Occupational Hygiene Procedure

INTRODUCTION

Charles Darwin University (CDU) recognises the requirement to manage exposure to hazardous agents and stressors in the workplace to minimise any potential risk to health.

COMPLIANCE

This is a compliance requirement under the:

- Work Health and Safety (National Uniform Legislation) Act 2016
- Work Health and Safety (National Uniform Legislation) Regulations 2017
- AS/NZS 1269.1,1: 2005
- Model Code of Practice - How to Manage Work Health and Safety Risks
- Model Code of Practice – Managing the Work Environment and Facilities
- Numerous Model Codes of Practice and Australian Standards as applicable to the specific potential hazards identified

INTENT

The purpose of this procedure is to provide a framework to facilitate the provision of a "safe place of work" through the identification and management of potential risks to the health of individuals (both acute and chronic) associated with the workplace and its activities.

This Procedure describes general requirements for management of exposure to hazardous agents and stressors in the workplace to minimize the risk to health. The Procedure outlines the process for a uniform approach to Occupational Hygiene across all Charles Darwin University (CDU) sites.

Health hazards that may be applicable to specific work activities may include, but not be limited to:

- Chemical hazards: hazardous materials in the form of solids, dusts (including airborne fibres e.g. synthetic mineral fibres), fumes (including welding, spray paint), liquids, mists, gases and / or vapours. These hazards may be absorbed via skin contact, inhalation and / or accidental ingestion.
- Physical hazards: noise, ionising and non-ionising radiation (ultraviolet, visible, infrared, radiofrequency, microwave, laser, static magnetic field), vibration (whole body and hand-arm), motion (e.g. sea sickness), pressure (including diving) and thermal work environment
- Biological hazards: potable water quality, ventilation - air handling systems (HVAC), food handling and hygiene, sewerage, vector borne and environmental (e.g. mosquito borne diseases, nuisance biting insects, snakes, wild animals, livestock, dogs, poisonous plants, etc.)
- Ergonomic (human) factors hazards: Manual handling tasks, appropriate design of buildings, plant, equipment, human machine interfaces, computer work station set up, lighting, etc.

This procedure applies to all employees of CDU and to all contractors engaged directly or indirectly by it. The procedure also applies to visitors and other personnel present on CDU work sites, using its facilities, or dealing with its employees or contractors.

RELEVANT DEFINITIONS

In the context of this document

Term	Definition
Breathing Zone	300mm radius of a person's nose / mouth as defined in AS2985
Chromium (VI) [hexavalent chromium or Cr(VI)	means chromium with a valence of positive six, in any form and in any compound **Employee exposure** - means exposure to Hexavalent Chromium which would occur if the employee were not using respiratory or skin protection protective equipment. **Exposure Limit** means an airborne concentration of Hexavalent Chromium of 0.005mg/m3 calculated as an 8-hour time-weighted average. The employer shall ensure that no employee is exposed to chromium (VI) in excess of the exposure level **Regulated area** means an area, demarcated by the employer, where an employee's exposure to airborne concentrations of chromium (VI) exceeds, or can reasonably be expected to exceed, the Exposure Limit of 0.005mg/m3. Regulated Areas will be established at the Action Level concentration, i.e. 0.0025mg/m3
Competent Person	Refers to a person with suitable qualifications and experience to conduct the required work e.g. an Occupational Hygienist
Excessive noise	Noise above the noise exposure criteria as set by the relevant statutory authorities or by the organization's noise policy, whichever is the lower
Exposure Standard	means an exposure standard in the publication Workplace Exposure Standards for Airborne Contaminants
Noise	All sound in the workplace, whether wanted or unwanted
Noise Exposure	The presence of a person at a point of emission
Protected Exposure	The presence of a person wearing hearing protectors at a point of emission
Scheduled Chemical	means a chemical listed in Schedule 14 of the Workplace Health and Safety Regulations that requires health monitoring
WHS	Workplace Health and Safety
Safety Data Sheet (SDS)	is a document concerning a hazardous substance, which is prepared in accordance with legislative requirements

PROCEDURES

1. Responsibilities

VP's all Departments

- Ensure compliance and effective implementation of the requirements of this procedure
- Provide adequate resources for the effective implementation of this
- Procedure
- Incorporate Health Risks, and their controls into their risk processes and registers

Line Managers / Supervisors

- Adequately identify, assess and control the health risks associated with their Scope of Work, evaluate controls to ensure effectiveness
- Provide appropriate resources to address risks identified, and ensure compliance to this Procedure
- Conduct relevant workplace monitoring, inspections and audits
- Ensure that the development pre-task risk assessments includes consideration of potential health risks, both short and long term
- Manage their contractors to meet this procedure, and its associated procedures, as they apply to their Scope of Work

Safety, Emergency and Wellbeing

- Provide advice and support to CDU Management as required

All Employees

- Participate in occupational health and hygiene requirements (e.g. workplace monitoring, medical surveillance)
- Consider health hazards in pre-task risk assessments
- Report any workplace health concerns to their line manager / supervisor

2. Training and Competence Requirements

CDU will ensure that all personnel who may be exposed to a health hazard (physical, chemical or biological) will receive basic awareness education at induction and / or job transfer, in the relevant occupational health and hygiene potential risks.

