

INDUSTRY STANDARD CONTAMINATED CONSTRUCTION SITES

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CONSTRUCTION AND UTILITIES







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WorkSafe Victoria is a division of the Victorian WorkCover Authority.

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INTRODUCTION

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Construction work often involves development of sites, both large and small, that have been contaminated by various substances. Contamination can be a health risk to both site workers and others living, working or passing nearby, if the risks are not controlled.

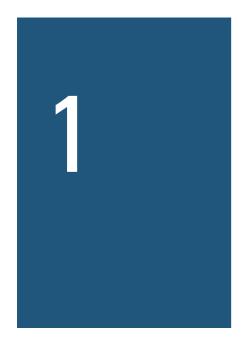
This Industry Standard provides land developers and principal building contractors in Victoria with a guide to safe work practices on contaminated construction sites. It outlines how to identify contamination, determine the level of contamination and provide and maintain an acceptable level of protection for workers and sub-contractors.

The document, jointly produced by EPA Victoria and WorkSafe Victoria, was an initiative of EPA Victoria's Project on OHS Guidance for Assessment, Remediation, Construction and Maintenance Workers on Potentially Contaminated Sites.

Development of this document took place with assistance from an industry working group comprising:

- CFMEU General and Construction Division
- Victorian Construction Safety Alliance
- Master Builders Association of Victoria
- Office of Housing
- EnviroProtect
- Kilpatrick & Associates
- Noel Arnold & Associates
- B Safe Consultants

Lane Consulting, HLA-Envirosciences Pty Ltd and Golder Associates Pty Ltd also provided input to the working group.



GENERAL INFORMATION

1.1 SCOPE

This Industry Standard aims to:

- raise awareness of potential worker health risks at construction sites with contaminated soil or water:
- provide general guidance for risk assessment relating to contaminants; and
- provide guidance on controlling risks of exposure.

It applies to all types of construction sites (including sites for housing, commercial, and civil and engineering construction) during any stages of construction, including excavation and demolition.

This Industry Standard does not cover:

- remediation (clean-up) of a contaminated site. This work is specialised and requires specific guidance from a competent person, such as an occupational hygienist or site safety assessor!
- environmental management of a contaminated site, unless the information can help manage occupational health and safety on a contaminated site.

1.2 Compliance with legislation

The following legislation applies to those who have control of sites that are contaminated:

• The Occupational Health and Safety Act 2004, administered by WorkSafe Victoria, the health and safety arm of the Victorian WorkCover Authority.

Employers, including principal contractors, have general duties under this Act to provide a safe and healthy working environment for workers, any contractors that they hire and others living, working or passing nearby.

• The Environment Protection Act 1970, administered by EPA Victoria.

Builders have duties under this Act not to pollute land, water and air during construction activities and not to cause or permit an environmental hazard. This means appropriate handling of industrial waste and preventing run-off, or any other uncontrolled movement of contaminated soil or water, from a construction site.

¹ A "Site Safety Assessor" is a professionally qualified and experienced person with specific responsibility for the hazards assessment and risks associated with the investigation of any site and to prepare site safety plans. [More information is in the National Environment Protection Measure (NEPM), Schedule B(9), Guideline on Protection of Health & the Environment During Assessment of Site Contamination.]

PART 1: GENERAL INFORMATION

1.3 Referenced documents

This Industry Standard works in conjunction with:

- WorkSafe Victoria's Code of Practice for Building and Construction Workplaces No.13 1990. This Industry Standard complements the Code's recommendations on providing amenities, personal protective equipment, clothing and other facilities.
- Environmental Guidelines for Major Construction Sites, published by EPA Victoria.
- National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 published by the National Environment Protection Council (NEPC) which is part of the Environment Protection and Heritage Council. This Federal Government body develops national environment protection measures and assesses and reports on the implementation of these measures in the state jurisdictions.
- certain other environment protection policies and guidance, mainly published by EPA Victoria, on managing and dealing with waste soil and water on construction sites.

See Appendix 3 for details of these publications.

2

WHAT IS A CONTAMINATED SITE?

2.1 DEFINITION OF A CONTAMINATED SITE

A contaminated site has had one or more certain substances added to it exceeding background levels² which may be a risk to human health or the environment.

These substances can be chemicals, such as heavy metals or solvents, or other contaminants such as medical waste.

Contamination may be the result of:

- · industrial processes once carried out on the site
- materials stored or dumped on the site
- some agricultural processes on the site, such as a sheep dip or where farm chemicals were mixed for application
- contaminants in imported fill
- demolition

2.2 Where do you find contamination?

A site may have contamination:

- on the surface of the soil or in fill material
- deeper in the soil (e.g. covered by soil or fill and not exposed until excavation starts)
- in surface water
- in groundwater
- in the air
- taken up by vegetation growing on the site
- as a result of substances released from existing buildings or plant or during demolition (e.g. asbestos).

Contaminants in soil are usually a greater risk to health than those in groundwater or surface water because workers are more frequently in contact with the soil.

Contaminants may be present in different amounts, in different locations on any site.

Usually contaminants are in the top 0.5 -1 m soil layer, although rain or water infiltration may carry contamination across a site. In some cases, wastes may be buried at deeper levels, especially if:

- natural hollows in the site were previously filled with imported materials
- the site was used as a waste storage depot or tip, or
- if an underground storage tank or other underground structure existed.

² See Definitions, page 19

PART 2: WHAT IS A CONTAMINATED SITE?

