVIRONMENTAL PROTECTION AGENCY

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Foreword

If you are involved with building construction, demolition, or renovation, your company creates construction and demolition (C&D) debris. These materials can consist of three types of waste: (1) Inert or nonhazardous waste; (2) hazardous waste as regulated by the U.S. Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act (RCRA); and (3) items that contain hazardous components that might be regulated by some states.

Most C&D debris is nonhazardous and is not regulated by EPA. Under RCRA, however, if you generate hazardous waste you are required to follow certain procedures when generating, storing, transporting, or disposing of it. In addition, many states have specific definitions of C&D debris that effectively determine what materials are allowed to be disposed of in nonhazardous waste landfills, C&D landfills, or incinerators. Even if federal or state regulations do not apply to your business, you should make efforts to keep the hazardous components of the wastes you generate out of landfills to conserve natural resources and protect human health and the environment. Follow the suggestions outlined in this issue for ways to reduce, reuse, and recycle your waste.

C&D Debris

C&D debris is one type of solid waste. It is a large and varied waste stream that includes concrete, asphalt, wood, gypsum, and asphalt shingles generated from the construction, renovation, and demolition of buildings, roads, bridges, and dams. Total C&D waste was estimated to be 325 million tons in 2003.

C&D debris is not federally regulated, except to the extent that solid waste landfills must follow a few basic standards outlined in the *Federal Register* at 40 CFR Part 257. States, therefore, have the primary role in defining and regulating the management of C&D debris.

Depending on your state's specific definition, C&D debris can include the following discarded materials:

- Concrete, cinder blocks, drywall (sheetrock, gypsum, or plaster), masonry, asphalt and wood shingles, slate, and plaster.
- Forming and framing lumber, plywood, wood laminates, wood scraps, and pallets.
- Steel, stainless steel, pipes, rebar, flashing, aluminum, copper, and brass, residential and commercial steel framing, structural steel, steel utility poles.
- Brick and decorative blocks.
- Siding.
- Doors and windows.
- Plumbing fixtures.
- Electrical wiring.
- Non-asbestos insulation.
- Wood, sawdust, brush, trees, stumps, earth, fill, and rock and granular materials.

Many states exclude certain materials from the legal definition of C&D debris, using terms such as "hazardous," "unacceptable," "potentially toxic," or "illegal". These wastes might or might not meet the federal definition of hazardous waste (see page 5). Those that do meet the legal definition of hazardous waste are required to be treated and/or disposed of in a manner consistent with the federal or state requirements for hazardous waste. Examples of these wastes can include:

- Waste paints, varnish, solvents, sealers, thinners, resins, roofing cement, adhesives, machinery lubricants, and caulk.
- Drums and containers that once contained the items listed above.
- Treated wood, including lumber, posts, ties, or decks, and utility poles.
- Asbestos-containing items, such as certain older types of floor tile, insulation, or other materials containing asbestos. (Regulated by the Toxic Substances Control Act [TSCA-see page 18])
- Lead-based paint, or lead flashing or solder.
- Products containing mercury.
- Other items that have inseparable hazardous constituents.

Generators of C&D Debris

Many of those involved in generating C&D debris can save money by reusing, exchanging, recycling, donating, and otherwise reducing the amount of C&D debris they throw away. Donations to charitable organizations classified as 501(c)3 are tax-deductible.

The National Association of Home Builders (NAHB) estimates that as much as 8,000 pounds of C&D debris is produced for every 2,000 square feet of house. A 1995 NAHB survey estimated that builders pay an average of $500 per home for waste removal.

C&D LANDFILLS

A large fraction of C&D debris generated in the United States ends up in C&D landfills. (See 40 CFR 257.) Since much of this waste stream is inert, states do not require these landfills to provide all of the same environmental protections as those licensed to receive municipal solid waste. Therefore, C&D landfills generally have lower tipping fees and handle a large amount of the C&D debris generated in the United States. Most states regulate C&D debris, although programs vary widely. For example, some states require liners or leachate collection systems; a few require both; and others require neither. Visit <www.cicacenter.org> for more information.

STATE HAZARDOUS WASTE REQUIREMENTS

While states have the primary responsibility for regulating nonhazardous C&D debris, they sometimes also have primary responsibility for regulating hazardous waste. States can receive legal permission, known as authorization, to implement EPA's RCRA hazardous waste program. State hazardous waste programs are consistent with, and are at least as stringent as, the federal hazardous waste program. Always contact your state authority to determine which state requirements apply to your business.

Frequently Asked Questions About RCRA

What Is RCRA?

RCRA is a federal law that encourages environmentally sound methods for managing commercial and industrial waste as well as household and municipal waste. It regulates facilities that generate, transport, treat, store, or dispose of hazardous waste.

The term "RCRA" is often used interchangeably to refer to the law, the regulations, and EPA policy and guidance. The law describes the waste management program mandated by Congress that gave EPA authority to develop the RCRA program. EPA regulations carry out the Congressional intent by providing explicit, legally enforceable requirements for waste management. EPA guidance documents and policy directives clarify issues related to the implementation of the regulations.

All of the RCRA hazardous waste regulations can be found in the *Code of Federal Regulations* (CFR), Title 40, Parts 260 to 279. The CFR can be purchased through the U.S. Government Printing Office (GPO).

Who Is Regulated?

Any business that generates hazardous waste is potentially subject to RCRA. You must conduct tests required by the regulations or use your knowledge of and familiarity with the waste you generate to determine whether it is hazardous waste. You might be subject to substantial civil and criminal penalties if you fail to properly or completely identify hazardous waste generated by your business.

How Are Generators Regulated?

If your business generates hazardous waste, you must manage it according to regulations for your specific generator type. Hazardous waste generators are divided into three categories, according to how much they generate in a calendar month:

- **Large Quantity Generators (LQGs)**. LQGs generate greater than or equal to 1,000 kg (approximately 2,200 lb) of hazardous waste per month or greater than 1 kg (approximately 2.2 lb) of acutely hazardous waste per month.
- **Small Quantity Generators (SQGs).** SQGs generate greater than 100 kg (approximately 220 lb) but less than 1,000 kg (approximately 2,200 lb) of hazardous waste per month.
- **Conditionally Exempt Small Quantity Generators (CESQGs)**. CESQGs generate less than or equal to 100 kg (approximately 220 lb) of hazardous waste per month and less than or equal to 1 kg (approximately 2.2 lb) of acutely hazardous waste per month.

Most construction, demolition, and renovation companies are considered CESQGs. CESQGs must comply with three basic waste management requirements to remain exempt from the full hazardous waste regulations that apply to generators of larger quantities of hazardous waste (SQGs and LQGs).

Some states do not recognize the CESQG class. Contact your state environmental agency to find out if the CESQG status is recognized. **To find your appropriate state contact, visit <www.cicacenter.org>.**

Under the federal RCRA requirements, your generator status might change from one month to the next as the quantity of waste you generate changes. State requirements vary widely. You must comply with whichever standard is applicable for a given month. In many cases, small businesses that fall into different generator categories at different times choose to always satisfy the more stringent requirements (usually state requirements) to simplify compliance. Generators must "count" the amount of waste generated, which involves adding up the total weight of all quantities of characteristic and listed waste generated at a particular facility. Certain wastes, such as those that are reclaimed or recycled continuously on site, may not be counted for the monthly total calculation under the federal regulations.

Asked Questions

What Is Hazardous Waste?

To be considered hazardous waste, a material first must be classified as a solid waste. EPA defines solid waste as garbage, refuse, sludge, or other discarded material (including solids, semisolids, liquids, and contained gaseous materials). If your waste is considered solid waste, you must then determine if it is hazardous waste. Wastes are defined as hazardous by EPA if they are specifically named on one of four lists of hazardous wastes (listed wastes) or if they exhibit one of four characteristics (characteristic wastes). Each type of RCRA hazardous waste is given a unique hazardous waste code using the letters D, F, K, P, or U and three digits (e.g., D001, F005, P039). See page 6 for additional information on relevant C&D waste codes.

Listed Wastes. Wastes are listed as hazardous because they are known to be harmful to human health and the environment when not managed properly, regardless of their concentrations. The lists include the following three types of waste:

- **Non-Specific Source Wastes.** These are material-specific wastes, such as solvents, generated by several different industries. Waste codes range from F001 to F039. Examples include ethyl benzene, methylene chloride, and toluene.
- **Specific Source Wastes.** These are wastes from specifically identified industries. Waste codes range from K001 to K161. C&D debris does not typically include specific source wastes.
- **Discarded Commercial Chemical Products.** Off-specification products, container residuals, spill residue runoff, or active ingredients that have spilled or are unused and that have been, or are intended to be, discarded. Waste codes for acutely hazardous chemicals range from P001 to P205 and U001 to U411. An example is U159, unused methyl ethyl ketone.

Characteristic Wastes. Even if your waste does not appear on one of the hazardous waste lists, it still might be regulated as hazardous waste if it exhibits one or more of the following characteristics:

- **Ignitability**. Ignitable wastes create fires under certain conditions or are spontaneously combustible, and have a flash point less than 60°C (140°F). One example is spent solvents. The waste code for these materials is D001.
- **Corrosivity**. Corrosive wastes are acids or bases that are capable of corroding metal containers, such as storage tanks, drums, and barrels. The waste code for these materials is D002. C&D debris does not typically include corrosive wastes.
- **Reactivity**. Reactive wastes are unstable under "normal" conditions. They can cause explosions, toxic fumes, gases, or vapors when mixed with water. The waste code for these materials is D003. C&D debris does not typically include reactive wastes.
- **Toxicity**. Toxic wastes are harmful or fatal when ingested or absorbed. When toxic wastes are disposed of on land, contaminated liquid might drain (leach) from the waste and pollute ground water. Toxicity is defined through a laboratory procedure called the Toxicity Characteristic Leaching Procedure (TCLP). Examples include trichloroethylene, asphalt wastes, and lead pipe. The waste codes for these materials range from D004 to D059.

Do Exclusions Exist?

The RCRA regulations contain many exclusions for wastes and waste management practices that are not considered to be hazardous.

What Are Some Typical RCRA Wastes in C&D Debris?

The following table shows some examples of C&D wastes that may be considered hazarous according to EPA's definition.

Most construction, demolition, and renovation companies are considered CESQGs. CESQGs must comply with three basic waste management requirements to remain exempt from the full hazardous waste regulations that apply to generators of larger quantities of hazardous waste (SQGs and LQGs).

(1) Identify all hazardous waste that you generate on site. Test procedures are described in an EPA document, *Test Methods for the Evaluation of Solid Waste, Physical/ Chemical Methods*, SW-846. (See the SW-846 Web site at <www.epa.gov/sw-846/sw846.htm> for more information.) You can also use your knowledge of the waste to make this determination; for example, you might know that the spent solvent you are disposing of is an ignitable hazardous waste, and therefore, you would not have to test for the solvent's flashpoint.

(2) You may not store more than 2,200 lbs (1,000 kg) of hazardous waste on site at any time.

(3) You must ensure delivery of your hazardous waste to an offsite treatment or disposal facility that is:

- A state or federally regulated hazardous waste management treatment, storage, or disposal facility.
- A facility permitted, licensed, or registered by a state to manage municipal or industrial solid waste.
- A facility that uses, reuses, or legitimately recycles the waste (or treats the waste prior to use, reuse, or recycling).
- A "universal waste" handler or destination facility subject to the universal waste requirements of 40 CFR Part 273. (Universal wastes include certain batteries, recalled and collected pesticides, mercury-containing thermostats, and mercury-containing fluorescent bulbs.)

Note that some states require CESQGs to obtain an EPA identification number and comply with certain storage standards. For more information refer to the Code of Federal Regulations (DCFR) Title 40 Parts 260 to 279, or visit <www.epa.gov/epaoswer/hazwaste/sqg/cesqg.htm>.

Activity	Wastes Generated	Possible RCRA Waste Codes
Land-Clearing, Wrecking, and Demolition	Ignitable or toxic wreckage and debris, and lead pipe.	D001 (ignitable wreckage and debris), D008 (lead pipe, toxic wreckage and lead-based paint debris), D009 (mercury-containing fluorescent lamps), D023-D026 (toxic wreckage and debris containing cresols).
Heavy Construction	Asphalt wastes, petroleum distillates, and used oil.(Asphalt is widely recycled.)	D001 (asphalt wastes, petroleum distillates, used oil sent for disposal), D004 (arsenic), D006-D008 (used oil sent for disposal containing cadmium, chromium, or lead), D018 (asphalt wastes containing benzene).
Carpentry and Floorwork	Acetone, adhesives, coatings, methylene chloride, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIK), mineral spirits, solvents, toluene, treated wood, trichloroethylene, and xylene.	D001 (acetone, adhesives, coatings, methylene chloride, MEK, MIK, mineral spirits, solvents, trichloroethylene, toluene, xylene), D004 (treated wood), D023-D026, D037 (treated wood), D035 (MEK), D040 (trichloroethylene), F001 or F002 (trichloroethylene, methylene chloride), F003 (acetone, xylene, MIK), F005 (toluene, MEK), U002 (unused acetone), U159 (unused MEK), U161 (unused MIK), U239 (unused xylene), U220 (unused toluene), U080 (unused methylene chloride).
Paint Preparation and Painting	Acetone, chlorobenzene, glazes, methanol, MEK, methylene chloride, paint, petroleum distillates, pigments, solvents, stripping compounds, toluene, and wastewater.	D001 (acetone, chlorobenzene, glazes, methanol, MEK, methylene chloride, paint, petroleum distillates, solvents, stripping compounds, toluene, wastewater), D007 (chromium pigments), D008 (lead pigments), D021 (chlorobenzene), D035 (MEK), F001 and F002 (chlorobenzene), F003 (acetone, methanol), F005 (MEK, toluene), U002 (unused acetone), U037 (unused chlorobenzene), U159 (unused MEK), U220 (unused toluene).
Specialty Contracting Activities	Acetone, adhesives, coatings, hexachloroethane, kerosene, MEK, MIK, pigments, solvents, toluene, wastewater, and xylene.	D001 (acetone, adhesives, coatings, MEK, MIK, kerosene, solvents, toluene, wastewater, xylene), D007 (chromium pigments), D008 (lead pigments), D034 (hexachloroethane), D035 (MEK), F003 (acetone, MIK, xylene), F005 (toluene, MEK), U002 (unused acetone), U131 (unused hexachloroethane), U159 (unused MEK), U161 (unused MIK), U220 (unused toluene), U239 (unused xylene).

Special Issues in C&D Debris

Special Issues

How Should I Manage C&D Debris Containing Mercury?

When preparing for demolition, contractors should be aware that some items inside buildings contain mercury, which is an extremely persistent and toxic human health and environmental threat. Contractors should carefully salvage these materials for proper recycling to prevent mercury contamination.

Mercury-containing wastes must be managed and disposed of as RCRA hazardous wastes if they meet the toxicity characteristic for mercury (waste code D009). Mercury-containing batteries, thermostats, and lamps may be managed under the Universal Waste Program, provided the state does not regulate the wastes more stringently. Items that contain mercury commonly found in buildings include:

- Fluorescent lamps, mercury vapor lamps, metal halide lamps, high pressure sodium lamps, and neon lamps. See <www.epa.gov/epaoswer/hazwaste/id/univwast.htm#lam>.
- Thermostat probes (found in gas-fired appliances with pilot lights such as ranges, ovens, clothes dryers, water heaters, furnaces, and space heaters).
- Thermostats, aquastats, pressurestats, firestats, monometers, and thermometers.
- Smoke detectors, emergency lighting systems, and security systems and alarms.
- Parts of sprinkler systems and coal conveyer systems.
- Elevator control panels.
- Exit signs.
- Barometers.
- Silent wall switches.
- Cathode ray tubes.
- Old paint.

Salvaging mercury-containing products not only keeps them from contaminating the soil and surface waters near building demolition sites, but it also prevents them from winding up in landfills or recycling systems. Waste combustors and hazardous waste treatment incinerators are tightly regulated and must comply with all EPA standards on air emissions.

Remember the following guidelines:

- Isolate items that contain mercury and take them to a mercury recycler or consolidation site. Contact your county or state environmental or solid waste office for services available in your area. Do not remove the mercury from items. Label and store the mercury-containing devices to ensure proper handling and disposal.
- Never crush fluorescent lamps because mercury could be released.
- Contractors should be aware that specialty buildings, such as hospitals, clinics, laboratories, and dental offices, might have additional mercury sources.

REMEMBER TO CHECK WITH THE APPROPRIATE STATE AND LOCAL AUTHORITIES ABOUT HOW TO PROPERLY HANDLE AND DISPOSE OF MATERIALS IN YOUR AREA.

WHAT IS THE UNIVERSAL WASTE PROGRAM?

The Universal Waste Program is designed to reduce the amount of hazardous waste items in the municipal solid waste stream, to encourage recycling and proper disposal of certain common hazardous wastes, and to reduce the regulatory burden on businesses that generate these wastes. Specifically, it streamlines the requirements related to notification, labeling, accumulation time limits, employee training, response to releases, offsite shipments, tracking, exports, and transportation of "universal waste."

Wastes that are considered federal universal wastes include batteries, agricultural pesticides, thermostats, lamps, cathode ray tubes, and mercury-containing equipment. Construction companies that handle large quantities of these federal universal wastes can take advantage of these special requirements when handling hazardous materials. The rule does not apply to CESQGs (businesses that generate less than 100 kilograms of universal wastes per month), although EPA encourages these businesses to participate voluntarily in collection and recycling programs. Additionally, companies should check with their state agency regarding the implementation of the Universal Waste Rule in their state.

For more information, visit EPA's Universal Waste Web page at <www.epa.gov/epaoswer/hazwaste/id/univwast.htm>.

How Should I Manage Lead-Based Paint Debris?

Lead-based paint has been banned since 1978, but many older structures still have this paint on walls, woodwork, siding, windows, and doors. Construction and demolition workers can be exposed to lead contamination by cutting, scraping, sanding, heating, burning, or blasting lead-based paint from building components, metal bridges and metal storage tanks. In addition to exposure to workers, lead-based paint debris or dust can also make its way into soil, potentially contaminating surface waters. Lead poisoning is a serious health threat for adults and is especially damaging to young children. It can cause anemia, reproductive disorders, and damage to the kidney, liver, and brain. Lead is absorbed into the bloodstream, soft tissue, and bones and teeth, where it breaks down extremely slowly (from 50 days to 50 years).

C&D debris contaminated with lead-based paint must be managed in different ways depending upon where the debris came from and what it is.

C&D debris from commercial or industrial sites that is contaminated with lead-based paint must be managed as RCRA hazardous waste if a representative sample meets the toxicity characteristic (D008).

Lead-based paint waste from removal or remediation activities, such as debris, paint chips, dust, and sludges, that exhibit the toxicity characteristic must be managed and disposed of as a RCRA hazardous waste. However, lead-based paint being removed from households is excluded because it is considered household waste, not hazardous waste.

Contractors working to renovate, remodel, or abate lead-based paint in homes are allowed to dispose of lead-based paint waste as household garbage. Contractors who generate the waste in this manner do not need to determine whether the waste meets the toxicity characteristic under RCRA, but should contact their state agency for possible additional requirements. This waste normally consists of building parts, such as doors, window frames, painted woodwork, and paint chips.

Anyone handling lead-based paint or lead-based paint debris—even if it is not technically considered hazardous waste—should follow several guidelines to protect their health and safety:

- Collect paint chips, dust, dirt, and rubble in plastic trash bags for disposal.
- Store larger lead-based paint building parts in containers until ready for disposal.
- Use a covered dumpster (such as a roll-off container) to store lead-based paint debris until the job is completed.
- Contact your local solid waste agency to determine where and how to dispose of lead-based paint debris.
- Do not smoke, eat, or drink around lead-based paint work.
- Always wash your hands and face before smoking, eating, or drinking.
- Do not wear clothes home that have been covered in lead-based paint dust.

Contractors working for publicly funded rehabilitation or renovation projects in public housing must follow the Department of Housing and Urban Development (HUD) guidelines for lead-based paint. They must also follow EPA rules regarding training and certification and Occupational Safety and Health Administration (OSHA) rules regarding hazard communication, personal protective equipment, testing of blood lead levels, and other special procedures.

How Should I Manage Asbestos Debris?

Asbestos-containing materials (ACMs) have been widely used for fire resistance and insulation in building construction since World War II. ACMs are most commonly found in:

- Insulation (blown, rolled, and wrapped).
- Resilient floor covering (tiles).
- Asbestos siding shingles.
- Asbestos cement products.
- Asphalt roofing products.

Because it can cause a variety of health issues, including scarring of the lung tissue and certain types of cancer, asbestos is strictly regulated by both EPA and OSHA. The Asbestos National Emissions Standards for Hazardous Air Pollutants (NESHAP), promulgated under the Clean Air Act, is the regulation most commonly applied to the construction industry (see page 17). Under NESHAP, some types of ACM are regulated, while others are not subject to special disposal requirements. The Asbestos NESHAP places ACM in three distinct categories.

Friable ACM

Friable ACMs are able to be crumbled under hand pressure and include sprayed-applied fireproofing or insulation. Friable ACMs are always regulated under NESHAP when they are disturbed during demolition or renovation.

Category 1 Non-Friable ACM

These materials, including floor tiles, are not considered regulated ACM and do not need to be removed prior to demolition or renovation. However, if they are subjected to sanding, grinding, cutting, or abrading, are in poor condition and friable, or if they will be burned, Category 1 Non-Friable ACM is considered regulated ACM and must be removed accordingly.

Category 2 Non-Friable ACM

The treatment of Category 2 non-friable ACMs, which includes asbestos cement, should be evaluated on a case-by-case basis. If these materials are likely to be crushed, pulverized, or reduced to powder during demolition or renovation, they should be removed prior to project start or treated as regulated ACM if exposed to these conditions.

If regulated ACM is present at a site designated for demolition or renovation, it must be properly packaged in leak-tight containers or wrapped and disposed of at an approved or licensed disposal site. State and local agencies that regulate asbestos removal can supply a list of disposal sites, and can be found in the government pages of local telephone directories. NESHAP also requires contractors to follow specific work practices when working with ACMs to ensure adherance to its zero visible air emissions standard for asbestos removal. Non-regulated ACM may be disposed of in landfills that accept ordinary demolition waste.

Regardless of whether asbestos is present at a demolition or renovation site, NESHAP regulations require contractors to submit a written notice to the state or local pollution control agency or to the EPA Regional Office 10 working days prior to the start of construction activities. Some EPA Regions require that both EPA and the state or local office be notified. Additionally, the building site must be inspected by a certified asbestos inspector, and owners and operators must have samples of materials suspected of containing ACM collected and tested prior to the start of construction activities.

In addition to NESHAP regulations, some states also have additional asbestos requirements which should also be considered during demolition and renovation projects.

Hazardous waste requirements checklist for construction projects

Managers of construction projects can use the following checklist to determine hazardous waste requirements under RCRA. You should also check state and local hazardous waste requirements for construction projects.

What type of hazardous waste generator are you?

CESQG	If you generate less than 100 kilograms (220 pounds) of hazardous waste per month, you are a Conditionally Exempt Small Quantity Generator (CESQG). Most construction contractors do not fall under the federal definition. CESQG contractors may be subject to state and local requirements.
SQG	If you generate between 100 and 1,000 kilograms (220-2,200 pounds) of hazardous waste per month, you area Small Quantity Generator (SQG).
LQG	If you generate more than 1,000 kilograms (2,200 pounds) of hazardous waste per month, you are a Large Quantity Generator (LQG).

REGULATORY REQUIREMENTS	SQG	LQG	REQUIREMENTS FOR HAZARDOUS WASTE GENERATORS
Hazardous Waste Identification	✓	✓	• Identify whether you generate hazardous waste to determine if you are subject to RCRA hazardous waste regulations. Test procedures are described in “Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods, SW-846,” or tests can be performed by a local laboratory.
EPA Identification Number	✓	✓	• Obtain an EPA Identification number (i.e., a RCRA hazardous waste generator number) for each facility within your company. EPA and states use this 12-character identification number to track hazardous waste activities. To get an EPA identification number, submit Form 8700-12 (Notification of Regulated Waste Activity), which is provided by your state hazardous waste agency. This is a one-time notification. Contact your state regarding the need for renotification if circumstances at your facility change.
Hazardous Waste Accumulation	✓		• Waste must be properly accumulated in containers or tanks.
		✓	• Waste must be properly accumulated in containers, tanks, drip pads, or containment buildings.
	✓	✓	• Hazardous waste containers must be closed, marked as "Hazardous Waste," and marked with the date accumulation began.
Hazardous Waste Storage	✓	✓	• Store hazardous waste containers in a secure location.
	✓	✓	• Perform weekly inspections of your hazardous waste containers.
			• You must have secondary containment measures in your hazardous waste storage area.
	✓	✓	• Hazardous waste storage areas must have fire suppression equipment.
	✓	✓	• Hazardous waste storage areas must have available radio or telephone communication.

