WORKING AT HEIGHTS
PROCEDURE SOP

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## APPENDIX 1: INSPECTION OF RETRACTABLE LANYARD WITH ENERGY ABSORBER

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DEFINITIONS

The definitions listed below apply to this document. For more details, please consult the Glossary:

<table>
<thead>
<tr>
<th>TERM</th>
<th>EXPLANATION</th>
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<tr>
<td>SANS</td>
<td>South African National Standards</td>
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<td>Anchor Points</td>
<td>Secure points of attachment for lifelines and lanyards.</td>
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<td>Competent Person</td>
<td>A person who has acquired, through training, qualification or experience or a combination of those things, the knowledge and skills required to do the task competently</td>
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<tr>
<td>Fall Arrest System</td>
<td>Are designed to arrest an accidental fall and consist of some or all of the following: anchorage, lifeline, lanyard, harness, shock absorbers, lifelines and inertia reel</td>
</tr>
<tr>
<td>Fall Restraint Systems</td>
<td>These systems are designed to prevent the user from moving into a fall hazard area and consist of: anchorage, lanyard, harness and horizontal lifeline</td>
</tr>
<tr>
<td>Free Fall</td>
<td>If any fall or part of a fall where the person suffering the fall is under the unrestrained influence of gravity over any fall distance.</td>
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<tr>
<td>Karabiner</td>
<td>Metal clip on either end of a lanyard that can be opened / closed by screwing the latch right / left</td>
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<tr>
<td>Shock Loading</td>
<td>Shock loading occurs when the harness is used to arrest a fall</td>
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1. OBJECTIVES
Namaqua Engineering Management mandate is that, wherever there is potential for any person to fall 1.5 metres or more, or to gain access to within 1.5 metres of an open edge from where there is potential to fall 1.5 metres or more, including working from various forms of ladders, portable and moveable elevated work platforms, cages, etc. and where objects could fall and cause injuries, personnel are required to use personal fall arrest equipment.

The objectives of this procedure are to:
- Fall Prevention and Protection is mandatory
- Ensure the safe use of fall restraint and fall arrest equipment.
- Identify when a fall arrest system should be used instead of a fall restraint system.
- Identify hazards associated with fall injury prevention systems.

2. RESPONSIBILITIES

2.1 Site Project Manager
The Site Project Manager shall have the following accountability:
- Ensure effective implementation of this procedure.

2.2 Project Construction Manager
The Project Construction Manager shall have the following accountabilities:
- Ensure full compliance with the requirements of this procedure.
- Audit the effective implementation of this procedure.
2.3 **PROJECT ENGINEER**  
The project Engineer shall have the following responsibilities:  
- Be responsible for the safe installation and the proper operation, running and maintenance of all machinery.  
- Be responsible for the safe erection and proper maintenance of all buildings, structures and tanks.  
- Be in charge of machinery.

2.4 **CONTRACTOR’S LINE MANAGERS**  
Contractor’s Line Managers shall have the following accountabilities:  
- Assess the correct work system.  
- Implement risk controls.  
- Provide input to design of temporary work platforms that are not scaffolding.  
- Approve temporary work platform design.  
- Arrange appropriate training  
- Audit the effective implementation of this procedure.

2.5 **PROJECT SHE MANAGER**  
The Project SHE Manager shall have the following accountabilities:  
- Audit and monitor compliance with this procedure.  
- Identify remedial corrective actions as required.

2.6 **SUPERVISORS**  
Supervisors shall have the following accountabilities:  
- Ensure the application of this procedure.  
- Ensure that Risk Assessments are developed for tasks associated with this procedure.  
- Ensure that employees review and sign the Risk Assessments prior to task commencement.  
- Ensure that employees are educated / provided with the appropriate PPE.

2.7 **ALL EMPLOYEES**  
All employees shall have the following accountabilities:  
- Ensure that an approved work method is selected according to this procedure before working at heights.  
- Ensure compliance with this procedure.  
- Ensure that a Risk Assessments is filled out and all risk minimization measures are fully complied with.

