

# Above the Shoulders PPE for Flood Recovery and Cleanup



*The devastation and human toll brought on by flooding can be enormous. People involved in flood-related activities face exposure to a range of work related hazards, such as hazardous materials, micro-biological agents, eye/head/face hazards, noise and heat stress. From the start of the recovery period, through clean-up and rebuilding, the need for personal protective equipment (PPE) is essential.*

The requirement for PPE applies not only to the professional worker, but also the businesses and homeowners attempting to salvage their property and the numerous volunteers. As these individuals are such a diverse group, their knowledge and experience in the use of PPE may vary significantly. At a minimum, a basic understanding of the use and limitations of each type of PPE is necessary. Workers fall under the scope of State or federal OH&S regulatory agencies and requirements apply when using PPE. For others, following basic best practice guidelines will help reduce exposures to flood-related hazards. For questions about the proper use of PPE, refer to product user instructions or contact the manufacturer directly.

Following is a discussion of above the shoulders PPE including respiratory, hearing and head/eye/face protection during flood recovery and cleanup. Clearly, there may be a need in many situations for other full body protection in the form of protective footwear, clothing, gloves, etc. Refer to the following websites for a comprehensive discussion on this topic.

<http://www.health.qld.gov.au/healthieryou/disaster/>

<http://emergency.cdc.gov/disasters/floods/>

<http://www.cdc.gov/niosh/topics/flood/>

<http://www.osha.gov/OshDoc/flood-tornado-recovery.html>

## Respiratory Protection

Workers involved in flood recovery

and clean-up face both obvious and hidden respiratory hazards. Many of these hazards do not become apparent until the waters have receded.

### Mould<sup>1</sup>

The flood aftermath can create optimal conditions for mould growth. An assessment of homes in New Orleans and surrounding parishes after Hurricane Katrina identified ~46% of homes with some mould contamination and ~17% with heavy mould contamination.

Although moulds can be found almost anywhere indoors or outdoors, they need moisture and nutrients to grow. Mould grows best in damp, warm environments. The availability of nutrients in indoor environments rarely limits mould growth as building materials including wood, wallboard, wallpaper, upholstery can be nutrient sources. The main factor that limits mould indoors is lack of moisture. Subsequent to water damage, mould may begin to grow on a variety of building materials and surfaces, both in open and hidden locations. Hidden mould may occur in places such as the back-side of plaster wall, wallpaper or panelling, inside ceiling cavities, and the underside of carpets and pads. Hidden mould may occur on areas inside walls around pipes, on walls behind furniture or inside air conditioning ductwork.

Mould 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 mould growth.

Disposal is typically the only remediation option for these materials. Smooth, hard surfaces such as metal and plastics can often be cleaned effectively.

Moulds reproduce by means of tiny spores. The spores are invisible to the naked eye and easily become airborne. They are an inhalation hazard as they are small enough to remain airborne. The typical size range for a mould spore is 2-10 microns (µm) diameter.

Disturbing the mould in any manner can result in higher air concentrations. Aerosolization can occur in many ways, including disturbance of mould contaminated areas by human activity and dispersal of spores in contaminated surfaces of HVAC systems. Moulds can also release low levels of volatile organic compounds (VOCs) that are thought to be the source of mould/mildew odours.

Health authorities report people with asthma, allergies, or other breathing conditions may be more sensitive to mould. Those with immune suppression (people with HIV infection, cancer patients taking chemotherapy, and people who have received an organ transplant) are also more susceptible to mould infections<sup>2</sup>.

### Dusts Containing Asbestos, Lead and Crystalline Silica

Cleanup and demolition in older buildings, both residential and commercial, can present exposure concerns to asbestos, lead

and silica. Structures built prior to 1975 may contain significant amounts of asbestos. Asbestos containing materials were commonly used in boiler/pipe insulation, fire-proofing, floor and ceiling tiles, roofing and siding materials. Many homes built prior to 1978 may contain lead based paint. Crystalline silica may be present naturally and in pulverized concrete. Any cleanup activity that involves disturbing debris can create airborne dusts, which may contain these and other harmful substances.