Obvious signs that a site is contaminated include:

- discoloured soil, or slimy or oily patches
- · distinctive odours from the soil
- foul smelling/discoloured surface water
- buried drums or other containers
- other waste material (may include asbestos or clinical waste)
- poorly growing or deformed vegetation
- · geotextile marker layer material

2.3 Examples of contaminants

Some common contaminants can be found on any site. Others depend on previous site use³. The main types of contaminants that may be harmful to workers' health are:

- metals (e.g. lead)
- inorganic compounds (e.g. cyanide compounds)
- oils and tars
- pesticides
- other organic compounds (e.g. benzene, toluene, polychlorinated biphenyls [PCBs])
- toxic, explosive or asphyxiant gases (e.g. methane)
- combustible substances (e.g. petrol)
- fibres (e.g. asbestos, synthetic mineral fibres)
- putrescible or infectious materials (e.g. medical wastes)
- radioactive waste
- other harmful waste (e.g. unexploded ordinance, syringes)

2.4 Potential health effects

Short or long term health effects to people exposed to contaminants depend on:

- the type of contaminants at the site
- the quantity of contaminants present; and
- the amount of time a person is exposed.

Exposure to contaminants in soil and/or water or fumes in the air can cause harm quickly (acute effects) or cause illness long after exposure (chronic effects).

Adverse health effects caused by certain chemicals can include:

- · headaches and nausea
- skin rashes
- breathing difficulties
- · liver or kidney problems; or
- · some types of cancer in the long term

DO NOT ignore the symptoms of possible exposure such as skin irritation or nausea.

If you develop such symptoms and have been working on a site that is or may be contaminated, report it to your employer and discuss it with your doctor.

³ See Appendix 1 for examples of land use that may have caused contamination.

PART 2: WHAT IS A CONTAMINATED SITE?

2.5 How can people be exposed?

The body absorbs chemicals mainly by:

- direct contact with the skin or eyes (includes exposure to dust)
- penetration through the skin (either damaged skin or intact skin)
- breathing in particles, dust, fibres or fumes and vapours
- swallowing soil particles or contaminated water
- · contaminated food or drinking water

2.6 Re-use of waste soil

Surplus soil imported from another site may contain contaminants from a previous use.

The ability to reuse this soil will depend on:

- the level of any contaminants
- · the current level of contamination on the site; and
- the end use of the site

In situations where a site has low-level metal contaminants in the soil and requires more fill, it may be acceptable to bring in fill that also contains low-level metals. In this situation, the risk should be assessed and any necessary measures implemented to control the risk to workers during construction.

The site owner, manager or site supervisor should obtain information, such as a Certificate of Analysis, from the supplier of the soil brought onto the site to ensure that the soil is suitable for the site's purposes.

The EPA encourages the re-use of waste soils where the soil is suitable for use on the receiving site and where there is a genuine need for such soil.

⁴ For more details, see *EPA Industrial Waste Management Policy (Prescribed Industrial Waste),* referred to in Appendix 3, or contact the nearest EPA regional office.



3.1 SITE ASSESSMENT

Many chemicals that are considered contaminants are present in soil on most sites at some level either naturally or introduced by some former industrial process.

In small amounts, these contaminants should not present a health risk; at higher levels there may be a health risk and precautions may be necessary. (Exact levels for each chemical that may be a risk to health will depend on each situation.)

On any site where contamination is, or may be present, a site assessment should be carried out as part of the process of identifying any risks to health and safety and determining control measures needed before construction work begins.

Contamination could be present (requiring a site assessment) on sites that:

- were previously used for industrial purposes
- have a site history indicating there may be contamination
- have physical signs of contamination
- contain fill material from former industrial sites (e.g. inner urban sites)
- have any other indicators of contamination (e.g. substances released from existing buildings or plant)

A site assessment involves checking the site's history, and if previous land use indicates that contaminants may be present (or there are obvious signs of contamination), taking soil samples to analyse them and identify what contaminants are present and at what concentrations.

Site assessments should be undertaken by a competent person with skill, knowledge, training and contaminated site experience using measures to protect against possible exposure. In most cases, specialist advice will be required to assist with taking soil samples during a site assessment, interpret test results and carry out risk assessments reflecting information provided by the site assessment.

3.2 Environmental audits

On some sites, a *statutory environmental audit*⁵ is required. Local councils usually require an audit when industrial sites or potentially contaminated sites are redeveloped for residential use. Audits may also have been conducted for bank or financial institutions' requirements or as required by the EPA.

An audit will include:

- an assessment of soil contamination and any risks to health or the environment
- advice on whether the site requires any remediation before use; and
- information about occupational health and safety for workers on the site.

⁵"Environmental audit" refers to a site assessment conducted by or reviewed by an independent EPA-appointed auditor operating under strict EPA guidelines. For more information refer to EPA Publication 860 'Environmental Auditing of Contaminated Land'.

An audit can provide valuable information to help assess risks from any contamination remaining on a site and assist in decisions about any required control measures.

Where a site has been issued with a statement of environmental audit, the occupier of that site must provide a copy of that statement to any person who becomes the occupier of the site, under the *Environment Protection Act*, section 53ZE.

To check whether an audit has been completed on a site, contact the site owner, local council or EPA Information Centre.

3.3 Risk assessment where contaminants are present

If the site assessment indicates contaminants are present, risks to the health of workers and others in the area should be assessed.

A risk assessment should be carried out by a competent person, and may require additional specialist advice. The risk assessment should consider the:

- type of contaminant present
- · working conditions
- · tasks to be carried out
- routes of exposure (the way substances get into the body); and
- level of exposure (e.g. hours of working in those conditions)

The level of contaminants that may pose a workers' health risk can vary from site to site depending on the type of contaminant and jobs performed. Each site will need an individual assessment.

Information from a risk assessment will determine appropriate control measures for workers on the site. These measures should be included in any health and safety plan and the Job Safety Analysis (JSA) for any work involving contaminant exposure.

3.4 Specialist advice

Site assessments and risk assessments usually require advice from a specialist contractor such as an experienced environmental consultant or occupational hygienist. These specialists will provide an accurate picture of the site, including the spread of contaminants across the site and potential workers' exposure.