Preparation for Transport	✓	✓	• Use a licensed hazardous waste hauler for transport.
	✓	✓	• Before being transported, waste must be packaged, labeled, and marked in accordance with applicable Department of Transportation (DOT) requirements. Call the DOT hazardous materials information hot-line at (202) 366-4488 for information.
	✓	✓	• Properly label and mark your hazardous waste prior to transport.
	✓	✓	• Make sure that the transporter has the proper placards to identify the characteristics and dangers associated with your waste.
	✓	✓	• Complete and sign the Uniform Hazardous Waste Manifest (see below).
Manifest Requirements	✓	✓	• Include the name, address, and EPA ID number of the hazardous waste generator (your site), the transporter, and designated TSDF on the manifest.
	✓	✓	• Include a description of the waste's hazards on the manifest as required by DOT rules.
	✓	✓	• Provide the quantities of the waste being transported and the types of containers on the manifest.
	✓	✓	• Complete the certification.
	✓	✓	• Obtain a copy of the signed and dated manifest from the TSDF within 45 days of shipment for LQGs or within 60 days for SQGs. If you did not receive a copy, you must submit an "exception report" to EPA.
Preparedness and Prevention	✓		• Your site must have a specified emergency response procedure. (Note: a written contingency plan is not required.)
	✓		• Your site's basic safety information must be readily accessible to employees.
	✓		• Site personnel familiar must be familiar with proper handling of hazardous waste and site emergency procedures.
		✓	• Your site must have an established personnel training program to educate workers on the proper handling of hazardous waste.
	✓	✓	• You must have an emergency coordinator on site or on call at all times.
Used Oil Standards	✓	✓	• If you generate used oil, you are subject to a separate set of management standards from the hazardous waste management standards if the used oil will be recycled. If the used oil is to be treated and disposed of, perform the hazardous waste identification step listed above.

The Life Cycle of a Typical Renovation/ Construction Waste

This example details the life cycle of just one potential construction waste, solvents and paint, that might be regulated under RCRA. The steps below illustrate the most common scenario of activities a CESQG should conduct with this waste. Other hazardous wastes could be produced by construction, demolition, and renovation activities, and other life cycles could be different depending on the type and amount of waste, and the type of generator. You might be able to significantly reduce the amount of hazardous waste you must manage by reducing, reusing, and recycling C&D debris. If these options are not available, the following steps must be taken to ensure proper management of the hazardous waste.

1

IDENTIFY WASTE

By running tests or using knowledge of the waste, identify whether the waste solvents and paints are hazardous. Based on these analyses, you determine that the appropriate RCRA hazardous waste code is D001 (ignitable wastes).

5

PLACE WASTE IN ACCUMULATION UNIT

If the waste is not reusable, exchangeable, or recyclable, ensure that it is delivered to one of several types of facilities to which CESQGs may send wastes (e.g., hazardous waste TSDFs, certain state licensed or permitted municipal solid waste facilities, or recyclers).

2

COUNT WASTE

As a second step, determine how much hazardous waste you have produced in a calendar month. Do not include waste that may be exempt from regulation such as household hazardous waste, mercury-containing batteries, thermostats, and lamps managed under the Universal Waste Program. Also do not include waste that is recycled on site without prior storage or accumulation, and wastes discharged in compliance with the Clean Water Act directly to a sewer where the wastes mix with domestic sewage and then pass to a Public Owned Treatment Works (POTW).

3

DETERMINE GENERATOR STATUS

Based on the waste counted, determine your generator status. In this example, you have produced less than 100 kg in the past month, which means you are a CESQG in this calendar month. If the amount of waste you generate fluctuates from month to month, you might want to satisfy the more stringent requirements each month to simplify compliance.

4

OBTAIN EPA IDENTIFICATION NUMBER

Before shipping waste off site for treatment, storage, or disposal, you must package, label, and mark waste containers in accordance with all applicable DOT requirements. For more information, call the DOT Hotline at 800 467-4922.

Reduce the Amount of Waste You Generate

Reduce Waste

A significant amount of money can be saved by those companies that take advantage of the various reuse, exchange, recycling, or donation opportunities that exist. By reducing the amount of C&D debris that is thrown away, companies also reduce their regulatory burden by avoiding the disposal of items that could be considered hazardous waste.

The following are several options for reducing the amount of C&D debris requiring disposal:

DECONSTRUCTION AND REUSE: Deconstruction means the selective disassembly of buildings to facilitate the reuse or recycling of valuable materials. This practice can involve the recovery of materials such as wood, structural brick, and highly functional finished components like windows, doors, cabinets, and decorative trim. Deconstruction is labor-intensive but can produce environmental, economic, and social benefits.

Reuse/Refurbish/Donate: Functional building or architectural components, in addition to scrap materials, can often be reused or refurbished. Some items could be used by your company for your next building job, and many items can be sold to used building materials stores, high-end salvaged architectural materials exchanges, salvaged wood distributors, scrap recyclers, individual homeowners, waste exchanges, or other outlets. Consider placing an ad in the local newspaper for excess salvage materials. If you can't sell the items you have salvaged, some of them may be donated to at least save money on disposal. Also, ask homeowners if they would like to keep clean, usable materials for their own future projects.

Recycle: Some materials, like the ones in the table on page 15, can be sold to scrap recycling businesses or through material exchanges. Sort materials as they are generated to maximize their recyclability and reuse. This practice is becoming increasingly cost efficient as processing and disposal costs rise. Visit <www.epa.gov/jtc/comm/construct.htm> for a complete list and more information.

Be sure to prevent hazardous contamination of materials destined for reuse or recycling. Consider accumulating various wastes separately to facilitate recycling. If you are storing waste that may be hazardous prior to recycling, you may have to comply with certain RCRA requirements.

PREVENT POLLUTION: Contractors can take several other pollution prevention and waste reduction measures as shown in the table. Some of these suggestions require contractors to make decisions prior to arriving at the job site, while others involve onsite activities.

BUYING GREEN: The recycling process is not complete until you've purchased products made with recycled content.

Note that RCRA specifies that the federal government and its contractors must purchase certain items with recovered material (recycled) content. Based on extensive research, EPA has designated several such construction products in the Comprehensive Procurement Guideline (CPG). Visit <www.epa.gov/cpg> for a complete list and more information. Many additional construction products are commercially available with recycled content or alternative, less toxic materials.

Sell or Donate for Reuse	■ Cabinets, doors, plumbing, lighting fixtures, tile carpeting, door hinges, wall paneling, mirrors, stairway bannisters, construcion-grade lumber, ornamental wood trim, clay tiles and bricks, metals such as copper and aluminum electrical hardware or wire, and some plumbing hardware. ■ Historical fabric and architectural items from historic buildings. ■ Old-growth timbers. ■ Clean, uncontaminated concrete waste is used in some municipalities as aggregate for soil stabilization or reprocessed for use in roads, foundation stone, and other projects. Check with your local licensed landfill operator, earthmovers, or road construction personnel. Rubble (concrete, bricks, cinderblock, and certain types of tile) can be crushed and sieved for use as an aggregate.
Reuse on Site	■ Joist cut-offs can be cut up and used as stakes for forming or for headers around floor openings. Wood scraps can be used as bridging, splicers, wall components, filler, scabs, and spacers. ■ Leftover rigid insulation can be used as ventilation baffles or installed into house envelopes at joist header assemblies. ■ Asphalt can be reused on site by heating pavement, injecting petroleum distillates, grinding, mixing, and rerolling. It is estimated that 86 million tons of asphalt are recycled each year.
Recycle	■ Metal recyclers often take aluminum or copper wiring scrap, other wiring fixtures, conduit, iron, copper, brass, steel, lead piping, and appliances, such as refrigerators, freezers, washers, and stoves. ■ Uncontaminated scrap lumber or pallets can be recycled into furniture or chipped and used for landscape mulch, compost, animal bedding, boiler fuel, or engineered building products. Sometimes pallets can be returned to the vendors. ■ Gypsum scraps can be recycled in some locations. ■ Glass can be recycled into fiberglass or used in place of sand in paving material. ■ Asphalt shingles can be used in asphalt highway and road paving and pothole repair. (visit <shinglerecycling.org>). ■ Thermal insulation (fiberglass, cellulose, rigid foam, foam-in-place). ■ Floor tiles (heavy duty/commercial use). ■ Carpet and carpet cushion.
Prevent Pollution and Reduce Waste	■ Ask drywall suppliers to back-haul scrap drywall for use in new drywall production. ■ Keep drywall cutoffs easily accessible to use for small spaces. ■ Replace toxic solvents, adhesives, and coatings with less hazardous products, such as water-based or low volatile organic compound (VOC) paint, adhesives, joint compounds, and sealants. ■ Reclaim solvents onsite for reuse, or contract with a recycling company. ■ To minimize spills while painting, clean spray guns by immersing only the front end in solvent. Clean spray guns by passing solvent through gun and into a container, rather than spraying cleaning solvent into the air. ■ Prepare smaller test batches of solvents and coatings. ■ Cover solvent, adhesive, and coating containers to prevent product evaporation. ■ Use solvent-based coatings with high levels of solids to reduce air emissions. ■ Arrange painting schedules to reduce wastes from cleaning equipment between tasks, shifts, or color changes.
Buy Green	■ Thermal insulation (fiberglass, cellulose, rigid foam, foam-in-place). ■ Floor tiles (heavy duty/commercial use). ■ Carpet and carpet cushion. ■ Recycled-content siding (made of recycled cellulose fiber and concrete). ■ Salvaged wood floors and trim. ■ Recycled steel studs and steel roofing. ■ Strawboard for interior walls (made of straw pressed together with a low VOC, formaldehyde-free adhesive). ■ Recycled-content roofing materials. ■ Plastic lumber products.

Reduce the Amount of Waste You Generate

Reduce Waste

How Should I Manage My Oil?

In the construction and demolition industry, many types of vehicles and equipment require the use of motor oil. Recycling is the preferred way of handling used oil to protect the environment and to conserve natural resources. Used oil can be re-refined into lubricants, re-processed into fuel oil, and used as raw materials for the refining and petrochemical industries. Used oil filters contain reusable scrap steel that producers can use as scrap feed. If you maintain your own vehicles, take the following steps to ensure the environment is protected by recycling this valuable resource:

- Follow good housekeeping practices and your state's used oil management standards.
- Do not mix used motor oil with anything.
- Keep clean-up materials such as rags, sand, booms, or clay kitty litter close at hand.
- Contain spilled oil by spreading sand or other clean-up material over and around the used motor oil.
- Buy and maintain reusable clean-up materials when possible.
- Recycle used oil clean-up materials or send them to an energy recovery facility when possible.
- Reduce waste and save money by using extraction devices (e.g., centrifuges, wringers and compactors) to recover used motor oil from reusable clean-up materials.
- Remove used motor oil from rags or other clean-up materials and recycle the motor oil as you normally would.
- Put used cleaning materials in the trash when they do not contain any free-flowing oil and when they can no longer be reused or recycled.
- Send used motor oil to a re-refiner whenever possible.
- Send used oil filters to a recycler whenever possible.

The recycling loop isn't complete until the materials that are sent for recycling are remanufactured into new products and purchased by consumers. Whenever possible, purchase re-refined motor oil for vehicles and equipment. Search EPA's Comprehensive Procurement Guidelines database for a listing of re-refined motor oil dealers in your area <www.epa.gov/cpg>.

How Should I Manage My Used Tires?

Typically, the many vehicles used in the construction and demolition industry will outlive their tires, requiring users to find replacements when the original tires are no longer functional. Discarded tires have always been and continue to be a serious disposal problem, taking up large amounts of landfill space and posing threats to human health and the environment. Salvaging used tires not only keeps them out of landfills, but provides the opportunity to save money on the replacements.

When tires becomes worn, take them to a retreader or other tire recycler. Technically, all types of tires can be retreaded. Retreading involves adding a new layer of tread to a used tire. Retreading tires not only saves landfill space, but also conserves the oil and energy used to make new tires. Retread tires cost between 30 percent and 50 percent less than a new tire. Search EPA's Comprehensive Procurement Guidelines database for a listing of retread tire manufacturers in your area <www.epa.gov/cpg>.

If tire retreading is not an option, look into the various state and private organizations that offer tire recycling programs. Recycled tires can be used in creating running tracks, playground surfaces, and shoe soles. Scrap tires can also be used in flooring/matting and as a soil amendment. Ground tires provide cushioning and maintain traction and shape; for this reason, they are increasingly used by highway departments as an asphalt additive to help extend the life of roads, and as low density aggregate in embankment and fill applications. See EPA's consolidated tire web site at <www.epa.gov/epaoswer/non-hw/muncpl/tires>.

Other Environmental Laws Affecting the Construction Industry

THE CLEAN WATER ACT

The Federal Water Pollution Control Act, commonly known as the Clean Water Act (CWA), is the federal program designed to restore and maintain the integrity of the nation's surface waters. CWA controls direct discharges to surface waters (e.g., through a pipe) from industrial processes or stormwater systems associated with an industrial activity. It also regulates indirect discharges, or discharges to publicly owned treatment works (POTWs) through a public sewer system, by requiring industrial facilities to pretreat their waste before discharging to a public sewer. Industrial pollutants from the construction industry that might be regulated by CWA include solvents and adhesives.

CWA Resources:

- 40 CFR Parts 100 to 129 and 400 to 503.
- Internet access: <www.epa.gov/OW/>
- EPA Office of Water: (202) 564-2240
- Your state water authority, Regional EPA office, and local POTW.

OIL POLLUTION PREVENTION UNDER THE CWA

The Oil Pollution Prevention regulations were promulgated under the authority of the CWA. These regulations establish requirements for facilities to prevent oil spills from reaching the navigable waters of the United States or adjoining shorelines. The regulations apply to non-transportation-related facilities with a specific aboveground or underground oil storage capacity that, because of their location, can reasonably be expected to discharge oil into the navigable waters of the United States.

Oil Pollution Prevention Regulation Resources:

- 40 CFR Part 112
- Internet Access: <www.epa.gov/oilspill/>

THE CLEAN AIR ACT

The Clean Air Act (CAA) regulates air pollution. It includes national emission standards for new stationary sources within particular industrial categories. It also includes national emission standards, which are designed to control the emissions of particular hazardous air pollutants (HAPs). Construction sites generate some HAPs, such as volatile organic compounds in organic solvents and paints. The CAA also seeks to prevent the accidental release of certain hazardous chemicals and to minimize the consequences of such releases.

CAA Resources:

- 40 CFR Parts 50 to 99
- Control Technology Center, Office of Air Quality, Planning and Standards, EPA, General Information: (919) 541-0800; Publications (919) 541-2777
- Internet Access: <www.epa.gov/ttn/catc>

ASBESTOS NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

The Clean Air Act also regulates asbestos renovations and demolitions. The Asbestos National Emissions Standards for Hazardous Air Pollutants (NESHAP) relating to demolitions and renovations is a work practice standard, meaning it does not place specific numerical emission limitations for asbestos fibers on asbestos demolitions and removals. Instead, it requires specific actions to be taken to control emissions. For more information about the asbestos NESHAP, asbestos-related renovation or demolition in buildings other than schools, or transport and disposal of asbestos waste, contact the Small Business Asbestos Ombudsman at (800) 368-5888 or <www.epa.gov/sbo>. For questions regarding asbestos in private homes, contact your state or regional EPA asbestos representative at <www.epa.gov/opptintr/asbestos/contacts.htm>.

CFR GUIDE TO HAZARDOUS WASTE REGULATIONS

To review the RCRA regulations referred to in this document, consult the following citations in 40 CFR:

- Part 260—Hazardous waste management system: general.
- Part 261— Identification and listing of hazardous waste.
- Part 262— Standards applicable to generators of hazardous waste.
- Part 263— Standards applicable to transporters of hazardous waste.
- Part 264— Standards for owners and operators of hazardous waste and specific types of hazardous waste management facilities.
- Part 265— Interim status standards for owners and operators of TSDFs.
- Part 266— Standards for the management of specific hazardous wastes and specific types of hazardous waste management facilities.
- Part 268— Land disposal restrictions.
- Part 270— EPA administered permit programs: the Hazardous Waste Permit Program.

CFR GUIDE TO HAZARDOUS WASTE REGULATIONS *continued*

- Part 271— Requirements for authorization of state hazardous waste programs.
- Part 272— Approved state hazardous waste management programs.
- Part 273— Standards for universal waste management.
- Part 279— Standards for the management of used oil.

FOR MORE INFORMATION

For additional information on any of these laws, visit <www.cicacenter.org>.

Other Environmental Laws Affecting the Construction Industry

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA OR SUPERFUND)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, commonly known as Superfund, authorizes EPA to respond to releases, or threatened releases, of hazardous substances that may endanger public health, welfare, or the environment, that might come from any source. Superfund also grants EPA the authority to force parties responsible for environmental contamination to clean it up or to reimburse response costs incurred by EPA. The most important part of this act applicable to construction sites is the hazardous substance release reporting requirement. The person in charge at your business must report to the National Response Center (800 424-8802), any release of a hazardous substance that exceeds a designated "reportable quantity" for that substance within a 24-hour period.

Superfund Resources:

- Internet Access: <www.epa.gov/superfund/>

THE EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT

The Superfund Amendments and Reauthorization Act (SARA) of 1986 created the Emergency Planning and Community Right-to-Know Act (EPCRA). This law was designed to improve community access to information about potential chemical hazards and to facilitate the development of chemical emergency response plans by state and local governments. The EPCRA regulations establish several types of reporting obligations for facilities that store or manage specified chemicals. Certain notification requirements apply to construction sites that use or store extremely hazardous substances. Also, many of the chemicals used by the construction industry, such as solvents, adhesives, and pigments, may be considered hazardous chemicals as defined by the Occupational Safety and Health Act (OSHA). Contact your local OSHA office if you have questions about whether the chemicals used in your construction business are considered hazardous under OSHA.

EPCRA Resources:

- 40 CFR Parts 350 to 372
- The State Emergency Response Commission <www.epa.gov/ceppo/serclist.htm>.
- Internet Access: <www.epa.gov/opptintr/tri/index.htm> and <www.epa.gov/swercepp/>

SAFE DRINKING WATER ACT

The Safe Drinking Water Act (SDWA) mandates that EPA establish regulations to protect human health from contaminants present in drinking water. Under the authority of the SDWA, EPA developed national drinking water standards and created a joint federal-state system to ensure compliance with these standards. EPA also regulates underground injection of liquid wastes under the SDWA to protect underground sources of drinking water.

SDWA Resources:

- 40 CFR Parts 141-148
- SDWA Hotline: (800) 426-4791
- Internet Access: <www.epa.gov/ogwdw/>

TOXIC SUBSTANCES CONTROL ACT

The Toxic Substances Control Act (TSCA) allows EPA to collect data on chemicals to evaluate, assess, mitigate, and control risks which may be posed by their manufacture, processing, and use. Construction sites may be affected by some of the TSCA requirements.

TSCA Resources:

- 40 CFR Parts 702 to 799
- TSCA Hotline: (202) 554-1404
- Internet Access: <www.epa.gov/internet/oppts/>

Contacts and Resources

U.S. EPA RESOURCES

EPA's Construction and Demolition Debris Web Page

Web: www.epa.gov/epaoswer/non-hw/debris

Defines construction and demolition debris, provides background information, and provides a link to EPA's report, entitled "Characterization of Building-Related Construction and Demolition Debris in the United States."

Web: www.epa.gov/reg5rcra/wptdiv/solidwaste/construction.htm

The Region 5 web site provides information on recycling waste at construction and demolition sites.

Managing Your Environmental Responsibilities—A Planning Guide for Construction and Development

Available at www.cicacenter.org

RCRA Hazardous Waste Resources

Web: www.epa.gov/osw/topics.htm

Provides an alphabetical, clickable index of waste topics. Links to other sections of the EPA site for more information.

RCRA Information Center

U.S. Environmental Protection Agency
RCRA Information Center (5305W)
1200 Pennsylvania Avenue, NW.
Washington, DC 20460
Phone: (703) 603-9230
Fax: (703) 603-9234
E-mail: rcra-docket@epamail.epa.gov

Holds and provides public access to all regulatory materials on RCRA and distributes technical and non-technical information on RCRA issues.

Envirosense

Web: www.epa.gov/envirosense/index.html

An EPA site containing technical, policy, and general information on pollution prevention topics.

Headquarters Library

U.S. Environmental Protection Agency
Headquarters Library
1200 Pennsylvania Avenue, NW (3404T)
Washington, DC 20460
Phone: (202) 566-0556
Fax: (202) 566-0562
E-mail: library-hq@epa.gov
Web: www.epa.gov/natlibra/hqirc/about.htm

Maintains environmental reference materials for EPA staff and the general public, including books, journals, abstracts, newsletters, and audiovisual materials generated by government agencies and the private sector. Also provides access to online computer service bulletin boards and CD/ROM systems.

Jobs Through Recycling Construction Web Page

Web: www.epa.gov/jtr/comm/construc.htm

Section of EPA's Jobs Through Recycling Web Site that addresses recycling of construction materials. Provides information on recycling markets for construction and demolition debris.

Comprehensive Procurement Guidelines

Web: www.epa.gov/cpg

EPA's Comprehensive Procurement Guideline Program specifies recycled-content products, including construction materials, for federal government use.

National Lead Information Center

Phone: (800) 424-LEAD (5323)
Fax: (301) 585-6151
Web: www.epa.gov/lead/nlic.htm

Distributes information about lead hazards and their prevention.

Pollution Prevention Information Clearinghouse (PPIC)

U.S. Environmental Protection Agency
Pollution Prevention Information Clearinghouse (PPIC)
1200 Pennsylvania Avenue, NW (7407)
Washington, DC 20460
Phone: (202) 260-1023
Fax: (202) 260-4659
Email: ppic@epamail.epa.gov

A free, nonregulatory EPA service dedicated to reducing or eliminating industrial pollutants through technology transfer, education, and public awareness. Provides links to EPA pollution prevention resources.

Small Business Ombudsman Clearinghouse/Hotline

U.S. Environmental Protection Agency
Small Business Ombudsman (2131)
1200 Pennsylvania Avenue, NW.
Washington, DC 20460
Phone: (800) 368-5888
Fax: (703) 305-6462
Web: www.smallbiz-enviroweb.org

Helps private citizens, small businesses, and smaller communities with questions on all program aspects within EPA.

OTHER FEDERAL AND STATE GOVERNMENT RESOURCES

Other Federal Resources

Army Corps Construction Engineering Research Lab

ERDC-CERL
PO Box 9005
Champaign, IL 61826-9005
Web: www.cecer.army.mil

CERL, a part of the U.S. Army Engineer Research and Development Center, conducts research and development to support environmentally sustainable military installations. To carry out its mission, CERL works extensively with the academic community and public industry, facilitating technology and knowledge transfer between the private and government sectors.

Code of Federal Regulations (CFR)

Superintendent of Documents
U.S. Government Printing Office
Phone: (866) 512-1800
(202) 512-1800 (DC area)
Web: http://bookstore.gpo.gov

Most of the RCRA requirements are contained in Title 400, Parts 260 to 299 contains. Order from the U.S. Government Printing Office.

Naval Facilities Engineering Service Center

Web: http://enviro.nfesc.navy.mil

Engineering Services section of the Naval Facilities Engineering Service Center.

U.S. Department of Transportation (DOT)

Hazardous Materials Information Center
Phone: (800) 467-4922
Web: http://hazmat.dot.gov/

Provides information about DOT's hazardous materials regulations.

U.S. General Services Administration's Construction Waste Management Database

Web: http://cwm.gsa.gov

Searchable online database contains nationwide information on companies that haul, collect, and process debris from construction projects.

USDA Forest Products Lab

One Gifford Pinchot Drive
Madison, WI 53726-2398
Phone: (608) 231-9200
Fax: (608) 231-9592
Web: www.fpl.fs.fed.us/documnts/recycling_wood.htm

The nation's leading wood research institute, recognized nationally and internationally as an unbiased source of information on wood science and use.

State Resources

Construction and Demolition Waste Recovery: Processing, Recycling, Burning and Transport

Web: www.dnr.state.wi.us/org/aw/air/reg/asbestos/asbes6.htm

Wisconsin Department of Natural Resources Web site outlines a number of issues related to construction and demolition waste.

Contacts and

Integrated Waste Management Board's Construction and Demolition (C&D) Recycling Program

Web: www.ciwmb.ca.gov/ConDemo

A California Web site that allows users to search a database of facilities within and outside of California that collect specific types of construction and demolition debris for reuse or recycling.

University of Florida Powell Center for Construction & Environment

Rinker Hall Room 304
P.O. Box 115703
Gainesville, FL 33711-5703
Contact: Dr. Charles Kibert
Phone: (352) 273-1189"
E-mail: ckibert@ufl.edu
Web: <www.cce.ufl.edu>

Fosters the implementation of sustainability principles into the creation of the built environment, ensuring that energy, water, materials, and land are utilized efficiently and that renewable and recyclable resources are emphasized.

MATERIALS EXCHANGE RESOURCES

EPA's Listing of International, National, and State-Specific Material Exchanges

Web: www.epa.gov/jtr/comm/exchange.htm

Defines and describes materials and waste exchanges, and provides contact information for state, national, and international material exchanges.

Materials Exchange Organizations Index

Web: www.recycle.net/recycle/exch

Alphabetical listing of materials exchanges.

RecycleXchange

Web: www.recyclexchange.com/exchange

Classified advertisements for buying and selling various materials, including construction and demolition debris.

Recycling Exchange Links on the Small Business Environmental Home Page

Web: www.smallbiz-enviroweb.org/pollution/recycling_links.html

Listing of helpful resource links for small businesses interested in increasing their recycling efforts.

TRADE, PROFESSIONAL, AND ADVOCACY ASSOCIATIONS AND ORGANIZATIONS

Construction Industry Compliance Assistance Center (CICA)

www.cicacenter.org

The CICA Web site provides plain language explanations of environmental rules for the construction industry and links to detailed information, including state regulations.

Construction Materials Recycling Association

P.O. Box 644
Lisle, IL 60532
Phone: (630) 548-4510
Fax: (630) 548-4511
Email: turley@cdrecycling.org
Web: www.cdrecycling.org
Contact: William Turley

A national association that promotes the recycling and reuse of construction and demolition materials.

