Namibian Uranium Association (NUA) HERSS Guidelines and Toolkit

2014

Namibian Uranium Association
HEALTH, ENVIRONMENT AND RADIATION SAFETY AND SECURITY (HERSS) GUIDELINES AND TOOLKIT

Document Change Record

Amendment History:

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<th>Version</th>
<th>Date</th>
<th>Reason for change</th>
<th>Document reference</th>
<th>Made by</th>
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<tr>
<td>1</td>
<td>17/02/2014</td>
<td>First updated version</td>
<td>NUA 01</td>
<td>WRS Swiegars</td>
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Good Practice
Health, Environment, Radiation Safety and Security (HERSS) Guidelines and Toolkit

FOREWORD

As “Uranium Sustainable Development” guidelines, it is not a legally binding document; rather, it constitutes practical recommendations and provides a practical basis for uranium exploration or mining companies in Namibia to address Health, Environment and Radiation Safety and Security issues from a business perspective. It forms part of the Uranium Stewardship’s Risk Management suite of standards and guidelines and is based on extensive knowledge and practical experience of its members worldwide. It is aligned with Namibian laws/Regulations and Best practices in the field of Health, Environment and Radiation Safety and Security Standards and is an evolving document changing over time. It will therefore be subject to regular review and updated as required.

The HERSS Guidelines and Tools provide:

2. A reference point against which continuous quality improvement in health care, environmental management, radiation safety and security can take place.

The HERSS Guidelines and Tools is an important step forward and bring about substantial convergence between Namibian and international standards. The benefits of these uniform standards and guidelines are clear and incorporate principles familiar to major uranium mining and milling companies worldwide. The HERSS Guidelines must be seen as tool to implement HERSS Standards.

I wish to acknowledge the following companies for initiating and sustaining the Uranium Stewardship programme in Namibia:

• Rio Tinto Rössing Uranium
• Langer Heinrich Mine
• AREVA Resources Namibia
• Bannerman Resources
• Reptile Uranium Namibia
• Swakop Uranium Mine (Husab Project)
• NORASA (Valencia Uranium Mine)
• Zhonghe Resources
• Marenica Uranium Project
The HERSS Guidelines and Tools are the result of many months of hard work by the members of the various committees of the NUA. The members invested both time and effort in the development and review of this document, which like all dynamic products, will continue to be improved. I wish to acknowledge in particular the dedicated work of Sandra Müller, Riana Scholtz, Angie Kanandjembo, Michelle Pfaffenthaler, Herman Strauss and Gunhild and Detlof von Oertzen.

Whilst we have taken all reasonable care in the preparation of the HERSS Guidelines and Tools, neither the Namibian Uranium Association’s Uranium Institute, its employees, or representatives shall have any responsibility or liability whatsoever with respect to any act or omission (whether negligent or not) of whatsoever nature of, or in connection with, the preparation of the HERSS Guidelines and Tools or any part thereof. These responsibilities are those of the user.

Sincerely,

Wotan Swiegers

Executive Director: Namibian Uranium Institute
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Always learning, always improving the way we work.
HEALTH, ENVIRONMENT AND RADIATION SAFETY/SECURITY (HERSS)
GOOD PRACTICE GUIDELINES AND TOOLKIT
FOR THE NAMIBIAN URANIUM MINING INDUSTRY

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1 URANIUM STEWARDSHIP APPROACH

1.1 Background Information

The primary functions of the Namibian Uranium Association (NUA) of Namibia are to protect the interest of member organisations, to uphold mining practice in Namibia to the highest standards, to observe international conventions and to ensure positive development of Namibia’s reputation as a mining nation. The NUA is both a member of the World Nuclear Association (WNA) and (via the Chamber of Mines) an associate member of the International Council on Mining and Metals (ICMM), leadership groups focused on improving the sustainable development performance of mining companies.

The mining industry, through the WNA and the ICMM, is developing guidelines on materials stewardship to promote responsible management of mining products. The ICMM is co-operating globally with the United Nations to develop a product management approach that is based on the principles of sound science and sustainable development.

Sustainable development is defined as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs (“Our Common future” – the Brundtland Report) which is enshrined in the Namibian Constitution.

The sustainable development framework of the ICMM consists of 10 principles, a reporting guideline, an independent assurance system and the promotion of good practices. The ICMM’s interpretation of sustainable development for the mining and metals sector means that investments should be technically appropriate, environmentally sound, financially profitable and socially responsible. It provides guidance for operational level implementation of the ICMM principles and elements by the Namibian mining industry.

1.2 International Council on Mining and Metals Sustainable Development Principles

1. Implement and maintain ethical business practices and sound systems of corporate governance.
2. Integrate sustainable development considerations within corporate decision-making process.
3. Uphold fundamental human rights and respect cultures, customs and values in dealing with employees and others who are affected by our activities.
4. Implement risk management strategies based on valid data and sound science.
5. Seek continual improvement of our health and safety performance.
6. Seek continual improvement of our environmental performance.
7. Contribute to conservation of biodiversity and integrated approaches to land use planning.
8. Facilitate and encourage responsible product design, use, re-use, recycling and disposal of our products.
9. Contribute to the social, economic and institutional development of the communities in which we operate.
10. Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.

In keeping with the ICMM principles, the Chamber and the NUA promote sustainable development and the balance between social equity, environmental protection, economic development and an effective governance framework. Sustainable development requires a management framework including a mix of regulatory mechanisms and voluntary initiatives.

1.3 Uranium Stewardship Approach

As a member of the WNA, the NUA members engaged in uranium mining and processing, recognize that managing radiation, health and safety, waste and environmental impacts is of paramount importance for the protection of workers, the public and the environment. Such responsible management (stewardship) of uranium mining and processing projects applies at all stages of planning and activities – from exploration through development, construction and operations, and on to decommissioning.

The NUA and the Chamber and in particular the Sustainable Development Committee of the NUA are acting to ensure that all parties directly involved in uranium mining and processing – including operators, contractors and regulators – strive to achieve a high level of excellence in these fields of management. The NUA is doing so by sustaining a strong safety culture based on a commitment to a framework of common, internationally shared principles.

The uranium industry in Namibia openly stated that it has a collective responsibility for leading practice in the stewardship of its product. Taking this commitment forward, the NUA has decided to develop good practice guidelines for safety, occupational health and environmental management for uranium mines. Good practice (the best way of doing things at a given site) and a sustainable approach to management is critical for any mining company to gain and maintain its ‘social licence to operate’ in the community. The guidelines will augment the state-led regulatory measures and must be supported,
promoted and their further development facilitated. It is important to create synergy between the voluntary initiatives led by the private sector and the state’s regulatory tools. The good practice guidelines will not only guide the members of the NUA but will set goals that uranium exploration companies that are not yet members follow suit.

1.4 International Standards

The NUA firmly believes that all uranium operations in Namibia should implement an internationally accepted environmental management systems such as the ISO system. **ISO 14001** is an internationally accepted good practice guideline that sets out how to put in place an effective environmental management system (EMS). Rössing Uranium and Langer Heinrich Uranium, full members of the NUA, are already ISO 14001 compliant.

The NUA also recognizes the fact that it takes time and commitment to introduce such a system. It therefore recommends a stepwise approach as outlined below. As a general guideline the NUA recommends that uranium companies consider adopting the NUA’s Good Practice Guidelines and the environment, health and social guidelines promoted by the International Finance Corporation (IFC) or the World Bank. In cases where mining companies are looking to use bankable feasibility documents, or require finance from the IFC or the World Bank, there is a need for strong adherence to their environmental management requirements. The IFC’s Environment and Social Standards apply to all projects it finances to minimize their impact on the environment and on affected communities. The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC and are generally considered to be achievable in new facilities at reasonable costs by existing technology.

When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

The initiatives of the uranium companies will ensure that the image of Namibia is upheld as a world-class uranium producer with good practices in occupational health, environmental management, safety and security.
2 NUA CHARTER, PRINCIPLES AND CODE OF PRACTICE

2.1 Charter

The members of the Namibian Uranium Association work cooperatively to enable the Namibian uranium exploration, mining and exporting industry to operate, expand and thrive safely and efficiently.

We will achieve this by:

A Commitment to Sustainable Development

Members will seek to balance the protection of environmental values in the areas that we explore and mine with the social and cultural needs of the communities within which we operate the people we employ and with the business and economic imperatives of our shareholders.

Uranium Stewardship

Through our commitment to the development and implementation of Uranium Stewardship principles, Members will contribute to actions to support the safe and peaceful use of nuclear technology. In our operations, we aim to protect individuals, society and the environment from any harmful radiological effects. We will engage others in the nuclear fuel cycle to support their efforts to do likewise.

Anti-Trust Behaviour

Members will avoid questions or discussions that could create the appearance of an attempt to set prices or engage in other anti-competitive behaviour. Members will not discuss terms of specific contracts, specific prices for products or services (whether current or projected), allocation of markets, customers or territories, refusals to deal with particular suppliers or customers or any similar matters that might impair competition within the uranium industry.

Supporting Fit-for-Purpose Regulatory Arrangements

Members will work with governments, industry and other stakeholders to achieve fit-for-purpose public policy, laws, regulations and procedures that facilitate the contributions of uranium exploration, mining, processing and exporting to sustainable development within Namibia’s sustainable development strategies. Members will, as a minimum, adhere to the applicable international and national laws, regulations and codes that govern the industry.
Transparent Reporting

Members will implement effective and transparent engagement, communication and independently verified reporting arrangements with their stakeholders. Members will report exploration results, mineral resources and ore reserves in accordance with national or international best practice guidelines.

2.2 Uranium Stewardship Principles

The global nuclear power industry is committed to working cooperatively to ensure uranium and its by-products are managed in a safe, environmentally, economically and socially responsible manner.

1. Uranium Stewardship is a programme of action by the global nuclear power industry to put that commitment into practice.
2. A central idea of Uranium Stewardship is the responsibility shared by all players in every sector of the nuclear fuel cycle, from exploration and mining to spent fuel recycling and management, from the production of medical resources to the operation of nuclear power plants, to work with all other sectors to give effect to stewardship principles. The NUA’s Uranium Stewardship Principles reflect and are consistent with the global principles being developed under the auspices of the World Nuclear Association.
3. The Namibian Uranium Association is developing plans for working with other sectors to implement stewardship principles.
4. The NUA’s Principles are additional to the broader Namibian minerals industry’s commitment to sustainable development as outlined in the International Council on Mining and Metals and the Minerals Council of Australia’s sustainable development statement, Enduring Values, as the benchmark that applies to the larger Namibian minerals industry, of which the uranium industry is part, and to the NUA’s Charter and Code of Practice.
5. Through commitment to the Principles, the Namibian uranium industry aims to engage the public and earn trust for the exploration, mining and export of uranium.
6. Recognizing that Uranium Stewardship is a responsibility shared by all players in every sector in the nuclear fuel cycle, the Namibian Uranium industry will work together in a spirit of cooperation with other sectors to give effect to these principles and commits to:
   i. The safe and peaceful use of nuclear technology
   ii. Continual improvement of our quality, health, safety, security and environmental performance to minimise the impacts of our activities on people and the environment
   iii. Contributing to social and economic development of the communities where we operate
iv. Recognition of fundamental human rights
v. Open, honest and transparent communication
vi. Operating ethically with sound corporate governance
vii. Sharing knowledge to encourage widespread adoption of best practices
viii. Acting responsibly in the areas that we manage and control, and share our concern in other sectors of the nuclear fuel cycle
ix. Providing responsible sourcing, use and management of uranium and all its by-products
x. As an industry, regularly communicate progress on the implementation of the principles to our stakeholders and review and update them as necessary.

2.3 Code of Practice

Preamble

The NUA’s Code of Practice defines principles of behaviour and standards of best practice to guide improvements in performance in the Namibian uranium industry. The industry already subscribes to good behaviour and practices and aims for excellence. However, there is never room for complacency and the community’s expectations about our industry continue to rise. The code is intended to be a living document that can be reviewed and revised as the industry’s performance improves, with a view to aiming for new, higher standards of best practice over time.

The NUA intends that the Code of Practice exemplify its Members’ aim of always seeking to improve industry practice in every facet of operations and in regard to every obligation that they are required to meet in Australia or elsewhere.

In developing the Code, the NUA has been mindful of the International Council on Mining and Metals’ (ICMM) Sustainable Development Framework and Principles which sets a context for the Code. In addition, the NUA endorses and adopts the Minerals Council of Australia’s sustainable development statement ‘Enduring Value’, as the benchmark that applies to the larger Namibian minerals industry of which the uranium industry is part. The Code is intended to apply to:

- All members of the Namibian Uranium Association
- All prospective members of the NUA must agree to apply the Code as a condition of membership
- Members of the NUA must apply the Code wherever in the world they operate
- All activities associated with the uranium industry including
✓ Exploration
✓ Mine and processing planning and design
✓ Mine and processing construction and development
✓ Mine and processing operations
✓ Management of product including storage and transport
✓ Mine and processing decommissioning and rehabilitation

- The management of the interaction between those activities and the human and physical environments in which they take place
- The relationships between Members of the NUA and the communities, especially the local communities, in which they operate.

Continuous improvement to leading practice in management

- Seek continuous improvement in performance
- Support continuous improvement to quality assurance approaches
- Identify leading practices and apply them where they will improve the performance of the business
- Identify, characterize, assess and manage risks that can impact upon health and safety
- Mitigate risks to safety by appropriate controls in engineering, management and other relevant measures of protection commensurate with risk
- Monitor, review and act on assessments of safety and environmental performance
- Ensure all employees and contractors undertake safety and environmental training to prevent and actively reduce risks to themselves and others. Update this training when indicated by review and feedback
- A NUA commitment to provide information and facilitate activities to enable members to pursue leading practice measures.

Safely manage, contain and transport all hazardous material, tailings and other wastes

- Build radiation management, waste management and environmental management plans into the business planning cycle
- Use leading practice and technologies to minimize risk to people and the environment over the life of a project and after closure
- Use site-specific risk analysis to account for current and long-term stability of waste and waste containment
• Put in place systems to secure radioactive sources and substances
• Provide new information as it becomes available
• Develop and implement site-specific water management practices which meet defined water quality objectives for surface and ground waters
• Develop and implement site-specific air and dust management practices
• Minimize the amount of hazardous waste and contaminated material
• Where possible, continue to improve security and safety for radioactive sources and substances during their transport
• Recycle and re-use waste and materials, to keep waste disposal to a minimum.

Provide adequately for mine closure and rehabilitation

• Ensure sufficient funds are allocated for mine closure and site rehabilitation and integrate effective management of close-out into project planning
• Apply leading practice procedures on project closure programmes.

Continuous improvement in leading practice in radiation control

• Aim to minimize occupational and public exposure doses by applying the principles of Justification, Optimization and Limitation in radiation control
• Monitor radiation doses to employees and contractors and monitor radioactive discharges, emissions, environmental concentrations and exposure rates
• Determine potential radiological impacts on the public and the environment
• Provide stakeholders, freely and transparently, with information about radiation control performance
• Cooperate with government initiatives to measure and monitor the impact of radiation doses.

Regulatory obligations

• As a minimum, adhere to the applicable international and national laws, regulations and codes that govern the industry
• Notwithstanding this commitment, the members will continuously adopt improved practices to increase standards of operation where possible.
Provide information about uranium and its properties to stakeholders

- Provide accurate and current scientific information about uranium, its properties and risks and its impact in site-specific, activity-specific or community-specific circumstances
- Explain how those properties which generate risks are to be managed in the specific circumstances.
These guidelines follow on from the NUA’s Health, Environment and Radiation Safety/Security Standards (available on the NUA website). The guidelines are based on practices applied by major international mining companies, partly adapted to Namibian conditions and legal requirements. They can be regarded as examples of leading practice, and as such set goals that new companies in the Namibian uranium industry should strive for.

The HERSS Guidelines are the result of many months of work by the NUA’s Technical Advisory Committees. The Technical Advisory Committees invested much time and effort in the development and review of this document, which like all dynamic products will continue to be improved. Feedback from users and suggestions for improvement will be much appreciated.

Whilst the NUA takes all reasonable care in the preparation of the HERSS Guidelines, neither the Namibian Uranium Association, the Namibian Uranium Institute, its employees, or representatives shall have any responsibility or liability whatsoever with respect to any act or omission (whether negligent or not) of whatsoever nature of, or in connection with, the preparation of the HERSS Guidelines or any part thereof. These responsibilities are those of the user.
4 OCCUPATIONAL HEALTH AND HYGIENE GUIDELINES FOR THE NAMIBIAN URANIUM EXPLORATION AND MINING INDUSTRY

4.1 Introduction

The Namibian Uranium Institute has developed Health, Environmental and Radiation Safety/Security Practice Standards, which are available on the NUA website. The standards set out the minimum requirements that are compulsory for members of the NUA. More detailed guidance documents can be found in these Occupational Health and Hygiene Guidelines. New companies in the Namibian uranium industry are encouraged to use these guidelines when compiling their occupational health and hygiene management plans. The Occupational Health Standard is reproduced below for ease of reference.

NUA Occupational Health Standard

The development of minimum health and safety standards is based on the Health and Safety Regulations of the Labour Act, the Atomic Energy and the Radiation Protection Act. The implementation of minimum standards for occupational health was agreed with the independent medical providers, an international occupational health consultant and the Ministry of Health and Social Services (MoHSS).

While uranium itself is only slightly radioactive, radon, a radioactive inert gas, is released to the atmosphere in very small quantities when the ore is mined and crushed. Precautions taken during the mining and milling of uranium ores to protect the health of the workers include:

- Efficient ventilation and dust control, because the dust may contain radioactive constituents and emit radon gas
- Limiting the radiation exposure of workers in mining, milling and tailings areas so that it is as low as reasonably achievable and in any event does not exceed the allowable dose limits set by the authorities
- The use of radiation detection equipment in all mines and plants
- The enforcement of strict personal hygiene standards for workers handling uranium oxide concentrate.

Minimum Legal Requirements

In Namibia all uranium mining and milling operations are undertaken under the Health and Safety Regulations of the Labour Act, the Atomic Energy and Radiation Protection Act and the Workers Com-
pensation Act (WCA) of Namibia. These set strict health standards for exposure, for both workers and members of the public.

A Member of the NUA shall:

**Appoint a duly qualified Occupational Medical Practitioner, who is**
- in good standing with the Health Professional Council of Namibia
- registered as an Occupational Medical Practitioner by the Ministry of Health and Social Services: Directorate Occupational Health
- approved by the Chief Medical Officer appointed by the NUA
- willing and able to accept and implement the HERSS Standards and Guidelines as published by the Namibian Uranium Institute (UI)
- willing and able to support and take part in NUA Research projects.

**Develop and implement an Occupational Health Programme with the following components:**
- The surveillance, by means of visits to the workplace, of the factors in the working environment that may affect employees' health, including physical, chemical and biological hazards, psychological factors, the lay-out and safety of existing and to be purchased machinery, other equipment and workstations, work methods, organization of the work and personal protective devices
- The provision to employees of the necessary information and training relating to health hazards arising from work and the working environment, as well as advising the employer and employees how to avoid such hazards
- The examination of the health of the employees prior to the commencement of their employment in order to ensure that they are healthy and fit for the work to be performed (pre-employment medical examination)
- The examination of the health of employees, periodically after the commencement of employment, if the employees are exposed to occupational health hazards
- The examination of the health of employees upon exit from employment to detect the presence of occupational diseases or injuries
- The surveillance of the occupational hygiene and the hygiene of sanitary installations, and all other facilities relating to the welfare of the employees of the company
- The record-keeping on employees' health, compilation and periodic review of statistics concerning health conditions in the company
- The organisation and provision of first-aid and emergency arrangements
The supervision of applicable working conditions for disabled employees, including the direction of affected employees to medical career rehabilitation, if necessary

The medical surveillance shall be conducted at the expense of the employer, and shall be conducted during working hours, without loss of pay to the employee being examined

The employer shall provide suitable facilities at the workplace or at a convenient central locality elsewhere for the medical surveillance, and shall facilitate the performance of the examinations.

4.2 Occupational Health Systems Guideline

Scope

An occupational health management system must:

- Be documented in a clear and auditable form
- Be practical
- Be working effectively and
- Include procedures for periodic review and revision.

