Vedanta Resources Plc

Sustainability Governance System

Guidance Note GN21

Work at Height

Guidance Note – Work at Height

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1. INTRODUCTION

1.1. Who is this Guidance Note aimed at?

This Guidance Note is aimed at all Vedanta subsidiaries, operations and managed sites, including new acquisitions, corporate offices and research facilities and to all new and existing employees and contractor employees. This Guidance Note is applicable to the entire operation lifecycle (including exploration and planning, evaluation, operation and closure).

This Guidance Note is for any personnel who work at height or supervise/manage work at height activities. The Guidance Note should be used in conjunction with the Vedanta Guidance Note GN07 on *Risk Assessment* and also associated Standards as listed in the back of this Guidance Note. The specific use of ladders and platforms is addressed in the Vedanta Guidance Note GN32 on *Ladders and Platforms*.

1.2 What is the aim of this Guidance Note?

The aim of this Guidance Note is to outline the company requirements which Vedanta implements in order to ensure that all work at height carried out within Vedanta's operations is planned and performed in a safe manner.

1.3 What issues does this Guidance Note address?

This Guidance Note presents the framework for carrying out work at height within Vedanta operations, showing the key technical activities that may apply in each of these contexts, and identifying the main decisions at each stage. This guidance note does not address other fall hazards associated with walking and working surfaces, staircases etc., and associated building/construction standards.

The focus of the Guidance Note is to provide preferred methods and outcomes rather than prescriptions whilst at the same time representing a practical "how to" guide for all Vedanta operators.

It is intended that the Guidance Notes will represent standard baseline guidance for all Vedanta staff within all the operations whilst recognising the need for flexibility at a site depending upon specific circumstances or regulatory specific requirements. In this sense, Guidance Notes are not designed to be definitive text, nor are they designed to provide prescriptive methods and procedures for undertaking tasks.

1.4 How should this Guidance Note be used?

This Guidance Note is not mandatory and is intended to reflect good practice and provide the basis for continual improvement of sustainability issues across the Vedanta business. However, where this Guidance Note is not used, operations will need to demonstrate (and document) how an equivalent process is in place and how this ensures that work at height is carried out safely.

In most cases there will also be national and/or local regulatory requirements governing work at height activities – operations must ensure that these requirements are identified and complied with.

The guidance focuses on general principles of work at height and some key themes in terms of operational control. It does not go into extensive detail on all aspects. Some aspects such as the use of nets and air bags, roof work etc. are referred to but not addressed in detail. It is imperative that such activities are only undertaken by trained and competent persons - extensive guidance on

these and other topics is available from national regulatory bodies and industry associations, and there are also numerous technical standards and specifications published by national and international standards bodies (some of the latter are listed at the end of this document, however users should always check the latest versions in force as this does change).

The guidance has been designed to be applicable for all Vedanta operations.

The remainder of this Guidance Note is structured as follows:

- *Section 2* – What Do We Mean by Working at Height?
- *Section 3* – Planning the Work
- *Section 4* – Training & Competency
- *Section 5* – Medical Fitness
- *Section 6* - Use Of Personal Fall Arrest & Fall Restraint Systems
- *Section 7* - Use of Safety Nets
- *Section 8*- Fragile Surfaces
- *Section 9* -Mobile Elevating Work Platforms
- *Section 10* -Work Overhead
- *Section 11* – Further Advice

At the end of the Guidance Note there is additional information on Definitions and Related Documentation.

2. WHAT DO WE MEAN BY WORKING AT HEIGHT?

Work at height is often considered (and sometimes defined in regulations) to mean work carried out at an elevation of more than 1.8 metres or in some cases 2 metres. This guidance, however, applies to all work at height where there may be a significant risk of personal injury in the case of a fall. This may be at levels below 1.8/2 metres and also includes work at ground level adjacent to an edge or pit/pond that could result in a fall, and obtaining access to or exiting from a workplace (except by a staircase in a permanent workplace).

3. PLANNING THE WORK

Prior to any potential work at height being carried out, **hazard identification and risk assessment** should be carried out (refer to the Risk Assessment (GN07) and Permit to Work (GN19)Guidance Notes). This should include factors such as:

- Consideration for the potential of objects, as well as personnel, to fall;
- Selection of appropriate control measures using the hierarchy of controls (see below);
- 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.