American Association of State Highway and Transportation Officials (AASHTO)

444 North Capitol Street, NW., Suite 249
Washington, DC 20001
Phone: (202) 624-5800
Fax: (202) 624-5806
Email: info@aashto.org
Web: www.transporation.org

Association representing highway and transportation departments in all 50 states, the District of Columbia, and Puerto Rico.

Asphalt Recycling & Reclaiming Association

PMB 250
#3 Church Circle
Annapolis, MD 21401
Phone: (410) 267-0023
Fax: (410) 267-7546
E-Mai: MemberServices@arra.org
Web: www.arra.org

Serves as a network for asphalt recycling information exchange and technology transfer among professionals in the highway industry.

Associated General Contractors of America

333 John Carlyle Street
Suite 200
Alexandria, VA 22314
Phone: (703) 548-3118
Fax: (703) 548-3119
E-Mail: info@agc.org
Web: www.agc.org

Organization of construction contractors and industry-related companies dedicated to improving the construction industry by educating the industry about the latest skills, technology, and products. Select "Environmental Services" and "Environmental Publications.

Building Deconstruction Consortium

Web: www.denix.osd.mil/denix/Public/Library/Sustain/BDC/bdc.html

A network of building professionals working to maximize reuse of building materials. The network identifies and develops technical resources to encourage building material reuse that is fiscally, environmentally, and occupationally sound.

Center for Resourceful Building Technology

P.O. Box 100
Missoula, MT 59806
Phone: (406) 549-7678
Fax: (406) 549-4100
E-Mail: crbt@ncat.org
Web: www.crbt.org

Dedicated to promoting environmentally responsible construction practices and containing information on recycled-content building products and environmental building techniques.

Deconstruction Institute

1143 Central Avenue
Sarasota, FL 34236
Phone: (941) 358-7730
Fax: (941) 362-4290
Web: www.deconstructioninstitute.com

Web site provides educational materials, tools and techniques, networking, case studies, articles, facts, and many other downloadable and interactive modules about the environmental impacts of building deconstruction.

Institute for Local Self-Reliance

927 15th St. NW, 4th Floor
Washington, DC 20005
Phone: (202) 898-1610
Web: www.ilsr.org

Organization helping community groups, government leaders, and entrepreneurs develop environmentally friendly economic strategies that contribute to sustainable economic systems.

Resources

National Association of Demolition Contractors (NADC)

16 North Franklin Street
Suite 203
Doylestown, PA 18901-3536
Phone: (800) 541-2412
Fax: (215) 348-8422
E-mail: info@demolitionassociation.com
Web: www.demolitionassociation.com

The National Association of Demolition Contractors represents over 850 demolition contractors and 200 associated industry companies worldwide. NADC facilitates education and communication regarding safety and technology between industry members and regulators.

National Association of Home Builders (NAHB)

1201 15th Street, NW
Washington, DC 20005
Phone: (800) 368-5242 or (202) 822-0200 within the Washington, DC metropolitan area.
E-mail: info@NAHB.org
Web: www.nahb.org

Organization representing home builders. Participates in a partnership, known as Build American Beautiful, along with Keep American Beautiful, Inc., a national nonprofit organization dedicated to improving waste practices. Build American Beautiful recognizes contractors who keep construction sites clean and make efforts to recycle and reduce wastes.

National Association of Home Builders Research Center

400 Prince George's Blvd
Upper Marlboro, MD 20774
Phone: (301) 249-4000, (800) 638-8556
Fax: (301) 430-6180
E-mail: webmaster@nahbrc.org
Web: www.nahbrc.org

A wholly owned subsidiary of NAHB, which aims to keep government agencies, manufacturers, builders, and remodelers on the leading edge of home construction technology.

The Recycled Materials Resource Center

220 Environmental Technology Building
35 Calvos Road
Durham, NH 03824
Phone: (603) 862-4704
Fax: (603) 862-3957
E-Mail: rmrc@rmrc.unh.edu
Web: www.rmrc.unh.edu

National center that serves as the principal point of contact for the use of recycled materials (pavements, secondary waste, by-product materials) in the highway environment.

The Reuse People, Inc.

2100 Ferry Point #150
Alameda, CA 94501
Phone: (510) 522-2722
E-mail: info@TheReusePeople.org
Web: www.thereusepeople.org

A nonprofit corporation dedicated to reducing the solid waste stream entering our landfills by diverting and salvaging usable building materials and providing them to individuals, businesses and families, including low-income families in Mexico.

Shinglerecycling.org

Web: www.shinglerecycling.org

An online resource center developed by EPA, the University of Florida, CMRA, and the National Roofing Contractors Association, shinglerecycling.org provides comprehensive information regarding shingle recycling, including barriers to recycling, recycling markets, regulatory concerns, and links to other resources.

Steel Recycling Institute

680 Andersen Drive
Pittsburgh PA 15220-2700
Phone: (800) YES-1-CAN (937-1226)
E-mail: sri@recycle-steel.org
Web: www.recycle-steel.org

National trade association representing the steel industry and providing steel recycling information, links, and a database of steel recyclers in the United States.

U.S. Green Building Council

1015 18th Street, NW., Suite 805
Washington, DC 20036
Phone: (202) 82-USGBC (828-7422)
Fax: (202) 828-5110
Web: www.usgbc.org

The mission of this coalition is to accelerate the adoption of green building practices, technologies, policies, and standards.

Used Building Materials Association

1702 Walnut Street
Boulder, CO 80302
Phone: (303) 440-0703
Fax: (303) 441-4367
Web: www.ubma.org

A nonprofit organization that represents companies and organizations involved in the acquisition and redistribution of used building materials.

United States
Environmental Protection Agency
1200 Pennsylvania Ave., NW. (5305W)
Washington, DC 20460

Official Business
Penalty for Private Use $300

United States
Environmental Protection
Agency

Indoor Environments Division (6609J)
Office of Air and Radiation

EPA-402-F-96-005
October 1996

Protect Your Family and Yourself from Carbon Monoxide Poisoning

Carbon Monoxide Can Be Deadly

You can't see or smell carbon monoxide, but at high levels it can kill a person in minutes. Carbon monoxide (CO) is produced whenever any fuel such as gas, oil, kerosene, wood, or charcoal is burned. If appliances that burn fuel are maintained and used properly, the amount of CO produced is usually not hazardous. However, if appliances are not working properly or are used incorrectly, dangerous levels of CO can result. Hundreds of people die accidentally every year from CO poisoning caused by malfunctioning or improperly used fuel-burning appliances. Even more die from CO produced by idling cars. Fetuses, infants, elderly people, and people with anemia or with a history of heart or respiratory disease can be especially susceptible. Be safe. Practice the DO's and DON'Ts of carbon monoxide.

CO Poisoning Symptoms

Know the symptoms of CO poisoning. At moderate levels, you or your family can get severe headaches, become dizzy, mentally confused, nauseated, or faint. You can even die if these levels persist for a long time. Low levels can cause shortness of breath, mild nausea, and mild headaches, and may have longer-term effects on your health. Since many of these symptoms are similar to those of the flu, food poisoning, or other illnesses, you may not think that CO poisoning could be the cause.

Play it Safe

If you experience symptoms that you think could be from CO poisoning:

✓ **DO *GET FRESH AIR IMMEDIATELY.*** Open doors and windows, turn off combustion appliances and ***leave the house***.

✓ **DO *GO TO AN EMERGENCY ROOM*** *and tell the physician you suspect CO poisoning.* If CO poisoning has occurred, it can often be diagnosed by a blood test done soon after exposure.

✓ **DO** Be prepared to answer the following questions for the doctor:

- Do your symptoms occur only in the house? Do they disappear or decrease when you leave home and reappear when you return?
- Is anyone else in your household complaining of similar symptoms? Did everyone's symptoms appear about the same time?
- Are you using any fuel-burning appliances in the home?
- Has anyone inspected your appliances lately? Are you certain they are working properly?

Prevention **is the Key to Avoiding Carbon Monoxide Poisoning**

✓ **DO** have your fuel-burning appliances -- including oil and gas furnaces, gas water heaters, gas ranges and ovens, gas dryers, gas or kerosene space heaters, fireplaces, and wood stoves -- inspected by a trained professional at the beginning of every heating

season. Make certain that the flues and chimneys are connected, in good condition, and not blocked.

✓ **DO** choose appliances that vent their fumes to the outside whenever possible, have them properly installed, and maintain them according to manufacturers' instructions.

✓ **DO** read and follow all of the instructions that accompany any fuel-burning device. If you cannot avoid using an unvented gas or kerosene space heater, *carefully follow the cautions* that come with the device. Use the proper fuel and keep doors to the rest of the house open. Crack a window to ensure enough air for ventilation and proper fuel-burning.

✓ **DO** call EPA's IAQ INFO Clearinghouse (**1-800-438-4318**) or the Consumer Product Safety Commission (**1-800-638-2772**) for more information on how to reduce your risks from CO and other combustion gases and particles.

✗ **DON'T** idle the car in a garage -- even if the garage door to the outside is open. Fumes can build up very quickly in the garage and living area of your home.

✗ **DON'T** use a gas oven to heat your home, even for a short time.

✗ **DON'T** ***ever*** use a charcoal grill indoors -- even in a fireplace.

✗ **DON'T** sleep in any room with an unvented gas or kerosene space heater.

✗ **DON'T** use any gasoline-powered engines (mowers, weed trimmers, snow blowers, chain saws, small engines or generators) in enclosed spaces.

✗ **DON'T** ignore symptoms, particularly if more than one person is feeling them. You could lose consciousness and die if you do nothing.

A Few Words About CO Detectors

Carbon Monoxide Detectors are widely available in stores and you may want to consider buying one as a back up -- *BUT NOT AS A REPLACEMENT* for proper use and maintenance of your fuel-burning appliances. However, it is important for you to know that the technology of CO detectors is still developing, that there are several types on the market, and that they are not generally considered to be as reliable as the smoke detectors found in homes today. Some CO detectors have been laboratory-tested, and their performance varied. Some performed well, others failed to alarm even at very high CO levels, and still others alarmed even at very low levels that don't pose any immediate health risk. And unlike a smoke detector, where you can easily confirm the cause of the alarm, CO is invisible and odorless, so it's harder to tell if an alarm is false or a real emergency.

So What's a Consumer to Do?

First, don't let buying a CO detector lull you into a false sense of security. Preventing CO from becoming a problem in your home is better than relying on an alarm. Follow the checklist of DOs and DON'Ts above.

Second, if you shop for a CO detector, do some research on features and don't select solely on the basis of cost. Non-governmental organizations such as Consumers Union (publisher of *Consumer Reports*), the American Gas Association, and Underwriters Laboratories (UL) can help you make an informed decision. Look for UL certification on any detector you purchase.

Carefully follow manufacturers' instructions for its placement, use, and maintenance.

If the CO detector alarm goes off:

- Make sure it is your CO detector and not your smoke detector.
- Check to see if any member of the household is experiencing symptoms of poisoning.
- If they are, get them out of the house immediately and seek medical attention. Tell the doctor that you suspect CO poisoning.
- If no one is feeling symptoms, ventilate the home with fresh air, turn off all potential sources of CO -- your oil or gas furnace, gas water heater, gas range and oven, gas dryer, gas or kerosene space heater and any vehicle or small engine.
- Have a qualified technician inspect your fuel-burning appliances and chimneys to make sure they are operating correctly and that there is nothing blocking the fumes from being vented out of the house.

DESINFECCIÓN DE AGUA POTABLE EN SITUACIONES DE EMERGENCIA

En una situación de emergencia, en que el servicio de agua habitual está interrumpido (por ejemplo, ante un huracán, una inundación o la rotura de una tubería de agua), es posible que las autoridades locales recomienden consumir solo agua envasada, hervida o desinfectada hasta que se restablezca el servicio de agua habitual. Las siguientes instrucciones le muestran cómo hervir y desinfectar agua para eliminar la mayoría de los microorganismos que causan enfermedades y que pueden estar en el agua. Sin embargo, al hervir o desinfectar el agua, no se eliminan otros contaminantes, como los metales pesados, las sales y la mayoría de otras sustancias químicas.

PARA BEBER, COCINAR, ELABORAR CUALQUIER BEBIDA PREPARADA, LAVAR LOS PLATOS Y CEPILLARSE LOS DIENTES, USE SOLO AGUA QUE HAYA SIDO DESINFECTADA EN FORMA ADECUADA.

- ❑ Use **agua embotellada** o agua que haya preparado y almacenado en forma apropiada como suministro de agua de emergencia.

- ❑ Si no tiene agua envasada, **hierva agua corriente**. Hervirla será suficiente para eliminar bacterias patógenas, virus y protozoos (OMS, 2015).
  - Si el aspecto del agua es turbio, permita que se asiente y fíltrela haciéndola pasar por un paño limpio, servilleta de papel o filtro de café.
  - Permita que el agua alcance un hervor constante durante no menos de un minuto. En lugares que estén a una altitud superior a los 5000 pies (1000 metros), hierva el agua durante tres minutos.
    - Deje que se enfríe en forma natural y guárdela en recipientes limpios con tapa.
  - Para mejorar el sabor soso del agua hervida, agregue una pizca de sal por cada cuarto de galón o litro de agua, o vierta el agua de un recipiente limpio a otro varias veces.

- ❑ Si no puede hervir agua, **desinféctela con lejía de uso doméstico**. Use solo productos a base de lejía de cloro sin olor que sean aptos para desinfección e higiene, según se indica en la etiqueta. No use lejía con aroma, para ropa de color ni con limpiadores agregados.
  - Si el aspecto del agua es turbio, permita que se asiente y fíltrela haciéndola pasar por un paño limpio, servilleta de papel o filtro de café.
  - Busque un gotero limpio del gabinete de medicamentos o del equipo de insumos de emergencia.
    - Busque la lejía líquida que haya estado guardada a temperatura ambiente durante menos de un año. La etiqueta debería indicar que contiene 8,25 % de hipoclorito de sodio.
  - Use la tabla que está en la siguiente página como una guía para decidir la cantidad de lejía que debe agregar al agua; por ejemplo, agregue 6 gotas de lejía por cada galón de agua. Duplique la cantidad de lejía si el agua está turbia, tiene algún color o está muy fría.
  - Mezcle y deje reposar durante 30 minutos. El agua debería tener un olor suave a cloro. De lo contrario, repita la dosis y deje en reposo durante otros 15 minutos antes de usar.
  - En caso de que el sabor a cloro sea demasiado intenso, vierta el agua de un recipiente limpio a otro y deje reposar durante algunas horas antes de usarla.

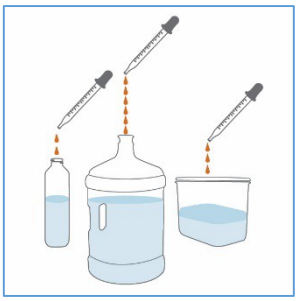


Tabla 1: Guía de dosis de lejía según la cantidad de agua

Volume of Water	Amount of Liquid Bleach to Add†
1 cuarto/litro	2 gotas
1 galón	6 gotas
2 galones	12 gotas (1/8 de
4 galones	1/4 cucharadita
8 galones	1/2 cucharadita
† La lejía contiene 8,25 % de hipoclorito de sodio.	

ORIENTACIÓN ADICIONAL SOBRE EL AGUA EN CASOS DE EMERGENCIA

Prepare y guarde un suministro de agua de emergencia. Visite el sitio web de la Agencia Federal para el Manejo de Emergencias (FEMA, por sus siglas en inglés) www.ready.gov/managing-water para obtener más información en inglés sobre cómo preparar y almacenar un suministro de agua de emergencia.

Busque otras fuentes de agua en su casa o en los alrededores. Si bien el agua envasada es la mejor opción, tal vez encuentre otras fuentes de agua si derrite cubos de hielo o desagota las tuberías o el tanque de agua caliente. No debe usar el agua del tanque de depósito ni del interior del inodoro ni de radiadores, colchones de agua, piscinas o hidromasajes.

Puede usar agua de ríos o lagos. Por lo general, es mejor usar agua que circula en lugar de agua quieta o estancada. No obstante, no use agua que tenga material que flota, color oscuro u olor dudoso.

Cualquiera sea la fuente, trate el agua según las instrucciones que están en la página anterior.

Si en su propiedad cuenta con un pozo de agua que se inundó, asegúrese de desinfectarlo y realice una prueba en el agua del pozo después de la inundación. Para obtener asesoramiento, comuníquese con el Departamento de Salud estatal o local o ingrese en water.epa.gov/drink/info/well/whatdo.cfm.

Tenga en cuenta el aspecto del agua y cómo filtrarla, si fuera necesario. La desinfección no actúa bien cuando el agua está turbia o tiene color. Si observa turbidez, deje que se asiente. Luego, filtre el agua haciéndola pasar por un paño limpio, servilleta de papel o filtro de café. Guarde el agua asentada y filtrada en recipientes limpios y con tapa.

OTROS MÉTODOS DE DESINFECCIÓN

Si no tiene lejía líquida, puede usar alguno de los otros métodos de desinfección que se describen a continuación.

- **Hipoclorito de calcio granulado**. El primer paso es preparar una solución de cloro que usará para desinfectar el agua. Por su seguridad, hágalo en un área ventilada y use protección para los ojos. Agregue una cucharadita colmada (aproximadamente ¼ de onza) de hipoclorito de calcio (HTH) granulado de alta resistencia a dos galones de agua y mezcle hasta que las partículas se haya disuelto. De la mezcla se obtendrá una solución de aproximadamente 500 miligramos por litro. Para desinfectar el agua, agregue una parte de solución de cloro por cada 100 partes de agua que está en tratamiento. Esto es casi lo mismo que agregar 1 pinta (16 onzas) de solución de cloro a 12,5 galones de agua. En caso de que el sabor a cloro sea demasiado intenso, vierta el agua de un recipiente limpio a otro y deje reposar durante algunas horas antes de usarla. PRECAUCIÓN: El HTH es un oxidante muy potente. Siga las instrucciones de la etiqueta sobre la manipulación y el almacenamiento seguros de esta sustancia química.
- **Yodo de uso doméstico (o "tintura de yodo")**. Es probable que tenga yodo en su gabinete de medicamentos o equipo de primeros auxilios. Agregue cinco gotas de tintura de yodo al 2 % por cada cuarto de galón o litro de agua que desinfectará. Si el agua está turbia o tiene color, agregue 10 gotas de yodo. Mezcle y deje que el agua repose durante al menos 30 minutos antes de usarla.
- **Tabletas para desinfección de agua**. Puede desinfectar agua con tabletas que contienen cloro, yodo, dióxido de cloro u otros agentes desinfectantes. Estas tabletas están disponibles en forma electrónica o en farmacias y en tiendas de artículos deportivos. Siga las instrucciones que aparecen en la etiqueta, ya que cada producto puede tener diferente potencia.

MÁS INFORMACIÓN

Organización Mundial de la Salud (OMS), 2015. *Informe técnico sobre agua hervida*: http://www.who.int/water_sanitation_health/dwq/Boiling_water_01_15.pdf?ua=1&ua=1]

Línea de atención directa de EPA sobre el Agua Potable Segura 1-800-426-4791
water.epa.gov/drink/hotline

United States
Environmental Protection
Office of Air and Radiation

Revised November 2012

Flood Cleanup: Avoiding Indoor Air Quality Problems

Fact Sheet

Introduction

During a flood cleanup, the indoor air quality in your home or office may appear to be the least of your problems. However, failure to remove contaminated materials and to reduce moisture and humidity can present serious long-term health risks. Standing water and wet materials are a breeding ground for microorganisms, such as viruses, bacteria, and mold. They can cause disease, trigger allergic reactions, and continue to damage materials long after the flood.

This fact sheet discusses problems caused by microbial growth, as well as other potential effects of flooding, on long-term indoor air quality and the steps you can take to lessen these effects. Although the information contained here emphasizes residential flood cleanup, it is also applicable to other types of buildings.

Prepare for Cleanup

Read ***Repairing Your Flooded Home*** prepared by the Federal Emergency Management Agency and the American Red Cross. The booklet discusses flood safety issues and can save your life. The booklet also contains detailed information on proper methods for cleaning up your home. You should also consult the wealth of information on the FEMA, CDC, and The American Lung Association sites on the subject, which are listed below:

- FEMA website on floods/flooding - www.fema.gov/hazards/floods
- The American Red Cross – www.redcross.org
- American Lung Association's Fact Sheet on Flood Clean-up www.lungusa.org/air/flood_factsheet99.html

This fact sheet provides additional information not covered in the original FEMA/American Red Cross booklet on indoor air quality concerns related to flooding (however, because this fact sheet was prepared in 1993, it is more than likely that FEMA and the Red Cross and the American Lung Association do have more up-to-date information and resources available which you should consult). Many of the methods used for general cleanup, as detailed in the booklet, are the same as those used to avoid problems with indoor air quality. For brevity, we have not provided detail on the general methods used for cleanup here. This fact sheet is intended to be used in conjunction with the FEMA/American Red Cross booklet and resources.

Children are different from adults. They may be more vulnerable to chemicals and organisms they are exposed to in the environment.

Avoid Problems from Microbial Growth

Remove Standing Water

Standing water is a breeding ground for microorganisms, which can become airborne and be inhaled. Where floodwater contains sewage or decaying animal carcasses, infectious disease is of concern. Even when flooding is due to rainwater, the growth of microorganisms can cause allergic reactions in sensitive individuals. For these health reasons, and to lessen structural damage, all standing water should be removed as quickly as possible.

Dry Out Your Home

Excess moisture in the home is an indoor air quality concern for three reasons:

- Microorganisms brought into the home during flooding may present a health hazard. These organisms can penetrate deep into soaked, porous materials and later be released into air or water. Coming in contact with air or water that contains these organisms can make you sick.
- High humidity and moist materials provide ideal environments for the excessive growth of microorganisms that are always present in the home. This may result in additional health concerns such as allergic reactions.
- Long-term increases in humidity in the home can also foster the growth of dust mites. Dust mites are a major cause of allergic reactions and asthma.

See **Step 4, Dry Out Your Home**, of the American Red Cross/FEMA booklet, ***Repairing Your Flooded Home***, on steps that should be taken to open up and dry out ceilings, walls, and floors in the home.

Be patient. The drying out process could take several weeks, and growth of microorganisms will continue as long as humidity is high. If the house is not dried out properly, a musty odor, signifying growth of microorganisms can remain long after the flood.

Remove Wet Materials

It can be difficult to throw away items in a home, particularly those with sentimental value. However, keeping certain items that were soaked by water may be unhealthy. Some materials tend to absorb and keep water more than others. In general, materials that are wet and cannot be thoroughly cleaned and dried within 24-48 hours should be discarded, as they can remain a source of microbial growth.

Information on the types of water-damaged materials that should be discarded are provided in Step 4, Dry Out Your Home, of the American Red Cross/FEMA booklet, *Repairing Your Flooded Home*

The booklet suggests that you may be able to dry out and save certain building materials (for example, wallboard, fiberglass insulation, and wall-to-wall carpeting that were soaked only with clean rainwater). You may, however, want to consider removing and replacing them to avoid indoor air quality problems. Because they take a long time to dry, they may be a source of microbial growth. For information on mold prevention and cleanup, visit www.epa.gov/mold.

In addition, fiberboard, fibrous insulation, and disposable filters should be replaced, if they are present in your heating and air conditioning system and have contacted water. (If a filter was designed to be cleaned with water and was in contact with clean rainwater only, ensure that it is thoroughly cleaned before reinstalling.)

Avoid Problems from the Use of Cleaners and Disinfectants

The cleanup process involves thorough washing and disinfecting of the walls, floors, closets, shelves, and contents of the house. In most cases, common household cleaning products and disinfectants are used for this task. FEMA also suggests the use of disinfectants and sanitizers on the ductwork for the heating and air conditioning system, if it has been flooded.

Disinfectants and sanitizers contain toxic substances. The ability of chemicals in other household products used for cleaning to cause health effects varies greatly, from those with no known health effect to those that are highly toxic. Read and follow label instructions carefully, and provide fresh air by opening windows and doors. If it is safe for you to use electricity and the home is dry, use fans both during and after the use of disinfecting, cleaning, and sanitizing products.

Be careful about mixing household cleaners and disinfectants together. Check labels for cautions on this. Mixing certain types of products can produce toxic fumes and result in injury and even death.

Avoid Carbon Monoxide Poisoning

Carbon monoxide (CO) is a colorless, odorless gas that can be lethal at high levels. Carbon monoxide levels can build up rapidly if certain types of combustion devices (for example, gasoline-powered generators, camp stoves and lanterns, or charcoal-burning devices) are used indoors. Do not use combustion devices designed for outdoor use indoors.

Avoid Problems from Airborne Asbestos and Lead Dust

Elevated concentrations of airborne asbestos can occur if asbestos-containing materials present in the home are disturbed. Airborne asbestos can cause lung cancer and mesothelioma, a cancer of the chest and abdominal linings. If you know or suspect that your home contains asbestos, contact the EPA TSCA Assistance Information Service at (202) 554-1404 for information on steps you should take to avoid exposure.

Lead is a highly toxic metal which produces a range of adverse health effects, particularly in young children. Disturbance or removal of materials containing lead-based paint may result in elevated concentration of lead dust in the air. If you know or suspect that your home contains lead-based paint, contact the National Lead Information Center to receive a general information packet, to order other documents, or for detailed information or questions. Call and speak with a specialist Monday through Friday, 8:00 am to 6:00 pm eastern time (except Federal holidays) at 1 (800) 424-LEAD [5323].