3. **WORKING AT HEIGHTS HAZARD MANAGEMENT**  
In order to minimise the hazards that personal experience when working at heights, the following hierarchy of controls shall be implemented by all personal and contractors at the Tshipi Project.
Elimination: the work is performed by a different means that does not expose the worker to the fall hazard. For example, it may be possible to fabricate items on the ground rather than assembling them at height, eliminating the need to access the fall risk area. Another example is that certain equipment (such as air condition units) can be installed at ground level to facilitate installation and maintenance without having to work at heights.

Substitution: substituting or replacing a hazard or hazardous work practice with a less hazardous one (e.g. providing an alternative means of access such as a safe walkway so the risks of falls are avoided, or installing an elevating work platform for work at heights).

Isolation: isolating or separating the hazard or hazardous work practice from people involved in the work or people in the general work areas (e.g. barricading or enclosing the fall risk area with edge protection, installing guardrails and covering floor penetrations).

Engineering control: if the hazard cannot be eliminated, substituted or isolated, an engineering control is the next preferred measure. First, the use of a passive fall prevention device should be undertaken. These include: Scaffolds, Step Platforms, Elevating Work Platforms, Work Boxes, etc.

If this is not possible, consider the use of a fall injury prevention system designated to restrain or arrest a worker’s fall from one level to another and minimise the risk of injury or harm to a worker if they fall. The following hierarchy applies:

(a) Fall Restraint Systems
(b) Fall Arrest Systems
(c) Catch Platforms, Safety Nets and Safety Mesh.
The following page summarizes the hierarchy of controls to be adopted:

- **STEP 1**  
  Try to bring the job to the ground level so that there is not a risk of falling.

  **If you can't...**

- **STEP 2**  
  Put up a solid barrier or handrail so that there is not a risk of falling.

  **If you can't...**

- **STEP 3**  
  Use a platform to work such as a scaffold or an elevating work platform

  **If you can't...**

- **STEP 4**  
  Use of a fall RESTRAINT system that will stop people reaching the edge.

  **If you can't...**

- **STEP 5**  
  Use of a fall ARREST (with energy absorber) that will arrest people if they fall.

  **If you can't...**

- **STEP 6**  
  **...DON'T DO THE JOB.**

  Go see the supervisor and re-assess the job.
4. FALL INJURY PREVENTION SYSTEMS

- A full body harness and a fall arresting device system shall only be worn as a last resort where it is not practicable to have physical barriers in place.
- No person shall wear a harness or any other fall arresting device unless they have been trained in the safe use thereof.
- Post fall recovery plans shall be considered before fall protection equipment is used.
- A permit to work must be obtained in any situation where fall protection equipment is used.
- All personal working at heights shall ensure that their safety helmets are secured by using a helmet chinstrap to retain the helmet on the head.
- When setting up the fall arrest equipment, inspect it for sharp edges, pinch points and sources of heat, which could wear, cut or burn through the lanyard if an artisan should fall and be left dangling.
- Always inspect the snap hook visually after attaching it to a harness or anchor point; merely hearing it click is not enough. There have been fatal accidents in which it was later found that the connector had not been closed properly.
- Always set up the attachment point for fall arrest or fall restraint between the safe access point and the hazard. If an artisan has to walk past the hazard to reach the attachment point, the purpose of the whole fall arrest system is defeated.

4.1 FALL RESTRAINT SYSTEM

A fall restraint system is required where personnel are required to work within 1.5 meters of an opening where they could fall.