Personnel will be updated as required and whenever new monitoring information is available, significant new or changed control measures are introduced, or new work practices are introduced.

3. Risk Assessment

Risk Assessment forms the basis for the development of monitoring, controls and health surveillance programs and should be applied to all sections of this procedure.

CDU will identify and manage all potential health hazards which may arise during their workplace activities. Appropriate controls shall be identified and implemented to reduce the risk from hazardous agents and stressors to ALARP, and in all cases to below relevant exposure standards. An ongoing monitoring and evaluation plan shall be developed and implemented as required.

In risk management of potential health hazards, consideration should be given to nature of the substance (toxicity and concentration), the health effects (acute and chronic), the amount of the substance or mixture absorbed by the body (skin, inhalation, ingestion / exposure time - extended shifts / hours of exposure will require additional calculations on exposure standard / effectiveness of controls).

Where there is evidence or concern about potential health effects from exposure to hazardous agents, a competent person (e.g. occupational hygienist) should conduct a quantitative risk assessment, and advise on requirements for ongoing monitoring and health surveillance.

The Hierarchy of Controls shall be utilised in determining control measures and shall be selected in the following priority:

- Elimination of the stressor or hazard
- Substitution of the process or stressor with a less hazardous arrangement
- Segregation of people in time or distance from the stressor
- Containment of the stressor
- Engineering controls
- Administrative controls (Procedures, Training, JSEA's, SWP's, etc.)
- Personal Protective Equipment (PPE) (includes selection, training and maintenance)

Personnel who, over a period of work, are expected to have at least 80% similar exposures to hazardous agents may be considered as a Similar Exposure Group (SEG) for those specific hazardous agents.

When assessing exposure profile, consideration and formal documentation should be made of the following:

- Primary tasks
- Shift length
- Shift rotations
- Work period (scheduled days in a work period)
- Number of personnel with similar exposures

3.1 Preliminary Risk Assessment

This may consist simply of a formal, documented walk through and/or desk top survey to identify areas requiring more detailed information, or formal quantitative assessment by a competent person.

Areas of the workplace where it is considered a hazard is present, but there is inadequate information to effectively assess the risk to personnel's health, will require a more detailed assessment, as will more complex hazard combinations (e.g. complex noise sources, chemical / noise combination, noise / vibration combination, heat / fatigue, commissioning and shutdown conditions, etc.). As applicable to the hazard, this will be personal dosimetry, with the time weighted average calculated to the shift/s being to the shift as actually worked.

3.2 Detailed Risk Assessment

A detailed assessment and / or Quantitative Assessment is required in areas where there is a likelihood of excessive exposure to the hazardous agent, or the risk associated with exposure to hazardous agent is inadequately defined. The detailed assessment shall provide results in the format advised by the appropriate Legislation, Australian Standards, Codes of Practice or relevant Industry Documentation. The assessment should provide initial information for consideration and / or implementation of future engineering controls, as well as to assist in the selection of appropriate interim controls (e.g. correctly attenuated hearing protection, correct filter for respirators, etc.).

3.3 Monitoring Strategies

Where required based on risk assessment (risk of exposure above 50% of relevant exposure standard) or legislative requirement, a monitoring program should be established which:

- Incorporates personal exposure measurement, and biological monitoring based on applicable recognised standards and conducted by a competent person
- Is validated at a frequency as determined required by a competent person or required by legislation
- Includes hygiene monitoring performance targets and performance measurement processes

3.4 Follow up Risk Assessment / Evaluation

A follow-up assessment is required where there are changes in exposures due to various factors, e.g.

- Deterioration of equipment
- Changes in work procedures / practices
- Introduction of new production processes, controls and / or equipment
- In areas where regular monitoring is required to check changes in exposures due to seasonal or workload related factors (including shift length changes)
- To determine the effectiveness of engineering controls

4. Health Monitoring

Health surveillance must be conducted where the risk assessment determines that there is a risk to the health of an employee to substances that require health surveillance, such that:

- The exposure of the employee is such that an adverse effect on the employee's health may occur under the particular conditions of work; and
- There is a valid method of health monitoring and / or surveillance

Note that there is a legislative requirement that some occupations to undertake health surveillance (for example a lead risk worker).

Where health surveillance is required, a formal plan must be developed documenting the methods and criteria for undertaking monitoring and surveillance, including the frequency and indications for reassessment and evaluation of the adequacy of controls. This plan must be developed by a health and hygiene professional with relevant competencies and/or experience.