Additional Information

EPA's website on natural disasters: Flooding - www.epa.gov/naturaldisasters/flooding.html

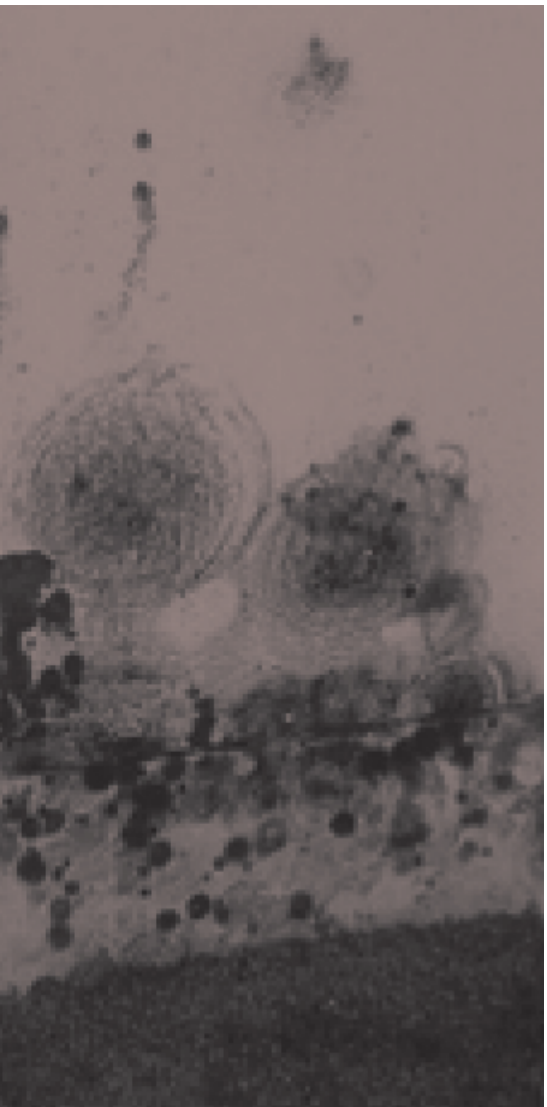
The Federal Emergency Management Agency's Flood website - www.fema.gov/hazards/floods/
Publications are available from:

FEMA – www.fema.gov
Jessup, MD 20794-2012
Phone: 800-480-2520/Fax: 301-362-5335

American Lung Association's Fact Sheet on Flood Clean-up - www.lungusa.org/air/flood_factsheet99.html

Centers for Disease Control (CDC) **Key Facts About Hurricane Recovery** - www.bt.cdc.gov/hurricanes/index.asp

HOMEOWNER'S AND RENTER'S GUIDE TO MOLD CLEANUP AFTER DISASTERS



Cleaning up after a flood can pose health risks. You and your family should wait to re-enter your home until professionals tell you it is safe, with no structural, electrical or other hazards.

Before you start cleanup activities, contact your insurance company and take pictures of the home and your belongings. Remember – drying your home and removing water-damaged items is your most important step for preventing mold damage.

IS THERE A PROBLEM?

Was your home flooded? If so, and you were not able to dry your home (including furniture and other items) within 24-48 hours, you should assume you have mold growth. You need to *completely* dry everything, clean up the mold, and make sure you don't still have a moisture problem.

You may see or smell mold on clothing, drywall, furniture, cardboard boxes, or books, but it may also be hidden under or behind items like carpet, cushions, or walls.

MOLD BASICS: HOW MOLDS CAN AFFECT YOUR HEALTH

Exposure to mold can lead to asthma attacks, eye and skin irritation, and allergic reactions. It can lead to severe infections in people with weakened immune systems. Avoid contaminated buildings and contaminated water as much as you can.

Flood water may have carried sewage or chemicals into your home. This could expose you or your family to viruses, bacteria, disease carriers (such as mosquitos), and parasites, as well as mold. To learn more about cleaning and disinfection go to: http://www.cdc.gov/healthywater/emergency/flood/standing.html

KEY MESSAGES

- Wear personal protective equipment. Wear an N-95 respirator at a minimum, goggles, and protective gloves.
- Use portable generators carefully, outside and away from the home, to avoid carbon monoxide poisoning and fires.
- Ensure the mold cleanup is complete before reoccupying your home.

You can protect yourself and your family from mold exposure by following these steps.

BEFORE YOU ENTER ANY MOLDY SITE:

- **Protect yourself and loved ones against hazards.** People with breathing problems like asthma or who have weakened immune systems should stay away from moldy sites. Children should not take part in disaster cleanup work. Check for loose power lines or gas leaks. Make sure the electricity and gas are turned off. Look for sagging ceilings or floors or other structural problems. Watch out for wet, muddy, or slippery floors.
- **Protect your mouth and nose** against breathing in mold: wear at least an N-95 respirator. If you plan to spend a lot of time removing moldy belongings or doing work like ripping out moldy drywall, wear a half-face or full-face respirator. Basic information on using it is in OSHA's general respiratory protection guidance.
- **Protect your skin.** Wear protective gloves (non-latex, vinyl, nitrile, or rubber). Do not touch mold or moldy items with bare hands.
- **Protect your eyes.** Wear goggles that provide *complete* eye protection. Choose goggles designed to keep out dust and small particles. Safety glasses or goggles that have open vent holes will not protect you against dust and small particles.

AFTER YOU LEAVE A MOLD SITE:

- **Protect yourself and loved ones**. Shower and change your clothes. This will help you avoid carrying mold and other hazards back to your current living quarters.

SHOULD I DO THIS MYSELF?

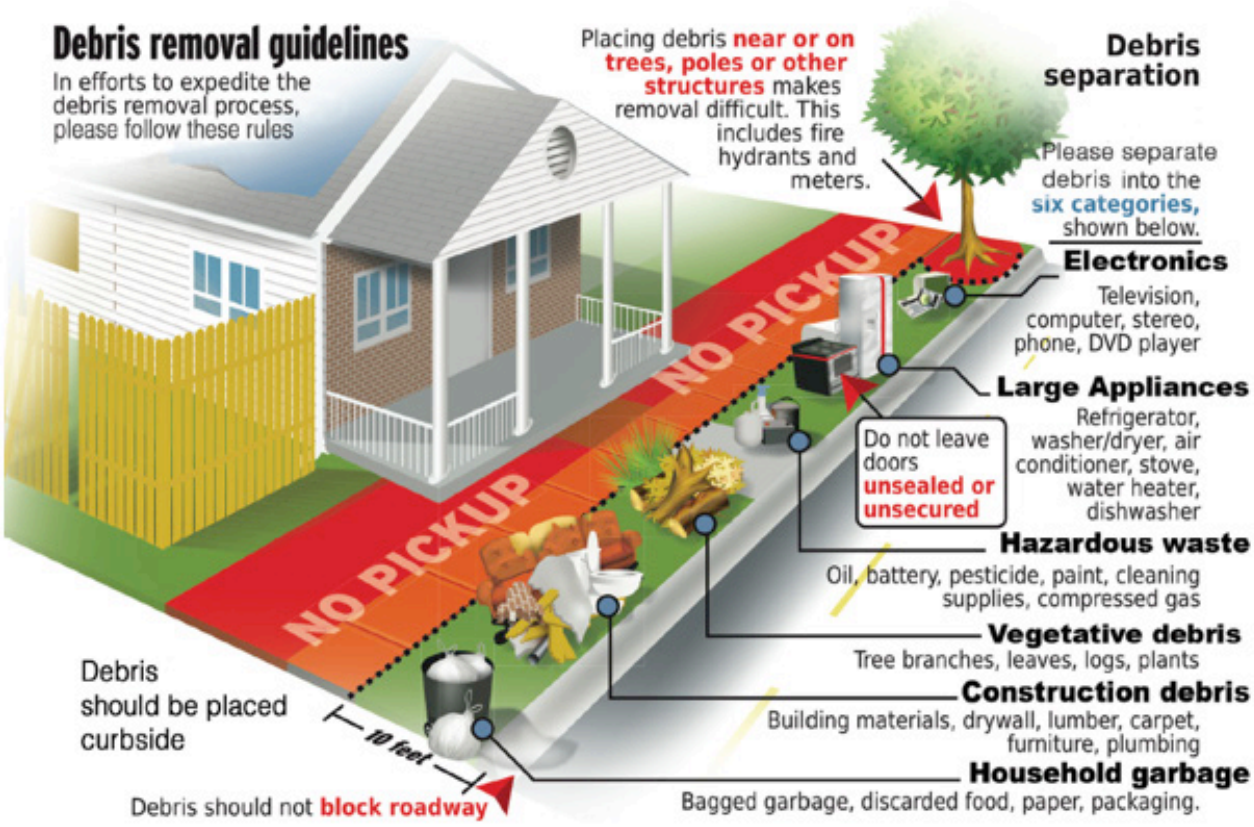
This job may be too difficult or dangerous for you. It may be best to get help from experienced and qualified professionals if you can. Hire a mold inspection or remediation professional affiliated with or certified by the National Environmental Health Association (NEHA), the American Industrial Hygiene Association (AIHA), the Institute of Inspection, Cleaning and Restoration Certification (IICRC), or American Council for Accredited Certification (ACAC) to inspect, repair, and restore the damaged parts of your home. Your state also may regulate mold remediation.

Sampling for mold is not usually recommended. Understanding the results can be difficult, and no matter what kind of mold is in your home, you need to clean it up and fix the moisture problem.

IF I MUST DO THIS MYSELF, HOW CAN I DO IT SAFELY?

Follow these steps:

1. Put on the personal protective equipment described above to protect your eyes, nose, mouth, and skin.
2. Remove standing water and wet materials. Use a wet vacuum to remove water from floors, carpets, and hard surfaces. Dry your home and everything in it as quickly as you can – within 24 to 48 hours if you can.
3. Open all doors and windows when you are working and leave as many open as is safe when you leave.
   - Open inside doors, especially closets and interior rooms, to let air flow to all areas. Take doors off their hinges if you need to.
   - Open kitchen cabinets and bathroom vanity doors; remove drawers, wipe them clean, and stack them to dry.
   - Open the attic access to let air flow to the attic. Before you open the attic door, make sure nothing will fall on you.
4. When electricity is safe to use, use fans and dehumidifiers to remove moisture. Do not use fans if mold has already started to grow, because the fans may spread the mold.
5. Clean with water and a detergent. Remove all mold you can see. Dry right away.
6. If you use cleaning products, do not mix cleaning products together. DO NOT mix bleach and ammonia because it can create toxic vapors.
7. Painting or caulking over mold will not prevent mold from growing. Fix the water problem completely and clean up all the mold before you paint or caulk.
8. Throw away items that can't be cleaned and dried. Throw away anything that was wet with flood water and can't be cleaned and dried completely within 24 to 48 hours. If you have precious items that you want to preserve, follow these guidelines from the Smithsonian Institute: http://www.si.edu/mci/english/learn_more/taking_care/mnm.html



SAFETY TIPS ON USING PORTABLE GENERATORS

If you use a portable generator for electricity use CAUTION to avoid carbon monoxide poisoning and fires.

- Use portable generators OUTSIDE and at least 20 feet away from buildings.
- Do not use portable generators inside your house or garage.
- Do not put portable generators on balconies or near doors, vents, or windows.
- Do not use portable generators near where you or your children are sleeping.
- Never refuel a generator while it is hot.
- For more information, go to: http://www.osha.gov/OshDoc/data_Hurricane_Facts/portable_generator_safety.pdf

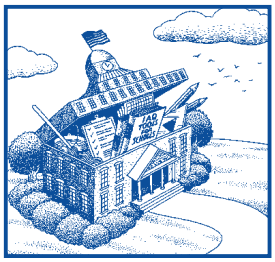
AM I DONE?

- If you still see or smell mold, you have more work to do. After a remediation, there should be no signs of water damage or mold growth.
- You may need to ask a mold remediation professional to know whether your mold problem is completely fixed. As noted in the "Should I do this myself?" section, sampling for mold is not usually recommended; instead, a careful inspection of the work area for completion of the cleanup and absence of mold-related odors is usually appropriate.
- If you have health problems that get worse when you return home, like asthma or allergy attacks or skin or eye irritation, you may still have some mold.

LOCAL CONTACT INFO:

United States Environmental Protection Agency
Indoor Environments Division (6609J)

Indoor Air Quality



Tools for Schools

Fact Sheet: MOLD IN SCHOOLS

When mold grows in school buildings and portable classrooms, some staff and students, particularly those with allergies or respiratory problems, may report adverse health effects.

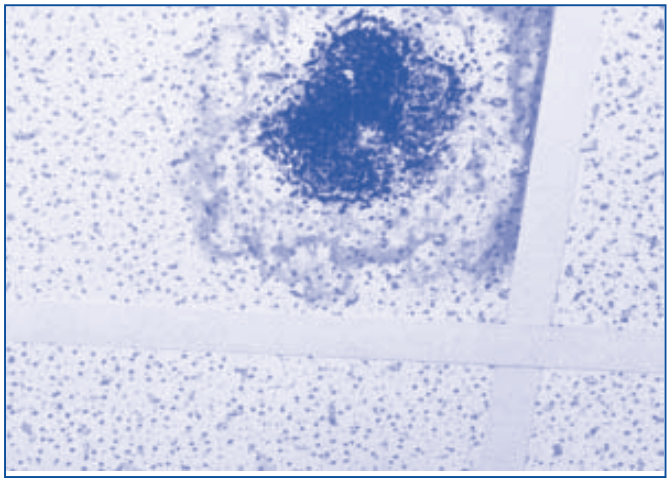
Mold requires oxygen, water, and a source of food to grow. There are molds that can grow on almost anything including: wood, paper, carpet, foods, and insulation. Controlling moisture is the key to managing mold in schools.

Why is Mold Growing in Your School?

- Mold grows in schools when airborne mold spores land on a damp "food source" and begin digesting it in order to survive.
- The water required for mold growth can enter school buildings and portable classrooms through leaky roofs, pipes, windows, foundations, and other structural openings. Water may also enter schools due to floods, poor drainage, or mis-directed sprinklers.
- Moisture problems in schools can result from scheduled maintenance activities or conditions during school breaks such as:
  - Increased moisture due to painting or carpet cleaning;
  - High humidity during the summer; and
  - No air conditioning or heating system operation (or reduced use) when school is not in session.
- When moisture enters the building and its interior structure, it can condense as it comes into contact with cooler indoor surfaces, such as windows, walls, and water pipes.

Where Does Mold Grow in Schools?

- Mold growth often results from excess moisture or water build-up in the following areas:



Photos above: mold growing on the surface of a unit ventilator and a ceiling tile.

  - On roof materials above ceilings;
  - Around windows;
  - Near water fountains;
  - On walls, ceiling tiles, and other visible surfaces;
  - On hidden surfaces, such as the back side of dry wall or wall coverings;
  - Around bathroom tiles;
  - In cooling coil drip pans and inside ductwork; and
  - In books and carpet.

Indoor Air Quality

Tools for Schools

What Health Effects are Associated with Mold?

- Potential health effects associated with mold exposure may include irritation of the eyes, skin, nose, throat, and lungs of both mold allergic and non-allergic people.
- In sensitive individuals allergic reactions can be caused by breathing in or touching mold.
- Dead mold may still cause allergic reactions in some people, so it is not enough to simply kill the mold and leave it there, the mold must be removed.

How Can You Manage Mold in Schools?

- The key to controlling indoor mold growth in schools is to control moisture.
- Conduct maintenance as scheduled and perform regular school building inspections for signs of mold, moisture, and leaks.
- Report all water leaks and moisture problems immediately to your maintenance staff.
- Clean and dry damp or wet building materials and furnishings within 24–48 hours after a leak or spill to prevent mold growth.
- Keep indoor relative humidity between 30% and 50%:
  - Ventilate bathrooms, locker rooms, and other moisture-generating sources to the outside.
  - Use air conditioners and dehumidifiers.
- Scrub mold off hard surfaces with water and detergent, and dry completely.
- Remove and replace porous materials, such as ceiling tiles or carpet, that become moldy.
- Avoid installing carpet in areas with perpetual moisture problems:
  - Near drinking fountains and classroom sinks.
  - On concrete floors in contact with the ground and subject to frequent condensation.

photo by Daniel Friedman

Photo above: mold growing on backside of wallboard.

- Cover cold surfaces, such as cold water pipes, with insulation.
- Ensure that the school operates exhaust systems, such as bathroom fans, together with air conditioning or heating systems.
- Establish policies that restrict moisture generating activities, such as carpet cleaning, during vacation unless moisture removing equipment is operating. Consider cycling the air conditioning system several hours every day or running portable dehumidifiers.
- Participate in U.S. EPA's *IAQ Tools for Schools* Program. This program provides guidance on good maintenance practices that help prevent mold growth and other IAQ problems.

Additional Resources

You can find more information on mold-related issues and moisture prevention in the following EPA documents:

- *Mold Remediation in Schools and Commercial Buildings*
  www.epa.gov/mold/mold_remediation.html
- *A Brief Guide to Mold, Moisture and Your Home*
  www.epa.gov/mold/moldguide.html
- *the IAQ Tools for Schools Action Kit*
  www.epa.gov/iaq/schools/actionkit.html
- *Managing Asthma in the School Environment*
  www.epa.gov/iaq/schools/asthma.html

United States Environmental Protection Agency

Office of Chemical Safety and Pollution Prevention (7404T)

EPA-740-F-11-001
September 2011
FACT SHEET

Post-Disaster Renovations and Lead-Based Paint

What is EPA's Renovation, Repair and Painting (RRP) Rule?
Contractors performing renovation, repair and painting projects that disturb more than six square feet of painted surfaces in homes and child-occupied facilities (including day care centers and schools) built before 1978 must, among other things, be certified and follow lead-safe work practices. Federal law requires that individuals receive certain information, such as EPA's *Renovate Right* brochure, before starting work.

Natural disasters, such as tornadoes, hurricanes, earthquakes or floods, often result in the need for renovations to damaged homes and other structures. When common renovation activities like sanding, cutting, and demolition occur in structures that contain lead-based paint, such activities create lead-based paint hazards, including lead-contaminated dust. Lead-based paint hazards are harmful to both adults and children, but particularly pregnant women and children under age six.

To protect against health risks, EPA's Renovation, Repair and Painting (RRP) Rule is designed to minimize exposure to lead-based paint hazards. Under this Rule, contractors performing renovation, repair and painting projects that disturb painted surfaces in homes and child-occupied facilities (including day care centers and schools), built before 1978, must, among other things, be certified and follow lead-safe work practices. For complete information about the RRP Rule and its requirements, go to: www.epa.gov/lead/pubs/renovation.htm#requirements.

To ensure that property owners and occupants are able to act quickly to preserve their homes and property in the wake of disasters, the RRP Rule includes an emergency provision exempting firms from certain requirements. See 40 CFR 745.82(b). Emergency renovations are defined as renovation activities that were not planned but result from a sudden, unexpected event that, if not immediately attended to, present a safety or public health hazard, or threaten equipment and/or property with significant damage. See the RRP Frequent Questions (FQ), #23002-32367, available at: http://toxics.supportportal.com/ics/support/splash.asp?deptID=23019.

Under the emergency provision of the RRP Rule, contractors performing activities that are immediately necessary to protect personal property and public health need not be RRP trained or certified and are exempt from the following RRP Rule requirements: information distribution, posting warning signs at the renovation site, containment of dust, and waste handling. Firms are NOT exempt from the RRP Rule's requirements related to cleaning, cleaning verification, and recordkeeping. Further, the exemption applies only to the extent necessary to respond to the emergency. Once the portion of the renovation that addresses the source of the emergency is completed, the remaining activities are subject to all requirements of the RRP Rule.

How do I find a list of certified renovation firms in my area?

To search an online directory of certified renovation firms, go to www.epa.gov/getleadsafe.

You can also contact the National Lead Information Center, 1-800-424-LEAD (5323).

What if I have a question about the RRP Rule that is not answered in this fact sheet?

Call the National Lead Information Center at 1-800-424-LEAD (5323).

My home has been severely damaged and will require extensive renovations. Does the RRP Rule apply?

The RRP Rule does not apply to an activity that demolishes and rebuilds a structure to a point where it is effectively new construction. Thus, in pre-1978 homes and child-occupied facilities where all interior and exterior painted surfaces (including windows) are removed and replaced, the provisions of the RRP Rule would not apply. Activities involving the removal and replacement of only some interior and exterior painted surfaces would still be covered under the RRP Rule. For more information, see the Frequent Questions (FQs 23002-18426 and 23002-23415) on our website at: http://epa.gov/lead/pubs/rrp-faq.pdf.

IMPORTANT NOTICE TO HOMEOWNERS

If you hire a contractor to perform renovation work on your pre-1978 home, you should be aware that, generally, your hired professional must be RRP-certified and observe the requirements of the RRP Rule. However, if the circumstances necessitate an emergency renovation as defined above, the professional need not comply with certain requirements of the RRP Rule as described earlier — but only to the extent necessary to respond to the emergency.

The RRP Rule **does not impose requirements on a homeowner performing work on an owner-occupied residence.** However, EPA encourages homeowners to hire certified professionals that have received required training on lead-safe work practices to prevent lead contamination. Homeowners that choose to perform renovation work themselves should take steps to contain the work area, minimize dust and clean up thoroughly. To learn how to perform renovation work safely, contact the National Lead Information Center, 1-800-424-LEAD (5323).

What steps should homeowners take to protect themselves and their families from exposure to lead dust if they plan on doing their own renovations?

- Contain the work area so that dust does not escape from the area. Cover floors and furniture that cannot be moved with heavy-duty plastic and tape, and seal off doors and heating and cooling system vents.
- Keep children, pregnant women, and pets out of the work area at all times.
- Minimize dust during the project by using techniques that generate less dust, such as wet sanding or scraping, or using sanders or grinders that have HEPA vacuum attachments which capture the dust that is generated.
- Clean up thoroughly by using a HEPA vacuum and wet wiping to clean up dust and debris on surfaces. Mop floors with plenty of rinse water before removing plastic from doors, windows, and vents.

United States Environmental Protection Agency

What to Do After the Flood

Drilled, driven or bored wells are best disinfected by a well or pump contractor, because it is difficult for the private owner to thoroughly disinfect these wells.

If you suspect that your well may be contaminated, contact your local or state health department or agriculture extension agent for specific advice on disinfecting your well. The suggestions below are intended to supplement flood precautions issued by State and local health authorities.

WARNING!
DO NOT TURN ON THE PUMP
There is danger of electrical shock and damage to your well or pump if they have been flooded

WARNING!
DO NOT WASH WITH WELL WATER
People drinking or washing with water from a private well that has been flooded will risk getting sick.

Well and Pump Inspection

Flood Conditions at the Well - Swiftly moving flood water can carry large debris that could loosen well hardware, dislodge well construction materials or distort casing. Coarse sediment in the flood waters could erode pump components. If the well is not tightly capped, sediment and flood water could enter the well and contaminate it. Wells that are more than 10 years old or less than 50 feet deep are likely to be contaminated, even if there is no apparent damage. Floods may cause some wells to collapse.

Electrical System - After flood waters have receded and the pump and electrical system have dried, do not turn on the equipment until the wiring system has been checked by a qualified electrician, well contractor, or pump contractor. If the pump's control box was submerged during the flood all electrical components must be dry before electrical service can be restored. Get assistance in turning the pump on from a well or pump contractor.

Pump Operation - All pumps and their electrical components can be damaged by sediment and flood water. The pump including the valves and gears will need to be cleaned of silt and sand. If pumps are not cleaned and properly lubricated they can burn out. Get assistance from a well or pump contractor who will be able to clean, repair or maintain different types of pumps.

Emergency Disinfection of Wells that have been Flooded

Before Disinfection: Check the condition of your well. Make sure there is no exposed or damaged wiring. If you notice any damage, call a professional before the disinfection process.

Materials Needed:

- One gallon of non-scented household liquid bleach;
- rubber gloves;
- eye protection;
- old clothes; and
- a funnel.

Step 1

If your water is muddy or cloudy, run the water from an outside spigot with a hose attached until the water becomes clear and free of sediments.

Step 2

Determine what type of well you have and how to pour the bleach into the well. Some wells have a sanitary seal with either an air vent or a plug that can be removed (a). If it is a bored or dug well, the entire cover can be lifted off to provide a space for pouring the bleach into the well (b).

Step 3

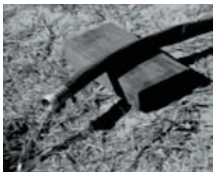
Take the gallon of bleach and funnel (if needed) and carefully pour the bleach down into the well casing.

Step 4

After the bleach has been added, run water from an outside hose into the well casing until you smell chlorine coming from the hose. Then turn off the outside hose.

Step 5

Turn on all cold water faucets, inside and outside of house, until the chlorine odor is detected in each faucet, then shut them all off. If you have a water treatment system, switch it to bypass before turning on the indoor faucets.



Step 6

Wait 6 to 24 hours before turning the faucets back on. It is important not to drink, cook, bathe or wash with this water during the time period --- it contains high amounts of chlorine.

Step 7

Once the waiting period is up, turn on an outside spigot with hose attached and run the water into a safe area where it will not disturb plants, lakes, streams or septic tanks. Run the water until there is no longer a chlorine odor. Turn the water off.

Step 8

The system should now be disinfected, and you can now use the water.

Step 9

Have your water tested for bacteria 7 to 10 days after disinfection.

Sampling and Testing the Well Water

Contact the local health department to have well water sampled and tested for contamination. Or, call your state laboratory certification officer to find a certified lab near you. You can get this number from the Safe Drinking Water Hotline (1-800-426-4791).

If the health department issues sterile bottles for the private well owner to collect water samples, follow all instructions for the use of these bottles.

After the pump is back in operation, the health department should sample and test the water at regular intervals.