A restraint system comprises:
- Anchor point(s).
- A lifeline or restraint line of appropriate strength and length which will prevent them from falling over the edge.
- A full body harness. (Spider Webb Type with self rescue leg straps)

4.1.1 Fall Restraint Installation

When planning the site layout and sequence of construction for installing a static safety line system, the safety considerations shall include:

- The system conforms to SANS 50363.
- Provision of anchor points (corrosion resistant where possible).
- The requirements for lateral and vertical mobility whilst a person is connected to the system and working.
- The potential for free falls.
- Fall distances and clearances (both vertically and laterally).
- Provision of safe access to and egress from a work area for persons installing anchor points.
- Installation is in a location where it will be possible to assist or rescue a person.
• Development of emergency rescue procedures before setting up and ensuring appropriate emergency equipment is available on-site, including a self-rescue kit if training in its use has been provided

4.2 FALL ARREST SYSTEM

4.2.1 Use of a Fall Arrest System instead of a Restraint System

A fall arrest system shall be used instead of a restraint system if any of the following situations apply:
• The User can reach a position where a fall of over 2m is possible.
  • There is a danger of the User falling through the surface (e.g. roofing material).
  • The slope is more than 15 degrees.

4.3 FALL ARREST EQUIPMENT

• Personal fall arrest equipment shall consist of a full body harness connected to a lifeline or structure, by means of a lanyard or inertia reel.
• Fall arrest equipment shall be set up prior to the task with the focus on prevention and the minimisation of fall distance.
• If personal fall arrest equipment is required, there shall be at least one team member in the vicinity that can assist and raise the alarm immediately should a person fall.
• Fall arrest equipment shall be removed at the end of the working shift.
• All fall arrest equipment that has been subject to shock loading shall be removed from service immediately. Lifelines shall be withdrawn from use until they have been inspected by an accredited person and declared safe to use.
• There shall be a minimum of slack in the lanyard between the person and the anchor point.
• The fall arrest system shall be designed to limit a free fall to a maximum of 2 meters.

4.3.1 Safety Harness

• A fall arrest system requires a full body harness. A full body harness consists of straps passed over the shoulders, across the chest, and around the legs. In a fall, a full body harness protects more than a safety belt, because it distributes the force of impact over a greater area of the body. Safety belts have also been known to slip off the body in a fall.
  • The full body harness must be the correct size and be adjusted securely. The harness instructions must be followed carefully to ensure the correct use of the harness.
  • The full body harness must comply with SABS EN 361.

4.3.2 Lanyards

• Lanyards comply with SANS 50354.
- All lanyards shall incorporate a potential energy absorber.
- Lanyard hooks shall not be connected directly to the lifeline but a karabiner shall be used.
- The lanyard, when passed around an anchor point, must not be hooked back on itself.
- Where the work method requires persons to detach and reattach at height, a dual lanyard system shall be used to ensure that at least one connection point is maintained at all times.
- Lanyards MUST NOT be connected together to increase the length of connection.
- The maximum length of the lanyard, including the Personal energy absorber should generally not exceed 2,0 m.

4.3.3 Inertia Reel Fall Arresters
An inertia reel can be attached to any suitable anchor point or to a lifeline using Manufacturer-approved methods.

The following shall be considered when using Inertia Reel Fall Arresters:
- Selection of the anchor point.
- Compliance with Manufacturer's specifications in regards to distance, height, number of personnel, etc.
• Where necessary, the inertia reels shall have a light cord attached to enable the wire to be drawn down.
• Inertia reels are to be attached directly to the “D” ring of the harness.

Examples of Typical Inertia Reels

4.3.4 Lifelines

There are many variables to consider in the erection of lifelines, these include:
• The number of people on the system at any one time.
• The length of the system.
• The length between immediate supports.
• The length of the lanyard.
• The distance below the User.

Engineer designed systems are necessary to consider all these variables.