Legal Requirements

All regulatory requirements must be met.

- As a minimum:
  - The Constitution of the Republic of Namibia
  - Labour Act No. 6 of 1992, amended as the Labour Act, Act No. 11 of 2007 and its Regulations
  - Atomic Energy and Radiation Protection Act, Act 5 of 2005 and its Regulations
  - International conventions and treaties which include World Health Assembly WHA 60.26, and Global Plan of Action on Worker’s Health 2008-2017
  - Government Notice No. 156 Labour Act: “Regulations Relating to the Health and Safety of Employees at Work”
- A list of current occupational health regulatory requirements, including external reporting requirements, must be available.
- The list must detail site responsibilities for compliance
- Local regulatory standards and requirements will take precedence over these company guidelines, except in those cases where the company standards are stricter.
Health Management System

Every company and site must have an occupational health policy (either separate or integrated with safety and/or environment) and an occupational health strategy. Both policy and strategy must:

- Address key occupational health issues relevant to the facility’s products and operations
- Guide the setting of objectives and targets
- Be endorsed by current management
- Be subject to regular review
- Be readily available to employees and contractors
- Establish the priority of occupational health protection in relation to other business goals; and
- Ensure that occupational health/hygiene responsibilities and accountabilities are defined, designated, documented and communicated.

As part of the annual management plan, every company and site must have an occupational health improvement action plan in place, to prevent all new occupational illnesses in its operations. This plan must:

- Be integrated into operational planning and procedures, such that adequate resources are allocated and performance is monitored; and
- Cover objectives, responsibilities, timing, priorities, deliverables and resources.

Every employee must have:

- Targets setting out how they are expected to contribute to the occupational health improvement action plan
- A formal meeting at least once a year with their immediate manager in which these targets are agreed and documented; and
- A formal meeting at least once a year with their immediate manager in which their performance against targets is reviewed and an appropriate action plan agreed and documented.

Priority site occupational health issues must be addressed and documented in site work procedures. These must be available to all employees and contractors, and inform them of their occupational health responsibilities.

A system must be in place to identify and correct inadequate occupational health performance. Consistent with local medical confidentiality laws, incidents and health anomalies must be recorded and analysed.
Work Systems that do not Compromise Health

- There must be a system to minimise exposure to hazardous substances, physical agents and activities. The system must be based on risk assessment and ensure that effective controls exist for hazardous activities.
- There must be a system for ensuring that employees are trained and equipped to carry out their work according to applicable work procedures that minimise exposure to hazards, and that their understanding and capability of this has been evaluated. Requirements for avoiding or minimising occupational health risks must be integrated into skills training.
- All plant and equipment must be designed, operated and maintained throughout life so as to minimise adverse health exposures.
- Each business and site must have an audit system consistent with the HSE policy, objectives and guidelines, to verify conformance with these standards.

Health Organization and Communication System

- There must be an occupational health organisation structure with the following elements:
  - A management coordination role must be designated for occupational health, with clearly defined accountabilities;
  - A committee that supports line management in developing and overseeing the occupational health and safety (OH&S) improvement action plans;
  - A structure of divisional and/or departmental committees which ensures occupational health coverage of all areas of the operation; and
  - A system to promote OH&S awareness.
- All businesses must have access to the services of a medical adviser/consultant and an occupational hygiene adviser. A system to ensure their knowledge remains current is required.
- There must be an induction process for new employees and contractors addressing possible occupational health issues. Understanding of their awareness must be evaluated.
- An annual summary of occupational hygiene and medical monitoring results must be maintained for all areas where a risk assessment has indicated the need for those investigations. As a minimum the occupational hygiene summary must include the mean and 95th percentile results for each exposure group, the appropriate exposure limits against which to judge these results and a summary of the effectiveness of any work during the year to reduce exposures. As a minimum the medical monitoring summary must summarise, without identifying individuals, the monitoring results and draw attention to any new cases of illness or adverse trends.
• There must be a system for encouraging, collecting, evaluating, documenting, archiving and (as appropriate) implementing suggestions relating to occupational health issues. Occupational health effects and complaints must be analysed to identify causes and any necessary corrective actions.
• There must be a system for ensuring that relevant incidents or hazardous conditions, which have been reported, are communicated internally.

4.3 Risk Management Guideline

Scope
To protect all who work in the uranium industry from occupational illness in a cost-effective manner, a control programme based on exposure assessments is required. The basis of the occupational health-risk programme is that the potential risk to a person’s health is a function of both the magnitude and frequency of the exposure to the hazard and the inherent capacity of the hazard to cause harm. Businesses must develop control systems designed to eliminate or reduce exposure to hazardous agents/conditions, appropriate to the degree of risk to health. This guideline details the requirements for a suitable programme to manage the risks to health.

Programme Design
A risk management programme requires the following elements:

• Hazard identification
• Exposure characterisation
• Risk assessment
• Risk control or treatment
• Monitoring and review of controls; and
• Documentation

People with adequate knowledge and experience in determining risk levels are required for both the initial risk assessment and to address the implications of plant and equipment upgrades and modifications.

Hazard Identification
The hazards in each work area must be defined and a hazard inventory that includes all the chemical, physical, biological and ergonomic hazards compiled. A health effect rating, the inherent capacity to
cause harm, for each hazard must be determined. Special attention must be given to hazards caused by carcinogens, mutagens and reproductive toxicants (CMRs).

**Exposure Characterization**

Exposures must be characterized for worker groups who have similar responsibilities and so would be expected to have similar exposure to the same range of hazards, termed ‘Similar Exposure Groups’ (SEGs). SEGs must be based on payroll classifications or personnel employee job/occupation codes plus job observation/interview. Exposure characterisation must use qualitative or quantitative methods as appropriate. Quantitative assessment must be conducted for SEGs where:

- Exposures could exceed, or have exceeded, an occupational exposure limit (OEL),
- Exposures have aroused complaints or adverse symptoms directly or indirectly related to chemical or physical agents in the workplace,
- Exposures are the result of a change in activities or processes that could potentially increase exposures,
- Exposures are to CMRs, ionising radiation or crystalline silica, or
- Assessment is required by regulations.

Hazards with very low exposure potential must be documented but need not be further assessed. However, this assessment must be reviewed periodically.

**Risk Assessment**

Risk assessment is the evaluation of the probability of adverse health consequences occurring because of conditions identified on the site. The following steps are required:

- All the monitoring data for employee health checks, the general workplace, personal monitoring and specific operations, and their relevance with regard to toxicity (OEL, duration of exposure, individual susceptibility, etc.) must be reviewed,
- An exposure rating for each SEG for each relevant hazard must be determined. This rating must record existing control equipment and procedures,
- A health risk assessment using a risk matrix to determine relative (not absolute) risk must be performed, and
- Action identification and prioritization must then be determined.

The assessment must be repeated at appropriate intervals.
Risk Control or Treatment

Where risk assessment indicates the need for controls or treatment, these must be assessed as to their efficacy in minimising or eliminating the risk of adverse health effects in a staged manner according to the hierarchy of controls:

- Removal or substitution of the hazard - the permanent solution
- Isolation (e.g. process automation, enclosure or local exhaust ventilation)
- Administrative controls such as rotation of personnel, and then
- Personal protective equipment (PPE).

PPE must only be used to achieve compliance with OELs in situations where the use of higher level controls is not commensurate with the degree of risk and cost, while higher level control options are being developed and implemented, or for short duration tasks. Control systems must be:

- Designed to be compatible with process and maintenance requirements
- Designed according to good occupational hygiene engineering practices
- Cost effective at achieving control of potentially hazardous exposures, and
- Regularly maintained and monitored.

Whenever practicable, purchasing criteria must be developed such that new equipment brought to site will not expose workers to more than the OEL in operating mode. Administrative controls must be appropriate. Where work practices are used for exposure control, they must be understood and followed as a result of training and enforcement. Safe handling procedures and precautions must be included in standard operating procedures (SOPs).

Where risk assessment indicates the need to reduce exposures to toxic substances, good personal hygiene must be enforced. The programme must include:

- No smoking, eating or drinking in designated hazard areas
- Washing of hands and face prior to eating or smoking
- Showering at work post-shift or after exposure to ‘dirty’ conditions, and
- Laundering of contaminated clothing by the business or site.

Where PPE is required, it must be provided, be appropriate and be managed effectively, such that:

- A single individual/function must be assigned overall responsibility for the PPE programme for the site,
- The programme must be adequately documented and include contractors,
• The programme must specify selection, administration, maintenance of PPE and training; and designate responsibilities and include signposting for PPE use,
• The programme must be consistent with local standards or regulations,
• PPE of the proper types must be readily available and its use (where required) must be enforced. Defective or damaged PPE must not be used,
• Protective equipment requirements must be indicated in operating manuals and procedures must be posted in hazardous areas and included in employee training,
• Employees must be trained in the health effects of exposures to specific hazards, when to use which PPE, how to fit it correctly, what to do if it fails and how to maintain it, and
• PPE use must be reviewed regularly for continued relevance.

Monitoring and Review of Controls

The risk assessment must reach one of the following conclusions for each SEG exposure:
• The risk is controlled by engineering standards,
• The risk is controlled only by the use of personal protective equipment (PPE) or administrative controls. Substitution/engineering controls must be considered and any reasons for their not being adopted documented,
• There are insufficient data to make a valid assessment. This must be coupled with a statement on the time scale over which valid data will be acquired, or
• There is a health risk at current exposures. This must be coupled with an action plan and time scale to control the identified risks.

For carcinogens, mutagens and reproductive toxicants (known and suspected), meeting an OEL is not adequate; exposures must be “as low as reasonably achievable or practicable”. There must be an annual documented review of exposure controls for these substances and a substitution programme. Performance standards and indicators for all control programmes must be developed and reviewed regularly.

Documentation

The risk management process must be documented in a comprehensive ‘Risk Register’ that lists all key risks that could impact on worker’s health, with an occupational health improvement action plan how to deal with risks.
4.4 Workplace Monitoring Guideline

Scope

If a risk assessment indicates the need, a workplace-monitoring programme is used to evaluate potential exposures and to develop controls that will protect the health of all who work on uranium mines. This guideline applies only to monitoring, sampling and analysis conducted within the workplace. It is not intended to extend to environmental or community monitoring, although some principles will be applicable to all monitoring programmes.

Programme Design

The workplace-monitoring programme must be based on risk-based exposure assessments and professional judgment. The programme must be consistent with site health risks, linked to employee health surveillance, and be linked to the facility’s objectives and targets. The programme must be designed to provide data to demonstrate compliance with legal standards. The data collected must enable an annual summary of each SEG’s exposures to be produced. The programme must be designed to document representative averages and the range of work exposure conditions. To the extent possible, all monitoring data must be collected such that it is statistically valid.

Monitoring

The workplace monitoring procedures must be adequate with regard to locations or persons monitored, parameters measured, frequency of measurements, sample collection technique used, and analytical method used. Personal monitoring rather than ‘static’, fixed-place or area monitoring must be performed for defining potential employee exposures. Static monitoring can only be used for measuring employee exposures when found to be well correlated with personal monitoring data.

Monitoring must be conducted to determine the potential for adverse exposure during both routine and non-routine or intermittent exposures (e.g. maintenance and campaign shutdowns or turnarounds), and for the purpose of designing controls and for assessing the success of controls. For carcinogens, mutagens and reproductive toxicants (known and suspected), exposure data must be statistically valid on an annual basis. Time-weighted average (TWA) measurements over several shifts, and consistent with the work-day period, must be used.

For progressive chronic conditions with a known cause, requiring long-term exposure for an effect to manifest (excluding noise), exposure data must be statistically valid on an annual basis. TWA measurements over several shifts, and consistent with the work-day period, must be used. If three or more
years’ data are all low (<50% of OEL), then monitoring periodicity can change to three-yearly, provided the process does not change.

For substances that manifest toxic effects after short-term exposures (e.g. CO, H₂S and SO₂ gas and some substances causing occupational asthma), a much shorter monitoring period throughout shifts will be required (in the order of seconds to minutes). Where risk assessment indicates the possible presence of levels of gas or vapour sufficient to cause health effects in less than one shift, continuous monitoring is required as long as the potential for harm exists. Capabilities for conducting any special air samples (e.g. tank entry, incident investigations, etc.) must be available.

**Reporting**

As a minimum, site data must be summarized using descriptive statistics - typically their central tendency (mean, median and geometric mean) and their spread (range, minimum and maximum, standard deviation, and geometric standard deviation). All unexpected non-conformances and OEL exceedences must be reported within 24 hours upon receipt and confirmation of analysis results to the manager of the area or department in which they occurred. All non-conformances and OEL exceedences must be reported in writing within 7 days upon receipt and confirmation of analysis results.

Data must be regularly reviewed, interpreted and reported. Management reports for the various hazards assessed and controlled should be regularly prepared and distributed to effected parties, including the medical adviser. Reports must include health hazard control recommendations and actions taken.

All personal monitoring results must be reported back to the employees concerned, and their significance explained, within a reasonable time from when results are available.

**Quality Control**

Written protocols/procedures for sampling and analysis, including quality control requirements, must be available and be regularly reviewed. Measuring equipment must be appropriate with regard to precision, accuracy, reliability, data output, backups, standards and availability of servicing. Equipment must be appropriately calibrated regularly. Staff carrying out workplace monitoring must have adequate training/experience and technical oversight where appropriate. There must be internal procedures for checking on the quality and relevance of monitoring data. SEGs must be periodically reviewed and data should be periodically checked statistically for outlier results. The analytical laboratory services used must have an active quality assurance or quality control programme in place.
4.5 Medical and First Aid Treatment Guideline

Scope
This Guideline covers the provision of facilities, equipment and services for the prompt and effective treatment of injuries and illnesses, whether to employees, contractors or visitors, occurring on a site, and the transfer to other facilities for ongoing treatment where required. The general principles given below must also be applied to other, more extensive services (if present).

Organization
The arrangements for the provision of appropriate treatment services must be risk-based and documented. These can include local off-site provisions, where they are adequate. The risk assessment must consider:

- The health and injury risks of the site and numbers and types of treatments experienced
- Special situations such as underground, remote, expatriate and lone workers
- Provisions for treatments throughout a 24-hour day and at weekends
- The location and adequacy of local, non-company treatment facilities, and
- Transport arrangements for emergency evacuation when required.

Adequate levels of staff, equipment and facilities must be provided. The minimum acceptable Guideline is:

- A person appointed to take charge of first-aid / medical arrangements,
- A qualified medical practitioner to act as the medical adviser (can also be the ‘appointed’ person and may be contracted),
- Ready access to a suitably qualified person to provide medical treatment,
- One trained and certified first aider per 50 employees on every shift, or the provision of full-time emergency services or paramedic support onsite. More first aiders may be required in underground or remote locations,
- Suitably stocked first-aid boxes or equivalent provision, located such that they are readily available,
- For permanent facilities, a first aid or ‘sick’ room that provides privacy for injured or sick employees during their wait for medical treatment or recuperation,
- An emergency vehicle, suitable for conveying injured or sick persons to a local treatment centre or ‘pick-up point’, where a local ambulance service is deemed inadequate; and
- Basic diagnostic capabilities for local diseases, where the site is ‘established’ and remote.
The site medical and first aid treatment system must be integrated into the site emergency procedures and safety reporting system. There must be an established and documented emergency communication system. The selected ‘appointed’ person and first aiders must be trained in first aid according to accredited Guidelines.

All employees must be informed of the first aid/medical arrangements and the procedure for activating the emergency procedure. Notices indicating contact details for first aiders or appointed persons, the emergency contact number/radio frequency, and where the first-aid box is, must be posted about the site. Special arrangements may be required to give first-aid information to employees with reading or language difficulties.

**First-aid Boxes**

The contents of the first aid box must be determined in consultation with local medical opinion, and must be appropriate to the number of employees and risks associated with the area. Adequate availability of the contents must be assured. First aid boxes may not be required where there are trained paramedics on site.

**4.6 Occupational and Medical Surveillance Guideline**

**Scope**

Medical surveillance in these Guidelines is restricted to the detection of conditions caused by workplace conditions, or conditions that might be risk factors for poor adaptation to work conditions, and applies to employees and contractors.

**Programme Design**

The medical surveillance programme must be consistent with local regulatory requirements, site health risks and be linked to the facility’s objectives and targets. It must be based on workplace monitoring and assessment. Where a possible health risk is identified, workers must be encouraged to participate in the medical surveillance programme. The medical surveillance programme must be based on sound ethical and clinical practice, such that:

- Worker’s privacy and confidentiality of individual health information is maintained;
- Test equipment is adequate and appropriate for identified health hazards, and written protocols, including quality control requirements, are available;
- Biological monitoring methods are appropriate;
- There are documented medical Guidelines for all safety critical jobs;
There are documented methods, Guidelines or guidelines available for determining illness progression resulting from workplace exposures;

- There are guidelines available for determining removal and re-entry levels for priority hazardous substances and agents where required; and
- Fitness for a particular type of work is determined.

Workers must be informed of the potential risks from tests and of the monitoring results. A system must be in place to notify appropriate personnel or new employees, those transferring to another job and those leaving the company. Where legally possible, a system must be in place that encourages employees to report health conditions that could affect their ability to do their job safely, or that might be confounded by job exposures (e.g. pregnancy and reproductive health risks).

**Examinations**

Medical examinations must be conducted by a physician, nurse or equivalent, as allowed by local law. A pre-employment or pre-placement examination is required when:

- The proposed job has specific health requirements, OR
- There is a risk that at current site conditions an adverse health effect could occur, OR
- There is a legal requirement.

Pre-placement guidelines for medical examination must be appropriate to the actual or foreseeable future, risks from the employment or the job assignment. Any invasive tests must only be undertaken when indicated by the nature of the future job and with the written permission of the candidate. Failure to provide an appropriate sample can be used to make a decision of suitability.

A periodic health surveillance programme is required when either:

- There is a probability that a health effect could occur from conditions on site
- There is a test that can detect that effect reliably
- Detecting the abnormality brings a health benefit to the worker
- The health benefits are greater than any harm from the testing
- There is a legal requirement for periodic health monitoring.

Particular attention must be given to appropriate medical monitoring for workers where risk assessment indicates the potential for exposure to high-risk hazardous substances including carcinogens, reproductive toxicants or respirable crystalline silica.
The frequency of examinations must be documented and be based on an assessment of the level of health risk, the speed of progression of any illness and on legal requirements. Employees must undergo an examination on resumption of work after a prolonged absence for health reasons. A medical examination is required on termination of employment, or where this is not legally possible must be offered, when either:

- There is a possibility that health changes could have occurred
- There is a need to document the degree of health changes during employment
- There is a legal requirement.

**Risk-based Medicals**

Matrices encompassing the principles of risk-based medical surveillance per job, currently based upon perceived risk exposures and including the principle of minimum health Guidelines for uranium mining are attached at the end of this section.

**Biological Testing**

Occupational health physicians or medical practitioners must retain overall responsibility for biological tests and other medical investigations. Biological monitoring must not be a substitute for the monitoring of the working environment and the assessment of individual exposures. Where legislation or company policy has both a workplace environment standard (OEL), and a biological standard, compliance with both must be achieved. Compliance with one cannot be used to excuse non-compliance with the other.

**Reporting**

The prime responsibility of a physician or nurse is to the individual patient. However, additional control of workplace conditions required to improve the health of the worker requires management actions. Where adverse health cases are detected, the physician/nurse must seek the worker’s written permission to give sufficient information to the appropriate manager to effect change, without breaking confidentiality conventions. The physician must encourage the employee to give this permission. If this permission is refused, the physician must record this in the individual’s notes, and consider, after consultation with plant staff on job requirements or the safety of others, if the potential outcome of continuing exposure is sufficient to warrant removal of the worker from further exposure.
Medical surveillance information must be provided to the company management in a form that respects the privacy of the individual, but enables the company to fulfil its duty of care obligations to employees. Adverse trends in health monitoring results for an area must be reported to the area manager in writing within seven days. The names of individuals may not be disclosed without their written authorisation.