CAUTION: Because of the extensive flood area and the speed and direction of ground water flow, your well may not be a safe source of water for many months after the flood. The well can become contaminated with bacteria or other contaminants. Waste water from malfunctioning septic tanks or chemicals seeping into the ground can contaminate the ground water even after the water was tested and found to be safe. It will be necessary to take long range precautions, including repeated testing, to protect the safety of drinking water.

CONCERNS AND ADVISORIES

If in doubt about the well water supply, follow health department drinking and bathing advisories.

Remember that there is a danger of electrical shock from any electrical device that has been flooded; consult a certified electrician. Rubber boots and gloves are not adequate protection from electric shock.

Well disinfection will not provide protection from pesticides, heavy metals and other types of non-biological contamination. If such contamination is suspected, due to the nearness of these contaminant sources, special treatment is required.

Information on home water treatment units (also called point-of-use and point-of-entry units) is available from U.S. EPA by phoning the **Safe Drinking Water Hotline (1-800-426-4791)**.

If you observe chemical containers (including barrels and drums) that have moved to your property, call your state or county health department or the **Superfund Hotline (1-800-424-9346)**.

For information on long-term water quality conditions in the area, consult the state or county health department.

Well owners may have information about the construction, or testing of their well and this information will be helpful to the health department in determining water quality conditions.

Septic systems should not be used immediately after floods. Drain fields will not work until underground water has receded. Septic lines may have broken during the flood.

United States Environmental Protection Agency

How to Dispose of Medicines Properly

DON'T: Flush expired or unwanted prescription and over-the-counter drugs down the toilet or drain unless the label or accompanying patient information specifically instructs you to do so.

DO: Return unwanted or expired prescription and over-the-counter drugs to a drug take-back program or follow the steps for household disposal below.

1ST CHOICE: DRUG TAKE-BACK EVENTS

To dispose of prescription and over-the-counter drugs, call your city or county government's household trash and recycling service and ask if a drug take-back program is available in your community. Some counties hold household hazardous waste collection days, where prescription and over-the-counter drugs are accepted at a central location for proper disposal.

Courtesy: Upper Watauga Riverkeeper and Appalachian Voices

Drug Take-Back Event

2ND CHOICE: HOUSEHOLD DISPOSAL STEPS*

1. Take your prescription drugs out of their original containers.

2. Mix drugs with an undesirable substance, such as cat litter or used coffee grounds.

3. Put the mixture into a disposable container with a lid, such as an empty margarine tub, or into a sealable bag.

4. Conceal or remove any personal information, including Rx number, on the empty containers by covering it with permanent marker or duct tape, or by scratching it off.

5. The sealed container with the drug mixture, and the empty drug containers, can now be placed in the trash.

* Drug Disposal Guidelines, Office of National Drug Control Policy, October 2009

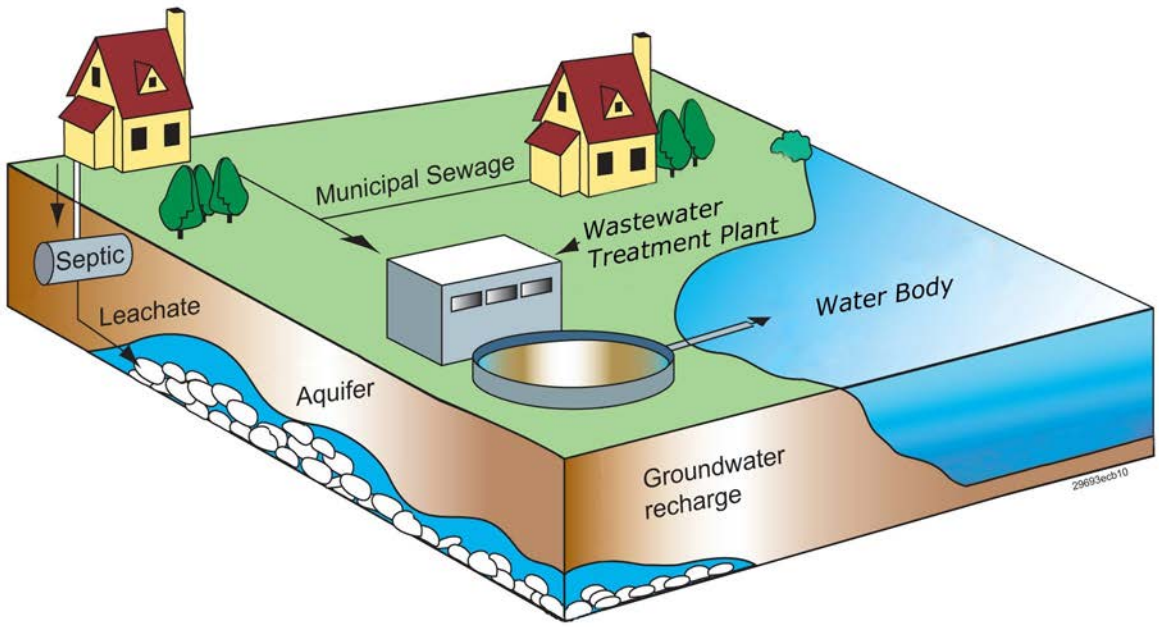
How Proper Disposal of Medicines Protects You and the Earth:

- Prevents poisoning of children and pets
- Deters misuse by teenagers and adults
- Avoids health problems from accidentally taking the wrong medicine, too much of the same medicine, or a medicine that is too old to work well
- Keeps medicines from entering streams and rivers when poured down the drain or flushed down the toilet

How Improper Disposal of Medicines May End Up in Our Drinking Water Sources

In homes that use septic tanks, prescription and over-the-counter drugs flushed down the toilet can leach into the ground and seep into ground water.

In cities and towns where residences are connected to wastewater treatment plants, prescription and over-the-counter drugs poured down the sink or flushed down the toilet can pass through the treatment system and enter rivers and lakes. They may flow downstream to serve as sources for community drinking water supplies. Water treatment plants are generally not equipped to routinely remove medicines.



For more information, go to www.epa.gov/ppcp/
Or call the Safe Drinking Water Hotline at 800-426-4791

Septic Systems—What to Do after the Flood

Where can I find information on my septic system?

Please contact your local health department for additional advice and assistance. For more information on onsite/decentralized wastewater systems, call the National Environmental Services Center at (800) 624-8301 or visit their website at www.nesc.wvu.edu.

Do I pump my tank during flooded or saturated drainfield conditions?

No! At best, pumping the tank is only a temporary solution. Under worst conditions, pumping it out could cause the tank to try to float out of the ground and may damage the inlet and outlet pipes. The best solution is to plug all drains in the basement and drastically reduce water use in the house.

What if my septic system has been used to dispose wastewater from my business (either a home–based or small business)?

In addition to raw sewage, small businesses may use their septic system to dispose of wastewater containing chemicals. If your septic system that receives chemicals backs up into a basement or drain field take extra precautions to prevent skin, eye and inhalation contact. The proper clean-up depends of what chemicals are found in the wastewater. Contact your State or EPA for specific clean-up information.

What do I do with my septic system after the flood?

Once floodwaters have receded, there are several things homeowners should remember:

- Do not drink well water until it is tested. Contact your local health department.
- Do not use the sewage system until water in the soil absorption field is lower than the water level around the house.
- Have your septic tank professionally inspected and serviced if you suspect damage. Signs of damage include settling or an inability to accept water. Most septic tanks are not damaged by flooding since they are below ground and completely covered. However, septic tanks and pump chambers can fill with silt and debris, and must be professionally cleaned. If the soil absorption field is clogged with silt, a new system may have to be installed.
- Only trained specialists should clean or repair septic tanks because tanks may contain dangerous gases. Contact your health department for a list of septic system contractors who work in your area.
- If sewage has backed up into the basement, clean the area and disinfect the floor. Use a chlorine solution of a half cup of chlorine bleach to each gallon of water to disinfect the area thoroughly.

- Pump the septic system as soon as possible after the flood. Be sure to pump both the tank and lift station. This will remove silt and debris that may have washed into the system. Do not pump the tank during flooded or saturated drainfield conditions. At best, pumping the tank is only a temporary solution. Under worst conditions, pumping it out could cause the tank to try to float out of the ground and may damage the inlet and outlet pipes.
- Do not compact the soil over the soil absorption field by driving or operating equipment in the area. Saturated soil is especially susceptible to compaction, which can reduce the soil absorption field's ability to treat wastewater and lead to system failure.
- Examine all electrical connections for damage before restoring electricity.
- Be sure the septic tank's manhole cover is secure and that inspection ports have not been blocked or damaged.
- Check the vegetation over your septic tank and soil absorption field. Repair erosion damage and sod or reseed areas as necessary to provide turf grass cover.

Remember: Whenever the water table is high or your sewage system is threatened by flooding there is a risk that sewage will back up into your home. The only way to prevent this backup is to relieve pressure on the system by using it less.

1. What are some suggestions offered by experts for homeowners with flooded septic systems?

2. Use common sense. If possible, don't use the system if the soil is saturated and flooded. The wastewater will not be treated and will become a source of pollution. Conserve water as much as possible while the system restores itself and the water table fails.

3. Prevent silt from entering septic systems that have pump chambers. When the pump chambers are flooded, silt has a tendency to settle in the chambers and will clog the drainfield if it is not removed.

4. Do not open the septic tank for pumping while the soil is still saturated. Mud and silt may enter the tank and end up in the drainfield. Furthermore, pumping out a tank that is in saturated soil may cause it to "pop out" of the ground. (Likewise, recently installed systems may "pop out" of the ground more readily than older systems because the soil has not had enough time to settle and compact.)

5. Do not dig into the tank or drainfield area while the soil is still wet or flooded. Try to avoid any work on or around the disposal field with heavy machinery while the soil is still wet. These activities will ruin the soil conductivity.

6. Flooding of the septic tank will have lifted the floating crust of fats and grease in the septic tank. Some of this scum may have floated and/or partially plugged the outlet tee. If the septic system backs up into the house check the tank first for outlet blockage. Clean up any floodwater in the house without dumping it into the sink or toilet and allow enough time for the water to recede. Floodwaters from the house that are passed through or pumped through the septic tank will cause higher flows through the system. This may cause solids to transfer from the septic tank to the drainfield and will cause clogging.

7. Locate any electrical or mechanical devices the system may have that could be flooded to avoid contact with them until they are dry and clean.

8. Aerobic plants, upflow filters, trickling filters, and other media filters have a tendency to clog due to mud and sediment. These systems will need to be washed and raked.

Flood water can make the air in your home unhealthy.

This is because when things get wet for more than 2 days they usually get moldy. There may also be germs and bugs in your home after a flood.

When cleaning wear

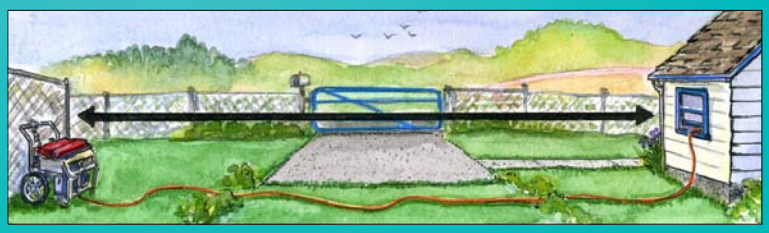
- ✓ An N-95 respirator (Hardware stores usually sell them.)
- ✓ Goggles
- ✓ Gloves
- ✓ Long pants, long-sleeved shirt, and boots or work shoes

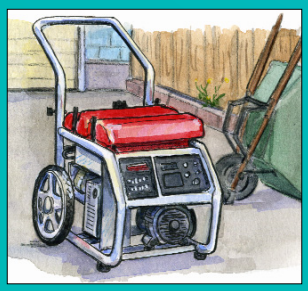
Clean and dry your house and everything in it.

Clean and dry hard surfaces. Throw away anything that was wet with flood water and can't be cleaned.

Flood Cleanup and the Air in Your Home

Use portable generators OUTSIDE and far away from the building.





Portable Generator

The exhaust, or fumes, from a portable generator could kill you in minutes if you breathe it in!

EPA

For more information contact the U.S. Environmental Protection Agency (EPA) free hotline

1-800-438-4318

or go to the EPA website

www.epa.gov/iaq/flood

EPA 402-H-07-001

Resources for You in the Aftermath of Hurricane Harvey

Our regional offices are up and running to assist you

TCEQ Customer Service and After-Hours Line:
1-888-777-3186

Texas residents can use this line to report environmental complaints or concerns. During regular business hours, calls will be routed automatically to the closest TCEQ regional office. Callers after business hours will be directed to an answering service that will get your message to the TCEQ immediately.

Los hispanohablantes pueden llamar al 1-888-777-3186.

Find TCEQ Guidance and Resources on the Web

Visit our main hurricane response webpage:
www.tceq.texas.gov//response/hurricanes

Here are some of the documents we've posted to assist you:

- Hauling hurricane-related debris to the curb in participating areas: <**go.usa.gov/xR688**>
- After the flood, is your water safe to drink? <**go.usa.gov/xR68R**>
- Disinfecting your private well: <**go.usa.gov/xR68Q**>
- How to sample your well water and understand the results: <**go.usa.gov/xR68E**>
- Status of systems in areas affected by Harvey: <**www.tceq.texas.gov/goto/harvey**>

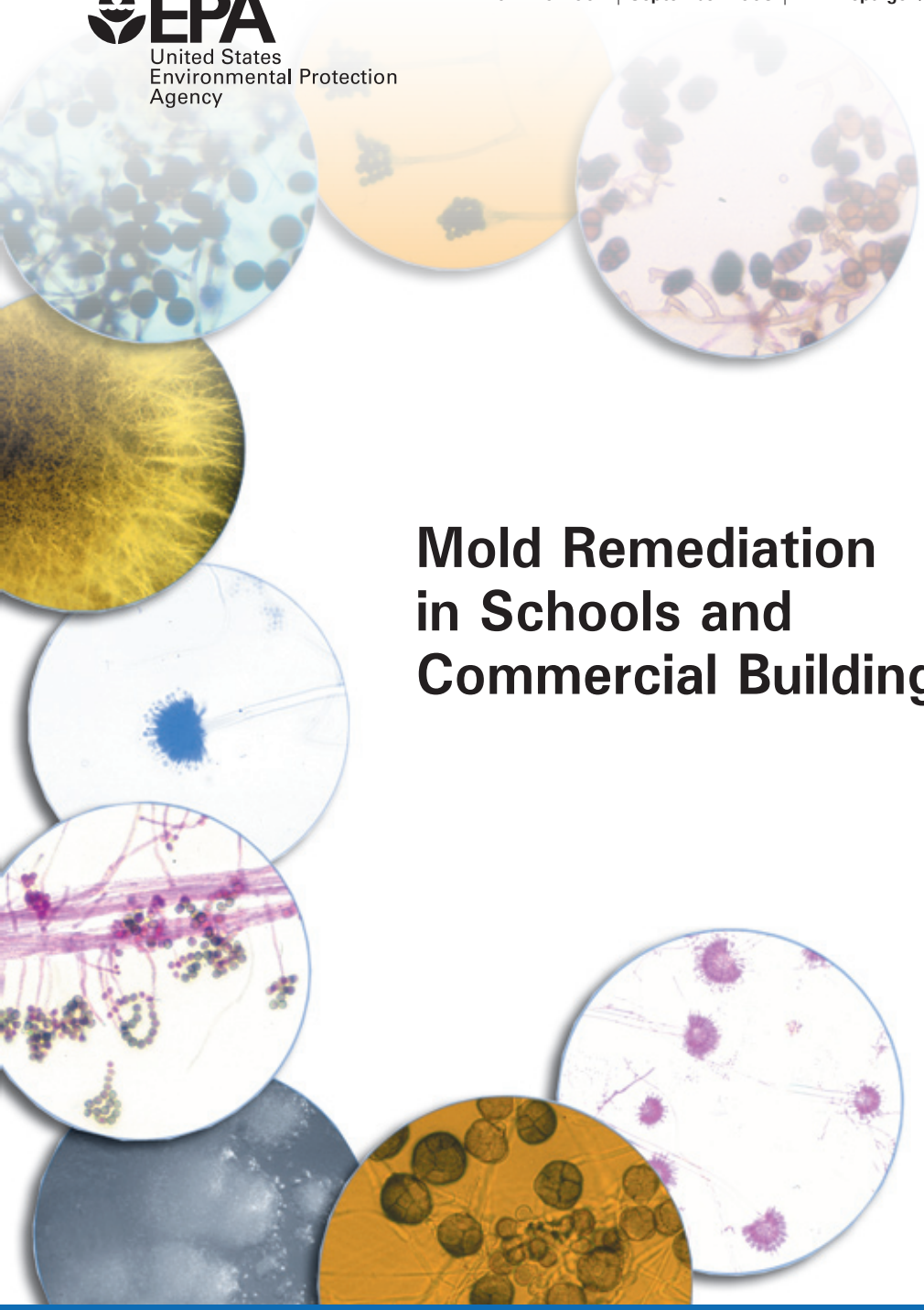
TCEQ

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

9/6/2017

EPA 402-K-01-001 | September 2008 | www.epa.gov/mold

United States Environmental Protection Agency



Mold Remediation in Schools and Commercial Buildings

Indoor Air Quality (IAQ)

Acknowledgements

This document was prepared by the Indoor Environments Division (IED) of the U.S. Environmental Protection Agency. IED would like to thank the reviewers of this document who provided many valuable and insightful comments, and the contractors who provided support during the development of this document.

EPA would also like to thank those who provided photos: Terry Brennan (Photo #2, Photo #3A, Photo #4A, Photo #6, Photo #8, Photo #9); Paul Ellringer (Photo #4C); Stephen Vesper, Ph.D. (Photo #3B); and Chin Yang, Ph.D. (cover photos, Photo #4B, Photo #5, Photo #7).

Please note that this document presents *recommendations* on mold remediation. EPA does not regulate mold or mold spores in indoor air.

Cover Photos: Magnified photos of different species of mold

Mold Remediation in Schools and Commercial Buildings

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Introduction

Concern about indoor exposure to mold has been increasing as the public becomes aware that exposure to mold can cause a variety of health effects and symptoms, including allergic reactions. This document presents guidelines for the remediation/cleanup of mold and moisture problems in schools and commercial buildings; these guidelines include measures designed to protect the health of building occupants and remediators. It has been designed primarily for building managers, custodians, and others who are responsible for commercial building and school maintenance. It should serve as a reference for potential mold and moisture remediators. Using this document, individuals with little or no experience with mold remediation should be able to make a reasonable judgment as to whether the situation can be handled in-house. It will help those in charge of maintenance to evaluate an in-house remediation plan or a remediation plan submitted by an outside contractor.[1] Contractors and other professionals who respond to mold and moisture situations in commercial buildings and schools may also want to refer to these guidelines.

Molds gradually destroy the things they grow on. Prevent damage to building materials and furnishings, save money, and avoid potential health risks by controlling moisture and eliminating mold growth.

Photo 2: Extensive mold contamination of ceiling and walls

[1] If you choose to use outside contractors or professionals, make sure they have experience cleaning up mold, check their references, and have them follow the recommendations presented in this document, the guidelines of the American Conference of Government Industrial Hygienists (ACGIH) (see Resources List), and/or guidelines from other professional organizations.

Molds can be found almost anywhere; they can grow on virtually any organic substance, as long as moisture and oxygen are present. There are molds that can grow on wood, paper, carpet, foods, and insulation. When excessive moisture accumulates in buildings or on building materials, mold growth will often occur, particularly if the moisture problem remains undiscovered or unaddressed. It is impossible to eliminate all mold and mold spores in the indoor environment. However, mold growth can be controlled indoors by controlling moisture indoors.

Molds reproduce by making spores that usually cannot be seen without magnification. Mold spores waft through the indoor and outdoor air continually. When mold spores land on a damp spot indoors, they may begin growing and digesting whatever they are growing on in order to survive. Molds gradually destroy the things they grow on.

Many types of molds exist. All molds have the potential to cause health effects. Molds can produce allergens that can trigger allergic reactions or even asthma attacks in people allergic to mold. Others are known to produce potent toxins and/or irritants. Potential health concerns are an important reason to prevent mold growth and to remediate/clean up any existing indoor mold growth.

Since mold requires water to grow, it is important to prevent moisture problems in buildings. Moisture problems can have many causes, including uncontrolled humidity. Some moisture problems in buildings have been linked to changes in building construction practices during the 1970s, ’80s, and ’90s. Some of these changes have resulted in buildings that are tightly sealed, but may lack adequate ventilation, potentially leading to moisture buildup. Building materials, such as drywall, may not allow moisture to escape easily. Moisture problems may include roof leaks, landscaping or gutters that direct water into or under the building, and unvented combustion appliances. Delayed maintenance or insufficient maintenance are also associated with moisture problems in schools and large buildings. Moisture problems in portable classrooms and other temporary structures have frequently been associated with mold problems.

When mold growth occurs in buildings, adverse health problems may be reported by some building occupants, particularly those with allergies or respiratory problems. Remediators should avoid exposing themselves and others to mold-laden dusts as they conduct their cleanup activities. Caution should be used to prevent mold and mold spores from being dispersed throughout the air where they can be inhaled by building occupants.

Prevention

The key to mold control is moisture control. Solve moisture problems before they become mold problems!

Mold Prevention Tips

- Fix leaky plumbing and leaks in the building envelope as soon as possible.
- Watch for condensation and wet spots. Fix source(s) of moisture problem(s) as soon as possible.
- Prevent moisture due to condensation by increasing surface temperature or reducing the moisture level in air (humidity). To increase surface temperature, insulate or increase air circulation. To reduce the moisture level in air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).
- Keep heating, ventilation, and air conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
- Vent moisture-generating appliances, such as dryers, to the outside where possible.
- Maintain low indoor humidity, below 60% relative humidity (RH), ideally 30 – 50%, if possible.
- Perform regular building/HVAC inspections and maintenance as scheduled.
- Clean and dry wet or damp spots within 48 hours.
- Don't let foundations stay wet. Provide drainage and slope the ground away from the foundation.

Investigating, Evaluating, and Remediating Moisture and Mold Problems

Safety Tips While Investigating and Evaluating Mold and Moisture Problems

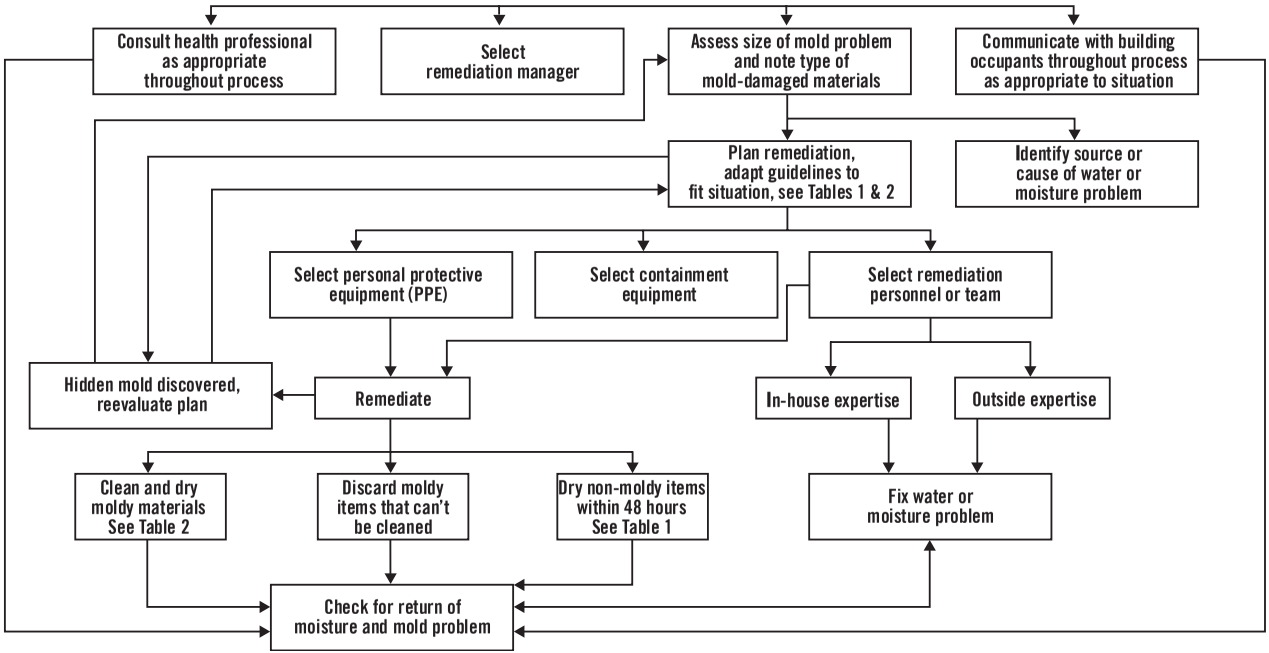
- Do not touch mold or moldy items with bare hands.
- Do not get mold or mold spores in your eyes.
- Do not breathe in mold or mold spores.
- Consult Table 2 and text for Personal Protective Equipment (PPE) and containment guidelines.
- Consider using PPE when disturbing mold. The minimum PPE is an N-95 respirator, gloves, and eye protection.

Moldy Areas Encountered During an Investigation

Photo 3A: Mold growing in closet as a result of condensation from room air

Photo 3B: Front side of wallboard looks fine, but the back side is covered with mold

Mold Remediation – Key Steps



Plan the Remediation Before Starting Work

Questions to Consider Before Remediating

- Are there existing moisture problems in the building?
- Have building materials been wet more than 48 hours? (See Table 2 and text)
- Are there hidden sources of water or is the humidity too high (high enough to cause condensation)?
- Are building occupants reporting musty or moldy odors?
- Are building occupants reporting health problems?
- Are building materials or furnishings visibly damaged?
- Has maintenance been delayed or the maintenance plan been altered?
- Has the building been recently remodeled or has building use changed?
- Is consultation with medical or health professionals indicated?