Specialists should conduct assessments in accordance with the principles of the National Environment Protection Measure (NEPM), in particular with Schedules B(4) *Guideline on Health Risk Assessment Methodology* and B(9) *Guideline on Protection of Health and the Environment during the Assessment of Site Contamination.*

3.4.1 Health-Based Investigation Levels

The person conducting assessments should also refer to the Health-Based Investigation Levels (HILs)⁶ listed in the NEPM Schedule B(7a) *Health-Based Investigation Levels* for initial guidance on potential health risks associated with particular contaminants.

HILs are not intended to be "response levels" or "cleanup levels", but should provide a trigger for further investigation if specified levels are exceeded.

HIL values have not yet been set for all contaminants in soil, including many volatile compounds. Where such contaminants exist on a site, the person conducting an assessment should develop other "acceptance criteria" for that site.

^{6&}quot;See "Definitions" on page 19 for more information on HILs

3.5 Developing a health and safety plan

Where a risk assessment indicates that contamination levels pose a risk to workers' health, the principal contractor, with assistance from a site safety assessor or other competent person with expertise in this field, should develop a health and safety plan specifying the risk of exposure to contaminants and how workers are to be protected.

Plans should include information from assessments and cover all relevant steps and processes, such as training, work variation, health monitoring etc.

The extent of the plan will depend on the results of the assessment and the reasonably practicable methods required to effectively control the risks.

The development of the plan should take into account the matters outlined in the following sections.

3.6 Managing a health and safety plan

Designate a specific person with the authority to follow through with the plan. This may mean close work with various state and local government authorities, consultants and parties who can assist in protecting workers from exposure to contaminants.

3.7 Consulting workers

During the risk assessment and development of a safety plan, employers must consult with employees who will be directly affected. Where employees are represented by any health and safety representatives (HSRs), consultation must involve these HSRs.

3.8 Information, training and supervision

Additional training and/or supervision for employees will be required for safe work practices, hygiene measures and implementation of control measures.

Training aims to ensure that workers:

- understand the hazards and risks associated with work on a contaminated site
- are not likely to cause harm to themselves or others
- know how to use any mobile plant and equipment and personal protective equipment and clothing (PPE).

During training, all workers should be provided with:

- copies of any health and safety plan
- copies of any safe work procedures (including JSAs)
- information about symptoms of exposure to contaminants on the site
- information on personal hygiene and managing of tools and equipment to eliminate hazards
- information on what to do in an emergency, who to contact in an emergency and who to notify about an incident; and
- contacts for emergency response, including medical and incident notification.

Workers should have access to these documents at all times.

3.9 Unexpected contamination and "hotspots"

Sometimes site contamination is not expected and is detected after work commences.

Excavations may uncover buried drums, other materials containing contaminants, or a geotextile 'marker layer'. This geotextile layer indicates that the site may have been contaminated and partially cleaned up previously.

In other situations a site may have been tested for contaminants at several locations, but some contamination "hotspots" may have been missed.

Unexpected contamination or hotspots on a site should be taken into account for any site health and safety plan. Precautions should be included in the plan, including:

- workers trained to recognise potential contamination and danger signs e.g. odours or soil discolouration
- precautions if signs of unexpected contamination or hot spots are found, such as:
 - stop work
 - · report signs to the site supervisor immediately
 - isolate the area with a physical barrier
 - assume the area is contaminated until an assessment proves otherwise
 - · assess the area to identify contaminants in the soil or spoil

3.10 Asbestos

Asbestos could be present on a construction site in various forms including cement pipes, pits, conduits, insulation coatings on pipelines and underground tanks or as fragments in the soil from past uses.

If asbestos is suspected or identified, it should be assessed in accordance with the Victorian *Occupational Health and Safety (Asbestos) Regulations 2003.*

The Regulations prohibit the supply, storage, transport, sale, use and re-use of asbestos or asbestos containing material. These prohibitions do not apply to soil in which asbestos containing material *was* present if the material has been removed and a visual inspection of the soil by a competent person indicates that there is no remaining material in the soil.

Any visible asbestos should be removed from a site in accordance with the Regulations. Even though known or identified asbestos has been removed, unidentified and/or normally inaccessible asbestos could still be discovered as work on the site progresses (e.g. in debris and waste buried in soil) and precautions taken similar to those for "unexpected contamination and hotspots" (see 3.9).

Depending on the type and amount of asbestos found, the site supervisor, hygienist or site safety assessor may need to call in a specialist asbestos consultant to provide advice on cleanup and monitoring and whether to hire a licensed asbestos removalist.

Bonded asbestos, asbestos cement

Bonded (non friable) asbestos, or AC sheet, has the asbestos fibres bonded into a matrix. When this is in good condition, it has a low risk of releasing fibres.

Where bonded asbestos is found on a site, inform the site supervisor and consult with an occupational hygienist or site safety assessor. If there are only isolated fragments, pick them up carefully and double-wrap in strong plastic for appropriate disposal?

Where a *significant* amount of bonded asbestos is found, cease work in the area, isolate the site and have an occupational hygienist or site safety assessor investigate.

For advice on appropriate disposal options refer to EPA Publication 364 *Transport and disposal of waste asbestos* or contact the nearest EPA regional office.

Friable asbestos

If any friable asbestos is visible on a site - e.g. old asbestos lagging - that area should be isolated, the site supervisor informed and an occupational hygienist or site safety assessor consulted. A 'Class A' licensed asbestos removalist (licensed by WorkSafe) is required to remove any amount of friable asbestos.

3.11 Protecting building trades during subsequent work

A copy of any health and safety plan, including the site assessment and risk assessment, should be provided to the owners of a contaminated site following completion of construction work.