4.7 Guidance in Support of Regulation 40 Relating to Health Surveillance

The following text is copied from Regulation 40 to provide a convenient reference to Namibian legal requirements with regard to health surveillance.

Regulation 40 of the Namibian Regulations for the Protection against Ionizing Radiation and for the Safety of Radiation Sources of the Atomic Energy Act (No 5 of 2005)

The main elements of a health surveillance programme should be:

- The assessment of the health of workers for the purpose of ensuring that they are fit to undertake the tasks assigned to them;
- The establishment and maintenance of records that would be useful in the case of:
  - accidental exposure or occupational disease,
  - statistical evaluation of the incidence of diseases that may relate to working conditions,
  - an assessment for public health purposes of the management of radiation protection in facilities in which occupational exposure can occur,
  - medical-legal inquiries
- The arrangements for dealing with accidental exposures and overexposures;
- The provision of an advisory and treatment service in the event of personal contamination or overexposure.

Responsibility

Health surveillance is the responsibility of the occupational health services, whose functions are listed in (1) above.

Responsibilities of Occupational Physician

The occupational physician should:
• Carry out medical examinations on workers prior to their employment, periodically when they are employed and upon the termination of their employment.

• Advise management periodically on the fitness of workers:
  o if a worker is found to be unfit for the specific work assignment, the occupational physician should indicate whether the condition is temporary or permanent and may recommend a transfer to alternative employment.
  o if any ailment could have been caused by prevailing working conditions, the occupational physician should advise the management of the need to take corrective action.

• Take responsibility for case management in the event of a suspected overexposure. This should include the submission of details of the case to relevant qualified experts, the counselling of the worker and the briefing of workers’ representatives if appropriate.

• Advise as appropriate on the arrangements for hygiene at work and the removal of radionuclides from wounds.

Medical Examinations

• Medical examinations of occupationally exposed workers should follow the general principles of occupational medicine.

• Persons employed in areas in which they may be exposed to radiation should be screened medically for fitness before commencing such employment and at appropriate intervals while so employed.

• A specific medical history and assessment should be made for the following purposes:
  o to determine fitness for the specific work for which the worker is to be employed,
  o to provide a baseline for use in the consideration of changes to specific work practices,
  o to provide a baseline for use in assessing an occupational disease or overexposure.

• The data compiled from the medical assessments may be used for epidemiological studies.

• On completing a medical examination, the physician should communicate his or her conclusions in writing to both the worker and the employer.

• Medical examinations to assess the exposure to hazards other than radiation should be performed in accordance with the provision of the specific legislation relating to the hazard.

• In a medical examination at the termination of employment, any work-related impairment should be identified and, if necessary, arrangements should be made for further periodic and follow-up examinations by the worker’s physician after employment has ceased.

• In keeping with good practice for occupational health, the occupational physician should ensure that the worker, on return from absence due to injury or illness, is fit to resume work.
● The occupational physician should have the authority on medical grounds:
  o to declare a worker temporarily unfit for his or her regular work,
  o to advise the employer on reinstating such a worker in his or her normal duties,
  o to recommend the transfer of a worker to other work.

**Notification of Ailments, Pregnancy and Overexposure**

● Workers should be encouraged to report any significant ailment promptly to the occupational physician.
● The employer should ensure that every female worker of child-bearing age is fully informed of the potential risks to the foetus associated with radiation exposure during pregnancy, and that the regulatory limits on foetal doses are complied with.
● The employer should advise female workers of child-bearing age to inform the management of a pregnancy as soon as possible.
● A worker should report any suspected accidental intake of radioactive substances to his or her supervisor and to the radiation protection officer.
● The occupational physician should be informed when it is suspected that an accidental intake exceeds the dose limit and should be advised of the outcome of any investigation to establish whether such an intake has actually occurred.
● When a worker has received a dose in excess of a reference level the Authority may require notification and investigation of the circumstances of the exposure.

**Medical Advice to Management**

● Medical advice to management on the suitability and fitness of an individual worker for a specific job and specific assignments should be provided on the basis of full knowledge of the worker’s state of health and the employer’s requirements for the job.
● If private occupational physicians are employed on a part time basis, they should be fully knowledgeable of the biological effects of radiation.
● The employer should make suitable facilities for medical examinations in the vicinity of the workplace available, and should also provide appropriate opportunities for the examining occupational physicians to familiarize themselves with the intended work activities and working environments of the individuals being examined.
Medical Advice to Workers

- The occupational physician should keep the worker fully informed of the reasons for particular examinations, as well as of any significant findings bearing on the worker’s health and particular working environment.
- The occupational physician should provide workers with specific counselling with regard to any radiological risks to which they are or might be subjected.

Medical Records

- Medical records should include records of all medical assessments — pre-employment; periodic; special; post-illness; at the termination of employment; laboratory reports; sickness reports; medical history reports.
- Medical records should be confidential and should be preserved in a manner approved by the Authority.
- Medical records should be retained for at least the lifetimes of the workers concerned. However, because of the possibility of litigation, a longer period of retention of records may be advisable.

4.8 Health Guideline for Elevated Uranium Levels in Urine

Intent

Uranium in urine sampling is a control measure, which acts as an indication to show whether existing protection measures are working effectively. The objective of urinalyses is to determine the amount of uranium in urine of occupationally exposed persons and other employees, including contractor workers, working in areas or performing tasks where intake of uranium is possible.

Scope

This document covers the urinalyses procedure and responsibilities of NUA members in terms of urine sampling and management actions. Further details on the interpretation of results and action to be taken in the event of an exceedence are given in the Code of Practice for Ionising Radiation.

Criteria for Urinalysis Results

Two reference levels for uranium in urine are applicable:

- Reference level 1: 20 micrograms per litre (µg/l) (Warning limit)
- Reference level 2: 40 micrograms per litre (Action limit)
It should be noted that the above reference levels are not limits. They are used to determine a course of action as outlined in this document.

Responsibilities

The NUA member company shall:

- Supervise the sampling procedure
- Manage non-attendance and any other problems during the sampling process;
- Record exceedence results and perform investigations
- Report on exceedence to the relevant supervisors and to the Occupational Physician
- Check the quality control programme for urinalysis by doing spot checks on the urine sample results
- Review the report of the urinalysis results
- Take management action in the event of exceedence in accordance with the instructions in this document
- Liaise with the Occupational Physician if any problems should arise, e.g. borderline cases, recurrences and out of range values
- Inform the relevant person of an exceedence in his urinalysis result and also of the follow-up thereof
- Ensure that employees report for exceedence follow-up sampling
- Ensure that employees who did not attend a scheduled sampling session report for sampling during the next sampling session
- Ensure that the urinalysis sampling programme, as a means of controlling the internal radiation exposure, is carried out effectively and according to leading practice criteria
- Decide, in consultation with the Occupational Physician, on the plan of action with regard to abnormal results in accordance with this document
- Decide, in consultation with the Occupational Physician on the removal of an employee from a work area as a result of an exposure.

The Occupational Health Physician shall:

- Provide clinical evaluation of a person, when required to do so
- Advise the relevant company in the event of an exceedance in terms of this document
- Keep a register of urinalysis exceedances in the employee’s medical record.
Sampling Procedure

An independent laboratory service provider shall perform urine sampling according to approved sampling procedures and standards.

Procedure for Exceedances

As soon as notification of an exceedance is received by the NUA member the following procedures should be followed:

a) Exceeded warning limit value of 20 micrograms per litre
   - Request the service provider to collect another urine sample for uranium analysis
   - Investigate occupational hygiene practices

b) Exceeded action limit value of 40 micrograms per litre
   Remove the worker from the exposure area and rotate to low-risk area until proven to have normal markers of preclinical kidney involvement
   - Request the service provider to collect another urine sample for uranium analysis
   - Refer to medical service provider for collection of a urine sample to perform:
     o Microalbuminuria test
     o B2 microglobulin in urine test
   - Investigate occupational hygiene practices
   - Send relevant person to medical service provider for examination, to check blood pressure, kidney functions, fasting glucose, and urine dipstick
     o Repeat urine for microalbuminuria and B2 microglobulin after one month in selected cases with abnormalities
   - Return to high-exposure work only if above results are normal
   - Not to return to high-exposure areas if above markers of preclinical kidney involvement remain abnormal; for permanent deployment in low-risk area.

Criteria for Testing

All employees who regularly work in a high-risk uranium exposure area, as determined by a risk assessment, need to have monthly uranium in urine tests. All these employees need to be seen for six-monthly comprehensive medical examinations.

Criteria for Selection

All employees who might be exposed to high levels of uranium need to be tested beforehand to confirm absence of existing microalbuminuria, e.g. diabetic and hypertensive patients and those with a history of kidney problems. This implies a specific pre-placement test for high-risk uranium exposure
area employees, which can be done as part of pre-employment testing or before deployment in high risk area. Sound engineering principles to reduce exposure remain imperative.

4.9 Occupational Health Records Guideline

Scope

This Guideline covers creation, use and storage of occupational health and hygiene records. In cases where workers are grouped into similar exposure groups for occupational hygiene measurements, individual deployment or personnel records will be needed to enable each worker’s exposures to be recreated.

Record Types

The following record types must be maintained:

- A register of site regulatory requirements
- A register of injuries/illness and first aid treatments
- Worker’s Compensation report forms with medical certificates
- Company’s reporting and investigation forms of fatal and significant incidents
- Occupational illness cases reported for the annual social and environmental report
- Documentation of site occupational health risk assessments – a risk register
- Documentation of site-derived OELs and SEGs
- A register of site MSDS, and of people/organisations who receive a site product MSDS
- A register of occupational health audits and reviews
- A register of occupational hygiene survey and assessment reports, including those by consultants and regulators
- Personal and static monitoring and survey field sheets
- Summary reports of workplace monitoring data and controls performance
- Documented procedures for inspection, assessment and maintenance of exposure controls, both engineering and personal protective equipment, where applicable
- Employee personal occupational medical files
- Employee site job history
- Training records of the site’s professional employees responsible for health and occupational hygiene advice
- Instrument calibration certificates and quality control documentation
- Radiation Management Plan
All confirmed occupational illness incidents attributable to site exposures must be reported annually as part of the social and environmental data collection. Occupational illnesses regarded as significant must also be reported according to the procedure for notification of fatal or significant issues.

Records Content

All health and hygiene risk assessments and surveillance results must be recorded, reported and maintained. These records must be legible, identifiable and traceable to the activity, product or service involved. A structured database of occupational hygiene monitoring data must be maintained and documented. Monitoring records must provide sufficient process and operation detail to allow an assessment of sampling and control effectiveness.

A personal occupational medical file must be maintained for all employees and made available to that employee or their personal doctor on request. It is preferable that a copy of each employee's SEG personal monitoring data also be maintained on this file, or can be readily linked to this file. Each medical examination report must be dated and signed by the examining physician, nurse or equivalent, with a printed name to identify (electronic signature is acceptable).

Records must contain data that have been reviewed and interpreted to a level of rigour sufficient to defend the company reputation in the case of community or regulatory challenge, from current or proposed legislation. With the employee’s consent, any significant finding on medical examination should be reported to their personal physician.

Retention Policy

On closure of permanent sites, the medical records must remain confidential. The physician must discuss with the company occupational physician, or records custodian, appropriate storage arrangements and responsibility for these records. Occupational health and hygiene records must be stored and maintained in such a way that they are readily retrievable and protected against damage, deterioration or loss. Their retention times must be established and recorded. Records must be kept for a period consistent with legal requirements or 30 years after employment ceases, whichever is longer.

Confidentiality

All medical results must be treated as confidential personal information and access restricted to physicians, nurses and equivalent, and to individual employees for their own records. Each site must devise a procedure for handling confidential medical records that protects them from access by unauthorised
personnel. All individuals working as “medical” personnel at the sites must sign a confidentiality agreement. Medical information may be supplied outside the bounds presented above, where there is explicit consent for the information to be used for a specific purpose (e.g. to meet worker’s compensation or superannuation requirements). In these cases, the information must only be used for this purpose and the information either destroyed or transferred to the individual’s medical records when the investigation is complete.

4.10 HIV/AIDS Guideline

Intent

This guideline sets out the basic principles with regard to HIV/AIDS prevention and treatment. We acknowledge HIV/AIDS as a workplace issue that is impacting significantly in many communities. We believe a healthy workforce and good management of community relationships is necessary for business success and that this is consistent with other contributions to sustainable development. This combined workplace and community HIV/AIDS approach demonstrates commitment to the good health of employees and contractors, and the communities.

Scope

All businesses must ensure that HIV/AIDS is managed in a non-discriminatory and confidential manner, as per any chronic health condition. The requirement for a business to implement this strategy will be risk-based. It will apply to all operating contexts in which the presence of HIV/AIDS results in a significant threat to employee health or business success. In most instances the risks posed by a one per cent or greater community prevalence rate, as defined by the United Nations in its annual AIDS Epidemic Update, will require all strategy elements to be implemented. Where businesses are unable to implement all elements of the strategy due to regional resource constraints, or other factors outside of their control, they will be required to develop an implementation strategy that will enable all elements to be addressed over a specified time frame.

Principles

The impact of HIV/AIDS makes it a workplace issue. It is treated as a distinct element within the normal business medical programmes. Discrimination towards employees on the basis of real or perceived HIV status is not tolerated. The confidentiality of all information on the HIV status and condition of employees and community members is strictly upheld. The management of all information relating to counselling, care and treatment and receipt of benefits respects the privacy of each individual. HIV/AIDS screening is not undertaken during recruitment or as a condition of employment.
The workplace response to HIV/AIDS has four key components:

- Prevention, Awareness and Education
- Voluntary Counselling and Testing (VCT)
- Wellness, Counselling and Treatment
- Monitoring and Evaluation

Mining contractors and transport operators are a group known to be at higher risk of contracting and transmitting HIV infection. All significant contracts, including haulage/shipping contracts, are to be assessed as to the risks associated with HIV/AIDS and appropriate control strategies implemented. All risks posed by HIV/AIDS are assessed and a mitigation strategy developed prior to any acquisition and throughout the life of mine from exploration, project development and commissioning, to operation and closure.

HIV/AIDS will be included in the five-year communities/social plan. This plan will integrate the business goals with the expected outcomes of the workplace HIV strategy and community relations activities. Partnerships will be actively sought with external organisations working to assist in HIV education, awareness raising and treatment to both employees and within the broader communities.

Please refer to the following documents when implementing a HIV/AIDS strategy:

- National Policy on HIV/AIDS (14th March 2007)
- National Strategic Plan on HIV/AIDS (Third Medium Term Plan 2004-2009)
- National Guidelines for the Treatment of Tuberculosis in Namibia (2012)

4.11 **Hearing Conservation Guideline**

**Scope**

This guideline applies only to noise exposures in the workplace. It covers noise hazard evaluation, control programme design and control programme evaluation (audiometric surveillance), to ensure that employees and contractors will not suffer adverse health effects from noise generated by the company.

**Programme Design**

Where risk assessment indicates the need, a hearing conservation programme must be in place such that:
- It complies with all relevant requirements in the Guidelines
- Workplace noise exposures are adequately described
- Noise sources that contribute to the exceedance of OELs are identified and adequately characterised
- Control measures are in place to minimise noise levels and protect employees and contractors from adverse exposure.

Where it is likely that the 95 percentile value of an 8-hour Leq mean exceeds 85 dB, or impulse noise exceeds 140 dB, the area must be identified and mapped, signposted or otherwise clearly communicated to employees working in the area. Signposting, where necessary, must use appropriate wording or symbols on signs to identify the hazard. These designated areas require a documented hearing conservation programme, regular monitoring of SEGs working in the area and a formal review of the practicality of engineering controls.

Monitoring must be based on the use of a sound level meter (SLM) approved by local regulatory authorities, with 3 dB exchange rate, and A-weighting and impulse noise measurement capability, as per documented methods. Employees whose potential Leq exceeds 85 dB (A), or impulse noise exposure exceeds 140 dB(C), must be encouraged to undergo audiometry. The results should be discussed with the worker.

**Audiometry Programme**

Where an audiometry programme is indicated, it must meet the following standards:
- All testing must be by pure tone audiometry in an audiometry booth or quiet room, with measured noise levels less than 40 dB;
- The initial audiogram must be taken prior to exposure to significant workplace noise;
- Testing must be by trained personnel;
- Audiometers must be calibrated according to the manufacturer’s guidelines. As a minimum, there will be a weekly biological calibration using a member of staff, and an annual quantitative check. All results must be documented;
- Audiograms must be read by trained persons who will identify any increasing hearing loss and then determine if this is noise induced. Any employee whose hearing deteriorates by 10 dB or more from baseline at 3, 4 or 6 kHz must be retested following removal from noise for a minimum of 48 hours, usually after a day off. If the downward shift persists the employee must be reviewed by a physician; and
- All results must be kept in medical confidence. Efforts should be made to persuade any worker with a progressing loss to allow this fact to be communicated to the relevant manager, such that duty of care obligations is fulfilled.

**Exposure Controls**

Elimination or substitution must be considered. Where required or practicable, there must be engineering controls in place. There must be documented procedures for inspection, assessment and maintenance of the engineering controls and noisy equipment to ensure that the equipment continues to operate to design specifications. Where required, there must be a documented hearing protection device (HPD) programme based on suitable standards, which provides training in the recognition of signs and symptoms of hazardous noise exposure, emergency procedures and preventative measures. HPDs must be selected with regard to the potential type and expected loudness of noise, comfort and compatibility with the work tasks.
4.12 Manual Handling and Vibration Guideline

Scope
This guideline is applicable to all NUA members and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post-closure management. It focuses on musculo-skeletal damage that can result from manual handling and from vibration. This guideline covers musculo-skeletal hazard evaluation, control programme design and control programme evaluation, to ensure that employees and contractors will not suffer adverse health effects from poor task and equipment design, or from inappropriate behavioural practices.

Programme Design
- The workplace must be assessed by a competent person for compliance with good design, layout and practice, to avoid or minimise adverse health consequences due to manual handling and vibration issues.
- The quantitative evaluation of vibration produced by specific equipment must include the following measurement parameters: direction of movement, frequency, intensity, and variation with time and duration, as per documented methods.
- Employees and contractors must be informed of the results of assessments and instructed in appropriate manual handling techniques, where the risk assessment indicates a need.
- Workplace vibration sources that could contribute to the exceedance of OELs (hence potential impact on worker musculo-skeletal fitness) must be identified and adequately characterised.
- Manual handling tasks assessed as having potential to cause an LTI (i.e. with potential for impact on worker musculo-skeletal fitness) must be identified and adequately characterised.
- Workplace manual or materials handling tasks risk-rated as “significant” must be assessed and recorded to include biomechanical factors (e.g. posture, bending, twisting, repetitive motions, working overhead, exerting force away from the body).

Exposure Controls
- Design criteria that address ergonomic requirements, and the minimisation of vibration where appropriate, must be available for the purchase or fabrication of all new fixed and mobile workplace equipment, and furniture. This also applies to retrofits to existing equipment.
- The operation must ensure that its management of change mechanisms eliminate or minimise ergonomic risks when designing workplaces, processes, facilities, machines and operational procedures.
• Control measures must be in place to minimise exposures and protect employees and contractors from adverse exposure. Where possible, machines or equipment, or alternative systems of work, must be employed to conduct heavy, awkward or repetitive tasks.
• Where risk assessment indicates the need, businesses must have within the periodic medical assessment a programme that includes:
  o encouragement of workers to recognise and report the early symptoms of musculo-skeletal disorders
  o encouragement of workers to recognise unsafe manual handling and vibration conditions
  o the identification of modifiable risk factors that may impact fitness for work
  o education and support to address any identified fitness for work risk factors
  o education and support to assist workers regain their fitness for work.

Machines, working equipment and tasks risk-rated as “significant” must be evaluated for possible modification or replacement where necessary.

4.13 Occupational Exposure Limits Guideline

Scope
To protect all who work on our sites from occupational illness, workplace hazardous exposures must be controlled to below occupational exposure limit (OEL) and/or biological test limit values.

Definitions

Occupational Exposure Limits (OELs) are levels of agents in workplace air, which it is believed are low enough to protect nearly all workers from discomfort and adverse health effects over a series of eight-hour shifts for a working lifetime. Biological test limit values provide a method of determining total exposure to a chemical by measurement of a chemical, a metabolite or a biochemical change in the body. OEL and biological test limit values should be used as guidelines.

