Introduction

This guidance note provides information for anyone who uses hydrofluoric acid or is responsible for managing or supervising its use in the workplace.

Hydrofluoric acid is a solution of hydrogen fluoride in water. It is corrosive, and highly poisonous. Skin contact with concentrated hydrofluoric acid or inhalation of its vapour has caused many serious injuries, even death. Concentrated solutions of hydrofluoric acid pass quickly through the skin and cause deep, painful burns. Dilute solutions also penetrate the skin, but it does not give the immediate burning sensation caused by the concentrated form of the acid, a user may tend to be less aware of the contact with the acid.

Hydrofluoric acid is used in many industries including metal treatment/cleaning, car detailing, glass etching, brick cleaning and laundry/dry cleaning.

Health effects

Hydrofluoric acid can cause serious injury or illness by:

- **Skin contact:** Concentrated hydrofluoric acid in contact with the skin will penetrate the skin to damage deeper tissues. This can lead to full-thickness skin burns. As well as this, fluoride entering the bloodstream will trap calcium and magnesium ions with rapid harmful effects on the heart, muscles and nervous system. Because of this, skin absorption is the main route of exposure for fatalities. Even dilute solutions will penetrate the skin although the effect is usually delayed. Once the dilute solution has penetrated, its destructive action will continue even after surface solution has been washed off.

- **Eye exposure:** A splash of hydrofluoric acid into the eyes can rapidly and permanently damage sight and urgent eye irrigation is required followed by immediate medical advice.

- **Inhalation:** The vapour of hydrogen fluoride, when inhaled, is almost completely absorbed into the bloodstream from the nose, throat and upper airway, before it reaches the lungs. During absorption, it can irritate or cause symptoms as mild as itching of the nose. However, inhalation of high concentrations of hydrogen fluoride vapour is very irritating and its absorption into the bloodstream can be fatal in the same way as skin absorption.

- **Ingestion:** Hydrofluoric acid can cause severe mouth, throat and stomach burns and may be fatal if swallowed.
NOTE: Do not confuse hydrochloric acid with hydrofluoric acid because of the similarity of names. On the skin, hydrochloric acid burns from the outside in. Hydrofluoric acid solution readily penetrates the skin and burns both skin and deeper tissues. If enough acid is absorbed, it may affect the heart and nervous system.

Legal requirements

Under the Victorian Occupational Health & Safety (Hazardous Substances) Regulations 1999 employers have a legal obligation to protect people at work against risks to their health associated with the use of hazardous substances. Work involving the use of products containing hydrofluoric acid at a concentration of 0.1% or higher falls within the scope of these Regulations. Solutions containing concentrations greater than 0.1% hydrogen fluoride are also Schedule 6 or Schedule 7 poisons. In Victoria, a permit is required from the Department of Human Services to sell or supply hydrofluoric acid.

Hydrofluoric acid is also classified as a Dangerous Good (refer Australian Dangerous Goods Code); it has a primary risk of Class 8 (corrosive) and a subsidiary risk of Class 6.1 (toxic). The Dangerous Goods (Storage and Handling) Regulations 2000 set out the requirements for the safe handling and storage of hydrofluoric acid.

Before using hydrofluoric acid for a work process, employers are required to obtain and have readily available a copy of the material safety data sheet (MSDS) from the manufacturer, importer or supplier. The MSDS provides information about the hazards of hydrofluoric acid and how to use it safely.

Preventing the risk of exposure

- Consider whether the process that uses hydrofluoric acid needs to continue.
- Consider whether a substance less hazardous than hydrofluoric acid will do the job instead.
- If a substitute is not available, then use the most dilute solution of hydrofluoric acid that is effective.

Controlling the risk of exposure

- Purchase hydrofluoric acid in ready to use concentrations rather than handling the concentrated hydrofluoric acid and diluting it yourself.
- Work with hydrofluoric acid in a well-ventilated area when the process that involves its use cannot be enclosed or controlled using local exhaust ventilation.
- Always wear personal protective equipment when handling hydrofluoric acid (see also the Personal protective equipment section below).
- Use sealed equipment such as a self-priming siphon or pump when transferring concentrated hydrofluoric acid.
- Use spouts and pourers designed to reduce flow when diluting hydrofluoric acid. Prefer containers from manufacturers that supply these.
- Make sure that the tanks/containers of hydrofluoric acid have fitted lids or caps.
- If you need to dilute hydrofluoric acid, always add the acid to water, never the water to acid.
- Do not work alone when handling hydrofluoric acid of more than 10 per cent concentration.
- Even when using dilute hydrofluoric acid wash hands and gloves in water frequently.
- Rinse components that have come into contact with hydrofluoric acid extremely well to avoid injuring other people who touch them after you.
- Use a brush or roller to apply hydrofluoric acid rather than a spray application.
- Develop and document safe work and emergency procedures covering control, first aid, spill containment and disposal of contaminated material.

Information and Training
Obtain a material safety data sheet from the supplier and follow the recommendations.
Transfer the dilute hydrofluoric acid into properly labelled containers. This is important because dilute hydrofluoric acid solution has the same appearance as water.
Be thoroughly aware of the hazards and fully trained in the safe use of hydrofluoric acid, its first aid and emergency procedures.