Remediation Plan

Assess the size of the mold and/or moisture problem and the type of damaged materials before planning the remediation work. Select a remediation manager for medium or large jobs (or small jobs requiring more than one person). The remediation plan should include steps to fix the water or moisture problem, or the problem may reoccur. The plan should cover the use of appropriate Personal Protective Equipment (PPE) and include steps to carefully contain and remove moldy building materials to avoid spreading the mold.[2] A remediation plan may vary greatly depending on the size and complexity of the job, and may require revision if circumstances change or new facts are discovered.

The remediation manager's highest priority must be to protect the health and safety of the building occupants and remediators. It is also important to communicate with building occupants when mold problems are identified.[3] In some cases,

[2] Molds are known allergens and may be toxic. You may wish to use Personal Protective Equipment (PPE) while investigating a mold problem, as well as during remediation/cleanup situations. The minimum PPE includes an N-95 respirator, gloves, and eye protection.

[3] See Appendix C.

especially those involving large areas of contamination, the remediation plan may include temporary relocation of some or all of the building occupants. The decision to relocate occupants should consider the size and type of the area affected by mold growth, the type and extent of health effects reported by the occupants, the potential health risks that could be associated with debris, and the amount of disruption likely to be caused by remediation activities. If possible, remediation activities should be scheduled for off-hours when building occupants are less likely to be affected.

Remediators, particularly those with health-related concerns, may wish to check with their doctors or health care professionals before working on mold remediation or investigating potentially moldy areas. If you have any doubts or questions, you should consult a health professional before beginning a remediation project.

HVAC System

Do not run the HVAC system if you know or suspect that it is contaminated with mold. If you suspect that it may be contaminated (it is part of an identified moisture problem, for instance, or there is mold growth near the intake to the system), consult EPA's guide *Should You Have the Air Ducts in Your Home Cleaned?*[4] before taking further action (see Resources List).

Photo 4A: Contaminated fibrous insulation inside air handler cover

Photo 4B: Mold growth on air diffuser in ceiling

Photo 4C: Moldy air duct

[4]Although this document has a residential focus, it is applicable to other building types.

Hidden Mold

In some cases, indoor mold growth may not be obvious. It is possible that mold may be growing on hidden surfaces, such as the back side of drywall, wallpaper, or paneling, the top of ceiling tiles, the underside of carpets and pads, etc. Possible locations of hidden mold can include pipe chases and utility tunnels (with leaking or condensing pipes), walls behind furniture (where condensation forms), condensate drain pans inside air handling units, porous thermal or acoustic liners inside ductwork, or roof materials above ceiling tiles (due to roof leaks or insufficient insulation). Some building materials, such as drywall with vinyl wallpaper over it or wood paneling, may act as vapor barriers,[5] trapping moisture underneath their surfaces and thereby providing a moist environment where mold can grow. You may suspect hidden mold if a building smells moldy, but you cannot see the source, or if you know there has been water damage and building occupants are reporting health problems. Investigating hidden mold problems may be difficult and will require caution when the investigation involves disturbing potential sites of mold growth—make sure to use PPE. For example, removal of wallpaper can lead to a massive release of spores from mold growing on the underside of the paper. If you believe that you may have a hidden mold problem, you may want to consider hiring an experienced professional. If you discover hidden mold, you should revise your remediation plan to account for the total area affected by mold growth.

Hidden Mold Growth

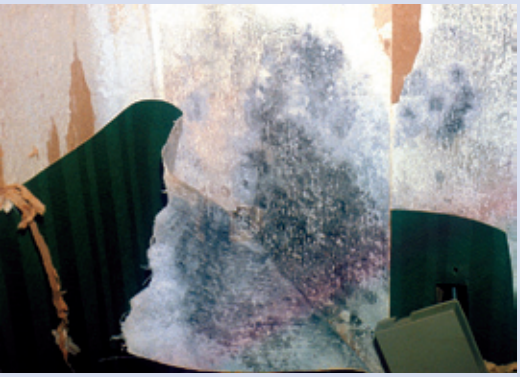


Photo 5: Mold growth behind wallpaper

[5]For more information on vapor barriers and building construction, see Resources List. It is important that building materials be able to dry; moisture should not be trapped between two vapor barriers or mold may result.

Remediation

1. Fix the water or humidity problem. Complete and carry out repair plan if appropriate. Revise and/or carry out maintenance plan if necessary. Revise remediation plan, as necessary, if more damage is discovered during remediation. See Mold Remediation – Key Steps (page 5) and Resources List (page 29) for additional information.
2. Continue to communicate with building occupants, as appropriate to the situation. Be sure to address all concerns.
3. Completely clean up mold and dry water-damaged areas. Select appropriate cleaning and drying methods for damaged/contaminated materials. Carefully contain and remove moldy building materials. Use appropriate Personal Protective Equipment (PPE). Arrange for outside professional support if necessary.

The Key to Mold Control is Moisture Control!

- When addressing mold problems, don't forget to address the source of the moisture problem, or the mold problem may simply reappear!
- Remember to check for high humidity and condensation problems as well as actual water leaks, maintenance issues, and HVAC system problems.
- Protect the health and safety of the building occupants and remediators. Consult a health professional as needed. Use PPE and containment as appropriate when working with mold.

Table 1: Water Damage Cleanup and Mold Prevention[6]

Table 1 presents strategies to respond to water damage within 24 – 48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Table 1, refer to Table 2 for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

[6] Please note that Tables 1 and 2 contain general guidelines. Their purpose is to provide basic information for remediation managers to first assess the extent of the damage and then to determine whether the remediation should be managed by in-house personnel or outside professionals. The remediation manager can then use the guidelines to help design a remediation plan or to assess a plan submitted by outside professionals.

Table 1: Water Damage – Cleanup and Mold Prevention

Guidelines for Response to Clean Water Damage within 24 – 48 Hours to Prevent Mold Growth*	
Water-Damaged Material†	**Actions**
Books and papers	* For non-valuable items, discard books and papers. * Photocopy valuable/important items, discard originals. * Freeze (in frost-free freezer or meat locker) or freeze-dry.
Carpet and backing – dry within 24 – 48 hours§	* Remove water with water extraction vacuum. * Reduce ambient humidity levels with dehumidifier. * Accelerate drying process with fans.
Ceiling tiles	* Discard and replace.
Cellulose insulation	* Discard and replace.
Concrete or cinder block surfaces	* Remove water with water extraction vacuum. * Accelerate drying process with dehumidifiers, fans, and/or heaters.
Fiberglass insulation	* Discard and replace.
Hard surface, porous flooring§ (Linoleum, ceramic tile, vinyl)	* Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary. * Check to make sure underflooring is dry; dry underflooring if necessary.
Non-porous, hard surfaces (Plastics, metals)	* Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary.
Upholstered furniture	* Remove water with water extraction vacuum. * Accelerate drying process with dehumidifiers, fans, and/or heaters. * May be difficult to completely dry within 48 hours. If the piece is valuable, you may wish to consult a restoration/water damage professional who specializes in furniture.
Wallboard (Drywall and gypsum board)	* May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard, and replace. * Ventilate the wall cavity, if possible.
Window drapes	* Follow laundering or cleaning instructions recommended by the manufacturer.
Wood surfaces	* Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors.) * Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry. * Wet paneling should be pried away from wall for drying.

*If mold growth has occurred or materials have been wet for more than 48 hours, consult Table 2 guidelines. Even if materials are dried within 48 hours, mold growth may have occurred. Items may be tested by professionals if there is doubt. Note that mold growth will not always occur after 48 hours; this is only a guideline.

These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then Personal Protective Equipment and containment are required by the Occupational Safety and Health Administration (OSHA). An experienced professional should be consulted if you and/or your remediators do not have expertise remediating in contaminated water situations. Do not use fans before determining that the water is clean or sanitary.

† If a particular item(s) has high monetary or sentimental value, you may wish to consult a restoration/water damage specialist.

§ The subfloor under the carpet or other flooring material must also be cleaned and dried. See the appropriate section of this table for recommended actions depending on the composition of the subfloor.

Table 2: Mold Remediation Guidelines[7]

Table 2 presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Table 2 are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods. If you are considering cleaning your ducts as part of your remediation plan, you should consult EPA's publication entitled, *Should You Have the Air Ducts In Your Home Cleaned?*[8] (see Resources List). If possible, remediation activities should be scheduled for off-hours when building occupants are less likely to be affected.

Mold and Indoor Air Regulations and Standards

Standards or Threshold Limit Values (TLVs) for airborne concentrations of mold, or mold spores, have not been set. As of December 2000, there are no EPA regulations or standards for airborne mold contaminants.

Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, professional judgment should always play a part in remediation decisions. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

[7] Please note that Tables 1 and 2 contain general guidelines. Their purpose is to provide basic information for remediation managers to first assess the extent of the damage and then to determine whether the remediation should be managed by in-house personnel or outside professionals. The remediation manager can then use the guidelines to help design a remediation plan or to assess a plan submitted by outside professionals.

[8] Although this document has a residential focus, it is applicable to other building types.

In cases in which a particularly toxic mold species has been identified or is suspected, when extensive hidden mold is expected (such as behind vinyl wallpaper or in the HVAC system), when the chances of the mold becoming airborne are estimated to be high, or sensitive individuals (e.g., those with severe allergies or asthma) are present, a more cautious or conservative approach to remediation is indicated. Always make sure to protect remediators and building occupants from exposure to mold.

Health Concerns

If building occupants are reporting serious health concerns, you should consult a health professional.

Table 2: Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods†	Personal Protective Equipment	Containment
SMALL – Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (Plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (Drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM – Total Surface Area Affected Between 10 and 100 (ft^2)			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1, 3, 4		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (Plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3, 4		
Wallboard (Drywall and gypsum board)	3, 4		
Wood surfaces	1, 2, 3		
LARGE – Total Surface Area Affected Greater Than 100 (ft^2) or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1, 3, 4		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (Linoleum, ceramic tile, vinyl)	1, 2, 3, 4		
Non-porous, hard surfaces (Plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3, 4		
Wallboard (Drywall and gypsum board)	3, 4		
Wood surfaces	1, 2, 3, 4		

Table 2 continued

*Use professional judgment to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected. Consult Table 1 if materials have been wet for less than 48 hours, and mold growth is not apparent.

These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

CLEANUP METHODS

Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.

Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood—use wood floor cleaner); scrub as needed.

Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.

Method 4: Discard – remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Minimum: Gloves, N-95 respirator, goggles/eye protection
Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

CONTAINMENT

Limited: Use polyethylene sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA-filtered fan unit. Block supply and return air vents within containment area.

Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA-filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including *Bioaerosols: Assessment and Control* (American Conference of Governmental Industrial Hygienists, 1999) and *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration* (Institute of Inspection, Cleaning and Restoration, 1999); see Resources List for more information.

Cleanup Methods

A variety of mold cleanup methods are available for remediating damage to building materials and furnishings caused by moisture control problems and mold growth. The specific method or group of methods used will depend on the type of material affected, as presented in Table 2. Please note that professional remediators may use some methods not covered in these guidelines; absence of a method in the guidelines does not necessarily mean that it is not useful.[9]

Method 1: Wet Vacuum

Wet vacuums are vacuum cleaners designed to collect water. They can be used to remove water from floors, carpets, and hard surfaces where water has accumulated. They should not be used to vacuum porous materials,

Photo 6: Heavy mold growth on underside of spruce floorboards

Molds Can Damage Building Materials and Furnishings

Mold growth can eventually cause structural damage to a school or large building, if a mold/moisture problem remains unaddressed for a long time. In the case of a long-term roof leak, for example, molds can weaken floors and walls as the molds feed on wet wood. If you suspect that mold has damaged building integrity, you should consult a structural engineer or other professional with expertise in this area.

[9] If you are unsure what to do, or if the item is expensive or of sentimental value, you may wish to consult a specialist. Specialists in furniture repair/restoration, painting, art restoration and conservation, carpet and rug cleaning, water damage, and fire/water restoration are commonly listed in phone books. Be sure to ask for and check references; look for affiliation with professional organizations. See Resources List.

such as gypsum board. They should be used only when materials are still wet—wet vacuums may spread spores if sufficient liquid is not present. The tanks, hoses, and attachments of these vacuums should be thoroughly cleaned and dried after use since mold and mold spores may stick to the surfaces.

Method 2: Damp Wipe

Whether dead or alive, mold is allergenic, and some molds may be toxic. Mold can generally be removed from non-porous (hard) surfaces by wiping or scrubbing with water, or water and detergent. It is important to dry these surfaces quickly and thoroughly to discourage further mold growth. Instructions for cleaning surfaces, as listed on product labels, should always be read and followed. Porous materials that are wet and have mold growing on them may have to be discarded. Since molds will infiltrate porous substances and grow on or fill in empty spaces or crevices, the mold can be difficult or impossible to remove completely.

Mold and Paint

Don't paint or caulk moldy surfaces; clean and dry surfaces before painting. Paint applied over moldy surfaces is likely to peel.

Method 3: HEPA Vacuum

HEPA (High-Efficiency Particulate Air) vacuums are recommended for final cleanup of remediation areas after materials have been thoroughly dried and contaminated materials removed. HEPA vacuums are also recommended for cleanup of dust that may have settled on surfaces outside the remediation area. Care must be taken to ensure that the filter is properly seated in the vacuum so that all the air must pass through the filter. When changing the vacuum filter, remediators should wear PPE to prevent exposure to the mold that has been captured. The filter and contents of the HEPA vacuum must be disposed of in well-sealed plastic bags.

Mold Remediation/Cleanup and Biocides

The purpose of mold remediation is to remove the mold to prevent human exposure and damage to building materials and furnishings. It is necessary to clean up mold contamination, not just to kill the mold. Dead mold is still allergenic, and some dead molds are potentially toxic. The use of a biocide, such as chlorine bleach, is not recommended as a routine practice during mold remediation, although there may be instances where professional judgment may indicate its use (for example, when immune-compromised individuals are present). In most cases, it is not possible or desirable to sterilize an area; a background level of mold spores will remain in the air (roughly equivalent to or lower than the level in outside air). These spores will not grow if the moisture problem in the building has been resolved.

If you choose to use disinfectants or biocides, always ventilate the area. Outdoor air may need to be brought in with fans. When using fans, take care not to distribute mold spores throughout an unaffected area. Biocides are toxic to humans, as well as to mold. You should also use appropriate PPE and read and follow label precautions. Never mix chlorine bleach solution with cleaning solutions or detergents that contain ammonia; toxic fumes could be produced.

Some biocides are considered pesticides, and some States require that only registered pesticide applicators apply these products in schools. Make sure anyone applying a biocide is properly licensed, if necessary. Fungicides are commonly applied to outdoor plants, soil, and grains as a dust or spray—examples include hexachlorobenzene, organomercurials, pentachlorophenol, phthalimides, and dithiocarbamates. Do not use fungicides developed for use outdoors for mold remediation or for any other indoor situation.

Method 4: Discard – Remove Damaged Materials and Seal in Plastic Bags

Building materials and furnishings that are contaminated with mold growth and are not salvageable should be double-bagged using 6-mil polyethylene sheeting. These materials can then usually be discarded as ordinary construction waste. It is important to package mold-contaminated materials in sealed bags before removal from the containment area to minimize the dispersion of mold spores throughout the building. Large items that have heavy mold growth

should be covered with polyethylene sheeting and sealed with duct tape before they are removed from the containment area.

Personal Protective Equipment (PPE)

If the remediation job disturbs mold and mold spores become airborne, then the risk of respiratory exposure goes up. Actions that are likely to stir up mold include: breakup of moldy porous materials such as wallboard; invasive procedures used to examine or remediate mold growth in a wall cavity; actively stripping or peeling wallpaper to remove it; and using fans to dry items.

Always use gloves and eye protection when cleaning up mold!

The primary function of Personal Protective Equipment (PPE) is to avoid inhaling mold and mold spores and to avoid mold contact with the skin or eyes. The following sections discuss the different types of PPE that can be used during remediation activities. Please note that all individuals using certain PPE equipment, such as half-face or full-face respirators, must be trained, must have medical clearance, and must be fit-tested by a trained professional. In addition, the use of respirators must follow a complete respiratory protection program as specified by the Occupational Safety and Health Administration (OSHA) (see Resources List for more information).

Personal Protective Equipment

Photo 7: Remediation worker with limited PPE

Skin and Eye Protection

Gloves are required to protect the skin from contact with mold allergens (and in some cases mold toxins) and from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should

be selected based on the type of materials being handled. If you are using a biocide (such as chlorine bleach) or a strong cleaning solution, you should select gloves made from natural rubber, neoprene, nitrile, polyurethane, or PVC. If you are using a mild detergent or plain water, ordinary household rubber gloves may be used.

To protect your eyes, use properly fitted goggles or a full-face respirator with HEPA filter. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not acceptable.

Respiratory Protection

Respirators protect cleanup workers from inhaling airborne mold, mold spores, and dust.

Minimum: When cleaning up a small area affected by mold, you should use an N-95 respirator. This device covers the nose and mouth, will filter out 95% of the particulates in the air, and is available in most hardware stores.

Limited: Limited PPE includes use of a half-face or full-face air purifying respirator (APR) equipped with a HEPA filter cartridge. These respirators contain both inhalation and exhalation valves that filter the air and ensure that it is free of mold particles. Note that half-face APRs do not provide eye protection. In addition, the HEPA filters do not remove vapors or gases. You should always use respirators approved by the National Institute for Occupational Safety and Health (see Resources List).

Full: In situations in which high levels of airborne dust or mold spores are likely or when intense or long-term exposures are expected (e.g., the cleanup of large areas of contamination), a full-face, powered air purifying respirator (PAPR) is recommended. Full-face PAPRs use a blower to force air through a HEPA filter. The HEPA-filtered air is supplied to a mask that covers the entire face or a hood that covers the entire head. The positive pressure within the hood prevents unfiltered air from entering through penetrations or gaps. Individuals must be trained to use their respirators before they begin remediation. The use of these respirators must be in compliance with OSHA regulations (see Resources List).

Disposable Protective Clothing

Disposable clothing is recommended during a medium or large remediation project to prevent the transfer and spread of mold to clothing and to eliminate skin contact with mold.

Limited: Disposable paper overalls can be used.

Full: Mold-impervious disposable head and foot coverings, and a body suit made of a breathable material, such as TYVEK®, should be used. All gaps, such as those around ankles and wrists, should be sealed (many remediators use duct tape to seal clothing).

Containment

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site.

The two types of containment recommended in Table 2 are limited and full. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. Choice of containment should be based on professional judgment.[10] The primary object of containment should be to prevent occupant and remediator exposure to mold.

Containment Tips

- Always maintain the containment area under negative pressure.
- Exhaust fans to outdoors and ensure that adequate makeup air is provided.
- If the containment is working, the polyethylene sheeting should billow inwards on all surfaces. If it flutters or billows outward, containment has been lost, and you should find and correct the problem before continuing your remediation activities.

[10] For example, a remediator may decide that a small area that is extensively contaminated and has the potential to distribute mold to occupied areas during cleanup should have full containment, whereas a large wall surface that is lightly contaminated and easily cleaned would require only limited containment.

Limited Containment

Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air handling units serving the affected area may have to be replaced once remediation is finished.

Containment Area

Photo 8: Full containment on large job

The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be remediated/cleaned prior to removal. The remediation guidelines outlined in Table 2 can be implemented when the containment is completely sealed and is under negative pressure relative to the surrounding area.

Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination chamber or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber. PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum.

Equipment

Moisture Meters: Measure/Monitor Moisture Levels in Building Materials

Moisture meters may be helpful for measuring the moisture content in a variety of building materials following water damage. They can also be used to monitor the process of drying damaged materials. These direct reading devices have a thin probe which can be inserted into the material to be tested or can be pressed directly against the surface of the material. Moisture meters can be used on materials such as carpet, wallboard, wood, brick, and concrete.

Moisture Meter

Photo 9: Moisture meter measuring moisture content of plywood subfloor

Humidity Gauges or Meters: Monitor Moisture Levels in the Air

Humidity meters can be used to monitor humidity indoors. Inexpensive (<$50) models are available that monitor both temperature and humidity.

Humidistat: Turns on HVAC System at Specific Relative Humidity (RH)

A humidistat is a control device that can be connected to the HVAC system and adjusted so that, if the humidity level rises above a set point, the HVAC system will automatically come on.

HVAC System Filter: Filters Outdoor Air

Use high-quality filters in your HVAC system during remediation. Consult an engineer for the appropriate efficiency for your specific HVAC system and consider upgrading your filters if appropriate. Conventional HVAC filters are typically not effective in filtering particles the size of mold spores. Consider upgrading to a filter with a minimum efficiency of 50 to 60% or a rating of MERV 8, as determined by Test Standard 52.2 of the American Society of Heating, Refrigerating, and Air Conditioning Engineers. Remember to change filters regularly and change them following any remediation activities.

Sampling

Is sampling for mold needed? In most cases, if visible mold growth is present, sampling is unnecessary. In specific instances, such as cases where litigation is involved, the source(s) of the mold contamination is unclear, or health concerns are a problem, you may consider sampling as part of your site evaluation. Surface sampling may also be useful in order to determine if an area has been adequately cleaned or remediated. Sampling should be done only after developing a sampling plan that includes a confirmable theory regarding suspected mold sources and routes of exposure. Figure out what you think is happening and how to prove or disprove it before you sample!

If you do not have extensive experience and/or are in doubt about sampling, consult an experienced professional. This individual can help you decide if sampling for mold is useful and/or needed, and will be able to carry out any necessary sampling. It is important to remember that the results of sampling may have limited use or application. Sampling may help locate the source of mold contamination, identify some of the mold species present, and differentiate between mold and soot or dirt. Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in indoor air samples should be similar to what is found in the local outdoor air. Since no EPA or other Federal threshold limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

Sampling for mold should be conducted by professionals with specific experience in designing mold sampling protocols, sampling methods, and interpretation of results. Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA), the American Conference of Governmental Industrial Hygienists (ACGIH), or other professional guidelines (see Resources List). Types of samples include air samples, surface samples, bulk samples (chunks of carpet, insulation, wallboard, etc.), and water samples from condensate drain pans or cooling towers.

A number of pitfalls may be encountered when inexperienced personnel conduct sampling. They may take an inadequate number of samples, there may be inconsistency in sampling protocols, the samples may become contaminated, outdoor control samples may be omitted, and you may incur costs for unneeded or inappropriate samples. Budget constraints will often be a consideration when sampling; professional advice may be necessary to determine if it is possible to take sufficient samples to characterize a problem on a given budget. If it is not possible to sample properly, with a sufficient number of samples to answer the question(s) posed, it would be preferable not to sample. Inadequate sample plans may generate misleading, confusing, and useless results.

Keep in mind that air sampling for mold provides information only for the moment in time in which the sampling occurred, much like a snapshot. Air sampling will reveal, when properly done, what was in the air at the moment when the sample was taken. For someone without experience, sampling results will be difficult to interpret. Experience in interpretation of results is essential.

How Do You Know When You Have Finished Remediation/Cleanup?

1. You must have completely fixed the water or moisture problem.
2. You should complete mold removal. Use professional judgment to determine if the cleanup is sufficient. Visible mold, mold-damaged materials, and moldy odors should not be present.
3. If you have sampled, the kinds and concentrations of mold and mold spores in the building should be similar to those found outside, once cleanup activities have been completed.
4. You should revisit the site(s) shortly after remediation, and it should show no signs of water damage or mold growth.
5. People should be able to occupy or re-occupy the space without health complaints or physical symptoms.
6. Ultimately, this is a judgment call; there is no easy answer.

Checklist for Mold Remediation*

Investigate and evaluate moisture and mold problems

- ☐ Assess size of moldy area (square feet)
- ☐ Consider the possibility of hidden mold
- ☐ Clean up small mold problems and fix moisture problems before they become large problems
- ☐ Select remediation manager for medium or large size mold problem
- ☐ Investigate areas associated with occupant complaints
- ☐ Identify source(s) or cause of water or moisture problem(s)
- ☐ Note type of water-damaged materials (wallboard, carpet, etc.)
- ☐ Check inside air ducts and air handling unit
- ☐ Throughout process, consult qualified professional if necessary or desired

Communicate with building occupants at all stages of process, as appropriate

- ☐ Designate contact person for questions and comments about medium or large scale remediation as needed

Plan remediation

- ☐ Adapt or modify remediation guidelines to fit your situation; use professional judgment
- ☐ Plan to dry wet, non-moldy materials within 48 hours to prevent mold growth (see Table 1 and text)
- ☐ Select cleanup methods for moldy items (see Table 2 and text)
- ☐ Select Personal Protection Equipment – protect remediators (see Table 2 and text)
- ☐ Select containment equipment – protect building occupants (see Table 2 and text)
- ☐ Select remediation personnel who have the experience and training needed to implement the remediation plan and use Personal Protection Equipment and containment as appropriate

Remediate moisture and mold problems

- ☐ Fix moisture problem, implement repair plan and/or maintenance plan
- ☐ Dry wet, non-moldy materials within 48 hours to prevent mold growth
- ☐ Clean and dry moldy materials (see Table 2 and text)
- ☐ Discard moldy porous items that can't be cleaned (see Table 2 and text)

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*For details, see main text of this publication. Please note that this checklist was designed to highlight key parts of a school or commercial building remediation and does not list all potential steps or problems.

