

Respiratory Hazards During Hurricane Cleanup

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The following is a discussion of anticipated respiratory hazards found during a typical hurricane response.^{1,2} Information is intended to provide a general overview of potential inhalation hazards. It is not intended to present every respiratory hazard exposure that may occur. A comprehensive exposure assessment conducted by a qualified health and safety professional is recommended prior to completing work tasks in hurricane-affected areas. Use of a properly qualified contractor to handle and remove common clean-up hazards may be necessary in order to minimize exposures and resulting adverse health effects.

OSHA 2005 Gulf-Coast Hurricane Response Sampling

Respiratory hazards have been documented by OSHA during an extensive sampling survey conducted last year in the Gulf Coast region.³ More than 10,000 personal and area samples were collected in Texas, Louisiana, Mississippi, Alabama and Florida during Hurricane Katrina and Rita response efforts. Sample results represent response worker exposures to gases and vapors, metals, crystalline silica, asbestos, noise and total/respirable particulate. Potential exposures exceeding the OSHA PEL were found for all hazard categories. Table 1 (see page 2) includes a summary of sample results.

The general approach to respirator selection requires knowledge of the specific contaminant, the air concentration and the occupational exposure limit.

The most significant respiratory hazards identified in the OSHA survey, with respect to % TWA samples > PEL, were for crystalline silica (9% of samples > PEL) and particulate dust (3%). Sampling data for mold was not provided. These results suggest that airborne particulates present a significant respiratory hazard during hurricane cleanup.

Clearly, noise is also an exposure concern due to the common use of heavy equipment and motorized hand tools, generators, etc. Appropriate selection and use of hearing protection devices is critical in controlling noise exposures exceeding the OSHA PEL.

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Exposure Hazard	No. of Sample Results	Results ^a	
		No. of TWA Samples > PEL	% of Total Sample Results
Gases and Vapors	1127	19	2%
Metals	4486	3	<1%
Crystalline Silica	614	55	9%
Asbestos	838	6	<1%
Noise	1425	358	25%
Particulate Dust (Total/Respirable)	1573	40	3%

^aResults are meant to illustrate potential health risk to workers involved in the hurricane response. Comparison of the TWA results to the PEL are based on the sample period. TWA sample results identified above the PEL are not necessarily an indication that an OSHA violation has occurred. Does not include data from samples in process.

Mold Hazards

The aftermath of a hurricane can create optimal conditions for mold growth. Subsequent to water damage, mold may begin to grow on a variety of building materials and surfaces, both in open and hidden locations. Hidden mold may occur in places such as the back-side of drywall, wallpaper or paneling, top side of ceiling tiles, and the underside of carpets and pads. Other areas of hidden mold may include areas inside walls around pipes, surface of walls behind furniture, inside ductwork, and in roof materials above ceiling tiles. Mold growth can occur in a relatively short time. Building contents constructed of absorbent materials (paper, cloth, wood, etc.) that have been wet for

more than 48 hours are a likely location for mold growth. Disposal is typically the only remediation option for these materials. Smooth, hard surfaces such as metal and plastics can often be cleaned effectively.

Molds reproduce by means of tiny spores. The spores are invisible to the naked eye and become easily airborne. They're considered an inhalation hazard in that they release spores that are small enough to remain airborne. Disturbing the mold in any manner will result in higher air concentrations. Molds can also release low levels of volatile organic compounds that are thought to be the source of mold/mildew odors.

Dusts Containing Asbestos, Lead and Crystalline Silica

Cleanup in older buildings, both residential and commercial, can present exposure concerns to asbestos, lead and silica. All structures built prior to 1975 may contain significant amounts of asbestos. Asbestos containing materials were commonly used in boiler/pipe insulation, fireproofing, floor and ceiling tiles, roofing and siding materials. Many homes built prior to 1978 may contain lead-based paint. Prior to discovering the harmful health effects of lead, it was used in paint, gasoline, water pipes and many other products. Crystalline silica may be present naturally and in pulverized concrete. Any clean-up activity that involves disturbing debris can create airborne dusts, which may contain these and other harmful chemicals.