Personal protective equipment (PPE)
Always use suitable personal protective equipment (PPE) and clothing to protect your skin, face, eyes, etc from exposure to hydrofluoric acid. Recommended equipment and clothing includes:
- a full face plastic shield and/or safety glasses
- gloves that are resistant to hydrofluoric acid such as nitrile or natural rubber
- long sleeved protective overalls
- protective boots, such as rubber boots
- protective apron (covering top of boots) when handling concentrated hydrofluoric acid
- approved respirator (complying with AS/NZS 1716) fitted with an acid-gas filter, when working in confined areas or when it is necessary to spray a solution of hydrofluoric acid.

NOTE: Workers using PPE must be trained in its proper use and limitations.

Clean up after using hydrofluoric acid
Ensure that PPE is thoroughly cleaned with water after its use and checked for any damage, for example pinholes or cuts in the gloves, especially the fingertips. Professionally launder all contaminated clothing. Following any contamination of clothing with hydrofluoric acid, remove the garments at once and place them in a large volume of water such as in a trough. Preferably, make the water mildly alkaline – for example, add a heaped tablespoonful of sodium bicarbonate (baking soda). Clothing, heavily contaminated with hydrofluoric acid, should be decontaminated (as above) and then be disposed.

Always store cleaned PPE in clean, dry conditions, preferably a locker.

Wash hands and faces at the end of each job, and before eating, drinking, smoking or going to the toilet. Where possible, arrange for users of hydrofluoric acid to shower before leaving work.

First Aid and medical
Where hydrofluoric acid is handled, always have calcium gluconate gel antidote available. Ensure that First Aiders, hospitals and clinics in the area are informed and equipped to treat hydrofluoric acid exposure. Provide safety showers and eyewash stations, and any additional equipment recommended in the First Aid section of the MSDS.

Calcium gluconate gel should be stored below 25 degrees Celsius to remain efficient. The gel has a limited shelf life and must be discarded and replaced after expiry. Calcium gluconate gel and tablets are available from selected pharmacies or distributors of first aid medical supplies.

Appropriate emergency procedures and treatment must start immediately following any accidental exposure to hydrofluoric acid. Refer to the material safety data sheet from the manufacturer, importer or supplier.

Storage
Hydrofluoric acid must be kept in its original package and stored in a ventilated, cool and dry area and out of direct sunlight. In enclosed storage areas, hydrofluoric acid vapour may cause serious corrosion of sprinkler systems.
Store hydrofluoric acid close to ground level, on corrosion resistant surfaces, and in well-marked areas so it cannot be confused with other acids like hydrochloric acid. The area should be accessible enough to avoid excessive handling, and have spill retention measures so that any spill of hydrofluoric acid is contained. If spill and leaks of hydrofluoric acid occur, they must be immediately cleaned up according to the directions in the MSDS.

Keep hydrofluoric acid well separated from other acids, alkalis, flammable liquids, pool chlorine, and solvents. Do not mix with other chemicals - this may result in fire and chemical reactions or explosion. Promptly dispose of any redundant stock of hydrofluoric acid.

Further information

Acts, Regulations & Codes

- Occupational Health and Safety Act 1985
- Occupational Health and Safety (Hazardous Substances) Regulations 1999
- Dangerous Goods (Storage and Handling) Regulations 2000
- Australian Code for the Transport of Dangerous Goods by Road and Rail (also known as the Australian Dangerous Goods Code)

Acts and regulations are available from Information Victoria on 1300 366 356 or order online at www.bookshop.vic.gov.au

If you only want to view the legislation you can use the Parliament of Victoria web site; go to www.dms.dpc.vic.gov.au, click on "Victorian Law Today" and scroll down to the "Search" window.

WorkSafe Victoria

- Code of Practice for Hazardous Substances – June 2000

Copies of publications, including codes of practice, can be obtained by contacting WorkSafe Victoria on 03 9641 1555, or your local WorkSafe Victoria office.

Other useful health and safety information is available on WorkSafe Victoria's web site; go to www.workcover.vic.gov.au and click on the WorkSafe Victoria logo.

Australian Standards

- AS/NZS 1716 – 2003: Respiratory protective devices

Copies of standards can be obtained by contacting Standards Australia on 1300 654 646 or by visiting the web site at www.standards.com.au.

Other

- National Industrial Chemicals Notification and Assessment Scheme (NICNAS)
  Hydrofluoric Acid (HF) – Priority Existing Chemical Assessment Report No. 19, June 2001

NICNAS falls under the jurisdiction of the Australian Government Department of Health and Aging. To view this document go to the NICNAS web site, www.nicnas.gov.au, then select Publications, Chemical Assessment Reports, Priority Existing Chemicals Assessment Reports, and scroll down to
PEC/19. Alternatively, insert the following address into the internet address field:

National Occupational Health and Safety Commission (NOHSC)

The NOHSC web site provides access to technical data and occupational health and safety information; go to www.nohsc.gov.au/OHSLegalObligations/ If you can't find guidance material that gives the solutions or advice you're after, try the national database of guidance material on the NOHSC web page; go to natindex.nohsc.gov.au/

Suppliers of hydrofluoric acid

Suppliers are a good source of information on use, chemical properties and health effects of this substance.

Note: This guidance material has been prepared using the best information available to WorkSafe Victoria. Any information about legislative obligations or responsibilities included in this material is only applicable to the circumstances described in the material. You should always check the legislation referred to in this material and make your own judgement about what action you may need to take to ensure you have complied with the law. Accordingly, the Victorian WorkCover Authority extends no warranties as to the suitability of the information for your specific circumstances.

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