The lifeline shall be:
• Installed so as to prevent kinking or damage on sharp edges and beams.
• Tensioned to reduce sag, however, care must be taken to ensure that the cable is not over tensioned.
• Installed at a height above the workface that will ensure that the distance of any potential fall is minimised.
• Inspected by the User prior to use. The inspection shall include an examination of all clamps and the physical condition of the complete system.
• Steel cables for lifelines shall have a minimum breaking strength of 15kN (approximately equivalent to 1500kg) and a minimum diameter of 12mm with a safety factor of 10.
• Only a certified and competent rigger with the authority to do so can install lifelines on site.
4.3.5 Anchor Points
- An anchor point shall be capable of withstanding a static load of 15kN (approximately 1500kg).
- All permanent anchor points shall be Engineer approved.
- Anchor points shall not be used by more than one artisan at any given time.
- Anchor points shall be located as high as equipment permits, so as to minimise the risk of a free fall exceeding the design capacity of the fall arrest system.
- If the artisan moves past the height of anchorage, the lanyard shall be moved to a higher anchor point using a dual lanyard system.
- The artisan shall be secured to at least one anchor point at all times.
- If there is no approved anchor point, the Supervisor shall identify a suitable structure that may be used as an anchor point. The Supervisor shall complete a detailed Risk Assessment. The temporary anchor point must be approved by a competent person prior to beginning work.

The following are examples of what MUST NOT be used as anchor points (this is not an all-inclusive list):
- Pipe runs less than 150 mm.
- Any pipe supported by hangars.
- Guard post and guardrails built with less than 150 mm steel pipe or square tubing.
- Eye Bolts.

5. PROCEDURE TO FOLLOW BEFORE WORKING AT HEIGHTS

5.1 Documented Risk Assessment
A documented risk assessment shall be conducted before the commencement of working at heights and at any time the scope of work changes or the risk of a fall increases. The risk assessments shall include:
- Consideration for the potential of objects, as well as personnel, to fall.
- Selection of appropriate control measures using the Hierarchy of Controls.
- The possibility for weather and other environmental conditions to influence the working conditions (e.g. wind, rain, snow, dust, gases, poor lighting, temperature, etc.)
- Selection of appropriate equipment.
- Selection of anchor and tie-off points.
- Condition of supporting structures such as roofs.
- Selection of appropriate barricading and/or demarcation.
- Fall clearances i.e. length of lanyard + tear-out distance + height of user + safety margin.

5.2 Permit to Work
A permit to work at heights must be obtained and approved by the relevant personal
5.3 **Falling Object Plan**
A system should be in place to prevent tools, materials and other object from falling from height.

5.4 **Emergency Rescue Plan**
- An emergency response plan/s should be available for the rapid retrieval of personnel in the event of a fall from height.
- Response time is critical if a person is to avoid suspension trauma.

6. **Training**
- All persons required to wear fall protection equipment shall be fully trained in the correct use and maintenance of the equipment.
- A training register of qualified people shall be kept on site; the training register shall contain the content of the training module given and the name of the trainer.
- All personal that are trained to work at heights must be fit for this type of work. Specific attention shall be given to potential risk factors (e.g. personnel who suffer medical conditions, such as vertigo and epilepsy, and to personnel who are overweight). Note: many harness systems have a maximum weight limit of 136kg.

7. **Signage**
Signage shall be permanently in place at entry points of lifeline systems to advise Users on the fall prevention system and inspection details.

The signage shall include statements on:
- The number of people allowed on the system at any time.
- The date of the last inspection.
- The date of the next inspection.
- The competent person conducting the inspections.

Additionally, barricading and warning signage should be placed on all lower levels where personnel or objects may fall.

8. **Care, Maintenance and Inspections**
- Equipment shall not be contaminated with paint or chemicals and shall be free from damage.
- Equipment shall be stored where it will not be damaged, preferably hung above floor level.
- Where hot work is to be carried out a modified welding jacket shall be used to prevent damage to the harness.

8.1 **Inspections**

**8.1.1 Inspection of Fall Prevention System**
Each component of the system and its means of attachment to an anchor point shall be inspected by a competent person:

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• After it is installed, but before the first use.
• At a minimum of six-monthly (bi-annual).
• Immediately after it has been used to arrest a fall.

These inspections must be documented and an equipment register and tagging system shall be in place.

If any signs of wear or weakness are found during the inspection, the User shall ensure that the components or means of attachment are withdrawn from use until they are replaced with properly functioning components.