#### *Bioaerosols*

Floodwater often contains infectious organisms, including intestinal bacteria such as *E. coli*, *Salmonella*, *Shigella*; and Hepatitis A Virus<sup>3</sup>. Pools of standing or stagnant water become breeding grounds for mosquitoes, increasing the risk of Ross River virus and other mosquito-borne diseases. Most cases of illness associated with flood conditions are brought about by ingesting contaminated food or water, exposures may also occur via skin contact and, to a lesser extent, inhalation. As a respiratory hazard, infectious agents may become airborne during certain clean-up activities such as pumping/aeration of floodwater or high pressure cleaning of contaminated surfaces.

#### *Considerations for Respirator Selection*

The general approach to respirator selection requires knowledge of the specific contaminant, the air concentration and the occupational exposure limit such as the SafeWork Australia Exposure Standard (ES) or the Threshold Limit Value® (TLV) published by the American Conference of Governmental Industrial Hygienists (ACGIH). In the case of mould, lack of recognized exposure limits requires use of other criteria in the selection process. The relevant Australian Standard for respirator use is AS/NZS1715.

Some US health authorities have published recommendations for

selecting respirators for mould remediation activities based upon the size of the contaminated area<sup>4,5</sup>. The USEPA offers the following general guidelines for respirator selection:

- For areas less than 1m<sup>2</sup>, an N95 (**Australian Standard equivalent is a P2**) disposable type respirator may be used in combination with nonvented goggles.
- For areas 1-10 m<sup>2</sup>, a P2 disposable respirator, or a half mask with P2 filters with nonvented goggles, or full facepiece respirator with P3 particulate filters should be used.
- For areas more than 10 m<sup>2</sup>, a full facepiece respirator with P3 particulate filters should be used.

Professional judgment that considers toxicity of the mould (if known), possibility of hidden mould, potential for aerosolisation and needs of the individual wearer should also be used when selecting a respirator.

For low-level VOC's that may be produced by mould, a carbon-loaded particulate filter offering nuisance level organic vapour relief, or an organic vapour ("A" type) filter with a particulate filter may also be used. Gases/vapours associated with disinfectants (chlorine, ammonia, etc.) should be measured, and may also warrant the use of an appropriate chemical cartridge with a particulate filter.

The CDC has prepared a chart containing population-specific recommendations for PPE, including respiratory protection, for protection against mould in flooded buildings. Refer to [http://www.bt.cdc.gov/disasters/mould/report/pdf/2005\\_mouldtable5.pdf](http://www.bt.cdc.gov/disasters/mould/report/pdf/2005_mouldtable5.pdf).

Respirator selection for other potential air contaminants must also be considered. In many cases, respirators used for mould exposures may also be used for other anticipated air contaminants as well.

Employers must select respirators based on OH&S requirements in their respective states with consideration to the respirator manufacturer's product user instructions. Consistent with current respirator

selection practices as described in AS/NZS1715, the following guidelines are indicated for selecting respiratory protection for flood recovery and clean-up applications:

- A respirator meeting Australian Standard AS/NZS 1716:2003 as a P2 particulate respirator may be used for:
- Dusts containing asbestos or lead require a half mask disposable or elastomeric respirator with a P1 or P2 particulate filter—these are suitable for use up to 10 times the relevant Exposure Standard.

A comprehensive exposure assessment conducted by a qualified health and safety professional is recommended prior to work in flood-affected areas. For homeowners, use of a properly qualified contractor to handle/remove common clean-up hazards (eg mould, asbestos, lead) is often recommended in order to minimize exposures and potential adverse health effects.

#### *Considerations for Respirator Training & Use*

Homeowners and volunteers, who don't necessarily have access to respirator training and fit testing programs, should, at a minimum, be made aware of basic information on the use and limitations of respirators.

The following guidelines are offered for non-occupational users of respiratory protection during flood clean-up:

- Homeowners should check with the local health department for recommendations on selecting the proper respirator.
- Volunteers should 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. *All users should read and follow the manufacturer's user instructions for the specific respirator to be fitted and used.* 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.