These OEL and biological test limit values will take precedence in all cases except where a lower legal limit is applicable. Skin absorption may be a significant additional source of exposure for some agents. These are indicated in the list with a “sk” notation.

Programme Design

Each business or site must establish or adopt an OEL for each agent for which significant worker exposure is possible. Where, in the absence of a legal or company OEL, a business/site standard is devel-
oped, this OEL must be documented. OEL and biological test limit values must be reviewed annually for relevance and efficacy.

Where workers have a working day longer than eight hours or unusual shift rotations are in effect, the TWA OEL may need to be reduced by a suitable factor to ensure adequate worker protection. Such factors require specialist consideration. For some agents, the existence of an adverse carcinogenic health effect is known or suspected, but there is no internationally accepted assessment of the appropriate OEL or no agreed practical method to quantify workplace levels. In these cases, exposures to agents meeting these criteria must be reduced wherever possible.

**OEL Values**

<table>
<thead>
<tr>
<th>Agents (in air)</th>
<th>Company OEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>25 ppm (TWA) 35 ppm (STEL)</td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.05 mg/m³</td>
</tr>
<tr>
<td>Asbestos</td>
<td>0.5 f/mL (chrysotile) 0.1 f/mL (others)</td>
</tr>
<tr>
<td>Beryllium</td>
<td>0.002 mg/m³</td>
</tr>
<tr>
<td>Boron (as B)</td>
<td>1 mg/m³</td>
</tr>
<tr>
<td>Cadmium fume</td>
<td>0.025 mg/m³</td>
</tr>
<tr>
<td>Carbon disulphide</td>
<td>10 ppm sk</td>
</tr>
<tr>
<td>Carbon monoxide (CO)</td>
<td>35 ppm</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.05 mg/m³ (Cr VI) 0.5 mg/m³ (Cr other)</td>
</tr>
<tr>
<td>Coal tar pitch (CTP) volatiles</td>
<td>0.2 mg/m³ (BSM) sk</td>
</tr>
<tr>
<td>Copper</td>
<td>1 mg/m³ (dust/mist) 0.2 mg/m³ (fume)</td>
</tr>
<tr>
<td>Fluorides</td>
<td>2.5 mg/m³</td>
</tr>
<tr>
<td>Hydrogen cyanide (HCN)</td>
<td>5 ppm (TWA) sk 10 ppm (STEL)</td>
</tr>
<tr>
<td>Hydrogen fluoride (HF)</td>
<td>2.5 mg/m³ (ceiling)</td>
</tr>
<tr>
<td>Hydrogen sulphide (H₂S)</td>
<td>10 ppm (TWA) 15 ppm (STEL)</td>
</tr>
<tr>
<td>Inhalable dust (total)</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td>Ionising radiation (gamma / x-rays), includes radon contributions</td>
<td>20 mSv/year</td>
</tr>
<tr>
<td>Lead</td>
<td>0.1 mg/m³</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.025 mg/m³ sk</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.5 mg/m³ (metal &amp; insol.) 0.1 mg/m³ (soluble)</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>3 ppm (TWA) 5 ppm (ceiling)</td>
</tr>
<tr>
<td>Non-asbestos fibrous silicates (NAFS), respirable</td>
<td>1.0 f/mL</td>
</tr>
<tr>
<td>NAFS, non-respirable</td>
<td>5 mg/m³</td>
</tr>
<tr>
<td>Noise</td>
<td>85 dB(A) (Leq) 140 dB (C)</td>
</tr>
</tbody>
</table>
### Agents (in air)

<table>
<thead>
<tr>
<th>Agent</th>
<th>Company OEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil mist</td>
<td>5 mg/m³ (TWA)</td>
</tr>
<tr>
<td></td>
<td>10 mg/m³ (STEL)</td>
</tr>
<tr>
<td>Respirable crystalline silica (quartz)</td>
<td>0.1 mg/m³</td>
</tr>
<tr>
<td>Respirable coal dust</td>
<td>3 mg/m³</td>
</tr>
<tr>
<td>Respirable dust – other</td>
<td>5 mg/m³</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.1 mg/m³</td>
</tr>
<tr>
<td>Silver</td>
<td>0.1 mg/m³ (insoluble)</td>
</tr>
<tr>
<td></td>
<td>0.01 mg/m³ (soluble)</td>
</tr>
<tr>
<td>Sodium hydroxide mist (NaOH)</td>
<td>2.0 mg/m³ (ceiling)</td>
</tr>
<tr>
<td>Sulphuric acid mist</td>
<td>1 mg/m³ (TWA)</td>
</tr>
<tr>
<td></td>
<td>3 mg/m³ (STEL)</td>
</tr>
<tr>
<td>Sulphur dioxide (SO₂)</td>
<td>2 ppm (TWA)</td>
</tr>
<tr>
<td></td>
<td>5 ppm (STEL)</td>
</tr>
<tr>
<td>Wood dust, respirable</td>
<td>1 mg/m³ (hardwood)</td>
</tr>
<tr>
<td></td>
<td>5 mg/m³ (softwood)</td>
</tr>
<tr>
<td>Zinc</td>
<td>5 mg/m³ (dust/mist)</td>
</tr>
<tr>
<td></td>
<td>1 mg/m³ (fume)</td>
</tr>
</tbody>
</table>

1The BSM is accepted as the current OEL, but is recognised to need revision. It is recommended that businesses work to this and investigate reducing exposures whenever possible until agreement on a modified standard is achieved. Absorption through intact skin can be significant and must be managed actively.

### Biological Test Limit Values

<table>
<thead>
<tr>
<th>Agents</th>
<th>Company Biological Test Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic in urine (creatinine corrected)</td>
<td>50 µg/g CR (end work week)</td>
</tr>
<tr>
<td>Cadmium in blood</td>
<td>5 µg/L (any time)</td>
</tr>
<tr>
<td>Cadmium in urine (creatinine corrected)</td>
<td>5 µg/g CR (any time)</td>
</tr>
<tr>
<td>Carbon monoxide in end-exhaled air</td>
<td>30 ppm (post-shift)</td>
</tr>
<tr>
<td>Carboxyhaemoglobin in blood</td>
<td>5% (post-shift)</td>
</tr>
<tr>
<td>Chromium (VI) in urine (creatinine corrected)</td>
<td>30 µg/g CR (end work week)</td>
</tr>
<tr>
<td>Fluoride in urine (creatinine corrected)</td>
<td>3 mg/g CR (pre-shift)</td>
</tr>
<tr>
<td></td>
<td>10 mg/g CR (post-shift)</td>
</tr>
<tr>
<td>Lead in blood, male</td>
<td>40 µg/dL (any time)</td>
</tr>
<tr>
<td>Lead in blood, female of reproductive capacity</td>
<td>20 µg/dL (any time)</td>
</tr>
<tr>
<td>Mercury in urine (creatinine corrected)</td>
<td>40 µg/g CR (pre-shift)</td>
</tr>
<tr>
<td>Uranium in urine</td>
<td>40 µg/L</td>
</tr>
</tbody>
</table>
4.14 Particulate and Gas/Vapour Exposures Guideline

Scope

This guideline applies to dust, fibres, mist and fumes (i.e. particulates), and gas and vapour exposures in the workplace, with emphasis on inhalation as the prime route of exposure. It covers particulate and gas/vapour hazard evaluation, control programme design and control programme evaluation (medical surveillance), to ensure that employees and contractors will not suffer adverse health effects from particulates or gas/vapours, either used or generated by a company.

Programme Design

Where risk assessment indicates the need, a workplace air monitoring programme must be in place such that:

- It complies with all relevant requirements
- The air quality of the workplace with regard to dust, fibre, mist, fume, gas and vapour emissions is adequately described
- Workplace particulate and gas/vapour sources that contribute to the exceedance of OELs are identified and adequately characterised
- Control measures are periodically checked that they minimise emissions and protect employees and contractors from adverse exposure.

Where it is likely that the 95th percentile value of a time-weighted average (TWA) mean concentration for total inhalable dust, respirable dust, respirable crystalline silica, asbestos or non-asbestos fibrous materials exceeds the relevant OEL, the area must be identified and mapped, signposted or otherwise clearly communicated to employees working in the area. Areas where other identifiable particulate hazards (PAH, lead, mercury, etc), gases (CO, SO2, NH3, etc.), or vapours exceed the relevant OEL, must also be similarly identified and clearly communicated. Signposting, where necessary, must use appropriate wording or symbols on signs to identify the hazard.

These designated areas require a documented respiratory protection programme, regular monitoring of SEGs working in the area and a formal review of the practicality of engineering controls. Particulate and gas/vapour monitoring must be based on the use of equipment approved by local regulatory authorities (if available), as per documented methods. There must be special consideration given to the sampling of hot/volatile/pressurised toxic process streams where they occur.
Medical Surveillance

Employees and contractors must be covered by a medical surveillance programme when:

- Their SEG’s TWA mean exposure to respirable crystalline silica, total inhalable dust, respirable dust, lead or asbestos dust is greater than 50% of the relevant OEL
- The medical adviser considers that it is advisable
- There is a legal requirement for medical monitoring.

Where risk assessment indicates a risk of a respiratory condition, assessment programmes must include chest x-rays and/or lung function tests. Where indicated, they must meet the following standards:

- High quality chest x-rays will be taken every 3 years
- All chest x-rays will be read to International Labour Organisation (ILO) standards by an ILO B reader, wherever possible
- Any progression of more than one step on the ILO extended scheme to a reading above 1/0 will be reviewed by a physician
- Any reading suggesting active lung disease will be reviewed by a physician and
- All spirometry will be performed by trained staff following the American Thoracic Society guidelines or equivalent.

All heavy metal monitoring programmes must meet the following standards:

- All testing will be of venous blood according to local standards
- Only laboratories using an active quality assurance or quality control scheme will be used for testing;
- All male workers with a whole-blood lead above 40µg/dL will be removed from exposure until the level has fallen below 30 µg/dL, and until the physician declares the worker fit for duty
- Females of reproductive capacity with a whole-blood lead above 20µg/dL will be removed from exposure until the physician declares the worker fit for duty, and exposure to lead should cease when pregnancy is notified to the company
- All male workers with a uranium in urine level above 40µg/dL will be removed from exposure until level has fallen below 20 µg/dL, and until the physician declares the worker fit for duty
- Females of reproductive capacity with uranium in the urine above 20µg/dL will be removed from exposure until the physician declares the worker fit for duty, and exposure to uranium should cease when pregnancy is notified to the company
- Employees should not be financially disadvantaged due to removal from exposure area.

All monitoring programmes for other substances must be documented.
Exposure Controls

Elimination or substitution must be considered. Where required or practicable, there must be engineering controls in place. There must be documented procedures for inspection, assessment and maintenance of the engineering controls to ensure that the equipment continues to operate to design specifications.

Controls must be of an adequate standard such that surfaces are adequately cleaned to avoid:

- dust generation due to material dislodgment (e.g. windblown), where practicable; and
- fume generation from accumulated dust during welding/heating or cutting operations.

Employees must not eat or smoke in areas or jobs with potentially harmful exposures. Cigarette smoking must also be prohibited wherever people are likely to be exposed to harmful levels of smoke. Abrasive blast cleaning must be conducted so as to protect worker health and minimise dust emissions. Substitutes must be used whenever practicable for abrasives containing crystalline silica. However, if such abrasives are used, workers must be aware of the hazards and exposure monitoring conducted. The hazardous properties of alternative materials must be considered before use.

Fixed station monitors and alarms must be installed where appropriate to warn against accidental or periodic releases of toxic gases/vapours (HCN, CO, SO₂ etc.). Such monitors must only be installed after training all affected personnel on the capabilities and limitations of the monitors. All fixed station monitors/alarms must be identified, listed and included in a periodic schedule of preventive maintenance and testing, including calibration of detectors. Periodic drills with regard to response to sounding of the alarm must be conducted. Periodicity should be based on level of risk.

Respiratory Protection Devices

Where required, there must be a documented respiratory protection device (RPD) programme based on suitable standards that provides training in the recognition of signs and symptoms of hazardous particulate and gas/vapour exposure, emergency procedures and preventative measures. RPDs must be selected with regard to:

- The potential particulate particle sizes, gas/vapour types, substance toxicity and likely concentrations
- Compatibility with the work tasks
- Comfort (as it affects wear-time) and allowance for adequate communication.
Half-face and full-face air-purifying respirators must not be used where:

- The atmosphere is oxygen deficient (< 19.5%)
- The atmosphere is immediately dangerous to life or health (e.g. in areas where CO concentrations are > 1,500 ppm or NH\textsubscript{4} > 300 ppm)
- Gases and vapours are more than 10 times their OEL or greater than 1000 ppm for half-face respirators, or more than 100 times their OEL for full-face respirators
- Particulates are more than 10 times their OEL for half-face respirators, or more than 100 times their OEL for full-face respirators.

For atmospheres that are oxygen deficient, or contain unknown hazards, or have concentrations of gases and vapours that are unknown, or could potentially exceed immediately dangerous to life or health (IDLH) values, an air-supplied type respirator must be worn. For effective use of air-purifying respirators (other than powered air-purifying respirators), fit testing must be qualitative and documented as a minimum, although quantitative fit testing is preferred. There must be a policy requiring a clean-shaven face when using a negative or neutral pressure RPD for routine tasks or the use of a positive pressure RPD will be required. A pulmonary function test may be required to determine whether or not an individual is medically fit to wear a respirator. For air-supplied RPDs, breathing air must be effectively filtered and/or isolated from plant and instrument air, and isolated from sources of nitrogen and carbon monoxide potential exposure. The quality of the breathing air must be checked for conformance with national standards.

4.15 Thermal Stress Guideline

Scope
This guideline addresses workplace heat stress. It covers high temperature conditions generated by the industrial process or the mining environment (hot weather) that can pose a risk to health and safety of employees and contractors.

Programme Design
Where risk assessment indicates the need, a documented thermal stress management programme must be in place such that:

- It complies with all relevant requirements
- Workplace thermal stress levels (temperature, air movement, humidity, etc.) are adequately characterised and described
- Activities (work level, etc.) and conditions (clothing, health, etc.) that have the potential to exacerbate thermal stress effects are identified and adequately characterised and described
• Hot areas or activities where employees have experienced excessive fatigue, muscle cramp, dehydration, dizziness and other symptoms of heat stress are identified and described
• Control measures, including training and clear documented work procedures, are in place to minimise thermal stress levels and protect employees and contractors from adverse exposure.

Where a risk of thermal stress is determined, an appropriately qualified person, in consultation with employees must conduct monitoring surveys on site. Medical examinations must include information about the operator’s physiological and biomedical aspects, and an interpretation of job fitness provided for defined extreme thermal conditions and job activities.

Measurement Techniques

Detailed heat stress assessment of identified tasks or jobs must be designed to:
• Start with the use of a simple heat stress index as a screening tool; then, if necessary
• Use rational heat stress indices in an iterative manner to determine the ‘best’ control methods for alleviating potential heat stress.

Exposure Controls and Treatment

Where relevant, elimination or substitution must be considered. Exposure controls must include:
• An acclimatisation period for new workers and those returning from extended leave or sickness
• Training in the recognition of signs and symptoms of heat or cold stress, emergency procedures and preventative measures
• Protective observation (buddy system or supervision); and
• A requirement for self-paced working.

The following exposure controls must be considered:
• Work/rest regimes based on the interpretation (by an expert) of measurements conducted, and job rotation
• Suitable rest areas with a provision of cool drinking water and cool conditions
• Selection of appropriate clothing or other PPE for extreme temperature conditions
• The use of engineering controls.

Where thermal stress is assessed to be a risk, the site must develop a suitable emergency response plan.
Attaching: Guidance for Risk Based Medical Examinations

1 Pre-employment – Mineworkers and Long-term Contractors

<table>
<thead>
<tr>
<th>Office based workers (e.g. Managers, PAs, Clerks, etc.)</th>
<th>Medical history</th>
<th>Examination report</th>
<th>CIR</th>
<th>Screening FOV</th>
<th>Audiogram</th>
<th>Vision</th>
<th>Long History</th>
<th>Hb/GGT</th>
<th>CBeeq</th>
<th>Calcareous</th>
<th>Urea &amp; Creat</th>
<th>Urea &amp; Creatinine</th>
<th>Urine &amp; Inorganic Phosphate</th>
<th>Creatinine</th>
<th>Uric Acid</th>
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<td>Security guards</td>
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<td>Electricians, Plant technicians</td>
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<td>Personnel and Fire &amp; Rescue (F&amp;R)</td>
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<tr>
<td>FF&amp;R with Medical Protocol</td>
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**KEY**
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2 Annual and Transfer – Mineworkers and Long-term Contractors

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<tr>
<th>Office based workers (e.g. Managers, PAs, Clerks, etc.)</th>
<th>Medical history</th>
<th>Examination report</th>
<th>CIR</th>
<th>Screening FOV</th>
<th>Audiogram</th>
<th>Vision</th>
<th>Long History</th>
<th>Hb/GGT</th>
<th>CBeeq</th>
<th>Calcareous</th>
<th>Urea &amp; Creat</th>
<th>Urea &amp; Creatinine</th>
<th>Urine &amp; Inorganic Phosphate</th>
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<td>Drivers/Operators</td>
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<tr>
<td>Radiation/Controlled Area Workers, including specified Lab workers</td>
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**KEY**
A = Annually
2A = Every 2nd year
# Exit – Mineworkers and Long-term Contractors

| Uranium Mines Permanent Employees and long term contractors - Exit Matrix | Medical history | Examinations report | CYP | Stress EOG | Audiology | Vision | Lung function | ECG | CChemical | Urine strip | Fic + FSR | CChem + DCT + UK + 43A micron globulin | U Meta Aluminium ratio | Urenium in urine | UAE | Pregnancy test |
| Office bound workers (e.g. Managers, PAs, Clerks, etc.) | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Security guards | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Storemen | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Electronics, Plant technicians | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Engineering | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Workshop, Boilermakers/ Welders | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| General workers | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Mining | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Geology | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Laboratory (non-radiation) | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Paramedics and Fire & Rescue (P&FR) | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| P&FR with Medical Protocol | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Driver/operators | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Driver/operators – Medical protocol | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |
| Radiation/ Controlled Area Workers, including specified Lab workers | 1 | 1 | IA | Ni | 1 | Ni | 16 | Ni | Ni | Ni | Ni | 1 | 16 | 1 | 1 |

**KEY**

1 = Indicated
IA = indicated only if previous test was done more than a year ago
Ni = Not indicated
### 4 Pre-employment – Short-term Contractors

<table>
<thead>
<tr>
<th>Uranium Mines Short term contractors - Pre Employment Matrix</th>
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<tbody>
<tr>
<td>Medical history</td>
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<tr>
<td>Office bound workers (e.g. Managers, PAs, Clerks, etc.)</td>
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<tr>
<td>Security guards</td>
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<td>Switchmen</td>
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<tr>
<td>Electricians, Plant technicians</td>
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<tr>
<td>Engineering</td>
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<tr>
<td>Workshop: Boilermakers/ Welders</td>
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<tr>
<td>General workers</td>
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<tr>
<td>Mining</td>
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<tr>
<td>Geology</td>
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<tr>
<td>Laboratory (non-radiation)</td>
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<tr>
<td>Paramedics and Fire &amp; Rescue (P&amp;FR)</td>
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<tr>
<td>P&amp;FR with Medical Protocol</td>
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<td>Driver/operators</td>
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<tr>
<td>Director/-operatives - Medical protocol</td>
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<tr>
<td>Radiation/ Controlled Area Workers, including specified Lab workers</td>
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</tbody>
</table>

### 5 Annual and Transfer – Short-term Contractors

<table>
<thead>
<tr>
<th>Uranium Mines Short term contractors - Periodical Matrix</th>
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<tbody>
<tr>
<td>Medical history</td>
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<tr>
<td>Office bound workers (e.g. Managers, PAs, Clerks, etc.)</td>
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<tr>
<td>Security guards</td>
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<td>Switchmen</td>
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<tr>
<td>Electricians, Plant technicians</td>
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<td>Engineering</td>
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<td>Workshop: Boilermakers/ Welders</td>
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<td>General workers</td>
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<td>Mining</td>
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<td>Geology</td>
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<td>Laboratory (non-radiation)</td>
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<td>Paramedics and Fire &amp; Rescue (P&amp;FR)</td>
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<td>P&amp;FR with Medical Protocol</td>
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<td>Driver/operators</td>
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<tr>
<td>Driver/operators - Medical protocol</td>
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<tr>
<td>Radiation/ Controlled Area Workers, including specified Lab workers</td>
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</tbody>
</table>

**KEY**

- **A** = Annually
- **2A** = Every 2nd year

*Note: The table and matrix provide a comprehensive overview of health and safety requirements for different roles at Uranium Mines, detailing frequencies for various medical and health assessments.*
## Exit – Short-term Contractors

<table>
<thead>
<tr>
<th>Uranium Mines Short-term contractors – Exit Matrix</th>
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</thead>
<tbody>
<tr>
<td><strong>Office bound workers</strong> (e.g. Managers, P&amp;A, Clerks, etc.)</td>
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<tr>
<td>Security guards</td>
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<tr>
<td>Watchman</td>
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<tr>
<td>Electronics, Plant technicians</td>
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<td>Workshop, Bureaucrats, Welders</td>
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<td>General workers</td>
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<td>Mining</td>
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<td>Geology</td>
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<td>Laboratory (Radioisotopes)</td>
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<td>Paramedics and Fire &amp; Rescue (PTF)</td>
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<td>PLEA with Medical Process</td>
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<td>Drivers/Operators</td>
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<tr>
<td>Decontamination/Medical protocol</td>
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<tr>
<td>Radiation Controlled Area Workers, including specified Lab workers</td>
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</tbody>
</table>

**KEY**
- I = Indicated
- IA = Indicated only if previous test was done more than a year ago
- N/A = Not indicated
- R0 = Indicated only if previous test was done more than 6 months ago
5 ENVIRONMENTAL GUIDELINES FOR THE NAMIBIAN URANIUM EXPLORATION AND MINING INDUSTRY

5.1 Introduction
The NUA has developed Health, Environmental and Radiation Safety/Security Practice Standards, which are available on the NUA website. The standards set out the minimum requirements that are compulsory for members of the NUA. Detailed guidance documents can be found in these Environmental Guidelines. New companies in the Namibian uranium industry are encouraged to use these guidelines when compiling their environmental management plans. The Environmental Standard is reproduced below for ease of reference.