When work at height is being planned then there is an established hierarchy of controls to eliminate or mitigate the risk:

- **Eliminate**

  Wherever possible, the need for work at height should be eliminated by doing the work in an alternative way at ground level – this could mean something as simple as using a pole to clean windows or paint high surfaces rather than using a ladder, or lowering drill masts to perform maintenance/servicing work rather than climbing the mast.

- **Prevent**

  By performing the work either from an existing safe place of work or providing one, e.g. by using a mobile elevating work platform, scaffold or providing edge protection/guard rails.

- **Reduce Distance & Consequences of a Fall**

  For example, the distance a person can fall can be reduced through the use of safety nets or fall arrest systems. An airbag can reduce the consequences of a fall.

- **Collective Measures Have Priority Over Individual Measures**

For both the prevention and reduction measures referred to above, collective measures (such as guard rails, safety nets) should be considered before individual measures (for example personal fall restraints).

- **Reduce Time Spent at Height**

  The risk exposure can be reduced by reducing the time required to be spent working at height, for example by using long life light bulbs that require less frequent replacement, or by programming work so that a number of smaller jobs can be carried out at the same time.

- **Training & Instruction**

  Anyone carrying out work at height needs to be competent to do so, and appropriately trained and supervised.

  Standard written work procedures, based on risk assessment, should be developed for all routine work at height. Any non-routine work at height should be covered by a permit to work system.

Note that even if a work at height task has been subject to a risk assessment (see GN 07 Risk Assessment) and a written procedure is in place, it would be good practice to carry out a dynamic risk assessment prior to starting work to ensure that there are no changes that need to be considered, or risks arising from the work site conditions and other activities being carried out at that particular time.

4. TRAINING & COMPETENCY

All personnel carrying out or supervising work at height activities should be trained and competent to do so. This includes specific training in the type of equipment being used, its construction (e.g. in the case of scaffolds), use and inspection/maintenance requirements.

Competency and training requirements should be clearly defined in the operation's systems and procedures, and appropriate records maintained. Competency should be periodically assessed and refresher training carried out as appropriate.

Training requirements associated with specific working at height methods/equipment are discussed in the relevant sections below.

5. MEDICAL FITNESS

Systems should be in place to ensure that those working at height are fit to do so. Specific consideration should be given to personnel who suffer medical conditions such as vertigo (see photo below) and epilepsy, as well as considering the weight of the person using the harness (e.g. many harnesses have a maximum weight limit of 136kg/300 lbs.).

Best practice example of a structure designed to test individuals' susceptibility to vertigo.

6. USE OF PERSONAL FALL ARREST & FALL RESTRAINT SYSTEMS

6.1 Selection and Specification of Equipment

Fall Restraint / Fall Arrest Systems

Where personnel are required to work within 2 metres of an opening where they could fall, then they should use personal fall restraint equipment, such as a fixed lanyard and harness as a minimum, which will prevent them from falling over the edge.
Where there is a potential to fall more than 2 metres personnel shall wear appropriate personal fall arrest equipment, which should comprise a full body harness and shock-absorbing lanyard or inertia reel.

Each operation's programmes/procedures for working at height should contain documented minimum specifications for fall restraint and fall arrest equipment to be used. This may refer to relevant EN/ISO, ANSI standards or other national/regional standards that offer a similar level of protection (see Further Advice section). As an example, some relevant US OSHA performance criteria are summarised below.

Personal fall arrest systems should, when stopping a fall:

i. *limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt (see below, however, with respect to use of body belts);*
ii. *limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness;*
iii. *bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07 m); and*
iv. *have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of six feet (1.8 m), or the free fall distance permitted by the system, whichever is less.*

The above criteria apply to personal fall arrest systems used by employees having a combined person and tool weight of less than 310 pounds (140 kg). For weights in excess of this, then adjustments may need to be made.

Source:OHSA 29CFR Part 1910 (Occupational Safety and Health Standards), 1910.66 App C, Personal Fall Arrest System.