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Hidden Respiratory Hazards

Other inhalation hazards to consider during hurricane clean-up:

- Releases of petroleum and other hazardous substances from underground and above ground storage tanks can present significant health and safety concerns.
- Carbon monoxide generated when using fuel-burning devices such as gasoline-powered generators and pressure washers, camp stoves and lanterns, or charcoal grills in homes, garages or other confined areas.
- Soils containing low volatility, hazardous chemicals such as polychlorinated biphenyls (PCBs), pesticides and metals. These chemicals tend to remain in soil for long periods of time and become airborne when disturbed.
- Infectious disease may be a concern in areas where floodwater contains sewage or decaying animal and human remains. Standing water is a breeding ground for microorganisms that can become airborne during clean-up activities such as pumping/aeration of floodwater.
- Cleaners and disinfectants used to wash/disinfect dirty surfaces (mud, mold, mildew), particularly if used in confined areas.

Considerations for Respirator Selection

The general approach to respirator selection requires knowledge of the specific contaminant, the air concentration and the occupational exposure limit (PEL, TLV, etc.). In the case of mold, lack of recognized exposure limits requires use of other criteria in the selection process. The US Environmental Protection Agency (USEPA) and the New York City Department of Health have published recommendations for selecting respirators for mold remediation activities based upon the size of the contaminated area.⁴ The USEPA offers the following general guidelines for respirator selection:

- For areas less than 10 square feet, an N95 filtering facepiece respirator approved under 42 CFR Part 84 may be used in combination with non-vented goggles.
- For areas between 10 and 100 square feet, an N95 filtering facepiece respirator, or either a half mask with non-vented goggles or full facepiece respirator with 100 level particulate filters (e.g., P100) should be used.
- For areas greater than 100 square feet, a full facepiece respirator with 100 level particulate filters should be used.



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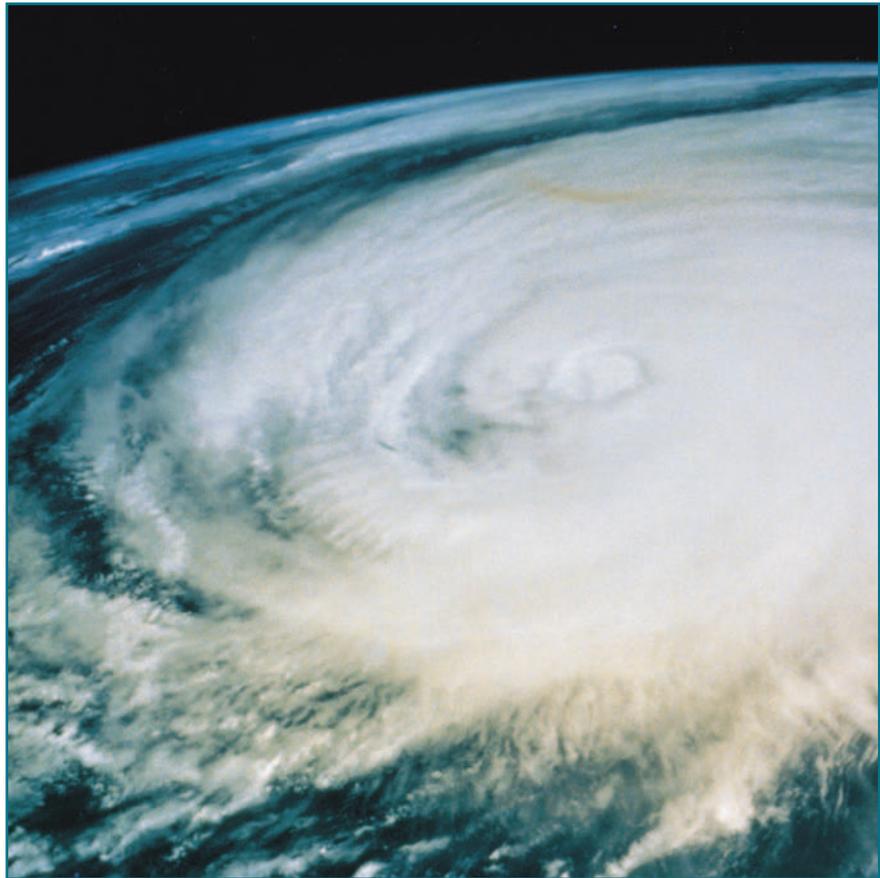
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Professional judgment that considers toxicity of the mold (if known), possibility of hidden mold, potential for aerosolization, and needs of the individual wearer should also be used when selecting respiratory protection.