5.2 NUA Environmental Standard
This standard aims to ensure that NUA member businesses comply with all applicable Namibian environmental legislation, international conventions and other requirements, e.g. the Strategic Environmental Management Plan for the uranium rush; and that they manage their environmental aspects in a manner that is planned, controlled, monitored, recorded and audited, using an Environmental Management System that drives continual performance improvement.

Scope
This standard is applicable to all NUA members. It covers all exploration, construction, mining, processing, distribution, transport, closure and corporate activities. The reference document for mine closure is the Namibian Mine Closure Framework. At established mines the standard also applies to contractors and suppliers with the level of EMS implementation commensurate to the level of environmental aspects and potential impacts associated with the products and services provided by the contractor or supplier.

Management Principles
Environmental Assessments
All operations must comply with the procedures for environmental assessments detailed in the Environmental Management Act, Act No. 7 of 2007. Specifically, they must ensure that:

- The assessment covers all relevant environmental and social aspects as well as cumulative impacts (refer to list below)
• The public consultation process begins in the early stages of the assessment, allows sufficient time for review and takes into account stakeholders’ comments
• The Scoping Report and Environmental Impact Assessment Report is published in a format that is easily accessible to interested parties and in line with (draft) EIA Regulations
• The approved Environmental Management Plan (EMP) is implemented
• Exploration or mine development activities do not begin before the relevant authorities have issued environmental clearances
• Adhere to all conditions in the Environmental Clearance.

Consider as a minimum the following list in the process of identifying environmental aspects and impacts associated with the operation:

• Emissions to air
• Visual and other socio-economic impacts
• Greenhouse gas emissions
• Noise and vibration
• Releases to underground and surface waters
• Mineral and non-mineral waste generation, disposal and management
• Land use and soil management
• Use of hazardous materials
• Use of natural resources
• Changes to ecosystems
• Impacts of radiation on the public and the environment (refer to the Radiation Safety Standard)

Where any of the environmental aspects in the list is not applicable to the operation, include a justification in the assessment report.

Environmental Management System
Exploration companies are required to have an EMP as a minimum. NUA member companies that are in operation are expected to implement an EMS that conforms to a nationally or internationally recognised standard such as ISO 14001 or European Eco-Management and Audit Scheme (EMAS). The environmental policy has to be aligned and compatible with the NUA Constitution, and all voluntary environment-related policy principles contained in codes and charters adopted by the NUA. Members are
to ensure that the EMS is compatible with the overall management system of the operation and in particular with the occupational health and safety management systems.

Planning

In conformity with the adopted international EMS standard and based on the operation’s environmental impact assessment ensure that the following steps are completed:

- Environmental aspects identified and significance of impacts assessed
- Applicable legal and other requirements identified
- Legal register compiled
- Environmental objectives and targets established
- Environmental management programmes in place.

Ensure that new activities, organizational arrangements and management procedures or changes to existing ones are subjected to previous identification of their environmental aspects and impact assessment through a documented procedure, e.g. a change management procedure.

Translate into the appropriate operational plans, programmes, projects and procedures the operation’s environmental performance indicators, objectives and targets. Identify all relevant internal and external business and operational environmental data requirements and establish the data quality provisions necessary to ensure:

- Completeness
- Consistency
- Statistical representation
- Methods used are ethical
- Accuracy and precision
- Transparency

Implementation and Operation

Each company has to have its own minimum operational environmental standards in place. In conformity with the adopted international EMS standard:

- Define environmental management structure and responsibilities
- Ensure that personnel are trained, aware and competent for managing the environmental aspects and impacts related to their roles
- Establish internal and external communication procedures
• Maintain the EMS elements documented (refer to the environmental guide-lines on the Uranium Institute website for leading practice examples)
• Establish and maintain document control procedures
• Implement operational control of environmental aspects
• Maintain an environmental emergency preparedness and response procedure and capability.

Designate operational control of the relevant environmental aspects as a clear and accountable responsibility of line management. This must include the authority, resources and competence required for operating to established plans and procedures and for achieving the specified environmental performance outcomes and targets.

Establish a cross-functional committee, including the line managers, to support the development, implementation and operation of the EMS including the establishment of targets and objectives on environmental matters. It is essential that the General Manager (or equivalent) and other top management structures, e.g. corporate head offices are fully aware of the EMS, and provide adequate resources to manage the environmental aspects connected with the operation.

Establish a communication programme related to environmental aspects including record keeping of stakeholder complaints, enquiries and views, as well as responses and feedback to them. Ensure that no material change in process or management that might involve an environmental aspect is carried out prior to competent process of approval, communication and incorporation into appropriate routines or procedures.

Conformance and Corrective Action
In conformity with the adopted national or international EMS standard, comply with the following requirements of that standard:

• Maintain procedures to monitor and measure activities that can lead to impact on the environment
• Maintain procedures for handling non-conformances and for corrective and preventive actions
• Maintain procedures for environmental record-keeping; and
• Maintain procedures of management system and performance auditing.

Review environmental data on a regular basis and take corrective actions if quality requirements are not met. Establish a process of internal environmental audits covering environmental performance
and the environmental management system. The audit requirements and process must ensure that the following conditions for internal environmental auditing are met:

- The members of an audit team must be sufficiently removed from the activities they audit to ensure independence of the audit process and its findings
- Develop and maintain audit protocols that reflect the environmental aspects and significant impacts of each activity/operation/business to be audited
- The frequency and coverage of the auditing process must be compatible with the significance of the potential environmental impacts
- A documented report must be prepared for each environmental audit, which details the audit findings, as well as responsible persons and time frames for closing out the audit findings.

Establish a system for recording and reporting all incidents and non-conformances involving injury to the public, third parties or animals, damage to property or damage to the environment or the potential for such injury or damage. This system must satisfy applicable regulatory requirements. If required by the company, establish a system for ensuring that a written report of significant incidents is submitted to the chief executive within 24 hours of their occurrence. Investigate any significant environmental incidents and non-conformances using qualified and trained personnel and transparent procedures. Incident and investigation reports are communicated in accordance with internal company procedures.

**Management Review**

Management reviews are carried out regularly to assess environmental performance and review objectives and targets to maintain continual improvement. Conduct a review of the EMS by senior management at least every three years or at lesser intervals if needed. The review process and its outcomes must be documented and signed off by management.

**5.3 Air Quality Control Guideline**

**Intent**

This guideline is to ensure that NUA member operations have identified and minimised air pollutant emissions and their potential impacts from all activities. This is to be accomplished by evaluating and prioritising emissions according to the significance of their impact, and taking effective measures to design and implement appropriate controls of emissions to ensure protection of ambient air quality.
Scope

The guideline is applicable to all NUA members and it covers emissions from all sources, including fugitive emissions, dust, fumes, gases and particulates. It applies during exploration, mining, mineral processing, materials handling, smelting, refining and on-site transport, and also includes their incremental impacts on the ambient air quality. If the business reports its carbon footprint it will also be responsible for ancillary activities (e.g. power generation) or off-site transport (rail, truck and ship).

Planning

- Identify and assess all community and third party health and environmental risks associated with the exposure to individual and combined air pollutant emissions from the operation’s facilities, and classify them on the basis of their predicted impacts.
- Develop internal criteria on ambient air quality when government regulations are absent or incomplete to ensure protection of local community health and the environment. The criteria must be in line with internationally accepted regulations, guidelines and methodologies.
- Determine and maintain records of background ambient air quality, meteorological characteristics affecting pollutant dispersion and other sources of emission in the vicinity of the facilities.
- Identify and characterize all significant pollutant emissions, from all sources, including fugitive emissions, and their method of release into the environment. Employ environmental aspect identification and develop procedures for adverse impacts on ambient air quality.
- Demonstrate that emissions from the operation under normal and worst case conditions, currently or after a modification, will not cause the operational impact on ambient air quality to violate regional or national air quality regulations, criteria and/or licence conditions.

Implementation and Operation

Implement appropriate procedures or control technologies to manage those emissions selected in the environmental aspects identification process as having potential or actual significant impacts on ambient air quality. Develop emergency preparedness and response procedures to respond to abnormal emission and dispersion conditions and to cover incidents where air quality guidelines were exceeded, including immediate measures to protect community health.

Performance Measurement

Implement a monitoring programme to measure (or estimate if appropriate) all significant emissions, air quality and ambient air impacts or nuisance air impacts from the operation where indicated by en-
vironmental aspects identification or regulatory authority. Where appropriate, impact levels can be established through dispersion modelling studies that are validated against ambient air quality measurements. In any monitoring programme, identify and use the specifications of local regulatory authorities (if available) for:

- Monitoring equipment
- Modelling assumptions
- Modelling programs
- Emission factors.

In the absence of such regulatory requirements, or if these are incomplete or inadequate, adopt recognized NUA or international specifications.

5.4 **Greenhouse Gas Emissions Guideline**

**Intent**

This guideline only applies if greenhouse gas (GHG) emission reporting is required by company policy. Its intent is to ensure GHG minimisation in NUA member operations. This is to be accomplished by identifying GHG emission sources, evaluating and prioritising them according to significance, and then designing and implementing appropriate control, reduction and mitigation measures of GHG emissions to the environment.

**Scope**

The guideline covers all sources of GHG emissions during exploration, mining, mineral processing, materials handling, smelting, refining and on-site transport. Where the company is also responsible for ancillary operations (e.g. power generation) or off-site transport (rail, truck and ship) those activities will be covered under the scope of this guideline.

**Planning**

The company is required to develop, document and maintain knowledge of GHG emissions. This must include an understanding of current and future GHG sources and the factors that affect emission levels from the sources. Identify and assess GHG-related risks and opportunities for the business or operation and include, where applicable, the use of specific or generic emissions abatement, cost curves and assessments of emissions trading and offset opportunities, while factoring in changes as a result of national or international policies and measures.
Develop GHG emission reduction targets to drive improvements in emission control and reduction. Progress towards the targets must be supported by suitable sets of actions and milestones that are linked to the business planning process. Ensure that technical and commercial considerations of GHG emission issues (including possible costs inferred by government imposed carbon tax schemes or CO₂ emission regulations) are included in:

- Annual business plans and valuations
- New project evaluations
- Capital expenditure programmes
- Due diligence reviews for divestments and acquisitions.

Implementation and Operation

Implement and maintain GHG emission control and reduction programmes. Upgrade these as the business needs and external requirements change and as there is progress in the understanding of, and responses to, climate change issues. Assign clear responsibilities and accountabilities for GHG management. Responsibilities must include progressing established actions towards achieving GHG targets.

Performance measurement

Ensure that the appropriate measures are in place for quantifying, or estimating where appropriate, GHG emissions. Conduct periodic reviews to identify potential risks and opportunities associated with GHG issues of the operation.

5.5 Noise and Vibration Control Guideline

Intent

The guideline is to ensure that NUA member operations that are situated close to the public minimise their noise and vibration impacts on the surrounding environment and communities. This is to be accomplished by identifying noise and vibration sources, evaluating and prioritizing the sources according to significance of potential impacts then taking effective measures to design and implement appropriate controls.
Scope

This guideline is applicable to all NUA members and managed operations. It covers all components of noise and vibration arising from exploration and operations, including mining, mineral processing, materials handling infrastructure and on-site transport, which may significantly impact on people, communities and the surrounding environment. Where the business or operation is also responsible for ancillary activities (e.g. power generation) or off-site transport (rail, truck and ship), those activities are also under the scope of this guideline. Occupational noise and vibration exposure is not covered by this guideline but rather by the occupational health guidelines on Hearing Conservation and Manual Handling and Vibration found in section 5.11 of this manual.

Planning

Develop, document and maintain knowledge of the baseline, and for existing operations, background noise and vibration levels. Employ change management procedures and predictive modelling of near- and far-field noise and vibration levels as part of the pre-feasibility and feasibility study for:

- New developments
- Significant expansions
- Changes to existing activities and facilities.

The model will, where applicable, incorporate baseline/background data, community expectations, and regulatory requirements and identify significant exposures to sensitive receptors. Identify which components of the facility and which activities are the key contributors to external noise and vibration levels and understand the generation, propagation and potential environmental impact under a range of meteorological and operating conditions. Establish the likely effectiveness of noise and vibration control mechanisms in achieving regulatory or licence requirements and accommodating community expectations. Develop internal criteria on noise and vibration performance when government regulations are absent or incomplete to ensure protection of local community health and the environment. The criteria must be in line with internationally accepted regulations, guidelines and methodologies.

Implementation and operation

Have a procedure in place to manage noise and vibration where an assessment based on prediction modelling or monitoring results indicates the need, in order to meet regulatory requirements and accommodate community expectations. Establish a model or real-time assessment of near- and far-field noise and vibration levels throughout the life of the operation. Adopt a hierarchy of noise and vibration controls, with engineering or design controls for noise sources being the first option implemented.
If due to safety reasons this is not permissible consider other control processes. Incorporate and maintain noise and vibration control requirements into design and operational criteria for relevant exploration and mining activities, including drilling and blasting, processing activities and new facilities. Incorporate noise and vibration performance criteria into purchasing requirements for relevant equipment and machinery.

**Performance measurement**

Have a procedure in place for monitoring noise and vibration levels outside current operations, that adequately samples potentially affected neighbouring areas, and covering a broad range of operating and meteorological conditions. Implement a monitoring programme to:

- Support operational control
- Verify compliance with targets and legal requirements
- Update and maintain the relevance of near- and far-field noise and vibration models
- Assess noise and vibration impact on the environment and communities under a broad range of operating and meteorological conditions.

### 5.6 Water Use and Quality Control Guideline

**Intent**

The intent of this guideline is to ensure efficient, safe and sustainable management and protection of water resources and ecosystems in and around NUA operations. This requires an understanding of the water resources, their spatial and temporal interrelationships, their ownership in the region and the needs of catchment stakeholders. This provides the basis for the development of an integrated and strategic approach to water management including social, environmental, operational and economic aspects.

**Scope**

This guideline is applicable to all NUA businesses from exploration and development through to closure. It includes any facilities situated off site that use significant volumes of water. It covers all water management activities for all types and sources of water.

**Programme Design**

Develop and maintain an appropriate understanding of the cumulative demands and impacts being placed on water resources and ecosystems in the catchments in which the operation works. This must
include understanding the current and future water requirements of key upstream and downstream users and stakeholders, and the flow regime and quality required to maintain ecosystem integrity.

Develop and maintain a site water balance that is appropriate to manage the site's water risks and that predicts future water requirements includes climate variability and identifies opportunities for water management improvements. Where there is significant risk, a solute balance for key contaminants must also be implemented.

Implement a change management process to ensure that new developments, expansions, modifications or replacement of existing facilities do not degrade the catchment quality, function, use and integrity of surface and subsurface aquatic ecosystems and water resources.

Develop and implement criteria on water abstraction, dewatering, effluent/discharge or water quality when government regulations are absent, insufficiently protective or ambiguous to ensure protection of surface water and ground water resources. The criteria must have formal approval from the operation’s CEO and be consistent with internationally accepted limits, thresholds, guidelines and methodologies.

Develop site specific targets for operational areas that drive improvements in site specific risks associated with water management. Progress towards the targets must be supported by appropriate actions as part of the site business plan.

Develop and implement a water management plan that describes the operational aspects for water management to comply with the intent of this guideline and with regulations and requirements of the pertinent authorities. This plan must be integrated with the site business plan and be updated at least every four years or more frequently when operational, social or environmental conditions so dictate.

Implementation and operation

Assign clear responsibilities and accountabilities for water management considering representation from across the organisational structure. Responsibilities must include tracking and reviewing progress in implementing the water management plan.

Design, construct and operate water withdrawal, storage, treatment and discharge facilities in accordance with appropriate practices and:
• ensure the design includes a risk assessment to identify and correct any potential failure scenarios, and that facilities will be able to handle expected flows and quality, including significant storm events
• ensure that construction meets relevant guidelines and regulatory requirements and addresses all the identified significant risks
• ensure that operation of the facility conforms to approved design criteria and operational procedures and includes emergency response procedures to protect aquatic ecosystems and aquifers.

Prepare emergency and contingency plans for 1) drought, 2) flood, 3) failures of large water retention structures; and 4) unplanned effluent discharges.

**Performance measurement**
Maintain safety inspection procedures, including the detailed verification of all identified hazards, for major water storage facilities. These requirements and the emergency plans mentioned above must be compatible with the major waste storage facilities inspection and signoff requirements detailed in the mineral waste management guideline.

Implement a monitoring, checking and corrective action programme to:
• support operational control
• verify compliance with targets and regulatory requirements
• compare actual and predicted water balances
• update water and solute balances, and catchment and ground water models
• compare actual and predicted ground water and surface water impacts
• assess impact on the environment
• assess, where appropriate, cumulative impacts of the operation on the catchment and other users
• meet reporting requirements
• meter flows and measure storages that are significant to the site water balance including recycle and reuse streams.

The frequency of monitoring must be based on site water risk or when there are significant changes in the process, operations or the environment impacting on water usage and/or quality.
5.7  Mineral Waste Management Guideline

Intent

The guideline is to ensure environmentally safe and effective management of mining and process wastes generated or handled by NUA member operations. Waste disposal facilities and sites shall be physically, biologically and chemically safe. Waste production shall be minimised and waste re-use, backfill and recycling maximized.

Scope

The guideline is applicable to all NUA members and covers the management of mining and process waste generated by their activities, or which are taken by the operations to dispose or manage on behalf of others. Mineral waste includes: waste rock, tailings from mineral processing, rejects from beneficiation or concentration of coal and other minerals, red mud from alumina production, refinery discsards and sludge’s, smelter and other furnace slags, ashes, and mine-dredging materials.