The type of heath monitoring referred to in the relevant legislation and standards will be provided unless:

- an equal or better type of health monitoring is available
- the use of that other type of monitoring is recommended by a registered medical practitioner with experience in health monitoring

CDU will:

- inform workers and prospective workers about health monitoring requirements
- ensure health monitoring is carried out by or under the supervision of a registered medical practitioner with experience in health monitoring
- pay all expenses relating to health monitoring
- provide certain information about a worker to the registered medical practitioner
- take all reasonable steps to obtain a report from the registered medical practitioner as soon as practicable after the monitoring has been carried out
- provide a copy of the report to the worker and the regulator if the report contains adverse test results or recommendations that remedial measures should be taken

- provide the report to all other persons conducting a business or undertaking whose workers may have been exposed

5. Records

CDU will:

- Formally notify personnel who are monitored of their recorded exposures with an explanation of the significance of the results
- personal biological monitoring and health monitoring data shall be kept as confidential records for at least 30 years after the record is made (40 years for reports relating to asbestos exposure)
- personal biological monitoring and health monitoring data shall be treated as confidential medical information
- de-identify any health and / or hygiene monitoring results used in summary reporting, monthly reports, presentations and the like

6. Hygiene Monitoring

6.1 Airborne Contaminants

6.1.1 Atmospheric Monitoring

Atmospheric monitoring is the sampling of workplace atmospheres to obtain an estimate of workers' potential inhalation exposure to airborne contaminants.

CDU will ensure that personal dosimetry / air monitoring is carried out to determine the airborne concentration of a substance or mixture at the workplace to which an exposure standard applies if:

- there is uncertainty about the level of exposure, or whether or not the airborne concentration of the substance or mixture exceeds the relevant exposure standard
- to indicate whether the exposure standards are being exceeded or approached
- monitoring is necessary to determine whether there is a risk to health
- to test the effectiveness of the control measures e.g. ventilation

6.1.2 Exposure Standards

Exposure standards represent airborne concentrations of a particular substance or mixture that must not be exceeded. There are three types of exposure standard:

- 8-hour time-weighted average
- peak limitation
- short term exposure limit

Exposure standards are based on the airborne concentrations of individual substances that, according to current knowledge, should not cause adverse health effects nor cause undue discomfort to nearly all workers.

Workplace exposure standards are available in the Workplace Exposure Standards for Airborne Contaminants and the Hazardous Substances Information System (HSIS) on the Safe Work Australia website, which contains additional information and guidance for many substances.

Where monitoring identifies that the exposure standard is being exceeded, the control measures will be reviewed, and as necessary the appropriate controls implemented and retest / evaluate the controls

Guidance on interpreting exposure standards is available in the Guidance on the

Interpretation of Workplace Exposure Standards for Airborne Contaminants.

To comply with the WHS Regulations, monitoring of workplace contaminant levels for chemicals with exposure standards may need to be carried out.

6.1.3 Airborne Dust

Work sites will ensure dust levels are kept ALARP via the use of dust control methods.

Where airborne dust levels are considered a health or safety hazard, consideration to ceasing the work activity until an improved working method can be approved and implemented to reduce the level of airborne dust to an acceptable level is required.

Where airborne dust levels continue to pose a potential risk to health, hygiene monitoring (including personal dosimetry) shall be conducted by a competent person, at a frequency and volume to establish the levels of dust, and the elements of the dust, to which personnel are exposed. The monitoring shall include Inhalable and Respirable components (as per AS3640:2004 and AS2985:2009).

As appropriate, review of current controls, and the implementation of additional controls shall be put in place to ensure levels of atmospheric contamination are not in excess of the Exposure Standard/s.

6.2 Hazardous Chemicals

CDU will implement and maintain controls to ensure that the risks associated with hazardous chemicals, substances and materials are maintained to ALARP.

Information on the nature and severity of the hazard can be gained from the Safety Data Sheet (SDS) in most cases (an SDS may not be available where the hazardous chemical is generated in the workplace).

The degree of the exposure can be determined by considering the actual processes and practices in the workplace, the quantities of substances being used, work practices and the way the workers carry out their work, and whether existing control measures adequately control exposure.

Health Monitoring may be required (Section 4 of this document).

Section 340 and 380 to 384 of the WHS Regulations requires compliance with Schedule 10 (of the Regulations); this list of prohibited carcinogens, restricted carcinogens and restricted hazardous chemicals must be adhered to and should be consulted prior to application for and / or bringing any new chemical to site.

The WHS Regulations 368, 370 and 406 require health monitoring for Hazardous Chemicals as per Schedule 14 (table 14.1) of the Regulations.

Additional Chemicals to consider for health monitoring (SafeWork Australia – Health Monitoring for Exposure to Hazardous Chemicals – Guide for Persons Conducting a Business or Undertaking) include:

- Antimony
- Beryllium
- Carbon disulphide
- Cobalt
- Cyclophosphamide
- Ethyl benzene

- Nickel
- Styrene
- Toluene
- Xylene

6.3 Asbestos

The importation of asbestos and asbestos containing products into Australia is prohibited by law. Where asbestos is discovered, the relevant legislation must be strictly adhered to in all aspects of identification, management and health monitoring requirements.

6.4 Synthetic Mineral Fibre

All handling and use of Synthetic Mineral Fibres (SMF) (e.g. insulation works) shall be in compliance with the National Code of Practice for the Safe Use of Synthetic Mineral Fibres [NOHSC: 2006].