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.
- If wearing a reusable respirator, follow the respirator manufacturer recommendations for cleaning. Daily cleaning is typically recommended.

Other conditions including facial hair, work rate, physical fitness, ambient temperature and humidity should also be considered by the nonoccupational user when making the decision to wear a respirator.

### Hearing Protection

Hazardous levels of noise are common among workers involved in debris collection, site clearing and transportation activities. High exposures (> 90 dBA) are associated with workers operating heavy equipment, chippers, chain saws and industrial vacuums. Employers are required to limit the 8-hour noise exposure to 85dBA or less.

#### *Considerations for Selection of Hearing Protectors (HPD's)*

Hearing protection is usually necessary when operating heavy machinery and power tools. Both ear plugs and ear muffs are available and should conform to Australian Standard AS/NZS1270. Hearing protector ratings like the SLC80 or Class were developed to help inform the buyer concerning the capability of the HPD to reduce noise exposures when worn correctly. The SLC80 is the theoretical reduction (in decibels) that the HPD will provide

when worn correctly.

Virtually any model or brand of hearing protector, if worn properly, is capable of providing more than 10 dB of protection and this is often enough. Consideration of other factors, such as overall comfort, is probably as important when selecting a HPD. At the end of the day, the hearing protector that is worn more of the time during the noise exposure is the one that provides the most protection.

### Head, Eye and Face Protection

There are potential eye, head and face hazards during emergency response/disaster recovery that can include impacts, airborne dusts, falling debris, building materials, glass; smoke, irritating vapours/gases; thermal hazards and fires<sup>8</sup>.

Common injuries include corneal abrasions, conjunctivitis, particles embedded in the eye, chemical splash or burn, lacerations, facial contusion and infectious agent exposure.

#### *Head Protection*

Head protection is necessary in any situation where:

- There is a risk of falling objects.
- A person may strike their head against a fixed or protruding object.
- Accidental head contact with an electrical hazard exists.

The most appropriate helmets - as used in industry - are Australian Standard AS/NZS1801 compliant Type I helmets.

#### *Eye and Face Protection*

Thousands suffer eye injuries at work each year, yet 90% of them could have been prevented by using proper protective eyewear. There are many criteria important in selecting the correct protective

eyewear. These include:

- AS/NZS1337 compliant
- Size and fit of eyewear
- Lens tint and colour
- Scratch resistant/anti-fog coatings
- Splash and dust hazard protection
- Protection from irritant vapours and gases
- Compatibility with other PPE
- Need for secondary protection, such as a faceshield
- Vision correction needs

Safety glasses, goggles and face shields may be designated either low, medium or high impact. When a face shield can be raised from the normal use position, the device must be used in combination with safety glasses or goggles.

**For additional assistance concerning the selection and use of PPE for flood recovery and cleanup, call the 3M Australia Tech Assist Helpline on 1800 024 464**

#### References

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3. OSHA. Fact Sheets on Natural Disaster Recovery: Flood Cleanup. Available at <http://www.osha.gov/OshDoc/floodCleanup.html>
4. USEPA. Mould Remediation in Schools and Commercial Buildings. 2001
5. NYC Department of Health, Bureau of Environmental & Occupational Disease Epidemiology. "Guidelines in Assessment and Remediation in Indoor Environments". 2000.
6. OSHA. Hurricane Matrix. "Part II: Summary of Air and Noise Sampling Results Representing Actual or Potential Exposures for Response and Recovery Workers Involved in Hurricane Response and Recovery Activities". Available at <http://www.osha.gov/SLTC/etools/hurricane/samplingpart2.html>
7. OSHA. Federal Register, Vol. 46, No. 11, p. 4109, January 16, 1981. "Occupational Noise Exposure; Hearing Conservation Amendment."
8. NIOSH. Eye Safety, Emergency Response & Disaster Recovery. Available at <http://www.cdc.gov/niosh/eyesafe.html>

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