The kind of personal fall arrest system selected should match the particular work situation, and any possible free fall distance should be kept to a minimum. Consideration should be given to the particular work environment. For example, the presence of acids, dirt, moisture, oil, grease, etc., and their effect on the system, should be evaluated. Hot or cold environments may also have an adverse effect on the system. Wire rope should not be used where an electrical hazard is anticipated.

Ideally, a personal fall arrest system is designed, tested, and supplied as a complete system. However, it is common practice for lanyards, connectors, lifelines, deceleration devices, body belts and body harnesses to be interchanged since some components wear out before others. It therefore needs to be highlighted that not all components are interchangeable. For instance, a lanyard should not be connected between a body belt (or harness) and a deceleration device of the self-retracting type since this can result in additional free fall for which the system was not designed. Any substitution or change to a personal fall arrest system should be fully evaluated or tested by a competent person before the modified system is put in use.

Where lanyards, connectors and lifelines are subject to damage by work operations such as welding, chemical cleaning, and sandblasting, the component should be protected, or other securing systems should be used. The work conditions and environment (including seasonal weather changes) should be fully evaluated before selecting the appropriate personal fall protection system. Once in use, the system's effectiveness should be monitored. In some cases, a program for cleaning and maintenance of the system may be necessary.

Fall restraint/arrest systems should be appropriately fitted to the user so that there is no risk of the user falling or slipping from the system. Procedures should be in place for the correct wearing and use of personal fall arrest and fall restraint systems.

There should always be enough clearance between the person and the ground or any structures, even if the safeguard distorts while arresting a fall. Personal fall arrest systems should be set up such that an employee can neither free fall more than six feet (1.8 m), nor contact any lower level. Personal fall arrest systems or components which have been subject to impact loading should be immediately removed from service and should not be used again for employee protection unless inspected and determined by a competent person to be undamaged and suitable for reuse.

Harnesses

Body harnesses should be designed to be secured about the worker in a way which distributes the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders, with means for attaching it to other components of a personal fall arrest system. A typical example is shown below. The attachment point of the body harness should be located in the centre of the wearer's back near shoulder level, or above the wearer's head.

Example of a 2-point full body harness for use with a fall arrest device and suitable anchorage point.

The use of body belts for the attachment of lanyards is not acceptable (except for specific tasks such as pole climbing for which suitable standards and training are in place, or for work positioning purposes where the purpose of the belt and lanyard is to prevent the user from moving into an area from which a fall could occur).

Harnesses and other transportable items of fall prevention equipment should be uniquely identifiable so that they are not used for other purposes.

Lanyards

Unless otherwise (more strictly) specified by local regulations, lanyards which tie off one worker should have a minimum breaking strength of 5,000lb (approximately 2,268kg or 22.2 kN). A shock-absorbing lanyard or inertia reel shall be used where the potential to fall is greater than 4 m. For falls of less than 4m, a short restraining lanyard is acceptable.

Self-retracting lifelines and lanyards which automatically limit free fall distance to two feet (0.61 m) or less shall have components capable of sustaining a minimum static tensile load of 3,000 pounds (13.3 kN) applied to the device with the lifeline or lanyard in the fully extended position.

Self-retracting lifelines and lanyards which do not limit free fall distance to two feet (0.61 m) or less, rip stitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN) applied to the device with the lifeline or lanyard in the fully extended position.

Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses, should be made from synthetic fibres or wire rope.

Dual lanyards should be provided and used for work which requires the operator to hook on and hook off when working at height so that the operator is secured to anchor points at all times.
Typical examples of lanyards and self-retracting lifelines are shown below. *Note: It is always recommended to use double lanyard while working at height, roof works etc., which will allow the user to remain attached at all times when moving or working.*

Cable self-retracting lifelines.

Dual energy absorbing lanyards – these allow the user to remain attached at all times when moving or climbing.

Horizontal Lifelines

Horizontal lifelines, where used, should be designed, and installed as part of a complete personal fall arrest system, which maintains a safety factor of at least two, under the supervision of a qualified person.

Examples of horizontal lifelines in use.