Risk assessment and atmospheric monitoring will be undertaken as determined by a competent person. Health Monitoring shall be conducted as per legislative, associated codes and standards requirements.

6.5 Abrasive Blasting

The substances used for abrasive blasting must be reviewed for their potential to cause injury or risk to health (SDS will provide some information) as per the legislation.

Hygiene monitoring, as required shall consist of personal dosimetry monitoring and / or of a type and at a frequency and volume, as advised by a competent person. They shall be undertaken in accordance with the AS3640-2004 and AS2985 for Inhalable and Respirable Dust Monitoring.

Air sampling shall be required at any location where:

- advised by the competent person
- visible dust from abrasive blasting can be seen outside the encapsulated abrasive blasting area
- uncertainty exists as to the potential exposure level to personnel

6.6 Spray Painting

The processes involved in spray painting and powder coating are hazardous due to a combination of factors such as the use, handling and storage of hazardous chemicals and exposure to electrical, noise, manual handling and plant hazards.

The WHS Regulations include more specific requirements to manage the risks of hazardous chemicals, airborne contaminants and plant, as well as other hazards associated with spray painting or powder coating activities such as noise and manual handling.

6.7 Welding

Welding is the process of permanently joining two or more materials together, usually metals, by heat or pressure or both. When heated, the material reaches molten state and may be joined together with or without additional filler materials being added.

Welding includes joining methods as diverse as fusion welding, forge welding, friction welding, braze welding, brazing, soldering and explosion welding.

Energy sources used for welding include gas flames, electric arcs, electric resistance, lasers, electron beams, friction, molten metal baths and ultrasound. Precautions are required to avoid fire and explosion, burns, electric shock, vision damage, inhalation of poisonous gases and fumes, and exposure to intense ultraviolet radiation.

CDU will ensure compliance with the legislation, the Safe Work Australia Code of Practice for Welding Processes (2012), and Health and Safety in Welding WTIA Technical Note No.7 (for guidance in the management of allied processes (e.g. metal preparation, metal cutting, gouging, brazing and soldering) in the identification and control of the associated risks to ALARP.

The WHS Regulations include more specific requirements to manage the risks of hazardous chemicals, airborne contaminants and plant, as well as other hazards associated with welding such as noise and manual tasks.

6.7.1 Airborne Contaminants - Welding Fumes

Welding can generate fumes, mists, dust, vapours and gases, including ozone. The amounts and types of fumes produced vary greatly depending on the process involved and the materials being used such as metals, solvents, flux, paint and plastics. The health effects of exposure to fumes, dust, vapour and gases can vary. Effects can include irritation of the upper respiratory tract (nose and throat), tightness in the chest, asphyxiation, asthma, wheezing, metal fume fever, lung damage, bronchitis, cancer, pneumonia or emphysema.

Some welding fumes are easy to see; however, many gaseous fumes and vapours are invisible. Ultraviolet radiation emitted by arcs may travel significant distances from arcs, especially in reflective environments and may give rise to significant quantities of ozone.

The Safe Work Code of Practice on Welding Processes contains information about fumes that are commonly released during welding. The SDS for welding rods and wires will provide information on what gases and fumes are released during welding. The WTIA (Welding Technology Institute of Australia) Fume Minimisation Guidelines provides further information about controlling airborne contaminants. To determine the risk of exposure to fumes during welding you should identify what equipment and materials are being used and the level of fumes, dust, vapour and gases generated. For exposure to welding fumes, total fume concentrations as well as individual fume components should be considered.

6.7.2 Chromium

Chromium and its compounds form a large and varied group of chemicals, the hazards of which depend on the chemical forms encountered. These are referred to as chromium metal (0), chromium (II), chromium (III), chromium (IV) and chromium (VI). Of these, chromium (VI) compounds have the most significant effects on health. These include:

<u>Short-term effects</u>

- Irritation and inflammation of the nose and upper respiratory tract
- Burns to the skin, possibly leading to ulcers
- Eye damage from splashes (in liquid form)

<u>Long-term effects</u>

- Damage to the nose, including ulcers and holes in the flap of tissue separating the nostrils
- Irritation of the lungs
- Kidney damage
- Allergic reactions in the skin and respiratory tract
- Risk of cancer of the lung and nose from certain processes

Exposure Levels

Chromium (Cr ll and Cr lll) are toxic, cause damage to the respiratory tract and are corrosive to the skin. The current 8-hour Time weighted average exposure level is 0.5mg/m3.