This information should be supplied to any workers involved in subsequent construction work on the site e.g. trenching, maintenance of underground services or demolition work. This ensures they are aware of the risk of exposure to contaminants in the soil and understand what control measures are required.

4

CONTROL MEASURES

4.1 LEVEL OF CONTROL MEASURES

The types of controls specified in a health and safety plan to protect the health of workers on contaminated sites will depend on the results of the site's risk assessment.

In many cases, principal contractors of sites with low levels of contamination may only need to provide personal protective equipment and clothing, relevant training and instruction and the standard amenities specified for any construction site in the *Code of Practice for Building and Construction Workplaces*. In other cases, one or more of the precautions outlined in this part will be necessary.

As the first step, principal contractors should determine whether the risk can be eliminated by removing contaminated soil from the site. Where this is not reasonably practicable, the risk must be reduced as far as reasonably practicable.

Follow the *hierarchy of control*, a ranking of controls in order of effectiveness, to reduce the risk as far as reasonably practicable:

- isolation e.g. separating workers from contamination by distance or some form of cover e.g. capping
- engineering controls e.g. use of powered mobile plant or barriers to reduce physical contact and suppress dust
- administrative controls e.g. reducing the number of employees exposed, minimising periods exposed and providing hygiene facilities
- personal protective clothing and equipment (PPE)

The most effective way to protect workers may be a combination of measures.

4.2 Removal of contaminated soil

For highly contaminated soil - where the risk assessment shows a health risk if workers are exposed - control the risk by removing contaminated soil, if this is reasonably practicable. An environmental consultant with experience in contaminated site assessment and remediation can provide guidance to remove and dispose of contaminated soil.

If the site is to be remediated by removing contaminated soil, complete this before construction commences when possible. Where not possible and site remediation is carried out at the same time as other construction works, the site health and safety plan should cover worker and public health during all stages of the work.

Contaminated soils that are Prescribed Wastes must be transported in an EPA permitted vehicle with an EPA Transport Certificate and disposed of at a suitable licensed site in accordance with the Environment Protection (Prescribed Waste) Regulations 1998.

⁸Refer to EPA Publications 878: Classification of Contaminated soil, 626: Management of Waste Contaminated Soil and Low Level Contaminated Soil, and 395b: Industrial Waste Strategy – Instruction for Completion of Waste Transport Certificates, or contact the nearest EPA regional office.

4.3 Capping soil on the site

Depending on the type of contamination and the construction activities on a site, an acceptable control measure may be to cap contaminated soil with an impervious layer and put procedures in place to prevent penetration of the cap.

Use of this method will depend on:

- type of contamination (capping may be unsuitable if contaminants cause fumes)
- amount of contamination
- proposed use of the site
- · depth of the water table
- · whether there will be a risk to workers during the construction process or;
- risks to other trades entering the site later (e.g. plumbers trenching through the capping layer)

Where soil is highly contaminated and is being treated to reduce contamination to a safe level to keep the soil on the site, capping may occur during the process.

During specialist remediation work, a temporary cover or method of containing contaminated soil may be necessary to prevent contact, dust blowing off-site and keep soil from washing into any drainage inlets close to the area. Construction work should be postponed until the treatment is completed.

These decisions will generally require specialist advice. For further information, contact the nearest EPA regional office.

4.4 Standard hygiene practices

Where isolation from contaminants is not reasonably practicable, and where skin contact is a main route of exposure, observe good hygiene practices:

- Personal protective equipment and clothing as a minimum, overalls, boots and gloves should be worn to cover exposed skin.
- Washing facilities provide adequate washing facilities to remove contaminants from hands and any exposed skin.
- Eating and personal habits eating or smoking should be prohibited in contaminated areas to minimise transfer of contaminants from hand to mouth.

4.4.1 Code of Practice for Building and Construction Workplaces

All health and safety plans for construction sites should include the standard hygiene requirements outlined in the Code of Practice for Building and Construction Workplaces (No.13) 1990. This is because any soil can contain bacteria, mould spores and irritants, as well as some contaminants.

In particular, note Parts 6 and 8 of the Code.

Part 6.1 states: "Principal contractors should consider providing showers on major sites where the nature of work causes the workers to require a shower, such as where processes are particularly dusty or hazardous."

Part 8.1 states: "Where the employee is required to change clothes and wear special protective clothing to work with toxic or dangerous substances, an appropriate facility for decontamination, separate from other sanitary and washing accommodation, should be provided."

See Section 4.6 for additional control measures and work procedures that may be necessary on some sites depending on the type and amount of contamination present and the outcome of the risk assessment.

4.5 Personal protective equipment and clothing

Work on contaminated sites usually requires using a range of personal protective equipment and clothing (PPE). PPE includes clothing e.g. overalls, boots and gloves, and eye protection, and may also include breathing protection, such as dust masks or respirators.

PPE should only be used where it is not reasonably practical to eliminate hazards or isolate people from them.

The use of PPE can lead to other dangers i.e. heat stress, and working difficulties such as restricted vision, lack of mobility and communication problems. Consider these factors when selecting the appropriate equipment. Further risk assessments may be necessary to determine PPE impact on other tasks at the site.

Selection of appropriate levels of PPE is based on the:

- type and amount of the contaminants on site
- nature of the work
- expected or potential exposure levels
- route of entry of the contaminants into the body
- actual performance of PPE

Workers should be trained and instructed in the correct use of specialised PPE (such as breathing protection).

PPE must be regularly cleaned, maintained and inspected to ensure it remains effective.

The site safety assessor may need to consult an occupational hygienist for advice on the selection of specialised PPE, and training and supervision for staff using this equipment. Affected employees and any elected health and safety representatives must be involved in consultation.

A program may be required to monitor the health of workers using PPE to ensure that the equipment is working effectively to prevent exposure.