Consideration shall be given to environmental factors that may have affected the condition of equipment, such as water, oil, grease, sharp edges and grit.

Items in the fall prevention system to check prior to use are:
• Ensure that the harness attachment point for the lanyards is the correct one, i.e.:
  - The fall arrest lanyards are attached to a “D” ring at the back between the shoulder blades.
  - Fall restraint lanyards are attached at hip level.
  - Lifeline lanyards are attached to a D ring at the back.

NOTE: Some harness attachment points may not be rated for fall arrest.

• Always inspect all fall arrest equipment and hardware before use. If the item is damaged, it must be taken out of service and inspected by a competent person prior to re-use.

If there are any doubts about the equipment, DO NOT USE IT - report to your supervisor.

8.1.2 Inspection of Inertia Reels
Inertia Reels shall be inspected prior to use and every 6 months.

When inspecting inertia reels the following shall be checked:
• The fall arrest device body:
  - Check that the mounting ring is in good condition.
  - Check the activation of the fall arrest indicator.
  - Check that labels are present.

• The locking mechanisms and lanyard guides:
  - Inspect the lanyard guides for excessive wear.
  - Check that the lanyard runs freely through the anchor point. - Check that the locking mechanisms work.
  - Check that the snap hooks and links work.
  - Check the karabiners for damage and check the movement of the latch.
NOTE: If the inertia reel has been used to arrest a fall it must be removed from service to be repaired.

8.1.3 Inspection of Anchor Points
- Anchor points not used in a lifeline system shall be inspected every 6 months.
- Prior to use the User shall visibly check all anchor points.
- If the anchor point is found to be unsafe the employer shall ensure that:
  - The anchor point is not used and is tagged to indicate it is unsafe.
  - The repaired anchor point is not used until it is inspected by a competent person and declared safe.

9. WORKING AT HEIGHTS USING TEMPORARY STRUCTURES
- All platforms, scaffolds and any other temporary structures shall be constructed only under the direction of competent and authorised persons.
- All forms of portable and movable elevated work platforms and suspended work cages shall conform to relevant approved design standards. People in the work platform basket shall each wear a correctly-fitted harness attached by a lanyard to a suitable anchor point. This does not apply to people working within a properly constructed and certificated scaffold or other structure at height with the requisite handrails and toe boards.

9.1 LADDERS
- All ladders will be of sound construction and will be properly maintained and in accordance with the Occupation Health and Safety Act 1993.
- Ladders will be inspected and logged once per month. They shall be inspected before and after use and any observed defect remedied at once.
- The best angle for easy use and security is approximately 75 degrees to the horizontal, i.e. one meter out of for each four meter up.
- All workers must be trained to detect defects in wooden and metal ladders.
- For all electrical work, non-conductive ladders will be used.

10. HAZARDS
10.1 Pendulum Effect
With the use of a fall arrest system, a potential hazard is that the User may swing into the ground (which is called "swing down") or swing back into the building (which is called "swing back"). Both swing down and swing back can occur inside a building.

10.1.1 Swing Down
With the hazard of swing down, the lanyard extends diagonally from the anchor point, following the perimeter edge of the roof. If the User falls, the lanyard will slide back along the perimeter until it is at a right angle with the edge of the roof. When this happens the User will drop and may hit the ground (see diagram below) or the lanyard may break when contacting the edge of the roof and the User will fall to the ground.
Consideration shall be given to the following measures to address the hazard of swing down:

- Install guardrails.
- Put the anchor point at a right angle to the position of the line at the perimeter edge.
- Install a second anchor point and belay devices, which are intermediate anchorages.

10.1.2 Swing Back

With the hazard of swing back in a fall, particularly from a perpendicular edge, the User will swing back into the building structure and collide with any obstructions in the path of the swing (see diagram below):

If there is a risk of swing back occurring, then the use of an individual fall arrest shall be reassessed.