Planning

- Identify, assess and document the quantities, characteristics and hazards of the wastes that will be generated by mining and processing of each distinct section of the mineral deposit.
- Develop and maintain an inventory of mineral wastes generated, handled and disposed of, whether on or off site, including descriptions of hazard and other characteristics, volumes and details of location and techniques used for handling and disposal.
- Maintain a procedure for identification of hazards, potential modes of failure and assessment of risks posed by tailings dams and other large waste disposal facilities.
- Maintain, for each waste disposal facility or site, an up-to-date model of the long-term physical and chemical waste behaviour and impacts on the environment. The model must be validated using data from prediction tests and monitoring.
- Ensure that design and construction of all waste disposal facilities or sites are:
  - Compatible with the waste behaviour, addressing any threats to the environment, particularly those posed by contaminated run-off, seepage, liquefaction and leachate;
  - Engineered to best available technology for stability and safety.
- New developments will not use tailings disposal facilities for water storage functions. Any existing dual storage of wastes and water must undergo a risk assessment and a study of potential alternatives.
- Avoid any uncontrolled riverine disposal of mineral wastes.
• Apply a change management procedure for the approval of any significant modification in waste generation, handling and disposal.

• Develop targets to drive improvements in the aspects of mineral waste management. Progress towards the targets must be supported by a suitable set of actions.

• Establish and maintain a documented Mineral Waste Management Plan that covers all stages of waste management from generation to final use and/or disposal.

Implementation and Operation

Maintain operational procedures commensurate with the identified hazards of each waste disposal facility for managing:

• The waste mass and its physical and chemical reactions, including the level of radioactive contamination

• The containment structure and its stability issues

• Spills, unplanned mixture or segregation of wastes.

Waste Placement

Ensure that the supervision and operation of dams and dumps is commensurate with the environmental and safety hazards posed by the structures. Undertake assessments of contractors and facilities used for wastes sent off-site for disposal or treatment, to verify that the wastes have been dealt with appropriately.

Performance Measurement

• Monitor physical stability parameters of waste disposal structures as an early detection and warning mechanism for potential failure.

• Conduct regular monitoring of the geochemical reactions occurring through the profile of the waste, for validation or review of the waste behaviour model and early warning of potential pollution problems.

• Conduct independent and external review by qualified engineering specialist(s) of all major waste storage facilities according to protocols and frequencies adequate to their physical and chemical hazards and level of risks. Frequency of external reviews must not be less than one every 2 years and any significant findings must be reported according to NUA requirements.

• Maintain an emergency system, including communication with stakeholders, for responding to potential incidents involving waste storage facilities and/or transport to disposal facilities.
5.8 Non-Mineral Waste Management Guideline

**Intent**

The guideline is to ensure sound non-mineral waste management in NUA member operations by the minimization of waste generation and ensuring the safe handling, treatment and disposal of all generated wastes.

**Scope**

This guideline is applicable to all NUA members from exploration/development and acquisition through to closure and post-closure. It covers non-mineral wastes generated by the activities of the operation, or non-mineral wastes received by the operation to dispose or manage on behalf of others. Mineral wastes generated as a direct product of mining or processing, are addressed in the Mineral Waste Management Guideline.

**Planning**

- Develop, document and maintain a characterization of the environmental hazards and risks associated with non-mineral wastes generated, disposed on-site, and transported and disposed off-site or managed on behalf of others.
- Develop and maintain a documented inventory of non-mineral wastes generated or received and disposed on or off-site.
- Maintain measurable indicators and targets for hazard and quantity reduction of significant non-mineral wastes destined for disposal.
- Develop and implement a Non-mineral Waste Management Plan. The plan shall give priority to those wastes identified as having significant hazard and the actions must demonstrate that the waste management hierarchy has been considered, as follows in order of preference:
  - Waste avoidance and reduction at source
  - Reuse and recycling and
  - Waste treatment and/or disposal.

**Implementation and Operation**

- Ensure that non-mineral wastes are segregated at generation and that wastes awaiting further treatment, transport or disposal are securely contained and monitored.
- Maintain operational procedures and effective controls for the safe handling, on-site and off-site transportation, storage and disposal of non-mineral wastes commensurate with their degree of hazard and compatibility.
- Maintain records of all wastes sent off-site, and a documented inventory and location of on-site waste landfills and storage areas. Historical and abandoned landfills shall be included in this inventory and their location documented.
- Disposal of waste must only be carried out in engineered and approved facilities and in accordance with established operational procedures.
- Undertake verification assessments of contractors and facilities used for wastes sent off-site for disposal or treatment, to verify that the wastes have been dealt with appropriately.

**Performance Measurement**

- Establish a procedure to inspect and monitor waste handling and storage facilities commensurate with the degree of hazard of the waste. Corrective action must be taken where unacceptable conditions are identified.
- The Non-Mineral Waste Management Plan must be reviewed at least every four years or more frequently when operational or environmental conditions so dictate.

### 5.9 Hazardous Materials and Contamination Control Guideline

**Intent**
This guideline pertains to the safe and responsible use and control of all hazardous substances, excluding radioactive materials (refer to chapter 7 for Radiation Standards) handled by NUA member operations in ways commensurate with their risks to the environment. The control measures shall also ensure the minimization of risks and environmental impacts due to spills or other escapes. For those cases where site contamination has occurred, the intent of the guideline is to ensure that contamination is properly characterised and managed.

**Scope**
This guideline is applicable to all NUA members from exploration/development and acquisition through to closure and post-closure. It covers the management of hazardous materials, including hazard identification and evaluation, cleaner production, reduction of use, re-use and recycling, inventory reduction, secure storage and transport, contamination investigations, site remediation and emergency re-
sponse. Where the operation is also responsible for ancillary activities (e.g. power generation) or off-site transport (rail, truck and ship), those activities are included in the scope.

Planning

- Develop internal criteria for hazardous materials and site contamination when government regulations are absent or incomplete to ensure the correct classification of such. The criteria must be in line with USC and internationally accepted regulations, guidelines, definitions and methodologies.
- Understand and document the environmental hazards of materials brought to site, site products, intermediates and by-products.
- Maintain a documented inventory of hazardous materials brought to site or produced on site and document their storage, usage and final destination.
- Identify and assess the environmental aspects and potential impacts associated with the transport, storage, use and transfer of hazardous materials, including failures of secondary containment structures.
- Develop and maintain a Contaminated Sites Register, with geographical references, for land currently or previously owned, leased and/or managed. Identify existing contamination and assess its environmental impact. The register must include known contamination for sites previously owned or leased regardless of whether remediation liabilities are retained. Ensure that registers are developed as part of the due diligence process for acquisitions.
- Develop and implement a Hazardous Material and Contamination Management Plan that consolidates:
  - Controlling the use and inventory of hazardous materials to minimum necessary quantities;
  - Assessing and promoting the use of environmentally safer alternatives to currently used hazardous materials;
  - Ensuring the safe use, storage and transport of hazardous materials.
- Develop and implement a remediation strategy for those existing contaminated sites where site investigation has shown there is an unacceptable environmental impact to current land uses, ecological function, surface and ground water resources, or where off-site impacts are occurring or are likely to occur.
Implementation and Operation

- Ensure that all employees and contractors involved with hazardous materials handling or remediation of contamination are fully aware of the associated environmental hazards and risks and are appropriately trained in routine activities and emergency actions.
- Ensure that new hazardous materials, including those brought in by contractors, are efficiently incorporated into the Hazardous Materials and Contamination Control Plan.
- Ensure that all hazardous materials are kept in adequate conditions and containment, within controlled areas and securely protected from contact of non-authorised personnel and, where necessary, from birds and other animals.
- Operate effective containment barriers for preventing spills of hazardous material from reaching the environment. Above ground tanks, drum storages and pipelines that contain hazardous material must have properly designed secondary containments.
- Storage tanks and pipelines containing or transporting hazardous materials must be above ground. Any exception must be justified and authorised duly.
- Storage tanks and pipelines containing or transporting hazardous materials must have leakage/spill identification and response controls in place.
- Implement selection criteria and control procedures for third party transporters, purchasers and other recipients of hazardous materials and implement follow-up procedures for any hazardous material sent off the premises.
- Maintain and test emergency response procedures, associated equipment and personnel for responding to potential, on-site and off-site hazardous material releases.
- Maintain spill and leakage detection equipment that is adequate for the risk posed by the hazardous material to the environment and linked to the appropriate operational control and emergency response unit.

Performance measurement

- Implement routine inspections, testing and monitoring procedures for detection of leaks from storage tanks and pipelines with frequency and methodology commensurate with the associated environmental hazards.
- Implement a systematic auditing procedure for significant aspects of hazardous materials management at site in order to verify its adequacy and performance.
5.10 Closure Guideline

Intent
The intent of this guideline is to ensure activities are left in a condition which minimises adverse impacts on the human and natural environment, and that a legacy remains which makes a positive contribution to sustainable development. This guideline seeks to influence the design, development, operation and closure of all NUA member operations so as to ensure the optimisation of post-closure outcomes in terms of social, environmental and economic development needs and expectations.

Also refer to the Namibian Closure Planning Framework published by the Namibian Uranium Association, which NUA members are expected to comply with.

Specifically it is intended that this guideline will result in improved closure and post-closure planning and implementation as indicated by:

- Improved scoping of closure in order to improve the accuracy of closure cost estimates
- Minimum costs of closure compatible with the objective of responsible social and environmental closure
- Integration of closure planning into business plans resulting in reduced actual costs of closure over the long-term
- Recognition and realization of positive legacies for local communities and lower exposure to future potential negative legacies
- Increased host community ownership of post-operational outcomes.

Enhanced company reputation will be accomplished through:

- Planning from project inception to ensure that closure is incorporated into project design
- Start of provision for closure at project onset, followed by regular review and updating of the provision
- Regularly reviewing and updating the scopes of closure strategy and plans
- Ongoing implementation and stronger linkages between the outcomes of closure planning and core business plans, including mine plans and all other relevant planning documents
- Integrated and accurate scoping of all aspects of the work required
- Development of strong and credible relationships with all stakeholders by consulting fully both internally and externally to increase levels of input and ownership.
Scope

This guideline is applicable to all NUA member operations. Exploration projects, order of magnitude and pre-feasibility studies are required to adopt and comply with as many of the clauses in the guideline as are required to ensure withdrawal from a project or study in a manner that meets the intent of the guideline.

Requirements

Companies are required to develop, maintain and manage a process for eventual closure, which addresses all relevant aspects and impacts of closure in an integrated and multi-disciplinary way, and provides a fully scoped and accurate cost of closure to the company that is documented and auditable. Thorough and comprehensive definition of the scope of measures to be undertaken at closure is necessary in order to reach a realistic estimation of the costs, and to provide assurance to the directors and shareholders that adequate financial provision for closure has been made.

Planning

Develop and maintain a knowledge base of the environment in which the operation is being developed and/or operates. The knowledge base must include:

- Characterisation of the socio-economic, cultural, biotic and abiotic environments
- National, regional and local legal and regulatory requirements for closure
- All agreements made with stakeholders.

In the case of exploration projects, order of magnitude and pre-feasibility studies, the level of detail of the knowledge base is defined by a number of factors including:

- The stage of the project or study
- The complexity of the environment (human and natural)
- Potential risks to the project
- The time required to collect data.

Closure Strategy

Develop and maintain a Closure Strategy that promotes a consolidated multi-disciplinary approach to closure and post-closure. The development of the strategy itself is a process whereby desired closure and post-closure options are evaluated and documented, and a preferred option chosen.

The Closure Strategy process must be documented and cover at a minimum the following:

- Outcome of the closure and post-closure aspects and impacts assessment;
Develop, document and maintain a Closure Management Plan based on the current preferred option for closure as determined through the Closure Strategy process. The Closure Management Plan must describe the operation’s ‘vision’ for closure and associated preferred closure option, and must as a minimum:

- Develop and document a set of objectives and performance targets for each operation. These objectives and targets must be responsive to the local environment and reflect regulatory and corporate requirements and stakeholder expectations. At a minimum performance targets must cover:
  - Rehabilitation
  - Biodiversity
  - Socio-economics
○ Communications
○ Employee Relations

- The objectives and targets must link into the operation’s existing core-planning process and form the basis of an operation schedule for closure. The schedule will serve as a tracking document to monitor performance of closure and post-closure.
- Maintain and document the ongoing consultation process for the preferred closure option
- This must include agreements about the varied roles and responsibilities for the operation, the community and various levels of government in terms of the eventual transition to closure.
- Develop and document a detailed description of closure and post-closure mitigation programmes. The programmes must address at a minimum the following:
  ○ The planning and actions required to enact the rehabilitation programme. The programme must be progressive and integrated into the short- and long-term mine plan and be compatible with all relevant local and regional land management plans
  ○ On-site and off-site biodiversity conservation programmes and initiatives, including details on partnership programmes
  ○ Linkages with other NUA guidelines
  ○ Commercial and customer-related issues and obligations
  ○ Environmental mitigation

- Develop and document a description of specific technical solutions related to infrastructure and facilities for the preferred closure option. These must include but are not restricted to:
  ○ Pit lakes and groundwater rebound;
  ○ Low-grade stockpiles;
  ○ Engineered tailings and other waste deposit covers.

- Develop and document a comprehensive employee information, communication and consultation framework. This framework will be established early in the life of the operation.
- Develop and maintain a list and assessment of risks and uncertainties associated with the preferred closure option. This list will be used to identify and define any additional work that is needed to reduce the level of uncertainty.
- Develop and maintain full auditable details of closure cost. The amount recognised for closure will be determined by using the best and most recent estimate of the expected cost. Cost estimates will have an accuracy of ±20%. Closure cost estimation methodologies must be based on approved accounting principles.
- The closure cost estimate, as reported in the financial statements, must be updated annually
during the operation’s life to reflect known developments, including scope changes, the effect of a further year’s inflation, exchange rate differentials and new regulatory requirements.

- Closure cost estimation procedures must ensure that identified post-closure costs, whether ongoing or one-off, are realistically estimated and incorporated into the estimate.
- Undertake a formal risk assessment to ensure that the scope of work on which the cost estimate is based is comprehensive. Financial contingency must be provided by the estimator and must reflect the amount of work that remains to be done to firm up the plan.
- Develop a detailed communication plan that is executed in a timely, consistent and transparent manner. This must target all internal and external stakeholders.
- Include an agreed process and time scale for post-closure management and monitoring. This must include all aspects of the closure process and must be negotiated with the relevant stakeholders.
- Develop and maintain a socio-economic mitigation programme which addresses as a minimum the following:
  - Socio-economic impacts, land owner considerations and community dependencies throughout the life of the operation;
  - Details of the transitional arrangements for company towns initiated by the operation, to be put in place before closure. This must include the development of a social plan, municipal and financial management plan and, as appropriate, a handover strategy.
  - Details of a handover plan for all infrastructure projects and social services developed by the company. This must include putting in place management and operational systems, ensuring there are adequate resources for the projects to continue delivering, and establishing sufficient lead-time for phase out.
  - All post-closure institutional arrangements that clearly outline the governance, financing, staffing and monitoring of these institutions.
  - The development of programmes to manage the issues associated with artisanal miners or other community activities, which have potential to adversely impact mine closure solutions.

**Decommissioning Plan**

A full decommissioning plan must be prepared 5 years prior to the estimated date of ceasing production. The decommissioning plan will contain specific details of how closure will be achieved and will be linked to the Closure Management Plan. Decommissioning cost estimation methodologies must
provide estimates with an accuracy of ± 15%. At 12 months from decommissioning cost estimation should be refined to an accuracy of ± 5%.

Implementation and Operation

- Ensure that the content of the knowledge base is periodically reviewed and updated
- Ensure that the Closure Strategy and associated Closure Management Plan and Decommissioning Plan are fully integrated into the operational management systems and decision-making processes
- Ensure there is clear line accountability for the implementation of the Closure Management Plan. This will include the authority, resources, training and competence required for achieving the specified closure objectives and targets
- Ensure that the Closure Strategy, Closure Management Plan, Decommissioning Plan, objectives and targets, and their results are communicated to all personnel and externally communicated to key stakeholders
- Ensure that all closure documentation and data records are stored and maintained in such a way that they are readily retrievable and protected against damage, deterioration or loss. Their retention times must be established, recorded and justified.
- Ensure that procedures are in place to cover all aspects of closure. In addition staff involved in closure must be trained to perform activities specific to the closure process.
- Ensure that in case of divestment, there is a formal agreement between the company and the purchaser and where relevant the government, that the purchaser agrees to fulfil a minimum set of closure requirements and will close the site to an agreed set of closure guidelines.
- Ensure that agreements regarding closure are made with the relevant government agencies and other stakeholders and include agreement on:
  - Concepts for closure
  - Closure requirements (environmental and social)
  - Timeframe for the approval of the preferred closure option
  - Clear definition of release criteria.

Performance Measurement

Businesses must develop and maintain full auditable details of estimated closure costs. The amount recognised in the financial statements for closure will be determined by using the best and most recent estimate of the expected costs. The closure cost estimate is developed by management, based on experience of similar transactions and advice provided by independent experts. Cost estimates must be to an accuracy of ± 20%.
The closure cost estimate, as reported in the financial statements, must be updated annually during the operation’s life to reflect known developments, including changes from the review of the closure strategy assumptions and inputs, scope changes, the effect of a further year’s inflation, exchange rate differentials, new regulatory requirements and any other material developments. The closure cost estimation procedure must ensure that identified post-closure costs, whether ongoing or one-off, are realistically estimated and incorporated into the estimate.

The closure strategy, its assumptions and inputs must be regularly reviewed to assess whether there has been a significant planned or unplanned change to the operation; at a minimum it must be assessed annually. Significant changes in the closure strategy must be reflected in the site’s Closure Management Plan and closure cost estimate.

The Closure Management Plan must be fully updated at least every 5 years. The systematic update must identify the adequacy, performance and areas of risk and opportunity of the Closure Management Plan. The update process must:

- Be conducted by a multidisciplinary team with appropriate skills, impartiality and experience levels;
- Involve input from key stakeholders;
- Consider future trends and possible changes in guidelines or expectations;
- Comprehensively re-estimate closure costs;

Ensure that closure-monitoring systems extend beyond the decommissioning period, as agreed with regulators, community and land owners. The monitoring system must be capable of demonstrating the success of closure measures to allow relinquishment.

Long-term studies must be conducted on an ongoing basis to fully understand and quantify benefits to local communities as outlined in the plan for addressing socio-economic development matters.

**5.11 Land Use Stewardship Guideline**

**Intent**

The guideline is to ensure sustainable stewardship of the land, which NUA members own, lease and/or manage. This requires an understanding of the current and potential use of the land, its value and community expectations followed by development of an integrated and strategic approach to land management that identifies and mitigates the impacts of mining or other operations on that land. The
guideline progresses biodiversity and generates beneficial business opportunities that flow from effective management.

Scope

This guideline is applicable to all NUA members and applies to all owned, leased and/or managed land. It covers all activities from exploration through mining and mineral processing to closure and includes the substantial component of the land that is not used directly for mining, processing or ancillary activities.

Planning

NUA companies are required to develop and maintain a documented description of all the aspects and implications of the land owned, leased and/or managed by the operation. This information base must include:

- The tenure, customary ownership, community expectations, former and current use of the land and its immediate surrounding
- The environmental, social and physical characteristics and capabilities of the land and its immediate surroundings
- The location of significant natural features
- The location of cultural heritage features, in consultation with those for whom the features have meaning/significance
- The location of potential legacy issue sites.

Develop in consultation with key stakeholders a Land Use Zoning. The zoning must be compatible with local and regional regulatory land use management plans and shall:

- Identify and map all land units
- Register acceptable uses and any restrictions pertaining to the land units.

Develop targets to drive improvements in land management. Progress towards the targets must be supported by a suitable set of actions. Develop and implement a Land-Use Management Plan based on the Land Use Zoning that promotes and integrates a sustainable approach to land management. The plan shall address:

- Issues of biodiversity conservation
- Environmental offsets
- Interactions with adjoining lands, including communities
- Legacy and protection of socio-cultural and natural heritage features.
Implementation and operation

- Integrate Land Use Management Plans into operations planning; closure planning, progressive rehabilitation programmes, project evaluations and capital expenditure reviews.
- Assign clear responsibilities and accountabilities for land-use management. Responsibilities must include progressing the Land Use Management Plan and its associated targets.
- Implement an authorization procedure to ensure that all land development is compatible with the Land Use Zoning and the Land Use Management Plan.
- Ensure that any alterations to the Land Use Zoning and Land Use Management Plan are adequately researched, justified and documented. Management authorization must be obtained before any alteration to the Land Use Zoning and Land Use Management Plan post-closure can be made.