4.6 Environmental monitoring

If a site has potential airborne contaminants, such as dusts, fibres, gases or vapours, environmental monitoring should check whether these are being generated, if any exposure is being adequately controlled and whether additional precautions are required to protect workers.

4.7 Additional hygiene measures

A risk assessment may identify the need for additional hygiene measures and work procedures, such as a serviced hygiene unit or work zones (see below) to control exposure where significant levels of contamination remain on a site.

If these measures are required, consult an occupational hygienist for further advice.

In most cases, a site requiring such measures *should be cleaned up before construction starts*. Site cleanup is specialised work and requires specialist advice.

The following is provided for general information only:

4.7.1 Serviced hygiene unit

To control exposure to significant levels of contamination, a serviced hygiene unit should be set up at the most convenient access and egress point to a contaminated area. This would reduce the risk of workers coming in contact with contaminants after leaving the work area, and prevent others outside the work site being exposed to contaminants.

A recommended layout for a hygiene unit is:

- first stage after exiting the "dirty zone", an area for removal and storage
 of contaminated work wear such as overalls, footwear, gloves etc
- second stage washing area (equipped with deep sink troughs for hand washing and showers for workers who have been in trenches or in dusty conditions)
- third stage a clean room used for the storage of normal clothing.

The unit's toilets should be situated so that workers undergo the hygiene procedure before using these facilities.

Boot wash

A boot wash, with a brush to remove soil, should be situated at the entrance to the first stage of the serviced hygiene unit.

Eating and personal habits

No eating or smoking should take place in the "dirty" area. An amenity area for workers, which can only be entered from the "dirty" zone by going through the serviced unit, may be installed on the clean side of the site.

4.7.2 Work zones

On larger sites, work zones around contaminated areas may be needed with boundaries clearly marked, signposted and controlled to prevent exposure to unprotected workers. Workers (including sub-contractors) should not enter these zones unless they are equipped with the minimum PPE stipulated in the health and safety plan and trained on its use.

A recommended layout for work zones is:

- an exclusion zone where the work may involve exposure to contaminants and which is restricted to essential personnel who are trained and appropriately protected
- a decontamination zone on the boundary containing a serviced hygiene facility and facilities for washing mobile equipment and plant
- a support zone where support services are located and unprotected people can work with minimal exposure risk.

4.7.3 Decontaminating mobile plant and equipment

The risk assessment may identify a requirement for decontamination of mobile plant and equipment at the boundary of the site when leaving the area.

Where this is required, contaminated plant and equipment should be thoroughly cleaned by washing wheels, underbody and wheel arches in particular, with a high-pressure hose until soil is visibly removed.

Drivers should stay in the cabs of their plant until washing has been completed to avoid the spread of contaminants.

In some situations, a wheel washing alternative may be to install a gravel barrier area at the exit point of the contaminated area to trap contaminated soil from vehicles.

To prevent build-up of contaminants in excavator cabs, it may be necessary to vacuum cabs at the end of the day by using an industrial vacuum cleaner that meets the requirements of Australian Standard AS 3544 -1998.

Disposal of contaminated waste water and materials

Contaminated waste wash water, contaminated gravel from barriers and other contaminated materials should be handled and disposed of according to environment protection requirements.

In the case of waste water and/or gravel, silt, or other waste that could wash off the site, this may have to be collected to comply with specific environmental requirements?

For further information, contact the stormwater coordinator at the nearest EPA regional office, or the local by-laws officer for the council where the site is located. For more advice on disposal of other contaminated materials such as gravel, contact the nearest EPA regional office.

⁹See EPA Publication 480 – *Environmental Guidelines for Major Construction Sites*, and Victorian Stormwater Action Program's *Protecting Stormwater Quality from Building and Construction Sites*.

4.7.4 Security

The risk assessment may identify that site entry should be restricted with fences or other barriers to protect members of the public. Signs at the perimeter and after hours security may also be necessary at some sites.

4.7.5 Communications

Large sites with a series of work zones need an effective communication system in case of emergencies and to assist with site control and response. It may also assist contact between on-site and off-site personnel in various zones.

This will depend on the size and remoteness of the site and the existence of any confined or enclosed spaces. The *Occupational Health and Safety (Confined Spaces) Regulations 1996* apply when working in confined spaces.

4.8 Summary of recommended control measures

Information from a risk assessment will determine appropriate control measures for a contaminated construction site to protect the health of workers and others.

While every contaminated site is different and may require different control measures as indicated by the risk assessment, the table on the following page sets out typical control measures on sites where contamination has been identified. For more information on controls, see the details in this part of the document

Control measures should be specified in a site health and safety plan and the Job Safety Analysis (JSA) for any work involving exposure to contaminants.

Employers who do not implement reasonably practicable control measures on contaminated sites and therefore risk the health of workers and others are likely to be in breach of the OHS Act.

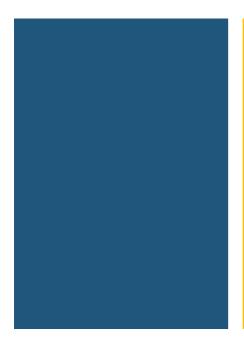
Specialist advice may be required to develop effective measures to protect workers from exposure.

In all cases workers must be consulted on developing control measures. Information, instruction and training must be provided to workers on any measures. Any health and safety representatives on site must be involved in consultation.