10.2 Suspension Trauma

Suspension trauma may occur when a person has an arrested fall because they are suspended and caught in an upright position. A person’s lower legs have a large storage capacity for blood and gravity pulls blood into them. The return blood flow to the heart is reduced as blood accumulates in the legs. As the blood supply to the heart is then restricted, the body suddenly slows the heart causing the person to faint.

This is a potentially fatal condition and quick rescue is critical.

11. References

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## 12. APPENDICES

### 12.1 APPENDIX 1: INSPECTION OF RETRACTABLE LANYARD WITH ENERGY ABSORBER

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<thead>
<tr>
<th>INSPECTION SCHEDULE</th>
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<tr>
<td><strong>Visually Inspect Unit and Report Findings:</strong></td>
<td></td>
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<tr>
<td>Is the serial number clearly visible?</td>
<td>YES  NO</td>
</tr>
<tr>
<td>Ensure that the equipment number is visible and legible.</td>
<td></td>
</tr>
<tr>
<td>Is the shackle fixing lug is damaged, burred or elongated?</td>
<td>YES  NO</td>
</tr>
<tr>
<td>Is the shackle fixing lug nut is loose?</td>
<td>YES  NO</td>
</tr>
<tr>
<td>Is the shackle fixing lug movement is sticky?</td>
<td>YES  NO</td>
</tr>
<tr>
<td>Is the inertia reel protection cover damaged?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>Shock Absorber</strong></td>
<td></td>
</tr>
<tr>
<td>Is the shock absorber stressed (partly pulled out)?</td>
<td>YES  NO</td>
</tr>
<tr>
<td>Is the shock absorber casing damaged?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>Lanyard (Pull lanyard slowly out of the way)</strong></td>
<td></td>
</tr>
<tr>
<td>Is the lanyard filthy from grease or chemicals?</td>
<td>YES  NO</td>
</tr>
<tr>
<td>Is the lanyard frayed or discoloured?</td>
<td>YES  NO</td>
</tr>
<tr>
<td>Is the stitching unravelling?</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>Lanyard Operation (Test by applying quick pull between mini-bloc and end off lanyard)</strong></td>
<td></td>
</tr>
<tr>
<td>Does the lanyard extend for more than 50mm when jerked? (Do 3 to 4 test pulls.)</td>
<td>YES  NO</td>
</tr>
<tr>
<td><strong>Karabiner</strong></td>
<td></td>
</tr>
<tr>
<td>Is there visual damage to the frame?</td>
<td>YES  NO</td>
</tr>
<tr>
<td>Is the latch lock nut is difficult to turn into the locked position (securing the latch from opening)?</td>
<td>YES  NO</td>
</tr>
<tr>
<td>Is the latch spring return action weak?</td>
<td>YES  NO</td>
</tr>
<tr>
<td>Are the latch securing pins loose?</td>
<td>YES  NO</td>
</tr>
</tbody>
</table>
In the event that any of the question results in a YES answer report this to the Supervisor before using the equipment. This should be elaborated upon, in the comments column and some detail supplied on further action taken.

Serial No:

EQUIPMENT IS SAFE / UNSAFE FOR USE
(Delete which ever is not applicable)

I hereby declare that I have inspected the equipment and I declare it safe for use.

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
<th>Co. No.</th>
<th>Date</th>
<th>Time</th>
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COMMENTS:

<table>
<thead>
<tr>
<th>ORIGINATOR</th>
<th>CLIENT</th>
<th>AUTHORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME &quot;&quot;: Henk Myburgh</td>
<td>NAME &quot;&quot;: Tshipi Mine</td>
<td>NAME &quot;&quot;:</td>
</tr>
<tr>
<td>SIGN:</td>
<td>SIGN:</td>
<td>SIGN:</td>
</tr>
<tr>
<td>DATE &quot;&quot;: 20.09.12</td>
<td>DATE &quot;&quot;:</td>
<td>DATE &quot;&quot;:</td>
</tr>
</tbody>
</table>