

# 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 need for PPE applies not only to the professional worker, but also to 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 OH&S regulatory agencies and requirements apply when using PPE. For others, following 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.

The 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 protection in the form of protective footwear, clothing, gloves, etc. Refer to the following websites for a comprehensive discussion on this topic.

<http://www.deir.qld.gov.au/workplace/subjects/floods/index.htm>

<http://www.health.qld.gov.au/healthiyou/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 the New Orleans district 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. Following 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 walls, wallpaper or panelling, inside ceiling cavities, behind furniture and the underside of carpets.

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. Whereas 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) in 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 like cleaning and dispersal of spores through contaminated air conditioning 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 suppressed immune systems (e.g 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 con-

cerns 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, fireproofing, 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.

#### *Respirator Selection*

The general approach to respirator selection requires knowledge of the specific contaminant, the air concentration and the occupational exposure limit (ES) as published by SafeWork Australia or the New Zealand Department of Labour. In the case of mould, lack of recognized exposure limits requires use of other criteria in the selection process. The relevant Australian/New Zealand Standard for respira-

tor use and selection is AS/NZS 1715.

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/New Zealand Standard equivalent is a P2**) disposable type respirator may be used in combination with non-vented safety goggles.
- For areas 1-10 m<sup>2</sup>, a P2 disposable respirator, or a half face respirator with P2 filters with non-vented safety 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 considered when selecting a respirator.

For low-level VOC's that may be produced by mould, a particulate filter with an activated carbon layer offering nuisance level organic vapour relief, or an organic vapour ("A" type) filter with a particulate filter may also be used.

The US 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 air contaminants as well.

Employers must select respirators based on OH&S regulatory requirements in conjunction with the respirator manufacturer's user instructions. Consistent with the current edition of AS/NZS 1715, the following guidelines are indicated for respiratory protection for flood recovery and clean-up applications:

- A P2 particulate respirator may be used for mould and bioaerosols.
- Dusts containing asbestos or lead require a half face disposable or elastomeric respirator with a P1 or P2 particulate filter—these are suitable for use in dust concentrations up to 10 times the ES

For workplaces, a comprehensive exposure assessment conducted by an occupational hygienist is recommended prior to work in flood-affected areas. For homeowners, use of a properly qualified contractor to handle/remove common clean-up hazards (e.g. 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 professional advice, 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 any specific 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 non-occupational 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 (>90dBA) are associated with operating heavy equipment, chipper, chain saws and industrial vacuums.

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

Hearing protection is usually necessary when operating heavy machinery and power tools. All hearing protectors should conform to Australian/New Zealand Standard

AS/NZS1270.

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. Realistically, 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 head, eye and face hazards during emergency response/disaster recovery that can include impacts, airborne particles, falling debris, building materials, glass, irritating vapours/gases, thermal hazards and fires<sup>7</sup>.

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

There are many criteria important in selecting the correct protective eyewear. These include:

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

For common flood cleanup activities safety glasses or safety goggles

meeting Australian/New Zealand AS/NZS 1337 with low or medium impact resistance will be suitable.

#### *Head Protection*

Head protection is necessary in any situation where:

- There is a risk of falling objects.
- A person may strike their head against an 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.

#### **References**

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5. NYC Department of Health, Bureau of Environmental & Occupational Disease Epidemiology. "Guidelines in Assessment and Remediation in Indoor Environments". 2000.
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7. NIOSH. Eye Safety, Emergency Response & Disaster Recovery. Available at <http://www.cdc.gov/niosh/eyesafe.html>



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