RECOMMENDED CONTROL MEASURES ON CONTAMINATED SITES

Information, instruction and training must be provided on all controls introduced

Level of risk on site	Control measures recommended
1. No contamination above background levels identified in site assessment. Dusty processes/contact with soil. Note: soil can contain harmful bacteria, spores and irritants, as well as some contaminants	 Amenities with hygiene facilities i.e. adequate washing facilities. In accordance with recommendations in the Code of Practice for Building and Construction Workplaces (No. 13) 1990
2. Site assessment indicates contaminants above background levels – but risk assessment indicates contaminants unlikely to pose risk to worker/public health.	Amenities with hygiene facilities i.e. adequate washing facilities
3. Risk assessment indicates contamination above background levels that pose some risk to worker/public health.	Eliminate risk by removing contaminated soil before work begins. Where elimination is not reasonably practicable, isolate workers from contamination or use engineering controls to reduce exposure. Where not reasonably practicable to use isolation or engineering controls, reduce exposure by: using personal protective equipment and clothing providing amenities with hygiene facilities observing good hygiene practices i.e. washing to remove any contaminants from hands/skin and no eating or smoking in contaminated areas.
4. Risk assessment indicates significant levels of contamination that is a risk to worker/public health.	Eliminate risk by removing contaminated soil before work begins. Where elimination is not reasonably practicable, isolate workers from contamination or use engineering controls to reduce exposure. Where it is not reasonably practicable to use isolation or engineering controls, reduce exposure by: using personal protective equipment and clothing to protect skin, eyes and to prevent inhalation use of serviced hygiene unit for removal and storage of contaminated work wear: sink troughs and showers in unit for removing contaminants, and clean room for storage of personal clothing separate amenities on the "clean" side of the site for eating/personal habits decontamination of mobile plant and equipment restricted entry to site to protect other persons from exposure. On large sites, work zones around contaminated areas with boundaries and controlled entry for workers and plant.



DEFINITIONS

"Background levels" means the naturally-occurring concentrations of substances in the local area of a site. [From the National Environment Protection Measure NEPM (Assessment of site contamination) 1999]

"Contaminated site" means a site with one or more substances (chemicals – e.g. petroleum or other hydrocarbons, heavy metals, infectious material, other waste products) present above background levels and where there may be a risk to human health or the environment.

"Contamination" means the condition of land or water where any chemical substance or waste has been added at above background level and represents, or potentially represents, an adverse health or environmental impact.

[From the National Environment Protection Measure (NEPM) 1999, Assessment of Site Contamination]

"Environmental Auditor" means an environmental professional with particular qualifications and expertise in contaminated site assessment, appointed as an auditor by the EPA and bound by the Environment Protection Act to conduct audits according to a strict set of protocols. Auditors must act as an independent person, responsible to the environment and the community.

"Environmental consultant" means a consultant working in the environmental field. A person employing an environmental consultant on a contaminated construction site should check that the consultant has experience in assessing contaminated sites.

"HIL" means Health-Based Investigation Level, as set out in the National Environment Protection Measure (NEPM) 1999. Schedule B(7a), Health-Based Investigation Levels.

Health-Based Investigation Levels for contaminants in soil provide initial guidance about potential health risks associated with sites with those contaminants. HILs are not intended to be "response levels" or "cleanup levels" but are intended to provide a trigger that further investigation is required if they are exceeded, to ensure that the work situation will not be harmful to health.

Investigation levels apply to the average concentration of a contaminant across a site. A site can still be below the HIL criteria even if there are some levels above the nominated value, provided the rest of the site has lower levels. Contaminant levels slightly above the relevant HIL are not necessarily unacceptable, however further investigation and/or risk assessment is required to determine this. For more information on interpreting HILs, see NEPM Schedule B(7).

Health-Based Investigation Levels for various contaminants are set out in the NEPM for four different exposure situations or different land uses. Examples of HILs from most to least harmful:

'HIL-A' - applies to soil on the most sensitive land uses, such as standard residential land, kindergartens and childcare centres. The Health Investigation Levels set in HIL-A are designed to protect the health of the most sensitive populations, particularly young children who may spend

DEFINITIONS

several hours each day playing outside and swallowing significant amounts of soil while playing. Young children are generally more vulnerable to the effects of contaminants than adults so the HIL-A levels have been set to be conservative and most protective.

'HIL-E' - applies to soil on sites suitable for parks, open space and playing fields and secondary schools. In particular, HIL-E levels are acceptable for skin contact and other incidental contact by adults and children. HIL-E levels are the next most protective criteria, after HIL-A.

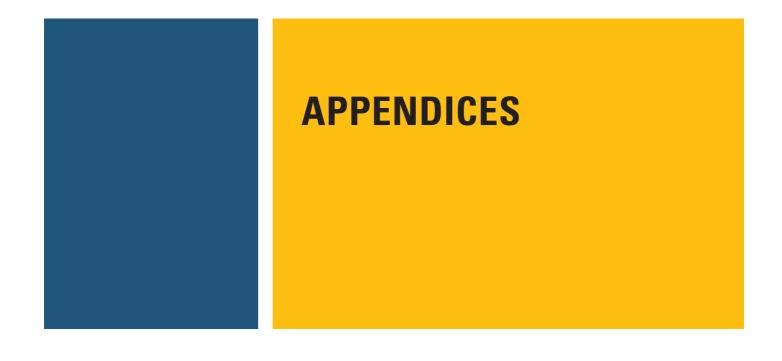
'HIL-D' - applies to soil on sites that are used for high-density residential land use, where there will be minimal exposure to the soil.

'HIL-F' applies to soil on sites that are suitable for commercial or industrial use, where the main population is adult workers and there is minimal contact with soil.

"Hygienist" means a person with relevant qualifications and specialised training in occupational health. The hygienists consulted for advice on construction sites should have experience on contaminated sites. Note: In some cases, occupational physicians may also be consulted; this would usually be in conjunction with the site's hygienist.

"NEPM" means National Environment Protection Measure (Assessment of Site Contamination) 1999, published by the National Environment Protection Council.

"Site Safety Assessor" means a professionally qualified and experienced person who has specific responsibility for the assessment of the hazards and risks associated with the investigation of any site and for the preparation of a site safety plan. [For more information, see NEPM, Schedule B(9), Guideline on Protection of Health & the Environment During Assessment of Site Contamination.]