Hexavalent Chromium (CrVl)

- is classified as a Class 1 carcinogen
- exposure level is 0.05mg/m3 for an 8-hour time-weighted average (TWA)
- No STEL value is set for Hexavalent Chromium
- The Action Level (50% of the exposure level) for Hexavalent Chromium is 0.025mg/m3 for an 8-hour TWA Hexavalent

Chromium (CrVl) Sources:

- welding, grinding, flame cutting and brazing operations involving stainless steel
- welding rods
- manufacture of stainless steel
- electroplating, and other surface coating processes
- painting and pigment application
- catalyst for some processes

Where required, CDU will have a Control Program to protect all employees from Hexavalent Chromium above the exposure levels, and where feasible to below the action that should include:

- Implemented controls as per the hierarchy of controls
- Work practice controls and operating procedural changes
- Use of SWP's / JSA's and like in the control program
- Training requirements and implementation
- Devices designed to lower employee exposures and maintenance of the same
- PPE (Respiratory Protective equipment) should be utilised to support higher level controls
- Hygiene monitoring program

Regulated Areas:

- Regulated Areas will be established for work areas where area monitoring results indicate the worker exposures may exceed, or can reasonably be expected to exceed, the Action Level (2.5µg/m3) for Hexavalent Chromium
- These areas shall be demarcated by displaying the Respirator pictogram at conspicuous locations to all Entry / Access points, with warning labels indicating the presence of Hexavalent Chromium
- Only authorized persons with proper protective equipment shall be admitted into the Regulated Area
- All employees working in a known Hexavalent Chromium area are responsible for adhering to all procedures and processes and reporting any potential exposure/s

Employee Awareness:
Awareness will be provided to all employees potentially exposed to Hexavalent Chromium prior to commencement of the task and at regular intervals thereafter
Awareness shall include:

- Hexavalent Chromium and where it is found
- How Hexavalent Chromium is absorbed by the body
- Adverse health effects
- Availability of the SDS's and how to utilise
- The various control measures adopted by the company to protect employees from Hexavalent Chromium exposure
- Respiratory Protection requirements, use and maintenance

- Avoiding food, beverages, smoking, and applying cosmetics in areas where there is Hexavalent Chromium exposure
- Wash face and hands thoroughly before eating, drinking or smoking
- Avoid use of contact lenses in Hexavalent Chromium areas

Exposures:
Where there is a known or a suspected exposure to Hexavalent Chromium, CDU will ensure the employee attends a medical examination that includes:

- Provision of medical and occupational history / potential exposure details to the treating medical practitioner
- Physical examination with emphasis on the respiratory system and skin
- Any limitations or recommendations on the use of respiratory protective equipment
- Any medical condition that may make the employee more susceptible to Hexavalent Chromium Exposure
- Medical Practitioners Report to be treated confidentially and filed on the employees medical file in keeping with the individual employer data storage requirements (see Appendix B for an example)

Ventilation can remove heat from the environment and reduce exposure to fumes and other atmospheric contaminants in the work area. There are three main types:

- local exhaust ventilation
- forced dilution ventilation
- natural dilution ventilation

The choice of ventilation system should take into account:

- the amount and type of fumes and contaminants produced
- the proximity and location of the welding process relative to the ventilation system
- the level of ventilation, natural or mechanical, both for the whole workplace and the welding area – this will also depend on screens and partitions which may restrict cross-flow at the work area
- the proximity of the welder's breathing zone to the fume source

Ventilation systems implemented shall meet with the legislation, Code of Practice and associated documents requirements.

Personal Protective Equipment (PPE)

Where required, PPE must be worn by workers to supplement higher levels of controls (such as ventilation systems or administrative controls).

Where PPE is to be used at the workplace, the equipment will be:

- selected to minimise risk to health and safety i.e. does not introduce another hazard e.g. thermal discomfort, musculo-skeletal injury, reduced vision or hearing
- suitable for the nature of the work and any hazard associated with the work
- a suitable size, fit and reasonably comfortable for the person wearing it
- maintained, repaired or replaced so it continues to minimise the risk

A worker must, as far as reasonably practicable, wear and maintain the personal protective equipment in accordance with any information, training or reasonable instruction and must not intentionally misuse or damage the equipment.

6.8 Radiation

Radiation comes from a number of sources and must be adequately assessed by a competent person.

6.8.1 Ultraviolet Radiation

The sun produces visible light or sunlight that we see, infrared radiation (heat) that we feel, and UV radiation that can't be seen or felt. UV radiation levels vary according to seasons (height of the sun), distance from equator, cloud cover, ozone levels and altitude.

Ordinary car or truck window glass filters out approximately 97% of UVB and 37% of UVA radiation. Laminated windscreens block all UVB and about 80% of UVA. Clear or tinted films can also reduce the amount of UVA and UVB radiation coming through the side glass. The amount of protection varies with different products. People who spend long periods in vehicles in the sun can still get sunburnt. Drivers with side windows down are at particular risk and need to protect themselves with clothing or sunscreen (Personal Protective Equipment (PPE)).

6.8.2 Radiation

CDU individual areas, as required, will develop and maintain an inventory of all relevant types of radiation sources that have a potential for adverse health effect, and should include radiation source type, type of radiation (e.g. radioisotope, radon, EMF, laser, etc.), strength and location.