Resources List – EPA

U.S. Environmental Protection Agency (EPA), Indoor Environments Division (IED)

An Office Building Occupant's Guide to IAQ
www.epa.gov/iaq/pubs/occupgd.html

Biological Contaminants
www.epa.gov/iaq/biologic.html

Building Air Quality Action Plan (for Commercial Buildings)
www.epa.gov/iaq/largebldgs/pdf_files/baqactionplan.pdf

Floods / Flooding
www.epa.gov/iaq/flood

Indoor Air Quality (IAQ) Home Page
www.epa.gov/iaq/index.html

IAQ in Large Buildings / Commercial Buildings
www.epa.gov/iaq/largebldgs

IAQ in Schools
www.epa.gov/iaq/schools

Mold Remediation in Schools and Commercial Buildings
www.epa.gov/mold/mold_remediation.html

Mold Resources
www.epa.gov/mold/moldresources.html

Resources List – OTHER

The following list of resources includes information created and maintained by other public and private organizations. The U.S. EPA does not control or guarantee the accuracy, relevance, timeliness, or completeness of this outside information. Further, the inclusion of such resources is not intended to endorse any views expressed or products or services offered by the author of the reference or the organization operating the service on which the reference is maintained.

American College of Occupational and Environmental Medicine (ACOEM)
(847) 818-1800 www.acoem.org/
Referrals to physicians who have experience with environmental exposures

American Conference of Governmental Industrial Hygienists, Inc. (ACGIH)
(513) 742-2020 www.acgih.org
Occupational and environmental health and safety information

American Industrial Hygiene Association (AIHA)
(703) 849-8888 www.aiha.org
Information on industrial hygiene and indoor air quality issues including mold hazards and legal issues

American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE)
(800) 527-4723 www.ashrae.org
Information on engineering issues and indoor air quality

Association of Occupational and Environmental Clinics (AOEC)
(888) 347-AOEC (2632) www.aoec.org
Referrals to clinics with physicians who have experience with environmental exposures, including exposures to mold; maintains a database of occupational and environmental cases

Asthma and Allergic Diseases:

American Academy of Allergy, Asthma & Immunology (AAAAI)
(414) 272-6071 www.aaaai.org
Physician referral directory, information on allergies and asthma

Asthma and Allergy Foundation of America (AAFA)
(800) 7-ASTHMA (800-727-8462) www.aafa.org
Information on allergies and asthma

American Lung Association (ALA)
(800) LUNGUSA (800-586-4872) www.lungusa.org
Information on allergies and asthma

Asthma and Allergy Network/Mothers of Asthmatics, Inc. (AAN-MA)
(800) 878-4403 or (703) 641-9595 www.aanma.org
Information on allergies and asthma

National Institute of Allergy and Infectious Diseases (NIAID)
(301) 496-5717 www.niaid.nih.gov/
Information on allergies and asthma

National Jewish Medical and Research Center
(800) 222-LUNG (800-222-5864) www.nationaljewish.org/
Information on allergies and asthma

Canada Mortgage and Housing Corporation (CMHC)
(613) 748-2000 [International] www.cmhc-schl.gc.ca/
Several documents on mold-related topics available

Carpet and Rug Institute (CRI)
(706) 278-3176 www.carpet-rug.org/
Carpet maintenance, restoration guidelines for water-damaged carpet, other carpet-related issues

Centers for Disease Control and Prevention (CDC)
(800) CDC-INFO (232-4636) www.cdc.gov
Information on health-related topics including asthma, molds in the environment, and occupational health

CDC's National Center for Environmental Health (NCEH)
(800) CDC-INFO (232-4636) www.cdc.gov/mold/stachy.htm
Questions and answers on *Stachybotrys chartarum* and other molds

Energy and Environmental Building Association
(952) 881-1098 www.eeba.org
Information on energy-efficient and environmentally responsible buildings, humidity/moisture control/vapor barriers

Floods/ Flooding:

Federal Emergency Management Agency (FEMA)
(800) 621-FEMA (3362) www.fema.gov/hazard/flood/index.shtm
Publications on floods, flood proofing, etc.

University of Minnesota, Department of Environmental Health & Safety
(612) 626-6002 www.dehs.umn.edu/
Managing water infiltration into buildings

University of Wisconsin-Extension, The Disaster Handbook
(608) 262-3980 www.uwex.edu/ces/news/handbook.html
Information on floods and other natural disasters

Health Canada, Health Protection Branch, Laboratory Centre for Disease Control, Office of Biosafety
(613) 957-1779 www.phac-aspc.gc.ca/msds-ftss
Material Safety Data Sheets with health and safety information on infectious microorganisms, including *Aspergillus* and other molds and airborne biologicals

Indoor Environmental Remediation Board (IERB)
(916) 736-1100 www.ierb.org
Information on best practices in building remediation

Institute of Inspection, Cleaning and Restoration Certification (IICRC)
(360) 693-5675 www.iicrc.org
Information on and standards for the inspection, cleaning, and restoration industry

International Society of Cleaning Technicians (ISCT)
(800) WHY-ISCT (800-949-4728)
Information on cleaning such as stain removal guide for carpets

ISSA—The Worldwide Cleaning Industry Association
(800) 225-4772 www.issa.com
Education and training on cleaning and maintenance

National Air Duct Cleaners Association (NADCA)
(202) 737-2926 www.nadca.com
Duct cleaning information

National Association of the Remodeling Industry (NARI)
(847) 298-9200 www.nari.org
Consumer information on remodeling, including help finding a professional remodeling contractor

National Institute of Building Sciences (NIBS)
(202) 289-7800 http://nibs.org
Information on building regulations, science, and technology

National Institute for Occupational Safety and Health (NIOSH)
(800) CDC-INFO (232-4636) www.cdc.gov/niosh
Health and safety information with a workplace orientation

National Pesticide Information Center (NPIC)
(800) 858-7378 http://npic.orst.edu/
Regulatory information, safety information, and product information on antimicrobials

New York City Department of Health and Mental Hygiene
www.nyc.gov/html/doh/html/epi/moldrpt1.shtml
"Guidelines on Assessment and Remediation of Fungi in Indoor Environments"

Occupational Safety & Health Administration (OSHA)
(800) 321-OSHA (800-321-6742) www.osha.gov
Information on worker safety, includes topics such as respirator use and safety in the workplace

Restoration Industry Association
(800) 272-7012 www.ascr.org/
Disaster recovery, water and fire damage, emergency tips, referrals to professionals

Sheet Metal & Air Conditioning Contractors' National Association (SMACNA)
(703) 803-2980 www.smacna.org
Technical information on topics such as air conditioning and air ducts

Smithsonian Museum Conservation Institute
(301) 238-1240 www.si.edu/mci
Guidelines for caring for and preserving furniture and wooden objects, paper-based materials; preservation studies

University of Michigan Herbarium
(734) 615-6200 www.herbarium.lsa.umich.edu
Specimen-based information on fungi; information on fungal ecology

University of Tulsa Indoor Air Program
(918) 631-5246 www.utulsa.edu/iaqprogram
Courses, classes, and continuing education on indoor air quality

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Appendix A – Glossary

Allergen.....Substance (such as mold) that can cause an allergic reaction.

APR.....Air purifying respirator

Biocide .....Substance or chemical that kills organisms such as molds.

EPA .....Environmental Protection Agency

Fungi .....Fungi are neither animals nor plants and are classified in a kingdom of their own. Fungi include molds, yeasts, mushrooms, and puffballs. In this document, the terms fungi and mold are used interchangeably. Molds reproduce by making spores. Mold spores waft through the indoor and outdoor air continually. When mold spores land on a damp spot indoors, they may begin growing and digesting whateverthey are growing on. Molds can grow on virtually any organic substance, providing moisture and oxygen are present. It is estimated that more than 1.5 million species of fungi exist.

Fungicide.....Substance or chemical that kills fungi.

HEPA .....High-Efficiency Particulate Air

Hypersensitivity .....Great or excessive sensitivity

IAQ .....Indoor Air Quality

Mold.....Molds are a group of organisms that belong to the kingdom Fungi. In this document, the terms fungi and mold are used interchangeably. There are over 20,000 species of mold.

mVOC.....Microbial volatile organic compound, a chemical made by a mold which may have a moldy or musty odor.

OSHA.....Occupational Safety and Health Administration

PAPR.....Powered air purifying respirator

PPE.....Personal Protective Equipment

Remediate .....Fix

Sensitization.....Repeated or single exposure to an allergen that results in the exposed individual becoming hypersensitive to the allergen.

Spore .....Molds reproduce by means of spores. Spores are microscopic; they vary in shape and size (2 – 100 micrometers). Spores may travel in several ways—they may be passively moved (by a breeze or waterdrop), mechanically disturbed (by a person or animal passing by), or actively discharged by the mold (usually under moist conditions or high humidity).

Appendix B – Introduction to Molds

Molds in the Environment

Molds live in the soil, on plants, and on dead or decaying matter. Outdoors, molds play a key role in the breakdown of leaves, wood, and other plant debris. Molds belong to the kingdom Fungi, and unlike plants, they lack chlorophyll and must survive by digesting plant materials, using plant and other organic materials for food. Without molds, our environment would be overwhelmed with large amounts of dead plant matter.

Molds produce tiny spores to reproduce, just as some plants produce seeds. These mold spores can be found in both indoor and outdoor air, and settled on indoor and outdoor surfaces. When mold spores land on a damp spot, they may begin growing and digesting whatever they are growing on in order to survive. Since molds gradually destroy the things they grow on, you can prevent damage to building materials and furnishings and save money by eliminating mold growth.

Moisture control is the key to mold control. Molds need both food and water to survive; since molds can digest most things, water is the factor that limits mold growth. Molds will often grow in damp or wet areas indoors. Common sites for indoor mold growth include bathroom tile, basement walls, areas around windows where moisture condenses, and near leaky water fountains or sinks. Common sources or causes of water or moisture problems include roof leaks, deferred maintenance, condensation associated with high humidity or cold spots in the building, localized flooding due to plumbing failures or heavy rains, slow leaks in plumbing fixtures, and malfunction or poor design of humidification systems. Uncontrolled humidity can also be a source of moisture leading to mold growth, particularly in hot, humid climates.

Health Effects and Symptoms Associated with Mold Exposure

When moisture problems occur and mold growth results, building occupants may begin to report odors and a variety of health problems, such as headaches, breathing difficulties, skin irritation, allergic reactions, and aggravation of asthma symptoms; all of these symptoms could potentially be associated with mold exposure.

All molds have the potential to cause health effects. Molds produce allergens, irritants, and in some cases, toxins that may cause reactions in humans. The types and severity of symptoms depend, in part, on the types of mold present, the extent of an individual's exposure, the ages of the individuals, and their existing sensitivities or allergies. Specific reactions to mold growth can include the following:

Allergic Reactions: Inhaling or touching mold or mold spores may cause allergic reactions in sensitive individuals. Allergic reactions to mold are common—these reactions can be immediate or delayed. Allergic responses include hay fever-type symptoms, such as sneezing, runny nose, red eyes, and skin rash (dermatitis). Mold spores and fragments can produce allergic reactions in sensitive individuals regardless of whether the mold is dead or alive. Repeated or single exposure to mold or mold spores may cause previously non-sensitive individuals to become sensitive. Repeated exposure has the potential to increase sensitivity.

Asthma: Molds can trigger asthma attacks in persons who are allergic (sensitized) to molds. The irritants produced by molds may also worsen asthma in non-allergic (non-sensitized) people.

Hypersensitivity Pneumonitis: Hypersensitivity pneumonitis may develop following either short-term (acute) or long-term (chronic) exposure to molds. The disease resembles bacterial pneumonia and is uncommon.

Potential Health Effects Associated with Inhalation Exposure to Molds and Mycotoxins

- Allergic Reactions (e.g., rhinitis and dermatitis or skin rash)
- Asthma
- Hypersensitivity Pneumonitis
- Other Immunologic Effects Research on mold and health effects is ongoing. This list is not intended to be all-inclusive.

The health effects listed above are well documented in humans. Evidence for other health effects in humans is less substantial and is primarily based on case reports or occupational studies.

Irritant Effects: Mold exposure can cause irritation of the eyes, skin, nose, throat, and lungs, and sometimes can create a burning sensation in these areas.

Opportunistic Infections: People with weakened immune systems (i.e., immune-compromised or immune-suppressed individuals) may be more vulnerable to infections by molds (as well as more vulnerable than healthy persons to mold toxins). *Aspergillus fumigatus*, for example, has been known to infect the lungs of immune-compromised individuals. These individuals inhale the mold spores which then start growing in their lungs. *Trichoderma* has also been known to infect immune-compromised children.

Healthy individuals are usually not vulnerable to opportunistic infections from airborne mold exposure. However, molds can cause common skin diseases, such as athlete's foot, as well as other infections such as yeast infections.

Mold Toxins (Mycotoxins)

Molds can produce toxic substances called mycotoxins. Some mycotoxins cling to the surface of mold spores; others may be found within spores. More than 200 mycotoxins have been identified from common molds, and many more remain to be identified. Some of the molds that are known to produce mycotoxins are commonly found in moisture-damaged buildings. Exposure pathways for mycotoxins can include inhalation, ingestion, or skin contact. Although some mycotoxins are well known to affect humans and have been shown to be responsible for human health effects, for many mycotoxins, little information is available.

Aflatoxin B_1 is perhaps the most well known and studied mycotoxin. It can be produced by the molds *Aspergillus flavus* and *Aspergillus parasiticus* and is one of the most potent carcinogens known. Ingestion of aflatoxin B_1 can cause liver cancer. There is also some evidence that inhalation of aflatoxin B_1 can cause lung cancer. Aflatoxin B_1 has been found on contaminated grains, peanuts, and other human and animal foodstuffs. However, *Aspergillus flavus* and *Aspergillus parasiticus* are *not* commonly found on building materials or in indoor environments.

Much of the information on the human health effects of inhalation exposure to mycotoxins comes from studies done in the workplace and some case studies or case reports.* Many symptoms and human health effects attributed to inhalation of mycotoxins have been reported including: mucous membrane irritation, skin rash, nausea, immune system suppression, acute or chronic liver damage, acute or chronic central nervous system damage, endocrine effects, and cancer. More studies are needed to get a clear picture of the health effects related to most mycotoxins. However, it is clearly prudent to avoid exposure to molds and mycotoxins.

Some molds can produce several toxins, and some molds produce mycotoxins only under certain environmental conditions. The presence of mold in a building does not necessarily mean that mycotoxins are present or that they are present in large quantities.

Toxic Molds

Some molds, such as *Aspergillus versicolor* and *Stachybotrys atra (chartarum),* are known to produce potent toxins under certain circumstances. Although some mycotoxins are well known to affect humans and have been shown to be responsible for human health effects, for many mycotoxins, little information is available, and in some cases research is ongoing. For example, some strains of *Stachybotrys atra* can produce one or more potent toxins. In addition, preliminary reports from an investigation of an outbreak of pulomonary hemorrhage in infants suggested an association between pulmonary hemorrhage and exposure to *Stachybotrys chartarum.* Review of the evidence of this association at the Centers for Disease Control and Prevention (CDC) resulted in a published clarification stating that such an association was not established. Research on the possible causes of pulumonary hemorrhage in infants continues. Consult CDC for more information on pulmonary hemorrhage in infants (see Resources List, page 31, for CDC contact and other information).

* Information on ingestion exposure, for both humans and animals, is more abundant–a wide range of health effects has been reported following ingestion of moldy foods including liver damage, nervous system damage and immunological effects.

Microbial Volatile Organic Compounds (mVOCs)

Some compounds produced by molds are volatile and are released directly into the air. These are known as microbial volatile organic compounds (mVOCs). Because these compounds often have strong and/or unpleasant odors, they can be the source of odors associated with molds. Exposure to mVOCs from molds has been linked to symptoms such as headaches, nasal irritation, dizziness, fatigue, and nausea. Research on mVOCs is still in the early phase.

Glucans or Fungal Cell Wall Components (also known as ß-(1,3)-D-Glucans)

Glucans are small pieces of the cell walls of molds which may cause inflammatory lung and airway reactions. These glucans can affect the immune system when inhaled. Exposure to very high levels of glucans or dust mixtures including glucans may cause a flu-like illness known as Organic Dust Toxic Syndrome (ODTS). This illness has been primarily noted in agricultural and manufacturing settings.

Spores

Mold spores are microscopic (2 – 10 *u*m) and are naturally present in both indoor and outdoor air. Molds reproduce by means of spores. Some molds have spores that are easily disturbed and waft into the air and settle repeatedly with each disturbance. Other molds have sticky spores that will cling to surfaces and are dislodged by brushing against them or by other direct contact. Spores may remain able to grow for years after they are produced. In addition, whether or not the spores are alive, the allergens in and on them may remain allergenic for years.

Appendix C – Communication With Building Occupants

Communication with building occupants is essential for successful mold remediation. Some occupants will naturally be concerned about mold growth in their building and the potential health impacts. Occupants' perceptions of the health risk may rise if they perceive that information is being withheld from them. The status of the building investigation and remediation should be openly communicated including information on any known or suspected health risks.

Small remediation efforts will usually not require a formal communication process, but do be sure to take individual concerns seriously and use common sense when deciding whether formal communications are required. Individuals managing medium or large remediation efforts should make sure they understand and address the concerns of building occupants and communicate clearly what has to be done as well as possible health concerns.

Communication approaches include regular memos and/or meetings with occupants (with time allotted for questions and answers), depending on the scope of the remediation and the level of occupant interest. Tell the occupants about the size of the project, planned activities, and remediation timetable. Send or post regular updates on the remediation progress, and send or post a final memo when the project is completed or hold a final meeting. Try and resolve

Mold in Schools

Special communication strategies may be desirable if you are treating a mold problem in a school. Teachers, parents, and other locally affected groups should be notified of significant issues as soon as they are identified. Consider holding a special meeting to provide parents with an opportunity to learn about the problem and ask questions of school authorities, particularly if it is necessary/advisable to ensure that the school is vacated during remediation. For more information on investigating and remediating molds in schools, refer to the U.S. EPA's *IAQ Tools for Schools* kit and the asthma companion piece for the *IAQ Tools for Schools* kit, entitled *Managing Asthma in the School Environment*.

Communicate, When You Remediate

- Establish that the health and safety of building occupants are top priorities.
- Demonstrate that the occupants' concerns are understood and taken seriously.
- Present clearly the current status of the investigation or remediation efforts.
- Identify a person whom building occupants can contact directly to discuss questions and comments about the remediation activities.

issues and occupant concerns as they come up. When building-wide communications are frequent and open, those managing the remediation can direct more time toward resolving the problem and less time to responding to occupant concerns.

If possible, remediation activities should be scheduled during off-hours when building occupants are less likely to be affected. Communication is important if occupants are relocated during remediation. The decision to relocate occupants should consider the size of the area affected, the extent and types of health effects exhibited by the occupants, and the potential health risks associated with debris and activities during the remediation project. When considering the issue of relocation, be sure to inquire about, accommodate, and plan for individuals with asthma, allergies, compromised immune systems, and other health-related concerns. Smooth the relocation process and give occupants an opportunity to participate in resolution of the problem by clearly explaining the disruption of the workplace and work schedules. Notify individuals of relocation efforts in advance, if possible.

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NOTES

This is a reprint of EPA document 402-K-01-001, March 2001. The guidance has not changed. The Resources List has been updated.

Indoor Air Quality (IAQ)

OSHA® FactSheet

Asbestos

Asbestos is a naturally occurring mineral fiber. It was used in numerous building materials and vehicle products for its strength and ability to resist heat and corrosion before its dangerous health effects were discovered. Individual asbestos fibers cannot be seen by the naked eye, which puts workers at an increased risk. The Occupational Safety and Health Administration (OSHA) has regulations to protect workers from the hazards of asbestos.

What is the hazard?

Asbestos fibers are released into the air during activities that disturb asbestos-containing materials.

The asbestos fibers can then be inhaled without knowing and trapped in the lungs. If swallowed, they can become embedded into the digestive tract as well.

Asbestos is a known human carcinogen and can cause chronic lung disease as well as lung and other cancers. Symptoms and/or cancer may take many years to develop following exposure.

Where is the hazard?

The hazard may occur during manufacturing of asbestos-containing products; performing brake or clutch repairs; renovating or demolishing buildings or ships; or cleanup from those activities; contact with deteriorating asbestos-containing materials and during cleanup after natural disasters.

Some materials are presumed to contain asbestos if installed before 1981. Examples of these materials, as well as other presumed asbestos-containing materials are:

- Thermal system insulation
- Roofing and siding shingles
- Vinyl floor tiles
- Plaster, cement, putties and caulk
- Ceiling tiles and spray-on coatings
- Industrial pipe wrapping
- Heat-resistant textiles
- Automobile brake linings and clutch pads

OSHA Standards

OSHA has three standards to protect workers from the hazards of asbestos depending on the type of workplace. For complete information on all of the requirements, see the standard specific to your type of workplace:

General Industry: 29 CFR 1910.1001 covers work in general industry, such as exposure during brake and clutch repair, maintenance work, and manufacture of asbestos-containing products.

Shipyards: 29 CFR 1915.1001 covers construction, alteration, repair, maintenance, renovation and demolition of structures containing asbestos during work in shipyards.

Construction: 29 CFR 1926.1101 covers construction, alteration, repair, maintenance, or renovation and demolition of structures containing asbestos.

What protections exist in the Standards?

- **Permissible Exposure Limit (PEL)** for asbestos is 0.1 fiber per cubic centimeter of air as an eight-hour time-weighted average (TWA), with an excursion limit (EL) of 1.0 asbestos fibers per cubic centimeter over a 30-minute period. The employer must ensure that no one is exposed above these limits.
- **Assessment** of workplaces covered by the standards must be completed to determine if asbestos is present and if the work will generate airborne fibers by a specific method under each standard.
- **Monitoring** necessary to detect if asbestos exposure is at or above the PEL or EL for workers who are, or may be expected to be exposed to asbestos. Frequency depends on work classification and exposure. The construction and shipyard standards require assessment and monitoring by a competent person.

- If the exposure has the potential to be above the PEL or EL, employers must use proper **engineering controls and work practices** to the extent feasible to keep it at or below the PEL and EL. Where feasible engineering controls and work practices do not ensure worker protection at the exposure limits, employers must reduce the exposures to the lowest level achievable and then supplement with proper **respiratory protection** to meet the PEL. The construction and shipyard standards contain specific control methods depending on work classification, and the general industry standard has specific controls for brake and clutch repair work.
- **Proper hazard communication and demarcation** with warning signs containing specified language in areas that have exposures above the PEL or EL is necessary. No smoking, eating, or drinking should occur in these areas and proper PPE must be provided and used to prevent exposure.
- **Separate decontamination and lunch areas** with proper hygiene practices must be provided to workers exposed above the PEL to avoid contamination.
- **Training** requirements depend on the workplace exposure and classification. Training must be provided to all workers exposed at or above the PEL before work begins and yearly thereafter. All training must be conducted in a manner and language in which the worker is able to understand. Workers who perform housekeeping operations in buildings with presumed asbestos-containing materials but not at the PEL must also be provided asbestos awareness training.
- **Medical surveillance** requirements are different depending on the industry. Medical surveillance must be provided for workers who engage in certain classifications of work, or experience exposures at or above the PEL in construction and shipyards. In general industry, medical examinations must be provided for workers who experience exposure at or above the PEL.
- **Records** must be kept on exposure monitoring for asbestos for at least 30 years, and worker medical surveillance records retained for the duration of employment plus 30 years. Training records must be kept for at least 1 year beyond the last date of employment.

Contact OSHA

For more information on this and other health-related issues impacting workers, to report an emergency, fatality or catastrophe, to order publications, to file a confidential complaint, or to request OSHA's free on-site consultation service, contact your nearest OSHA office, visit www.osha.gov, or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

Worker Rights

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- Receive information and training (in a language and vocabulary the worker understands) about workplace hazards, methods to prevent them, and the OSHA standards that apply to their workplace.
- Review records of work-related injuries and illnesses.
- Get copies of test results that find and measure hazards.
- File a complaint asking OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA's rules.
- OSHA will keep all identities confidential.
- Exercise their rights under the law without retaliation or discrimination.

For more information, see OSHA's workers page.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

For assistance, contact us. We can help. It's confidential.

U.S. Department of Labor
www.osha.gov (800) 321-OSHA (6742)

DEP FS-3507 01/2014

TCEQ REGULATORY GUIDANCE
Critical Infrastructure
RG-518 • September 2017

Managing Debris from Declared Disasters

Disposing of Debris

Large volumes of debris are generated following natural or human-caused disasters such as hurricanes, floods, tornados, fires or explosions, etc. The Texas Commission on Environmental Quality has developed the following guide for managing and disposing of debris associated with the cleanup of areas affected by these events.

If the debris was the result of a fire, see *Managing Debris from Texas Wildfires* at <www.tceq.texas.gov/goto/wildfire-debris>.

Debris may include:

- trees, brush, and other vegetative matter
- construction or demolition waste, such as drywall, lumber, roof shingles, treated wood, plastics, etc.
- furnishings and appliances
- other municipal solid waste, including putrescible waste (waste that can cause foul odors as it decomposes), and animal carcasses
- hazardous waste, such as cleaning supplies, automotive products, paints and solvents, etc.

Applicability

If You Are an Authorized County or Municipal Solid Waste Operator:

This information will help you understand relevant environmental rules and decide on a reasonable course of action to follow.

Contact your TCEQ regional office if you have questions. Find the regional office that serves you at <www.tceq.texas.gov/goto/region>.

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If You Are Not an Authorized County or Municipal Solid Waste Operator:

Your city, county, or other local authorities will offer specific instructions on what to do with debris and other waste. If you have received no instructions and you cannot reach local authorities, follow the guidelines below until you hear from them.