Performance measurement

Implement a systematic auditing procedure of all aspects of land use management procedures in order to verify their adequacy, performance and areas of risk or opportunity.
6 RADIATION SAFETY GUIDELINES FOR THE NAMIBIAN URANIUM EXPLORATION AND MINING INDUSTRY

6.1 Introduction

The NUA has not developed specific radiation safety guidelines since this sector is now well regulated by the National Radiation Protection Authority (NRPA). The text reproduced below is from the NUA HERSS Radiation Safety Standard, while section 7.3 shows the NRPA’s Guide to the Development of a Radiation Management Plan.

6.2 Radiation Safety Standard

- All operations working with radioactive materials of specific activity exceeding 1 Bq/g must prepare a Radiation Management Plan (RMP) complying with the requirements of the guidance documents for RMP, as issued by the National Radiation Protection Authority.
- The RMP is to fulfil the requirements set by the NRPA’s regulation entitled Radiation Protection and Waste Disposal Regulations: Atomic Energy and Radiation Protection Act, 2005 (Act No. 5 of 2005).
- The RMP must describe a programme of activities that meets all applicable regulatory requirements, and at a minimum include the following elements:
  - pre-operational radiation risk assessment
  - exposure group and critical group classification
  - work area classification, based on surveyed radiation areas and quantification of exposure levels
  - occupational exposure monitoring programme including occupational dose assessments
  - public exposure assessment and monitoring programme, including a programme to monitor the release of radionuclides into groundwater and the air
  - transport plan for transporting radioactive materials in compliance with national regulations regarding the transport of radioactive substances
  - clearance and control procedures for all contaminated materials and equipment leaving or arriving at site (including scrap)
  - leak (swipe) tests on sealed radioactive containment equipment
  - waste monitoring and disposal programmes
  - lock-out procedures for vessels and equipment containing radioactive sources
- emergency procedures
- inventory of all relevant types of radiation sources that have a potential for adverse health effects, which includes a description of the radiation source(s), type of radiation, activity and unit/material location.

- Work areas that potentially give rise to ionising radiation doses exceeding 5 mSv must be designated as restricted access or controlled areas. These areas must be clearly demarcated, identified, mapped and signposted and 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 regular personal radiation monitoring.

- All sources of ionising radiation must be managed in accordance with the RMP.

- All sources of ionising radiation must be disposed of and/or securely stored in accordance with local regulations and international best practice.

- Each operation must have a trained and approved designated Radiation Safety Officer in accordance with the requirements set out by the NRPA.

- Each operation must have a documented radiation awareness programme for all its workers.

- Each operation shall design and maintain a routine radiation exposure monitoring and surveillance programme commensurate with ensuring that occupational exposures are accurate assessed and that the principles of ALARA and dose limitation are applied.

6.3 Guide to the Development of a Radiation Management Plan

Intent

This document serves to provide guidance on the development of a Radiation Management Plan in pursuit of compliance with the requirements for an authorization as contemplated in Chapter 4 of the Namibian Atomic Energy and Radiation Protection Act.

The Radiation Management Plan is a comprehensive document that describes organizational and technical arrangements to fulfil the requirements of the Atomic Energy and Radiation Protection Act (Act No of 2005, herein referred to as the Act); the Regulations for Protection Against Ionizing Radiation and for the Safety of Radiation Sources; and the Regulations for the Safety and Secure Management of Radioactive Waste. The Radiation Management Plan forms the basis for consideration of all authorizations and subsequent safety assessments related a practice or radiation source. Therefore the Radiation Management Plan is a pre-requisite for any authorization of activities within the scope of the Act or Regulations.
It is therefore pertinent to each operator to develop and submit a comprehensive Radiation Management Plan (RMP) which addresses the applicable aspects relating to radiation safety. The major elements that should constitute any RMP are described in this guidance document.

**Background**

The RMP should provide a clear and detailed introduction describing the technical nature of the business or operation. In particular, the description should provide information relating to the radiation sources, radioactive or nuclear material that will be used or generated in the intended practice, including a detailed outline of the premises. The radiation hazard should be described by identifying the type of radiation, the likely exposure pathways as well as the critical group (workers, public, patients, and environment) along the potential exposure pathways (the routes by which radioactive material can reach or irradiate human beings) *(Sections 17(1); 21 (1) of the Act)*.

This section may also briefly list and introduce the requirements met or to be met under other national legislation *(Section 21 (i) of the Act)*.

**Pre-Operational Safety Assessment**

The RMP should provide results of all assessments, including environmental impact assessment and studies that have been carried out in respect of the practice concerned *(Section 21(1g) of the Act)*. The results of the assessment should be consistent with the exposure pathways identified above and should make realistic potential dose estimates to the critical group identified along each exposure pathway.

**Organizational Arrangements**

The organisational arrangement should describe the assignment of responsibilities to different management levels, including corresponding organizational arrangements and, if applicable (for example, in the case of subcontractors), the allocation of the respective responsibilities between employers and the registrant or licensee. The description may be supported by an organisational chart and the profile of the business, legal person, Radiation Safety Officer. The RMP should clearly identify and describe the role and profile of the Radiation Safety Officer consistent with the requirements of Section 30 of the Act.
**Occupational Radiation Protection Programme**

The occupational radiation programme should describe the approaches and methods to be adopted for optimising the protection of workers. A typical occupational radiation protection programme should contain the following sub-items:

- types of radiation hazard to protect against
- areas to be delineated as controlled and supervised areas
- methods of dose assessment (external dose, radon and radon progeny concentrations, radioactive dust concentration, etc.)
- local rules and supervision
- dosimetry service provider
- equipment to be used for routine monitoring
- protective equipment to be issued
- group of workers to be monitored on an individual basis, including frequency of monitoring
- work areas to be monitored, including frequency of monitoring programme
- education and training programme
- engineered controls
- health surveillance programme
- management of doses and dose records

NB! Each subheading should be supported by a description providing the details and rationale for the decision/method adopted.

**Medical Exposure Control**

The aim of this section is to describe how the operator will optimise the patient doses by ensuring that the minimum exposure is administered for the desired image quality or targeted therapeutic dose. Some of the elements that should be described include the following:

- Qualifications and training of personnel that will be involved in the administration patient exposures
- Maintenance and calibration of equipment
- Assessment of patient doses
- Local rules and procedures
- Management of records
- Quality assurance and quality control.
Public Exposure Monitoring Programme

This section should describe the programme for monitoring radiation exposure along pathways that could potentially affect the public and the environment. The monitoring programme should include the following sub-headings supported by a description of each:

- description of exposure pathways
- description of critical group
- the types of radiation the identified exposure pathways
- control of visitors
- list and description of sites to be monitored
- monitoring techniques to be adopted (area monitoring, sampling, measurements, etc.)
- Management of records.

Waste Management Programme

The waste management programme should provide information related to the management of radioactive waste in the form of either sealed radioactive sources, contaminated material or the effluents arising from the operations of the practice

Sealed radioactive sources

Attempt should be made to ensure that sealed sources are returned to the supplier. Alternatively an explanation should be provided describing the arrangements to be made to store the sources safely until appropriate disposal options are identified. This section should describe both arrangements with respect to sources returned to supplier as well as the interim storage of the sources.

Unsealed radioactive sources

This section should describe the exposure pathway along which effluents will be discharged. A routine programme should be developed for measuring the radioactivity of radionuclides in the effluents. Detailed description and procedures should be provided on the methodology for mitigating the hazard (preventing or minimizing discharge).

Contaminated material

All material and objects that are or could potentially be contaminated during the operations of the practice should be identified. A detailed programme should be developed describing the procedures how the contaminated waste will be managed (i.e. classification, decontamination, handling, treatment, disposal, etc.).
Tailings

The potential tailings should be characterized in detail and a comprehensive description should be made on how tailings will be managed from the date of waste generation to decommissioning of the facility.

Emergency Preparedness and Response

If a practice or radiation source has a potential for accidents which may provoke unplanned exposure of any person, an emergency plan appropriate for the source and its associated risks should be prepared and kept operational. In particular the plan should characterise the content, features and extent of a potential emergency. Furthermore this section should describe the methods, procedures and instruments for assessing and mitigating the accident and its consequences.

Transport Plan

All radioactive materials transported to and from site should be packed, shielded, marked and labelled in accordance with the IAEA Regulations for the Safe Transport of Radioactive Material. This section should make reference to the material to be transported and also provide specific details relating to packaging, marking and labelling. The emergency procedures during transport should be outlined in the section dealing with emergency situations. Containers of radioactive source imported from recognised foreign suppliers often comply with provisions of the IAEA regulations. The packing, marking and labelling of radioactive ores and their concentrates should be in accordance with Schedule 5 of the IAEA Regulations (1996 edition).

Safety and Security of Radiation Sources

This section must describe the measures that will be employed to ensure the safety and security of sources. It should provide the procedures for performing source inventories and for prevention or detection of potential source leakage. In addition this section should describe the control that will be in place to prevent or detect unauthorised access to or removal of radioactive or source material.

Conclusion

This document is intended to be a guidance document only that should be used in the development of the Radiation Management Plan. It will become the basis for dialogue between the operator and Authority prior to an authorisation or during routine safety assessment. The Authority may at its discretion direct the operator to comply with specific requirements of the Act or Regulations.
References:

- IAEA - Safety report Series 40.
- ICRP, Publication no 84.
- Atomic Energy and Radiation Protection Act, no. 5 of 2005
- SA Society for Occupational Medicine, Guideline23 (2013) for pregnant workers
- Health, Environment and Radiation Safety/Security (HERSS) - NUA Minimum Medical Standards.

6.4 **Guideline for the management of pregnant employees**

**Intent**

- This procedure provides guidelines concerning the protection of the health of women against potential hazards in their working environment at NUA members mine site during pregnancy (antenatal), after the birth of a child (postnatal) and while breastfeeding.
- This procedure provides steps to be followed when a female employee is deemed to be pregnant by a medical practitioner.
- This procedure provides a list of the principal physical, ergonomic, chemical and biological hazards that can be detrimental to the health and safety of pregnant and breastfeeding employees and recommended steps to prevent or control these risks.
- To assist in defining guidelines for recruiting and appointing pregnant employees.

**Scope**

This procedure applies to all permanent employees and contractors working at/on the premises of NUA participating companies.
Procedure

NUA members are committed to provide and maintain a work environment that is safe and without risks to the health of employees. This includes risks to the reproductive health of our female employees and the rights to a healthy pregnancy.

- No pregnant or breastfeeding employee will be required to do work that is hazardous or detrimental to her health or that of her child.

Radiation requirements

- Pregnant employees must not be exposed to more than 1 mSv per annum above back ground radiation as per the requirements of the Atomic Energy and Radiation Protection Act, as the foetus is regarded as a member of the public (from ICRP 75).
- This dose limit refers to the radiation exposure incurred at work by all employees and contractors. Calculation of exposure dose is based on a 40 hour week and 2000 working hours per annum.
- Discrimination against a pregnant or breast feeding employee is not permitted.
- NUA members will identify record and regularly review potential risks and control measures relating to pregnant and breastfeeding women in the workplace.
- If an employee works as a shift worker, alternative employment must be offered while pregnant and until the baby is 6 months old.
- NUA members will only accept medical confirmation of the pregnancy in writing by a medical practitioner.
- An appropriate risk based activity assessment must be completed in order to decide on the appropriate control measures to be implemented to mitigate risk to the health & safety of employee.
- Risks and conditions as indicated in annexure 1 will be considered when a risk assessment for pregnant & breastfeeding employee is conducted.

Step by step activities to follow if an employee suspects to be pregnant or becomes pregnant

- The employee will need to confirm the pregnancy with a medical practitioner
- The employee must inform his Supervisor as well as the Occupational Health Practitioner (OHP) and the Radiation Officer of her pregnancy condition and provide relevant Doctor’s report as soon as she becomes aware of her pregnancy.
• The employee will be moved from any area suspected to be hazardous pending proper risk assessment and/or recommendations from the OHP where necessary

• The OHP, Radiation Officer, Line Manager/SHE representative and the employee concerned, will conduct an activity based risk assessment and evaluate the risks posed by specific tasks using the questionnaire in appendix 2

• Written up activity based risk assessment will be forwarded to the OHP

• The Occupational Medical Practitioner (OMP) will clinically evaluate the condition of the pregnancy and advice the OHP in writing on requirements of each individual pregnancy case. Consent of employee to release medical information shall be obtained.

• The Occupational Medical Practitioner (OMP) will conduct a continuous risk assessment at every stage of the pregnancy e.g. 1st, 2nd, and 3rd trimesters as risks may differ at every stage of the pregnancy if the person is working on the Mine Site; refer to annexure 3

• The OHP will upon notification of the pregnancy evaluate work environment and work place practices and potential exposures that may affect the employee during pregnancy and educate the pregnant employee of the hazards and control measures made available for her safety and that of the child during this period.

• Upon return from confinement, the employee will be required to go through an evaluation with the OHP and re-induction before commencement of their duty.

• The Occupational Health Practitioner (OHP) will keep a record of every notification of pregnancy and the management of every case for a period of 30 years after the employee has left the mine.

6.4.1 Responsibilities

Responsibilities of an Employee

• A pregnant person shall inform the Radiation Protection Officer, or her supervisor or manager, IMMEDIATELY when she becomes aware of the status of her pregnancy. This is done in terms of Radiation protection of the foetus and will in no way jeopardize their employment career.

• Continuously, as determined by the medical practitioner, attend antenatal services and inform employer in case of any medical complications/conditions arising which may affect her work
• A pregnant employee has a duty to take reasonable steps to protect their own health and safety and to carry out any lawful instruction given by the Occupational Health Practitioner (OHP).

Responsibilities of the Occupational Medical Practitioner (OMP)

• Where risks to health of pregnancy are involved, Occupational Medical Practitioner (OMP) will inform the employee of the risks involved and steps to be taken to prevent exposure
• Inform the Human Resources department if appropriate adjustment to current work environment cannot be made, for the transfer of employee to an alternative position.

Responsibilities of Radiation Officer

• The Radiation Protection Officer will upon notification of the pregnancy, evaluate the work environment which will include the following: Work place practices and potential radiation exposures that may affect the employee’s foetus during pregnancy and ensure that monthly urine radiation testing is conducted.
• Educate employee on the risk to an infant ingesting radioactive substances by breast feeding.

Responsibilities of the HR Department

• OHP will inform employees about potential risks to pregnant and breast feeding employees and the importance of immediate notification of pregnancy as part of SHERQ induction.
• It is the responsibility of the Human Resources department to allocate suitable alternative employment to a pregnant employee if deemed so by the outcome of the risk assessment and the Occupational Health Practitioner (OHP)’s recommendations.

6.5 The identification and assessment of hazards

Appendix 1 describes the extent to which certain of these physical agents may constitute a hazard to the health and safety of pregnant and breast-feeding employees and suggests methods to prevent or control these hazards.

The following hazards should be considered when risk assessment of pregnant employees is conducted:
- **Physical hazards**: the control of physical hazards in the workplace includes the recognition, evaluation and control of –
  - Exposure to noise, vibration, radiation, electric and electromagnetic fields and radioactive substances
  - Work in extreme environments
  - Control of the thermal environment (heating and cold).
- **Ergonomic hazards**: The application of ergonomics involves ensuring that work systems are designed to meet the employee’s needs for health, safety and comfort.
- **Chemical hazards**: Contact with harmful chemical substances may cause infertility and foetal abnormalities.
- **Biological hazards**: Many biological agents, such as bacteria and viruses, can affect the unborn child if the mother is infected during pregnancy. Employees working with animals and sewage plants are more likely to be exposed to infection than other workers. Universal hygiene precautions are required to prevent disease. These include high precaution of personal hygiene, surveillance of staff in high-risk areas, appropriate sterilisation and disinfecting precautions, the use of protective clothing and gloves.

### 6.6 ANNEXURES

6.6.1 Annexure 1 List of hazards with potential risks to reproductive health (especially pregnant women)
6.6.2 Annexure 3: Do’s and Don’ts of a pregnant woman
6.6.3 Annexure 2 Questionnaire on work related risks for pregnant and breast feeding employees
**Annexure 1: List of hazards with potential risks to reproductive health (especially pregnant women)**

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Involved risks</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical hazards</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration and mechanical shocks</td>
<td>Increase the risk of miscarriage and stillbirth and in the later stages of pregnancy can result in premature labour.</td>
<td>It is advised that pregnant workers and those that have recently given birth (1-4 months) avoid work that is likely to involve uncomfortable, whole body vibrations, especially at low frequencies, or where the abdomen is exposed to shocks or jolts.</td>
</tr>
<tr>
<td>Extreme Heat</td>
<td>May lead to dizziness and faintness, particularly in the case of women performing standing work. Lactation may be impaired by heat dehydration.</td>
<td>Limit the exposure of pregnant and breastfeeding workers to extreme heat.</td>
</tr>
<tr>
<td>Noise</td>
<td>Prolonged exposure to noise can elevate the blood pressure of pregnant women and lead to tiredness. The effect of noise on the foetus is not known.</td>
<td>Take into consideration the occupational exposure level of 85dB (A) as outlined in the Namibian Labour Act No.11 of 2007</td>
</tr>
<tr>
<td>Ionising Radiation</td>
<td>The effect of exposure to low doses of ionising radiation to the foetus is not known.</td>
<td>Work procedures should be designed to keep exposure of pregnant women as low as reasonably achievable and below the statutory dose limit of 1 mSv per annum for a pregnant woman. Pregnant women or breast-feeding mothers shall not work in designated radiation areas.</td>
</tr>
<tr>
<td>Non-ionising (electromagnetic) Radiation</td>
<td>It has not been established if non-ionising electromagnetic radiation constitutes a risk to human reproductive health as long as it is below recommended exposure limits.</td>
<td>Women who are pregnant or who are planning to have children and are worried about working in an area with electromagnetic fields should discuss their concerns.</td>
</tr>
<tr>
<td><strong>Ergonomic Hazards</strong></td>
<td></td>
<td>Employers should ensure that hours of work and the volume and pacing of work are not excessive i.e. overtime and that, where practical, employees have some measure of control over how their work is organised. Seating should be avail-</td>
</tr>
<tr>
<td>Physical and mental strain</td>
<td>Excessive physical or mental pressure may cause stress and give rise to anxiety and raised blood pressure during pregnancy.</td>
<td></td>
</tr>
<tr>
<td>Physically strenuous work</td>
<td>Employees whose work is physically strenuous should be considered to be at increased risk of injury when pregnant or 4 months after the birth of a child.</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heavy physical exertion, including the lifting or handling of heavy loads, heavy physical work, static postures, frequent bending, repetitive work, awkward posture, standing or sitting for a long period should be avoided from early pregnancy onwards.</td>
<td></td>
</tr>
<tr>
<td>Prolonged sitting or standing</td>
<td>Sitting or standing for long periods during pregnancy can have serious health consequences. Standing for long unbroken periods can result in complications during pregnancy such as deep vein thrombosis, varicose veins, premature labour and even miscarriage.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Workstations should be adjustable to allow for necessary changes in posture. Pregnant employees who sit for long periods should be provided with a proper chair with lumbar support rest to prevent lower back pain. A footrest could alleviate pain and discomfort in the case of both sitting and standing workers. Pregnant employees who work in a stationary position should be given frequent rest breaks. Mobility during breaks should be encouraged to help prevent swelling of the ankles and improve blood circulation. Where work organisation permits task rotation, this should be done to allow the worker to do tasks that involve standing, sitting and moving. Changing of postures should be done at least after every hour.</td>
<td></td>
</tr>
</tbody>
</table>