Where legislative requirements and / or a risk assessment indicate the need, a documented radiation management programme will be developed so:

- all types of radiation sources are adequately characterised and described such exposures can be eliminated or reduced to ALARP
- it provides a clearly defined chain of responsibility, with duties and responsibility documented and
- education is provided for employees regarding radiation safety, including the radiation management programme elements

The ionising radiation management programme must meet all applicable regulatory requirements, and at a minimum include the following elements (as applicable):

- surveyed radiation areas and quantification of exposure sources/levels
- exposure and medical monitoring programmes based on established investigation levels
- transport of radioactive materials in compliance with local regulations
- waste monitoring and disposal programmes
- clearance and control procedures for all contaminated materials and equipment leaving or arriving at site (including scrap)
- leak (wipe) tests on sealed radioactive containment equipment
- lock-out procedures for vessels and equipment containing radioactive sources and radon decay product measurement prior to entry
- emergency procedures
- environmental impact risk assessment (air, water, waste, foods, etc.)
- product/waste life cycle control; and
- dose assessment for employees and critical exposure groups, according to documented methods and conducted by a competent person

Areas with ionising radiation with annual doses greater than 5 milli Sieverts (mSv) must be designated as restricted access or controlled areas and mapped, signposted or otherwise clearly communicated to employees working in the area.

Each person whose potential exposure exceeds 5 mSv per annum or who is a designated radiation worker must undergo periodic personal radiation monitoring and / or medical surveillance designed to show continued fitness for radiation work, and / or any adverse health effects from radiation work.

Each operation where individual worker's exposures could exceed 5 mSv per annum must have a trained radiation protection adviser or ready access to a trained protection consultant as per the local legislative requirements.

All controls must be reassessed annually to ensure their continued effectiveness and that operating practices are in accordance with written procedures.

A Procedure that provides further detail on the management of x-raying, or ionizing radiation radiographic work should be available for all such activities in individual CDU work areas.

6.8.3 Diesel Particulate Matter (DPM)

Diesel exhaust is a combination of a number of chemicals and particles; however, exhaust as a whole can be classed as exposure to particulate matter. In diesel exhausts, it is the invisible nano particles created by diesel engines that can be inspired deep into the lungs, which present the most risk for lung cancer. Workplaces where workers are in close proximity diesel fuelled equipment, or in enclosed spaces with diesel fuelled equipment present the greatest risk to worker health (e.g. underground mines, enclosed operation of forklifts or diesel generators). In many cases the fact that the equipment is operating in the open environment significantly reduces the potential for excessive exposures.

The AIOH (Australian Institute of Occupational Hygienists) supports the use of an exposure standard of 0.1 mg/m3 DPM (measured as submicron elemental carbon) as being a balance between the factors of primarily minimising irritation, secondarily minimising any potential for risk of lung cancer to a level that is not detectable in a practical sense in the work force, and finally on the basis of setting a level achievable as best practice by industry and government.

The exposure limit for DPM must be adjusted to account for extended shift lengths or non-standard rosters, using an appropriate adjustment model selected by a component person.

CDU will determine if any operations within their activities of work is likely to cause excessive exposure levels to DPM. Where excessive exposure levels are reasonably foreseeable, steps must be taken to eliminate or mitigate this to below exposure levels and / or a hygiene monitoring program established as required.

7. Noise

7.1 Introduction

Occupational noise induced hearing loss (NIHL) is a major compensable industrial disease in Australia and is linked to increased employee turnover and absenteeism, lowered performance and possible contribution to accidents.

Noise-induced hearing loss can be reduced, or often eliminated by means of feasible engineering and administrative controls. Where higher controls (Hierarchy of Controls) are not feasible, Hearing Protection Devices (HPD's), properly rated and fitted, can offer reasonable protection against hearing loss.

The legislative and National Standard for exposure to noise in the occupational environment is an:

- eight-hour equivalent continuous A-weighted sound pressure level, LAeq,8h, of 85d(B)A

- for peak noise, the national standard is a C-weighted peak sound pressure level, LC, Peak, of 140dB(C)

The exposure to noise is taken to be that measured at the employee's ear position without taking into account any protection, which may be afforded by personal hearing protectors.

Where the shift duration is 10 hours or longer, there is an increased risk (due to continued exposure after maximum temporary hearing threshold shift), which can be further increased by reduced recovery time between subsequent shifts and where more than a 5-day week is worked.

For extended shifts beyond 8 hours, a method for "normalising" noise exposure levels for extended shifts is provided in which applies a penalty of 1 dB for shift length ≥ 10 to < 14 hours, effectively adjusting the 8-hour level equivalent 85 dB(A) noise exposure standard to 82 dB(A) for a shift greater than 10 hours, but less than 14 hours (a table, as below is provided for adjustments for other shift durations).

Shift Length (hours)	Adjustment to add to L_{Aeq8h}, (dB)
< 10	+0
> 10 to < 14	+1
> 14 to < 20	+2
> 20 to < 24	+3

See AS/NZS 1269.1,1: 2005 for further information

Where the noise level exceeds the normalised exposure level, controls shall be put in place; including, but not limited to,

- access shall be restricted to the area
- prominent warning / mandatory safety signs (AS1319-1994 Safety signs for the occupational environment) designating the required HPD's (AS/NZS 1269.3:2005 Occupational Noise Management – Hearing Protector Program) are placed at the contour line

Noise assessments shall include all plant and equipment to ensure compliance with this plan.