APPENDIX 1: LAND USES THAT MAY HAVE CAUSED CONTAMINATION

Industry	Examples of sites
Agricultural and/or horticultural	Farms with sheep or cattle dips. Pesticide mixing sites. Abbatoirs
Battery manufacture/recycling	Manufacturing/recycling plants.
Bio-medical	Hospitals, laboratories.
Chemicals	Plants where these products are manufactured - corrosives, adhesives, dyes, explosives, foam, flocculants, fertilisers, herbicides and pesticides, paint, oils, pharmaceuticals, plastics, photographics, rubber, soap/detergents, solvents, beverages and wood products.
Energy	Gas works, power stations, electrical substations
Manufacturing	Plants using these substances during manufacturing: corrosives, adhesives, dyes, foam, flocculants, oils, plastics, photographics, rubber, soap/detergents, solvents, beverages and wood products.
Metal working	Foundries, iron and steel works, metal treaters and smelters, metal recycling plants (e.g. car parts).
Mineral extraction	Mining sites, land reclamation, waste disposal and recycling sites.
Miscellaneous	Dry cleaners, printers, tanners, breweries and distilling plants. Asbestos disposal sites. Sites with recent pesticide application to soil for building foundations.
Military	Explosives manufacturing, storage and testing sites.
Petrochemical industry	Refineries, storage depots and service stations.
Transport	Airports, engine works and railway yards.
Waste disposal	Landfills – industrial waste, council tips (household waste), asbestos disposal.
Water supply and sewerage	Treatment plant and depots.

For more information and details of land use that may have contaminated soil or water and a list of associated contaminants, refer to Appendix 1 of Australian Standards AS 4482.1 *Guide to the sampling and investigation of potentially contaminated soil.*

APPENDIX 2: CHECKLIST FOR CONTAMINATION ON CONSTRUCTION SITES

THIS CHECKLIST SUMMARISES KEY SECTIONS OF THE INDUSTRY STANDARD ON CONTAMINATED CONSTRUCTION SITES.

	TANDARD ON CONTAMINATED CONSTRUCTION SITES.
1. Is contamination present at the site?	 Contamination is likely to be present on sites that: were previously used for industrial purposes have a site history indicating there may be contamination have physical signs of contamination contain fill material from former industrial sites have other indicators of contamination e.g. substances released from buildings.
2. Has a site assessment been done?	A site assessment is necessary when contamination is known or likely to be present. It involves: • checking the site's history • taking soil samples to identify contaminants and their concentrations. Site assessments should be undertaken by a competent person. Specialist advice will be required in most cases to assist with taking soil samples. NOTE: a statutory environmental audit may be required by local councils/EPA or other bodies, on potentially contaminated sites. An audit provides information on any risk to the health of workers on the site.
3. Is a risk assessment required?	A risk assessment is necessary when a site assessment indicates that contaminants are present that may be a risk to the health of workers on the site.
4. Was the risk assessment adequate?	Conduct a risk assessment to determine any risk to health according to principles in the National Environment Protection Measure (NEPM)* and consider: • type of contaminant present • working conditions • tasks to be carried out • routes of exposure • level of exposure e.g. duration. Each site is different and needs an individual assessment. Specialist advice is usually required to conduct a risk assessment.
5. Have relevant "acceptance criteria" been used in assessing the risk from contaminants?	Develop "acceptance criteria" for contaminants in soil based on the specific situation and activities at the site. Consult the NEPM Health-Based Investigation Levels (HILs)* for initial guidance on the levels of particular contaminants that may be acceptable or where further investigation is required to determine if there is a risk to the health of workers on the site. For contaminants that do not have HILs set e.g. volatile compounds, develop other "acceptance criteria" with specialist advice.
6. Have the appropriate control measures been chosen to protect workers from exposure?	If the risk cannot be <i>eliminated</i> by removing contaminated soil from the site, reduce the risk as far as reasonably practicable. Control measures in order of effectiveness are: • isolation • engineering controls • administrative controls • personal protective equipment and clothing (PPE). A combination of measures may be the most effective. See Part 4 of the Industry Standard for more information.

APPENDIX 2: CHECKLIST FOR CONTAMINATION ON CONSTRUCTION SITES

7. Has a health and safety plan been developed to include protection of workers from exposure to contaminants?	Where a risk assessment indicates that contamination levels pose a risk to workers' health, develop a safety plan and include: • information from assessments on the risks to health • all relevant steps and processes to protect workers.
8. Is there a procedure in place to deal with "unexpected" contamination?	 Ensure workers: know how to detect signs of further "unexpected" contamination know to stop work immediately and report the discovery.
9. Have workers been consulted on the site assessment, risk assessment and on a plan to protect them against exposure?	Employers must consult with affected workers and any health and safety representatives.
10. Are workers appropriately trained and supervised, and new employees inducted?	Every worker must be trained in their tasks and the control measures required, and supervised by a person with appropriate knowledge and experience.

For further information:

- Refer to the *Industry Standard for Contaminated Construction Sites*. The standard and other WorkSafe publications can be ordered from WorkCover Publications on: 9641 1333 or 1800 136 089 or picked up from your local WorkSafe office.
- Visit WorkSafe's website: www.worksafe.vic.gov.au for OHS information, solutions and guidance material.
- Call the WorkCover Advisory Service on 9641 1444 or toll-free on 1800 136 089
- National Environment Protection Measure, NEPM (Assessment of Site Contamination) 1999 *Schedules B(4) Guideline on Health Risk Assessment Methodology, B(9) Guideline on Protection of Health and the Environment during the Assessment of Site Contamination, B7 Health Investigation Levels. Website www.ephc.gov.au
- For information about contamination found on site, or about environmental management on construction sites, visit the EPA Victoria website: www.epa.vic.gov.au or contact the nearest EPA regional office.
- For information about the environmental audit system, contact EPA Land and Groundwater Unit, tel. (03) 9695 2519.