### Chemical Hazards

<table>
<thead>
<tr>
<th>Carbon monoxide</th>
<th>Risks arise when engines or appliances using petrol, diesel and liquefied petroleum gas are operated in enclosed areas. Carbon monoxide can result in the foetus being starved of oxygen.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Occupational exposure to carbon monoxide should be avoided during pregnancy and breast-feeding.</td>
</tr>
<tr>
<td>Lead</td>
<td>Affects the nervous system of young children and is detrimental to child development.</td>
</tr>
<tr>
<td>Contact with lead should be avoided during pregnancy and breast-feeding.</td>
<td></td>
</tr>
<tr>
<td>Mercury and mercury derivatives</td>
<td>Organic and inorganic mercury compounds can have adverse effects on the mother and foetus.</td>
</tr>
<tr>
<td>Women of childbearing age should not be exposed to mercury compounds.</td>
<td></td>
</tr>
<tr>
<td>Polychlorinated Biphenyls (PCBs)</td>
<td>PCBs can cause deformities in the child. Maternal exposure before conception can also affect foetal development as PCBs can be passed on to the</td>
</tr>
<tr>
<td>No pregnant women should be exposed to PCBs at work.</td>
<td></td>
</tr>
</tbody>
</table>
foetus through the mother's blood.

| Organic solvents | Exposure to organic solvents including aliphatic hydrocarbons, toluene and trichloroethylene can lead to miscarriage and have a detrimental effect on the foetus. | Pregnant women should be protected to exposure against these organic solvents. |
| Pesticides and herbicides | Exposure to certain pesticides and herbicides is associated with an increased risk of miscarriage and can adversely affect the development of the child. | Exposure to pesticides and herbicides should be avoided or minimized. |
| Tobacco smoke | Tobacco smoke contains carbon monoxide, carcinogenic and other harmful substances. Smoking and the inhalation of environmental smoke affects foetal blood supply and can lead to retarded growth and development and more early childhood diseases. Smoking carries an increased risk. | Care should be taken to ensure that women employees are able to work without being exposed to tobacco smoke. |

**Biological Agents**

| Hepatitis A, B & C | General precautions must be taken for all forms of hepatitis. Vaccination is the most effective means available of preventing hepatitis B e.g. prior to pregnancy |
| HIV | Universal precaution is important for workers potentially exposed to HIV. Health workers, First aid personnel should exercise care when handling the blood, tissues or mucosal areas of all patients. |

**Other Common aspects of pregnancy to be considered**

<p>| Morning sickness | Nausea | As a result of morning sickness employees may be unable to perform early shift work. Exposure to nauseating smells may also aggravate morning sickness. |
| Backache and varicose veins | Backache and varicose veins may also result from static postures and manual handling. | Avoid static postures, vibration and excessive manual handling. |</p>
<table>
<thead>
<tr>
<th>Frequent visits to toilets</th>
<th>Work activities unattended</th>
<th>Frequent visits to toilets may lead to employee leaving her work activities unattended, please be patient.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in body size</td>
<td>Increase in body size may require new PPE and may also impair dexterity, agility, coordination, speed of movement and reach.</td>
<td>Re-arrange work activities if possible.</td>
</tr>
<tr>
<td>Tiredness</td>
<td>Tiredness associated with pregnancy may affect the employee’s ability to work overtime and night shift.</td>
<td>Avoid night shift and overtime work to minimize overexertion.</td>
</tr>
</tbody>
</table>
**Annexure 2: Do’s and Don’ts per Trimester**

<table>
<thead>
<tr>
<th>Trimester</th>
<th>Possible Risk &amp; conditions at this stage</th>
<th>What to do</th>
</tr>
</thead>
<tbody>
<tr>
<td>The First Trimester</td>
<td>This is a stage of pregnancy from conception to 12 weeks. Hormonal changes cause frequent nausea, vomiting, increased fatigue and heightened emotional sensitivity. Heartburn and indigestion, frequent urge to urinate, constipation, dizziness may be experienced.</td>
<td>Frequent but small meals, nutritive diet, no smoking or alcohol, light exercise, drinking plenty of water, and taking adequate rest will assist in mitigating some of the problems of first trimester.</td>
</tr>
<tr>
<td>The Second Trimester</td>
<td>The second pregnancy trimester starts from the 13th week to the 28th week. Baby grows rapidly and shows movements; the umbilical cord thickens to carry oxygen and nourishment to the foetus. Tiredness is common at this stage.</td>
<td>Light exercise, good personal hygiene, nutritive diet, adequate rest is important</td>
</tr>
<tr>
<td>The Third Trimester</td>
<td>This is the last trimester from the 28th week till the birth of the baby. The foetus continues to grow in size, bringing in changes in physical appearance. Movement becomes difficult.</td>
<td>Deep breathing helps in providing good oxygen supply to the baby. Take adequate rest, healthy diet and light exercise, avoid carrying heavy weights and standing for long periods.</td>
</tr>
</tbody>
</table>
## Annexure 3: Questionnaire

### QUESTIONNAIRE ON WORK RELATED RISKS FOR PREGNANT AND BREAST-FEEDING WOMEN

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes / No</th>
<th>Describe areas of work where this is involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you been evaluated by the Dr.?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you been informed about the hazards in your workplace?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you exposed to noise levels above 85dB (A)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you exposed to repetitive vibration?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you exposed to radiation/radioactivity at work?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you exposed to high electric or electromagnetic fields?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you exposed to any radioactive substances?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you work in extremely hot (&gt;32°C ambient temperature) or cold conditions?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you do heavy physical work?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you required to stand or sit for long, continuous periods and for how long?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you required to bend or twist frequently while working?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you lift heavy objects? Please give maximum weight.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you required to work continuously for long periods without any rest breaks?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you required to do manual handling of heavy or awkward objects?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have to stand in awkward positions to carry out your tasks?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you exposed to any hazardous chemical substances?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, please list them.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you exposed to hazardous bacteria, viruses or parasites?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a risk of contracting malaria?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will the effects of morning sickness expose you to other risks?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will poor balance increase you risk of accident e.g. from falling if working at height?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can fatigue due to pregnancy increase your risk of accident e.g. while driving or operating machinery?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(This questionnaire to be completed by Occupational Health Officer during task risk assessment of a pregnant and breast feeding employee)

Name: ..................................................... Comp No.: .....................................................
Department: ............................................ Section: ............................................................
Department:  ............................................ Section: ............................................................
Pregnant/Breastfeeding:  ......................  Weeks: .............................................................

Comments
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7 SAFETY GUIDELINES FOR THE NAMIBIAN URANIUM EXPLORATION AND MINING INDUSTRY

7.1 Intent

The NUA has developed Health, Environmental and Radiation Safety/Security Practice Standards, which are available on the NUA website. The standards set out the minimum requirements that are compulsory for members of the NUA. More detailed guidance documents can be found in these Safety Guidelines. New companies in the Namibian uranium industry are encouraged to use these guidelines when compiling their occupational health and hygiene management plans. The Safety Standard is reproduced below for ease of reference.

7.2 Safety Standard

In order to comply with this standard, a company must have a general safety management system. The system has to be documented in a clear and auditable form. It has to be practical, working effectively, and include procedures for periodic review and revision. The following minimum requirements for safe work systems have to be covered:

- There must be a system, based on risk assessment, for ensuring that effective controls and safe work procedures exist for all hazardous activities, including the safe handling and storage of hazardous substances and including emergency procedures drills.
- There must be a system for ensuring that employees are trained and equipped to carry out their work according to the applicable safe work procedures, and that their competence has been tested.
- There must be a system for ensuring that activities requiring technical certification are carried out only by suitably certified people.
- There must be a system for ensuring the risks associated with aviation operations are controlled in accordance with the NUA Business Unit Aviation Safety Guidelines.
- There must be a system of first-party auditing carried out by line management, which verifies that all employees are competent, trained, equipped and, if required certified, to carry out their work in compliance with safe work procedures; and do in fact carry out their work in accordance with the applicable safe work procedures.

Each NUA member company’s safety management system should as a minimum include the following standards: Electrical Safety (Isolation), Equipment Safeguarding, Lifting Equipment, Work-
ing in Confined Spaces, Working at Heights and Vehicle and Driving Safety. Standards for Safety Incident Investigation and Injury and Incident Recording and Reporting are required by Namibian law.

7.3 **Isolation Guideline**

**Aim**
To ensure that all machinery and equipment is isolated, locked out and made safe prior to any access, work or repair being carried out.

**Scope**
This guideline applies to all sources of hazardous energy and hazardous substances. Examples: potential, kinetic, elastic, chemical, electrical, mechanical, thermal, radiation and static energy, and substances such as gases, vapours, liquids, dust etc.

**Definitions**

- Authorised person: a competent person tested and appointed in writing to perform specific isolation procedures
- Competent person: defined in the Health and Safety Regulations means a person who
  
  (a) has, to the satisfaction of the Chief Inspector, served an apprenticeship in an engineering trade which included the operation and maintenance of machinery, or who has had not less than five years practical experience in the operation and maintenance of machinery and who during or subsequent to such period of apprenticeship or practical experiences, as the case may be, has acquired thorough knowledge in maintenance and operation appropriate to the class of machinery of which he or she is required to take charge or which he or she is required to inspect, or in connection with which he or she is required to work; or
  
  (b) has obtained a degree in mechanical or electrical engineering recognised by the Chief Inspector and has not had less than two years post-graduate practical experience in the maintenance and operation of machinery; or
  
  (c) is a registered engineer.
- Isolation: means to physically remove any connection or means to supply any form of energy to equipment in order to make energisation of such equipment impossible or to neutralize any form of energy, e.g. stored energy.
- **Lock out:** means to put a personal lock or appropriate device onto equipment in such a way that it would be impossible to connect, switch on or start, utilise or energise the equipment without removing the lock or device.

- **Make safe:** means to remove any threat or potential threat to health and safety posed by the source of energy. This includes but is not limited to barricading, clamping, chocking, constraining, deflating, earthing, neutralising, purging and ventilating.

**Isolation Procedures**

- All designated systems, plant and equipment (including hired and contracted equipment) must have written procedures for isolation.

- This procedure will set out how the system, plant or equipment is to be made safe and kept safe prior to gaining access or commencing cleaning, maintenance work, or repair work.

- The procedure will clearly define the responsibilities of all parties involved.

**Responsibilities**

- Before any work begins on a system, plant or equipment the authorised person must ensure isolation has been done and that the system, plant or equipment is made safe in accordance with the isolation procedure.

- It shall be the responsibility of the authorised person to test that the isolation is effective.

- Every person who has to perform work on the system, plant or equipment must then apply their personal lock or appropriate device.

**Minimum Legal Requirements**

Labour Act 1992: Regulations relating to the Health and Safety of employees at work. In particular Chapter 4: SAFETY OF MACHINERY; Part I – General Safety of Machinery; B. Guards and Protective Devices; Regulation 61 – Isolation of energy sources.

**7.4 Equipment Safeguarding Guideline**

**Aim**

To eliminate the risk of fatalities and injuries where and when there is the potential of human interaction with moving parts of potentially hazardous parts of plant and equipment.
**Scope**

This minimum standard applies to the safe-guarding of people from moving parts of plant, mobile equipment, power tools, high pressure equipment, electrical, and other energy sources with the potential to move and objects falling or projecting from moving equipment.

**Design Standards**

- The design of new plant and equipment needs to consider all energy sources and be designed where practical to eliminate the need for guarding
- Plant and equipment safe-guards shall be designed and constructed to comply with relevant legislation, code of practices and recognised leading industry practices, with due consideration of maintainability and operability
- Where safe-guarding and interlocking systems are insufficient to protect people, access to plant and equipment shall be controlled and monitored
- Fail-to-safe switches or devices shall be installed on all manually-operated rotating plant and equipment and power hand-tools (e.g. lathes, grinders etc).

**Operating Standards**

- Guards shall only be removed for maintenance, repair and cleaning after plant and equipment have been isolated, locked out and tested in line with the Isolation Standard
- Where the temporary removal of safe-guards is necessary on operating plant and equipment for purposes of fault-finding, testing and commissioning a risk-based procedure shall be in place
- Safe-guards shall be in place prior to plant and equipment being put back into operation.

**Electrical Specific Standards**

- All electrical work must be conducted by competent personnel only in accordance with governing regulation, code, design criteria and safe work procedures
- Electrical safety devices such as earth leakage and overload protection shall be installed on all final distribution circuits and the settings established by qualified personnel. "Qualified person" means a person who is able to submit documentary proof that he or she has received a thorough theoretical and practical education and training in engineering to the satisfaction of a competent professional institution recognised by the Chief Inspector, and who has held a position of independent responsibility for the control and supervision of machinery
• Electrical equipment, grounding continuity and electrical safety devices shall be inspected and/or tested on a suitable schedule and the findings recorded

• Electrical panels, enclosures, control centres, substations and other electrical equipment shall be appropriately guarded, labelled and made inaccessible (except for emergency shut-off mechanisms) to unauthorised personnel

• There shall be a system in place to determine the appropriate PPE that must be worn by electrical personnel when working electrical equipment.

Minimum Legal Requirements
Labour Act 1992: Regulations relating to the Health and Safety of employees at work: Chapter 4: SAFETY OF MACHINERY; Regulation 52 – General machinery protection Chapter 9: ELECTRICAL SAFETY; Regulation 258 – 271.

7.5 Lifting Equipment Guideline

Aim
To eliminate or minimize the risk of fatalities, injuries and incidents arising from the performance of lifting operations.

Scope
This guideline applies to all cranes including vehicle-mounted cranes, equipment used as cranes, hoists, lifting and rigging equipment.

Design Standards
• Electrical overhead cranes and mobile cranes shall have overload protection
• The safe work load (SWL) shall be clearly identified and marked on all cranes and lifting equipment and shall not be exceeded
• All lifting hooks (except for grab and chain shortening hooks) must be fitted with a safety latch to prevent the load from accidentally detaching
• Operator control stations of vehicle mounted cranes must be located in an area protected from the swinging load and from the crane jib.

Operating Standards
• All lifts must be subject to a risk assessment
• Crane operators must undertake a pre-operational safety check for each shift the crane is used
- A crane may not be operated with a defective safety device
- The operator must not leave the crane controls while a load is suspended
- Loads must not swing over people or occupied buildings and no person shall be under a suspended load or in a position where they could be struck by a falling load
- Tag lines must be attached to loads that require steadying or guidance while being suspended
- A preventative maintenance system shall be in place to ensure that all cranes and lifting equipment are maintained and in a serviceable condition, with appropriate records being kept
- With the exception of pick and carry operations, no lifting shall be carried out without outriggers deployed and locked.

**People Requirements**

- Suitably qualified, certified and competent person/shall be involved in the planning, supervision and implementation of the lifting operations
- A competent inspector shall perform inspection of cranes, lifting machines and lifting equipment
- Crane operators and crew shall be able to communicate in a common language and to use the correct crane signals.

**Minimum Legal Requirements**


**7.6 Confined Spaces Guideline**

**Aim**

To eliminate the risk of fatalities and injuries where personnel need to enter confined spaces.

**Scope**

Confined spaces may include but are not limited to: storage tanks, process vessels, boilers, pressure vessels, sewers, shafts, tunnels, ceilings, abandoned workings etc
Definition

A confined space is defined as an enclosed or partially enclosed or partially enclosed space that:

- Has been identified as such by a risk assessment
- Is not intended or designed primarily as a place of work
- May have restricted entry or exit
- May have an atmosphere that contains potentially harmful contaminants or explosive atmosphere
- May not have a safe level of oxygen
- May cause entrapment or engulfment.

Standards

- All identified confined spaces should need to be permanently labelled, indicating that authorisation is required to enter the confined space
- Entry into a confined space must only occur after a comprehensive risk assessment has taken place and written approval has been obtained from a competent person
- Once approval has been obtained entry into a confined space may only take place when:
  a) A trained stand-by person is available at all times at the entry/exit of the confined space
  b) There is an adequate communication system available between the people in the confined space and the stand-by person
  c) Where a specific procedure is necessary, such procedure has been done in writing and all personnel entering the confined space and the stand-by person fully understand the procedure and all necessary equipment such as forced ventilation systems; self contained breathing apparatus are in place
- A rescue plan is in place and rescue equipment is readily available.

Minimum Legal Requirements

Labour Act 1992: Regulations relating to the Health and Safety of employees at work, in particular - Chapter 5: HAZARDOUS SUBSTANCES; Regulation 192 – Hazardous fumes and lack of oxygen.

7.7 Working at Heights Guideline

Aim

To eliminate or minimize the risk of fatalities, injuries and incidents arising from working at heights.
Scope
This minimum guideline applies to all tasks where the risk assessment highlights a danger of falling irrespective of the actual height concerned.

Definitions
- Fall arrest system: means the use of multiple approved safety equipment components such as body harnesses, lanyards, deceleration devices and anchorages interconnected and rigged to arrest a free fall
- Fall prevention: means the design and use of a fall prevention system which ensures no exposure to an elevated fall hazard
- Barricading: means a physical barrier that prevents inadvertent access to an area.

Fall Prevention
Wherever practical a safe work area must be provided by means of work platforms or scaffolds.
- Work platforms and scaffolds must have complete guardrails and toe-boards, and safe access and egress must be provided
- In case of a scissor-lift or man-lift every person in the lift must be secured at all times with proper fall protection equipment and there must a system in place to prevent tools and equipment from falling.

Fall Protection
In cases where no fall prevention is possible, fall protection must be used when working at 2 metres height or more:
- A person has fall protection, if secured with an approved fall arrest system to an anchorage point, where practical above the head of the worker that ensures that the worker will not swing excessively or touch the ground in case of a fall
- There must be a system in place to ensure fall protection equipment is tested and certified for use; inspected by the user before use, and destroyed following a fall or where inspection shows evidence of excessive wear or mechanical malfunction
- There must be a system to ensure anchorage points are tested and approved by a competent person
- Where the work method requires a person to detach and re-attach at height, a dual lanyard system shall be utilised to ensure that at least one connection point is maintained at all times.
Additional Measures

- Where overhead work is being conducted, barricades must be erected around the work area to protect others below from falling objects
- Emergency response plans and equipment must be readily available for rapid retrieval of personnel in the event of a fall from height, as response time is critical if a person is to avoid suspension trauma.

Minimum Legal Requirements

Labour Act 1992: Regulations relating to the Health and Safety of employees at work, in particular - Chapter 8: CONSTRUCTION SAFETY; Regulation 246, 252 – 256.

7.8 Vehicle Guideline

Aim

Vehicle accidents still remain one of the highest risks for both operating mines and exploration companies and thus the aim is to eliminate or minimize the risk of fatalities, injuries and incidents arising from the use of vehicles.

Scope

This guideline applies to all vehicles, including mobile mining equipment owned by the relevant member or its contractors.

7.8.1 Vehicle Standards

The following minimum standards must be in place for all vehicle types:

- Seat belts for all occupants, unless a risk assessment specifies otherwise
- Setting of appropriate speed limits for vehicle types, road surfaces and environmental conditions
- Installation and maintenance of road traffic control signs as appropriate to the work site
- An appropriate pre-operational safety check
- Appropriate means to safely access and egress from the vehicle.

Light vehicle interaction with heavy mobile mining equipment shall be controlled and light vehicles shall have:

- Systems that enable positive communication with the heavy mobile mining equipment
- A visibility flag at a minimum height of 3 metres from the ground level
- Overtaking standards.
7.8.2 Training and Associated Responsibilities

- No person may drive a vehicle unless they are trained, competent and licensed to operate that vehicle. The frequency of renewal of licenses shall be determined by a risk assessment.
- A system shall be in place to ensure that persons operating any equipment associated with a vehicle e.g. vehicle mounted crane; winch etc are suitably trained and accredited.
- A system shall be in place to manage driver fatigue.
- Mobile telephones, whether hands free or not, shall be used by the driver of a vehicle only when the vehicle is stationary and in a safe location.
- Systems shall be in place to ensure that risks associated with vehicle journeys are managed and controlled.

Minimum Legal Requirements

Regulations made under Section 138A of the Minerals (Prospecting and Mining) Act, 33 of 1992 as amended: Health and Safety of Persons employed or otherwise present in or at mines (10th Draft), in particular - Part XVI HAULAGE AND TRANSPORT.