If the total "area" noise from combined plant, equipment or machinery in any unrestricted area is found to exceed normalised exposure levels, immediate processes to reduce the noise levels in the affected area are to be implemented. This may require some plant or equipment being shut down until appropriate controls can be implemented.

CDU shall implement noise control measures by means utilising the hierarchy of controls (e.g. elimination through purchasing policy – 'buy quiet'; reduction of noise at source, modification of the noise transmission path; reduction of the time personnel spends in noisy areas, with HDP being the lowest level of control) to ALARP.

The general objectives of noise exposure assessments are

- to determine the exposure of personnel likely to be exposed to noise above the normalised exposure level for work area / job role (assist in prioritisation of controls and determining audiometry requirements)
- to assist in the mapping of noise hazard areas / contour maps for the appropriate placement of warning signage

- to obtain further information to assist in determining what measures to take to reduce noise
- to check the effectiveness of any control measures which have been applied
- to assist in the selection of appropriate hearing protectors i.e. determine attenuation, where other control measures are not practicable
- preparation of noise exposure reports

Further information on this process can be found in AS/NZS 1269.2:2005 and AS/NZS 1269.0:2005.

7.2 Noise Assessment

7.2.1 Preliminary Assessment

This may be formal initial walk through and/or desk top survey to identify areas requiring more detailed information or a noise survey. Areas of the workplace that are considered a noise hazard (normalised exposure levels) will require further and more detailed assessment, as will more complex noise sources (e.g. sources from two or more sources of noise).

7.2.2 Detailed Assessment

A detailed assessment is required in areas where there is a likelihood of exposure to excessive noise. The detailed assessment shall provide results in the form of Time Weighted Average and the peak for persons likely to be subject to exposure to excessive noise.

7.2.3 Follow-up Assessment

A follow-up assessment is required where

- 5 years has elapsed since last assessment - monitor changes in noise exposure due to various factors, e.g. deterioration of equipment, changes in work procedures, introduction of new production processes and the effectiveness of engineering noise controls

- partial assessment of the workplace e.g. in areas where new plant has been introduced, where work practices have changed, in new vehicles / mobile plant which may have been purchased and in areas where regular monitoring is required to check changes in noise exposure due to seasonal or workload related factors

7.3 Assessment for Personal Hearing Protection

Where an assessment of noise exposure indicates that exposure to excessive noise requires the issue of hearing protectors, monitoring shall be carried out by a competent person in those areas where people are exposed to excessive noise; with a view to establishing the sound attenuation requirements for hearing protectors.

7.4 Occupational Noise Survey and Reports

The measurements and evaluations of noise exposure shall be carried out by a competent person (AS/NZS 1269:1:2005).

All instruments used for noise surveys shall have been calibrated by an approved certifying authority within the previous two-year period in accordance with AS1259:1990.

Equipment used for noise surveys in hazardous areas shall be certified as intrinsically safe by an approved certifying authority or otherwise the hot work permit procedure must be followed.

Noise assessment / survey reports, control measures implemented and their evaluation, noise related investigations and health surveillance should be maintained as auditable records.

8. Vibration

8.1 Exposure Levels

Whilst mandatory exposure levels have not yet been developed in Australia, European mandatory levels are used as a guide.

On CDU sites, the United Kingdom specific regulation for Vibration (The Control of Vibration at Work Regulations (2005)), limits shall apply.

Vibration exposure limits are defined as:

Hand-Arm vibration the 8 hour daily exposure (A[8])

- Limit value is 5 metres/sec2
- Action value is 2.5 metres/sec2

Whole Body vibration the 8 hour daily exposure (A[8])

- Limit value is 1.15 metres/sec2
- Action value is 0.5 metres/sec2

The daily exposure shall be ascertained on the basis set out in Schedule 1 part 1 of The Control of Vibration at Work Regulations (2005) SI 2005 No. 1093.

Any working environment likely to expose personnel above the daily Exposure Action Value (EAV) shall

- introduce a program of controls to reduce exposure to ALARP
- take immediate action to reduce their exposure below the limit

Risk assessment shall be undertaken for activities, which use vibratory tools (pneumatic drills, riveting tools, impact wrenches, grinders, electric drills, fettling tools).

Control Measures

The Commonwealth Occupational Health and Safety Code of Practice 2008 prescribes a process for controlling the risks of vibration exposure as per the hierarchy of controls.

Where hazardous vibration is identified, CDU will measure the vibration levels in accordance with the following Australian Standards:

- AS.2670.1:2001 – Evaluation of human exposure to whole body vibration
- AS 2763: 1988 – Vibration and shock – Hand transmitted vibration – guidelines for measurement and assessment of human exposure

Where identified as required, CDU will monitor and review the exposure levels of their employees, assess the control measures in place and conduct regular medical checks of workers as required.

9.3 Hand–Arm vibration

Hand–arm vibration (HAV) is vibration transmitted to the hand and arm during the operation of hand-held power tools and hand-guided equipment, or holding materials being processed by machines. Hand–arm vibration is commonly experienced by workers who regularly use tools such as jackhammers, chainsaws, grinders, drills, riveters and impact wrenches.