For low-level microbial VOCs that may be produced by mold, a carbon-loaded particulate filter offering nuisance level organic vapor relief, or an organic vapor cartridge used with a particulate filter may also be used. Gases and vapors associated with disinfectants (chlorine, chlorine dioxide, ammonia, etc.) should be measured, and may also warrant the use of an appropriate chemical cartridge used with a particulate filter.

Respirator selection for other potential air contaminants must also be considered. In many cases, respirators used for mold exposures may also be used for other anticipated air contaminants as well. Consistent with current respirator selection practices, the following additional guidelines are offered when selecting respiratory protection for hurricane clean-up applications:

- A 42 CFR Part 84 approved N-Series particle filter (e.g., N95, N100) may be used where no oil aerosols are present.
- An R-Series or P-Series particle filter may be used for both oil and non-oil aerosols. When used for oil aerosols, refer to the manufacturer product packaging for time use limitations.



- Dusts containing asbestos require a minimum of a half mask elastomeric respirator with a 100 level particulate filter. OSHA prohibits use of filtering facepiece respirators (disposables) for asbestos. Refer to 29 CFR 1926.1101 Asbestos Construction Standard for specific OSHA mandated respirator selection requirements.
- Dusts containing lead require a minimum of a 100 level filtering facepiece respirator or half facepiece respirator with 100 level particulate filters. Refer to 29 CFR 1926.62 Lead in Construction Standard for specific OSHA mandated respirator selection requirements.

- A filtering facepiece respirator or half facepiece respirator with appropriate cartridges/filters may be used up to 10X the PEL.

Considerations for Respirator Training

Individuals participating in hurricane clean-up efforts represent a diverse group that includes both professional workers and volunteers. Their knowledge and experience in the use of respiratory protection may vary significantly. At a minimum, a basic understanding of respirators is essential to everyone prior to initial use. For professional workers falling under the scope of OSHA, specific regulatory requirements are applicable.

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Employers using respiratory protection must comply with all requirements of 29 CFR 1910.134 Respiratory Protection Standard, including, but not limited to, medical evaluations, training and fit testing, prior to using respirators. Fit testing provisions require that all workers wearing a tight-fitting, half or full facepiece respirator must pass a quantitative or qualitative fit test. The medical evaluation, which is used to determine if the person is physically able to wear a respirator, must be completed prior to the fit test. Respirator training must be completed on a minimum annual basis.

Volunteers should not be exposed to any hazardous airborne contaminants. Respirator use for volunteers is intended to help keep non-harmful dusts and certain particles out of their nose, mouth and lungs, and with some filters to help eliminate annoying odors only. The following guidelines are offered for non-occupational users of respiratory protection during hurricane clean-up:

- Check with the organization/agency to determine if they have a respirator program for their volunteers. If not

providing respirators, ask if they can recommend an appropriate respirator for the anticipated work. Contact the respirator manufacturer if assistance is needed selecting a respirator.

- Wearing a respirator adds physical stress in the form of additional weight and increased breathing resistance. If you have any doubts concerning your ability to wear a respirator, contact your physician. Discuss the type of work you will be doing, the respirator you intend to use and the anticipated contaminants.
- Follow the respirator manufacturer instructions for proper respirator donning and doffing procedures. A user seal check is required each time the respirator is worn. Also check instructions to determine if there are any time use limitations for the respirator.
- If wearing a reusable half facepiece or full facepiece respirator, follow the respirator manufacturer recommendations for cleaning. Daily cleaning is typically recommended.

Other work-specific conditions including work rate, physical condition, and ambient temperature and humidity, should also be

considered when making the personal decision to wear a respirator.

For additional assistance concerning the selection and use of respiratory protection for hurricane clean-up, call 3M Technical Service at (800) 243-4630. ■

References

1. <http://www.cdc.gov/niosh/topics/flood/>
2. <http://www.epa.gov/>
3. <http://www.osha.gov/katrina/lisareports/katrinaresults.html>
4. "Mold Remediation in Schools and Commercial Buildings", 2001, USEPA. "Guidelines on Assessment and Remediation in Indoor Environments", 2000. NYC Dept. of Health, Bureau of Environmental & Occupational Disease Epidemiology.

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