APPENDIX 3: REFERENCES AND OTHER INFORMATION

EPA VICTORIA

Legislation

Environment Protection Act 1970

Environment Protection (Prescribed Waste) Regulations 1998

Policies

Industrial Waste Management Policy (Prescribed Industrial Waste) 2000

Industrial Waste Management Policy (Waste Acid Sulfate Soils) 1999

State Environment Protection Policy (Prevention and management of contamination of land) 2002

Publications

- 480 Environmental Guidelines for Major Construction Sites
- 275 Construction techniques for Sediment Pollution Control
- 448 Classification of wastes
- 878 Classification of Contaminated soil
- 626 Management of Waste Contaminated Soil and Low Level Contaminated Soil
- 655 Acid Sulfate Soil & Rock
- 441 A Guide to Sampling and Analysis of Waters, Wastewaters, Soils and Wastes.
- 395b -Industrial Waste Strategy Instruction for Completion of Waste Transport Certificates
- 364 Transport and disposal of waste asbestos
- 860 Environmental Auditing of Contaminated Land

Victorian Stormwater Action Program's Protecting Stormwater Quality from Building and Construction Sites

Draft Best Practice Guidelines on Management of Waste Soil

Draft Guidelines for On-site Treatment of Waste Soil

WORKSAFE VICTORIA

Legislation

Occupational Health and Safety Act 2004

Occupational Health and Safety (Confined Spaces) Regulations 1996

Occupational Health and Safety (Asbestos) Regulations 2003

Publications

Code of Practice for Building and Construction Workplaces 1990

Code of Practice for Demolition 1991

Code of Practice for Plant 1995

Code of Practice for Confined Spaces 1996

Code of Practice for Trenching 1988

Other useful health and safety construction information is available at:

www.workcover.vic.gov/construction.

APPENDIX 3: REFERENCES AND OTHER INFORMATION

OTHER REFERENCES AND INFORMATION

National Environment Protection Council (part of the Environment Protection and Heritage Council)

National Environment Protection (Assessment of site contamination) Measure 1999 www.ephc.gov.au

This includes:

- Schedule B(4) Guideline on Health Risk Assessment Methodology
- Schedule B(7a) Guideline on Health-Based Investigation Levels
- Schedule B(9) Guideline on Protection of Health and the Environment during the Assessment of Site Contamination.

Australian Department of Health and Ageing

Health-based Soil Investigation, third edition 2001 www.health.gov.au

• Standards Australia - Australian standards

GENERAL

	AS 4482.1-1997	Guide to the sampling and investigation of potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds
	AS 4482.2-1999	Guide to the sampling and investigation of potentially contaminated soil Part 2: Volatile substances
	AS 3798-1996	Guidelines on earthworks for commercial and residential developments
PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING		
	AS 1336-1997	Recommended practices for eye protection in the industrial environment
	AS 1337-1992	Eye protectors for industrial applications
	AS 2161.1-2000	Occupational protective gloves: selection, care and maintenance
	AS 2210.1-1994	Occupational protective footwear: Guide to selection, care and use
	AS 2919-1987	Industrial clothing
	AS 3765.1-1990	Clothing for protection against hazardous chemicals - Protection against general or specific chemicals
	AS 1715 - 1994	Selection, use and maintenance of respiratory protection devices
	AS/NZ 1716 - 1994	Respiratory protective devices.
	AS 3544 - 1998	Industrial vacuum cleaners for particulates hazardous to health

New Zealand Department of Labour, Occupational Health and Safety Service

visit www.standards.com.au

Health & Safety Guidelines on the Cleanup of Contaminated Sites 1994. www.osh.dol.govt.nz

To purchase Australian Standards, or for more information, tel. 1300 654 646 or

APPENDIX 3: REFERENCES AND OTHER INFORMATION

• Health & Safety Executive, UK

Protection of Workers and the General Public during the Development of Contaminated Land 1991. www.hse.gov.uk

 Construction, Forestry, Mining and Energy Union (Construction & General Division)

Workplace & Environmental Contamination, tel (03) 9341 1794



Developing the standard in partnership

Foundations for Safety Victoria is Victoria's peak forum for dealing with occupational health and safety issues in the construction industry.

Foundations for Safety Victoria brings together State Government regulatory agencies, construction workers' unions and employer associations representing principal contractors and specialist trades sub-contractors.

It meets in full session every three months and establishes working parties to progress various health and safety initiatives.

At the time of printing, the organisations represented on Foundations for Safety Victoria were:

- Air Conditioning and Mechanical Contractors Association
- · Association of Wall & Ceiling Industries Victoria
- Australian Industry Group
- Australian Manufacturing Workers Union
- Australian Master Bricklayers Association
- Australian Workers' Union
- Building Commission Victoria
- Civil Contractors Federation
- CEPU Electrical Trades Union
- CEPU Plumbing Division
- CFMEU Construction and General Division
- CFMEU FEDFA Division
- Engineers Australia
- Federation of Bricklayers & Masonry Employers
- Finishing Trades Association of Australia
- Housing Industry Association
- Master Builders Association of Victoria
- Master Plumbers & Mechanical Services Association of Australia
- National Electrical and Communications Association
- Office of the Chief Electrical Inspector
- Plumbing Industry Commission
- Royal Australian Institute of Architects
- Victorian Construction Safety Alliance
- Victorian Crane Association
- Victorian Employers Chamber of Commerce and Industry
- Victorian Trades Hall Council
- WorkSafe Victoria

You can help improve health and safety within the construction industry by providing your feedback on this Industry Standard or on other health and safety issues to any member organisations of Foundations for Safety Victoria.

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