Exposure to HAV can result in disrupted circulation in the hand and forearm and/or damage to nerves and tendons, muscles, bones and joints of the hand and arm. It can cause a range of conditions collectively known as hand–arm vibration syndrome (HAVS) and specific disorders such as carpal tunnel syndrome, 'tennis elbow' and 'vibration white finger'.

Control measures involve isolating or cushioning methods or a combination of these such as

- substituting alternative methods of processes to eliminate the need to use vibrating hand-held tools
- selection of tools with low vibration at purchase
- modifying existing tools to minimise vibration or prevent vibration from moving into the handle of the tool
- directing cold air away from the operator's hand
- maintenance of equipment to minimise vibration
- altering work practices and organisation to reduce exposure
- development of work procedures / JSA's / SWP's or like training

9.4 Whole-Body Vibration

Whole Body Vibration is that which is transmitted to the whole body through the seat or floor / feet.

The longer a worker is exposed to WBV, the greater the risk of health effects and musculoskeletal disorders. The most commonly reported disorder from exposure to WBV is low-back pain. It is sometimes experienced by drivers, operators and passengers in vehicles and machines when travelling over uneven surfaces.

Control measures should follow the hierarchy of control and may include:

- modifying the process to eliminate the task or the risk
- redesigning the task or the equipment to reduce vibration exposure
- buying machines or vehicles that are designed to reduce the vibration transmitted to the operator
- improving and maintaining road surfaces
- implementing a seat maintenance program to ensure vibration dampened and seats are maintained in good condition
- implementing speed limits, regular work breaks, posture changes or job rotation to reduce exposure time
- providing information and supervision on adjusting and operating equipment, including seats to reduce exposure
- implementing safe work procedures / JSA's / SWP's

9. Microbiological Hazards

10.1 Potable Water

The greatest risks to consumers of drinking water are pathogenic microorganisms. Protection of water sources and treatment processes are therefore of paramount importance in meeting the requirements of the Australian Drinking Water Guidelines (ADWG). The ADWG are based on levels which, utilising current knowledge is safe to drink over a life time so that it constitutes no risk to health.

The National Health and Medical Research Council of Australia (NMHRC) have set guideline values for water quality. The ADWG are a minimum requirement. The values are action levels, exceedance of which should result in an investigation and remedial action where required.

The guidelines should be referenced when sampling of the water supply has been carried out and the results of the analyses are available. All sampling and testing (including laboratory analysis) shall meet the requirements of the relevant legislation, codes and standards.

The Australian Drinking Water Guidelines requires the following samples to be undertaken:

- Free Chlorine
- Microbiological
- Amoebae (required when water storage reaches 300C)
- Drinking Water Analysis Suites – consisting of
    - Physicals
    - Metals

Potable Water tanks (of any size) utilising a potable water truck for filling must provide written evidence that the truck being utilised meets requirements outlined in the 'Guidelines for Drinking Water Transport in the Northern Territory' (2011).

Potable Water Labelling requirements should meet those requirements as outlined in AS 1345-1995 Identification of the contents of tanks, pipes, conduits and ducts.

The drinking water system must have, and continuously maintain, robust multiple barriers appropriate to the level of potential contamination facing the water supply. Use of filtration, disinfection and maintenance preservation combined with regimented monitoring are all barriers in successful management.

Carbon and or Charcoal filters are not to be used as these will remove Chlorine – which is needed to disinfect the water.

As required, potable water monitoring shall be collected and / or conducted by a competent person via accredited laboratories and the results reported to the CDU Corporate Safety Manager or delegate on a monthly basis, with results outside the standards to be reported immediately.

10.2 Ice Machines/Water Coolers

Water Coolers and Ice Machines must have a formal cleaning and filter change program that meets with manufacturer recommendations at a minimum.

10.3 Legionella

All equipment with the potential for generating Legionella (such as cooling towers and associated equipment, air-handling systems, hot water services and showers) should be identified, and the risks of contamination and aerosol generation assessed.
Where there is an assessed risk that Legionella could grow in the system and cause harm, a programme must be in place such that:

- all such equipment is identified on a register, which must contain details of the regular maintenance, cleaning and checking programmes
- control measures are in place to minimise aerosol emissions
- there must be a documented water treatment programme, including procedures for inspection, assessment and maintenance of the controls
- new or retrofitted equipment is designed and constructed to minimise the risk of Legionella growth

Where required, Legionella monitoring shall be conducted by a competent person via accredited laboratories and the results reported to the relevant CDU Line Manager and Corporate Safety Manager or delegate on a monthly basis, with results outside the standards to be reported immediately.

Adequate procedures must be available for disinfecting systems if significant concentrations of Legionella bacteria are present. Once disinfected, systems must be retested to confirm effectiveness of treatment.

10. Compliance and assurance

Compliance with the requirements established in this procedure will be reviewed as part of CDU's assurance activities.

ESSENTIAL SUPPORTING INFORMATION

Internal
Occupational Health and Safety Policy
External

Relevant Legislation, Codes of Practice and Australian Standards

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