As much as possible, separate debris into different piles—for example—

- branches, leaves, and other vegetative materials that can go into a wood chipper
- metal and related materials suitable for recycling
- glass (gather glass carefully; before you set it out, double-bag it to avoid accidents)
- lumber, insulation, bricks, siding, and other debris from buildings
- furniture and other large items
- appliances (use duct tape to hold refrigerators and freezers closed)
- ruined clothing and furnishings

Set the piles as close to the road as possible:

- If you have a curb near your home, put them on top of the curb, not in the road.
- If you have a ditch and no curb near your home, put them in the grassy area between the ditch and the road. Be sure not to block the ditch or the road.

Note: Do not include any containers of chemicals that might be classified as household hazardous waste, such as pesticides, gasoline, etc. Refer to the section on household hazardous waste (page 6) for guidelines about how to deal with these materials.

If you have questions, call the TCEQ Customer Service and After-Hours Answering Service Line at 888-777-3186 to help you reach your local authority.

Disaster Declarations

Sites of significant disasters are often declared disaster areas either by the governor or the president. Among other considerations, the declaration will be specific to certain counties and may enable them to receive additional financial and technical assistance for managing the debris.

Be sure to learn what requirements you need to fulfill to obtain your funding. To qualify for assistance, refer to the Federal Emergency Management Agency (FEMA) website at <www.fema.gov>, or call 800-621-FEMA (3362) (TTY: 800-462-7585).

Sorting and Stockpiling Debris before Disposal or Burning

State and federal regulations apply to the disposal of specific types of debris. The TCEQ recognizes that, under the difficult conditions after a disaster, full compliance with these regulations may significantly delay the removal of debris from affected areas. In many cases, the TCEQ will waive, delay, or streamline some requirements in the aftermath of a disaster.

Sort debris as much as possible. You may only burn vegetation and clean, untreated wood and only if your county allows it. Sorting and stockpiling waste prior to burning is addressed in the general conditions section of the temporary debris management form (see next section in this document).

Note: Do not burn debris that was generated by a wildfire because environmental conditions may promote additional wildfires. Do not burn debris without special county authorization, if your county is under a burn ban. Options for disposal of segregated debris that should not be burned are discussed in later sections of this document.

Temporary Debris-Management Sites

Request approval for each site or property where you plan to temporarily stockpile debris that has been collected. The forms you must use are available at <www.tceq.texas.gov/goto/temp-debris-form>. Your local facility may not be eligible for FEMA reimbursement without receiving this temporary authorization.

Options for Burning

Outdoor Burning

The TCEQ authorizes certain types of outdoor burning in Title 30, Texas Administrative Code, Chapter 111, Subchapter B. For more information see *Outdoor Burning in Texas* (TCEQ publication RG-049) at <www.tceq.texas.gov/goto/rg-049>.

Note: If your county is under a burn ban, do not burn debris without special county approval. Check with your county emergency management office or county judge.

In response to declared disasters, the TCEQ may broaden the authority of county and municipal governments to allow burning of some debris. We will send authorization letters to affected counties as provided in 30 TAC 111.215.

Many counties will approve this type of burning, but only if they ensure that fire-protection personnel and equipment are available and fully operational. Contact

your county or municipal authorities to determine how they wish to handle the burnable debris.

If both the county—and if applicable—the city allow, you may burn untreated lumber, limbs, trees, and other plant debris resulting from the declared disaster, provided you do not create a nuisance condition or a traffic hazard, do not violate any local ordinances, and comply with all general requirements as laid out in this document and in the temporary debris-management site authorization.

Anyone wishing to file a complaint about inappropriate burning may call the TCEQ Environmental Complaints Hot Line at 888-777-3186 or send an e-mail to <cmplaint@tceq.texas.gov>.

Burning Debris in Air-Curtain Incinerators

The TCEQ allows the use of ACIs in the disposal of debris during emergency cleanup operations such as the removal and disposal of debris from a declared disaster. ACIs are used when debris is burned in a trench dug in the ground, or with a containment box or chamber made for this purpose. ACIs established at temporary sites must meet the general conditions on the temporary debris management site form, available at <www.tceq.texas.gov/goto/temp-debris-form> (TCEQ-20660).

Only trees, brush, and other vegetative matter, and clean lumber (not including wood that has been painted, stained, or pressure treated with chemicals) may be burned in an ACI during a declared disaster.

How do I obtain authorization for use of an ACI?

If you plan to clean-up debris from a **declared** disaster you do not have to register an ACI. Instead, before burning, contact your local TCEQ regional office. You must meet the conditions on the TDMS form.

Depending on the emergency, regional-office personnel may conduct a site assessment. Once the regional office has granted permission, you don't need an ACI permit for the disaster cleanup as long as you follow the limitations you and the TCEQ have agreed to.

Where can I operate an ACI?

To reduce the potential of nuisance conditions, operate ACIs at least 300 feet from the nearest property line and any other facility with an air permit. If that is not possible, contact your TCEQ regional office.

How long can I operate a portable ACI?

You may operate portable facilities temporarily located at a site for up to 180 consecutive calendar days or 600 hours, which ever ends first. However, federal requirements begin to apply after eight weeks of use.

If you need to operate the ACI for longer than eight weeks, contact your TCEQ regional office to request an extension. When the ACI is no longer in use, you must remove it from the site.

What records do I need to keep?

Equip the ACI with a run-time meter and record the dates and times, and how many hours the ACI is used. Keep records showing that you complied with all operating instructions and followed requirements for locating the ACI.

If you bury ash from trench-burning on the site, contact your TCEQ regional office and your county about filing deed records, if necessary. Keep any other records requested by your regional office.

Disposal of Construction and Demolition Debris

Construction and demolition waste includes all materials that are direct or indirect by-products of construction work or that result from demolition of buildings and other structures, including, but not limited to:

- drywall
- wood
- packing material and boxes
- plastics
- roof shingles and other roofing material
- metal
- concrete, bricks and stones

You may recycle many construction demolition materials. The TCEQ offers recycling resources at <www.tceq.texas.gov/p2/recycle>. If recycling isn't possible, waste should be sent to an authorized landfill.

See Table 1 for disposal options for demolition-related storm debris such as household hazardous or commercial waste, appliances, compressed-gas containers, tires, and vegetation.

Household Hazardous Waste

Household hazardous waste collection may be an option for a community affected by a disaster. Check with your local emergency-management officials or county office. Substances often found in homes that might be considered HHW include:

- paints, thinners, and turpentine; furniture strippers; wood preservatives, stains, and finishes
- pesticides, insecticides, flea collars and sprays, roach and ant killers, rat and mouse poisons, and herbicides
- oven, toilet, drain, and rug and upholstery cleaners
- bleaches, disinfectants, mothballs, ammonia-based and powdered cleansers, and swimming-pool chemicals (i.e. chlorine tablets, muriatic acid, salts, etc.)
- floor and furniture polish
- household and automobile batteries
- automotive products including: antifreeze, transmission and brake fluids, motor oil, and gasoline

Communities affected by a disaster may be able to compile the household hazardous waste in a staging area for collection and disposal by a contractor. City and county officials are encouraged to offer options for collection. If a HHW collection is scheduled, residents should separate these types of materials.

For general questions about household hazardous waste, visit the HHW Program Web page at <www.tceq.texas.gov/p2/hhw/howto.html>. You may also contact the TCEQ HHW Program Manager at 512-239-3143 or <recycle@tceq.texas.gov>.

If you are a public official in one of the counties eligible for relief, and have questions about the disposal of HHW by a TCEQ contractor, call your local TCEQ regional office or the TCEQ emergency-management section in Austin at 512-239-1510.

Disposal of Unknown, Suspicious, or Leaking Waste

Do not approach, examine, or attempt to move any containers of unknown substances or potentially hazardous materials, regardless of size. These containers may be leaking fumes or contain flammable or pressurized chemicals.

Call the Texas 24-hour spill hot line at 800-832-8224 to report the location of drums or other containers of hazardous or unknown wastes in any of the counties affected by the disaster declaration.

When you call, please give your contact information, a location and description of the container, and any potentially affected residences or businesses that are

nearby. Emergency personnel will remove the container for safe disposal or transport it to a safe location.

Disposal of Animal Carcasses

Animal carcasses should be buried in pits or trenches, or by mounding. Disposal should always be carried out in a manner that protects public health and safety, does not create a nuisance, and prevents the spread of disease and adverse effects on water quality. The owner or operator of a farm or facility is responsible for disposal in a timely and sanitary manner.

For more information see these TCEQ publications:

- *Disposal of Domestic or Exotic Livestock Carcasses* (RG-419) <www.tceq.texas.gov/goto/carcassdisposal>
- *Outdoor Burning in Texas* (RG-049) <www.tceq.texas.gov/goto/rg-049>

If you suspect that an animal died from a disease, contact the Texas Animal Health Commission at <www.tahc.state.tx.us/>.

Note: Be aware of burn bans. If the animal carcasses are the result of a wildfire, burning is **not** allowed. Find a map of county burn bans at <http://txforestservice.tamu.edu/>.

Table 1

Options for management of segregated debris

Waste Type	Examples of Waste Type	Disposal or Burn Option
Vegetation	Trees, brush	Preferred: Recycle Option: Outdoor burn using an ACI, if possible Option: Type I MSW landfill Option: Type IV MSW landfill
Clean Lumber	Lumber, and similar wood materials that have not been painted, stained, or chemically treated	Preferred: Recycle Option: Outdoor burn using an ACI, if possible Option: Type I MSW landfill Option: Type IV MSW landfill
Animal Carcasses	Non-diseased poultry, cattle, domestic animals	Preferred: On-site burial or mounding Preferred: MSW Type I landfill Option: Outdoor burn, using an ACI if possible Option: Off-site disposal using a renderer or a commercial waste incinerator
	Diseased poultry, cattle	Contact the Texas Animal Health Commission at <www.tahc.state.tx.us/>
Household or Commercial Waste	Putrescible waste	MSW Type I landfill
	Garbage, refuse, rubbish	MSW Type I landfill
Construction or Demolition Waste	Asbestos containing debris - shingles, siding, insulation, tiles	MSW Type I landfill with Special Waste Authorization
	Painted, stained, or treated wood	Preferred: MSW Type IV landfill Option: MSW Type I landfill
	Non-asbestos roof shingles	Preferred: Fuel source for cement kilns with appropriate air authorization Option: MSW Type IV landfill Preferred: MSW Type I landfill
	Drywall	Preferred: MSW Type IV landfill Option: MSW Type I landfill
White Goods, Appliances	Refrigerators, stoves, washers, dryers, small appliances, etc	Preferred: Recycle Option: MSW Type I landfill

Waste Type	Examples of Waste Type	Disposal or Burn Option
Household Hazardous Waste	Cleaning products	Preferred: HHW collection Option: MSW Type I landfill Option: Permitted HW facility
	Paints, solvents	Preferred: HHW collection Option: MSW Type I landfill Option: Permitted HW facility
	Pesticides	HHW collection
	Automotive products: oil, antifreeze, brake fluid, gasoline, etc	Preferred: HHW collection Option: Registered used-oil collector Option: Permitted HW facility
	Batteries	Preferred: Recycle (lead-acid batteries are not allowed in MSW landfills) Option: HHW collection
	Electronics: computers, TVs, etc.	Preferred: HHW collection Option: Recycle Option: MSW Type I landfill Permitted HW facility
Compressed Gas Containers		Recycle
Tires		Pick up by authorized scrap-tire transporter Option: authorized processing or end-use facility

TCEQ GENERAL INFORMATION
Water Supply Division
GI-432 • June 2017

Disinfecting Your Private Well

Is Your Well Flooded? Disinfect It Before You Drink It!

If your private well is flooded, do not use water from it until the following three things have occurred:

1. The floodwaters have receded from the well and your plumbing system.
2. You have disinfected the well and your plumbing.
3. You have sampled your water and received a lab report confirming that the disinfected water contained no bacteriological contaminants.

In these instructions we provide information on how to disinfect your well and your household plumbing system and how to sample the water for analysis by a bacteriological laboratory.

You can use these steps any time you suspect that your well has become contaminated by harmful bacteriological contaminants, not just after a flood.

You also have the option of choosing to hire someone to disinfect and test the water from your well.

Before You Begin

Know the hazards

Be aware of the possible hazards involved in disinfecting your well:

- You will be working with water and electricity. Use the appropriate precautions to avoid electrical shock.
- You will be using liquid bleach or solid calcium hypochlorite. These chemicals can burn your skin and eyes and whiten your clothing if handled improperly. Read the manufacturer's warnings on the label and take the recommended precautions.

Find another source of water

Before you start, make sure you have enough drinking water from another source for all the drinking, cooking, and bathing you will need to do for at least 12 to 24 hours. Consider these options for other sources:

- Bottled water.
- Water from some other source that is known to be uncontaminated.
- Water that you boil before use. If you choose to boil water, heat it to the boiling point and let it continue at a full boil for two minutes. Let it cool before using it for drinking or bathing.

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- Water that you have disinfected another way. Find information about disinfecting water at EPA's Emergency Disinfection of Drinking Water webpage at <www.epa.gov/ground-water-and-drinking-water/emergency-disinfection-drinking-water>.

You also need to have some extra water available to flush toilets, but that does not have to be drinking water.

Know how long you need

Allow time for disinfecting your well and plumbing system, and for sampling and analysis:

1. **Disinfect the well itself:** about an hour and a half.
2. **Disinfect the rest of your plumbing:** 12 to 24 hours.
3. **Flush the system:** varies; about 5 to 10 minutes per faucet.
4. **Sample the water and send it to the lab:** about 15 minutes.
5. **Get the results back from the lab:** about two days.

Sampling the water is very important. You shouldn't drink or cook with water from your well until a bacteriological lab confirms that the water is free of harmful germs.

How to Disinfect Your Well and Plumbing System

Gather the information and materials you will need.

Locate on your property:

- The power switch to your well pump.
- The power to your water heater.
- The wellhead. (This is the concrete pad on top of the well. It might be in your pump house or just outside somewhere. It generally has a pipe sticking out that goes to your pressure tank.)
- The faucet nearest to the wellhead. (This should be a water tap that you can hook a garden hose to.)
- If your well is pressurized, locate the pressure release valve. (It might look like a faucet.)
- The well access plug. (It might look like a large bolt.)

Figure 1: The wellhead on your property will typically include a pipe leading to your pressure tank.

Gather these materials:

- Disinfectant: liquid chlorine bleach ("bleach" in the rest of these instructions) or solid calcium hypochlorite.
- A wrench that fits the well access plug.

- A funnel (wide mouthed if you use calcium hypochlorite).
- A garden hose long enough to reach the wellhead from the nearest faucet.

Table: How Much Disinfectant to Use

If your well is this deep:	Use this much bleach:	Or use this much solid hypochlorite:
Less than 100 feet	1 quart	**1/8 cup**
100 to 200 feet	2 quarts (1/2 gallon)	**1/4 cup**
200 to 300 feet	3 quarts	**3/8 cup**
More than 300 feet	**4 quarts (1 gallon) or more**	**1/2 cup or more**

Liquid chlorine bleach

Liquid chlorine bleach is sold as a cleaning product, but not all bleaches will work for disinfecting your well:

- **Don't** use bleach that is scented or odorless—it should have a sharp chlorine odor.
- Find a list of approved brands at <www.tceq.texas.gov/goto/bleach>.
- You may use bleach that is not on this list if it has an NSF (National Sanitation Foundation) seal, as shown in Figure 2, or says "meets NSF Standard 60" on the label.

Figure 2: NSF Seal

The NSF seal. NSF International certifies products for specific uses—for example, bleaches for safely treating drinking water. If you have questions about whether a particular disinfectant is safe to use in your well, call **the NSF at** 800-NSF-8010.

Calcium hypochlorite

Calcium hypochlorite is sold for chlorinating swimming pools. Because it contains more chlorine than bleach, it might be easier to work with, especially if you follow these tips:

- Make sure the calcium hypochlorite you use has an NSF seal or says "meets NSF Standard 60" on the label.
- Get a granular or powdered form, not the large tablets. (They can be hard to break into pieces small enough to fit into the well, and they can be slow to dissolve.)
- If you get a powdered form, be sure it's fresh. (The powder can lose its disinfecting power on the shelf.)

What not to use

Don't use other disinfectants in your well. After all, you want to drink this water! Especially avoid these:

- Scented (or "scentless") laundry bleaches.

- Chlorine-free bleaches.
- Disinfectants designed for hot tubs.

Disinfecting the well

The time needed for this part of the process depends on whether or not you have a pressurized well. If your well has a screened vent at the wellhead, or if you haven't used an air compressor to maintain water pressure, your well is probably not pressurized.

Disinfecting a pressurized well

This process takes at least 12 hours:

1. Turn off the power to the well pump and air compressor.
2. At the wellhead or pump house, find the pressure-release valve. Before you open it, be sure that you are in the open and breathing fresh air, not the vented air, which may contain hydrogen sulfide, methane, or other gases that sometimes can build up in wells.
3. Open the valve to release all the pressure in the well.
4. Remove the access plug. (You'll need to replace it later.)
5. Put the funnel in the opening where you removed the access plug.
6. Pour in the bleach or calcium hypochlorite. (See the table on page 3 for the right amount to add.)
7. Replace the access plug. Let the well sit for at least 12 hours. During this waiting period:
    - Following the manufacturer's directions, turn off the power to your water heater and drain it.
    - Drain any other water-storage tanks that are connected to your plumbing system.
    - If you can, collect at least some of this water (for example, in 5-gallon buckets) to use whenever anyone needs to flush a toilet during the rest of the disinfection process.
    - Read the rest of these instructions—especially "How to Sample Your Water and Understand the Results" on page 6. You can save yourself some time later by finding a water-sampling kit now.
8. When the 12-hour waiting period is over, turn on the power to your well pump and air compressor.

More than you can do?

If you are not comfortable carrying out these steps, contact a professional water-well driller to perform them for you.

Disinfecting a non-pressurized well

1. Turn off the power to the pump.
2. Remove the access plug.
3. Put the funnel in the opening where you removed the access plug.
4. Pour in the bleach or calcium hypochlorite. (See the table on page 3 for amounts.)

5. Connect the garden hose to the faucet nearest the wellhead.
6. Turn the power to the pump back on.
7. Turn on the faucet and run water through the funnel into the well for one hour. By circulating the chlorinated well water, you will expose all fittings and equipment in the well to the chlorine solution and improve the germ-killing action.
8. During this hour:
    - Following the manufacturer's directions, turn off the power to your water heater and drain it.
    - Drain any other water-storage tanks that are connected to your plumbing system.
    - If you can, collect at least some of this water (for example, in 5-gallon buckets) to flush toilets during the rest of the disinfection process.
    - Read the rest of these instructions—especially "How to Sample Your Water and Understand the Results" on page 6. You can save yourself some time later by finding a water-sampling kit now.
9. After the hour is up, remove the garden hose and funnel and immediately replace the access plug.

Disinfecting your plumbing

To disinfect the rest of your plumbing system, you will fill the pipes with chlorinated water from the well and let it remain at least overnight—if you can, let it remain for 24 hours. For the best results, follow the steps below:

1. Working away from the well, go to the next closest outside faucet. Turn it on, run the water until you can smell the sharp odor of bleach (chlorine), and then turn it off.
2. Repeat step 1 until you have reached all the outside faucets.
3. Refill the water heater, but don't turn the heat back on yet.
4. Refill any water-storage tanks.
5. Go inside and flush each toilet until the water coming in smells chlorinated.
6. Repeat step 1 on each inside faucet. Be sure to include bathtubs, showers, and other faucets and to do this to the cold- and hot-water faucets.
7. If you have a chilled-water line on your refrigerator, run it until you smell bleach.
8. Now that your plumbing system is full of chlorinated water, let everything stand at least overnight or, if you can, for 24 hours to kill germs in your plumbing. During this time:
    - Don't use this water for drinking, cooking, bathing, washing clothes, or washing dishes.
    - You can use this water for flushing toilets, or you can use water collected from draining your water heater. If the toilet isn't clogged, it will flush if you pour in 2 or 3 gallons of water from a bucket.
    - If you have an icemaker, let it run, but dispose of all the ice it produces.
    - Run your empty dishwasher and clothes washer through a full cycle.

Flushing the system

After the chlorinated water has been in your plumbing system for 12 to 24 hours, it's time to flush the system. This process will take about the same amount of time it took to fill the system with chlorinated water—about 5 to 10 minutes per faucet, on average:

1. While you are carrying out the rest of these steps, drain your water heater and any other water-storage tanks connected to your plumbing system.
2. Starting with the outside faucet farthest from your well, open the faucet and run it until you no longer smell chlorine and the water is clear of any debris or color.
3. Working your way back toward the well, continue step 2 with each outside faucet. Don't flush any inside faucets until you have finished outside—otherwise, you might flood the septic system.
4. Flush each toilet once.
5. Repeat step 2 with each inside faucet.
6. If you have a chilled-water line, run it until you no longer smell bleach. Dispose of all of this water.
7. Refill the water heater and any other water-storage tanks.
8. Following the manufacturer's directions, turn the power to your water heater back on.
9. Run a rinse cycle on your dishwasher and your washing machine.

More than you can do?

If this process for disinfecting a well seems like more than you want to handle, call a plumber or licensed water-treatment specialist to have it done for you. While not that complicated, it's important to have the job done right.

How to Sample Your Water for Bacteriological Contaminants and Understand the Results

Now that you have disinfected the well and your plumbing system, there are four steps to getting a valid sample and a meaningful test result:

1. Get the right container and form.
2. Collect the sample.
3. Send the sample to the lab for analysis.
4. Read the lab report and understand the results.

Until you are sure that your water is not contaminated, you shouldn't use it for drinking, cooking, bathing, washing dishes, washing clothes, or household cleaning.

Get a container and form

You have to use a special container to collect a drinking-water sample and complete a special form to send with the sample to a lab for analysis:

- If your area has experienced a hurricane, flood, or other natural disaster, recovery teams may be distributing water-sampling kits. Check with the

county or local emergency-management coordinator in your area to see if you can get the container and form you need.
- If not, call a public health laboratory near you and ask someone to send you a kit for collecting a water sample for bacteriological testing. If you can't reach a lab near you, you can use one that is farther away. It's important to find a lab that can serve you quickly.

Public-health laboratories in Texas

Find the public-health laboratory nearest you on the list of accredited labs in Texas at <www.tceq.texas.gov/goto/certified_labs>.

You may call also call the TCEQ at 512-239-3754 and ask for this information.

Collect the sample

Find a good sampling location. The best site is an outside faucet in the open that does not leak.

- Take the sample at the faucet, not through a hose.
- Avoid sampling from fire hydrants, dirty areas, and areas behind bushes.
- Do not take samples from kitchen or bathroom sinks.
- Try not to sample in high or gusty winds or when it is raining.
- Handle samples carefully! It is easy to contaminate them. Contaminated samples give inaccurate results.

Follow these steps to take the sample:

1. Do not open the sample container yet. Open the faucet to full flow for 3 minutes to clear the line.
2. Reduce the flow to a slow, steady, spray-less stream—about the thickness of a pencil (¼ inch).
3. Be careful not to touch the inside of the container when you open it.
4. Do not rinse the container out—just fill it without splashing.
5. Close and seal the container. Make sure it doesn't leak—leaking samples cannot be accepted for analysis.
6. Note the time. (You will need to enter this on the form you send in with the sample.)

Send the sample to the lab

Don't delay! Your sample must arrive at the laboratory no more than 30 hours after you collect it. But first complete the form and pack the sample properly. If you have questions about this, ask the lab.

Fill out the submission form

With your sampling container, there will be a bacteriological submission form. Here's how to complete it for a private well:

- For "Name of Water System," write "Private."
- For "County," write in the name of your county.
- For "Send Results To:" enter your name and mailing address.

- Enter the date and time that the sample was taken.
- For “Type of System,” write “Individual.”
- For “Water Source,” give as much information as you can—for example, the location, diameter, and depth of the well. If you know the aquifer that the well is drilled into, enter that information, too.

Pack and send in the sample

Enclose the sample container in a plastic bag, seal it, and wrap the bag securely in bubble wrap or some other suitable padding. Put it on ice and the form in a box or envelope and send it by express delivery to the lab for analysis.

Check out the results

It should take about two days for the lab to complete its tests and return the results to you. The most important part of the results is the part about coliform organisms. There are three possible outcomes:

1. **Coliform organisms not found.** This is good news: As far as levels of harmful bacteria are concerned, your water is considered safe to drink at the time of sampling.

2. **Coliform organisms found.** This is not good news. Coliform organisms are present in your water, and it might not be safe to drink. Here is what to do:
   - Don’t use the water for drinking, bathing, cooking, preparing food, making ice, washing dishes, or cleaning.
   - Instead, boil or disinfect your water before you use it, use bottled water, or get water from another source,
   - If you choose to boil your water, heat it to the boiling point and let it continue at a full boil for two minutes. Let it cool before using it for drinking or bathing.
   - To learn how to disinfect water, go to EPA's Emergency Disinfection of Drinking Water webpage at <www.epa.gov/ground-water-and-drinking-water/emergency-disinfection-drinking-water>.
   - Disinfect the well and repeat the test.
   - Until you get a test result of “coliform organisms not found” from the lab, continue to boil or disinfect your water, use bottled water, or use water from another source.
   - If repeated tests continue to show coliform organisms are present, consider adding continuous disinfection equipment to your well.

3. **Unsuitable for analysis.** This is a gray area: The lab could not draw a conclusion, perhaps because of a sampling error. For example, if you rinse out the container before you collect the sample, the result might be “unsuitable for analysis.” If you get this result, you may choose simply to repeat the test, or you may consider disinfecting the well again before repeating the test.