Anchor Points

Anchor points should be independent of the means of supporting or suspending the worker. Unless otherwise (more strictly) specified by local regulations, anchor points should be capable of supporting at least 5,000lb (22.2kN) per worker attached. Alternatively, the anchor point should be designed, installed, and used as part of a complete personal fall arrest system with a safety factor of at least two, under the supervision of a qualified person

Anchor points should be located above the head of the worker wherever practical, and should ensure that in the event of a fall, the worker will neither swing nor touch the ground. Anchor points should only be installed by competent persons. Whenever a fixed anchor point is installed, there should be a safe means of accessing the anchor point without the need to use work at height PPE.

Examples of some different types of some commonly encountered anchor points and devices are shown overleaf.

Re-usable concrete anchorage device.

Beamwalk adjustable anchorage device for use on I-beams.

Permanent D-Bolt anchorage device for use on concrete, metal or wood surfaces. Can be bolted or welded to the structure.

Re-usable roof anchorage device.

Cross arm strap - designed to wrap around structures for a secure anchor point.

Fall protection cable pass-through cross arm strap designed to wrap around typical I-beam or pipe application for overhead tie-off.

A system should be in place for the periodic inspection and testing of anchor points in accordance with a recognised standard.

Connectors

Connectors should be drop forged, pressed or formed steel, or made of equivalent materials. Connectors should have a corrosion-resistant finish, and all surfaces and edges should be smooth to prevent damage to interfacing parts of the system.

Dee-rings and snap-hooks should be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN). Dee-rings and snap-hooks should be 100% proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

Dee-rings.

Example of a locking snap hook.

Snap-hooks should be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snap-hook from depression of the snap-hook keeper caused by the connected member, or should be a locking type snap-hook designed and used to prevent disengagement of the snap-hook by the contact of the snap-hook keeper with the connected member.

6.2 Emergency Response Arrangements

If a person falls while wearing a harness then there is a risk of suspension trauma which can lead to permanent brain damage or death. It is therefore critical that there are arrangements in place to get the person down safely in the shortest possible time and before the emergency service response. If this cannot be done then harness work is not the correct system of work.

Appropriate equipment should be provided to enable the retrieval of a suspended person, and personnel trained in its use. The availability of rescue personnel, ladders or other rescue equipment should be evaluated. In some situations, equipment which allows employees to rescue themselves after the fall has been arrested may be desirable, such as devices which have descent capability.

Example of a rescue pack.

Example of an evacuation descender system for self-rescue.

Personnel should be trained in the risks associated with suspension whilst wearing a harness, and in the appropriate emergency response and first aid measures (note that there are established protocols to follow in terms of positioning of the casualty and other first aid measures).

The emergency response arrangements should be periodically tested in drills/exercises.

6.3 Training

Before using a personal fall arrest system and after any component or system is changed, employees should be appropriately trained.This should include:

- specific lifelines and other equipment which may be used;
- limits with respect to use/application of the equipment;
- proper anchoring and tie-off techniques;
- estimation of free fall distance, including determination of deceleration distance, and total fall distance to prevent striking a lower level;
- methods of use;
- any specific recommendations of the equipment manufacturer(s); and
- inspection and storage of the system.

6.4 Maintenance and Inspection

All fall prevention and protection equipment should be properly inspected, tested and certified for use. This includes structures and protective devices such as working platforms, guard rails, scaffolds, anchor points and mobile elevated work platforms which are designed to provide a safe workplace at height.

Thorough inspection, testing and certification shall be undertaken by a competent person at frequencies recommended by the manufacturer, or as required by local regulations (whichever is more stringent), however this should be at least annually. Equipment should also be subject to a visual inspection prior to and after each use. Records of inspections shall be maintained and, if necessary (or required by regulation), marked on the equipment.

If a contractor is undertaking the work, details of their equipment inspection systems shall be reviewed against the requirements above.

Any component with any significant defect must be withdrawn from service immediately, and should be tagged or marked as unusable, or destroyed. Examples include:

- cuts, tears, abrasions, mould, or undue stretching;
- alterations or additions which might affect its efficiency;
- damage due to deterioration;
- contact with fire, acids, or other corrosives;
- distorted hooks or faulty hook springs;
- tongues unfitted to the shoulder of buckles;
- loose or damaged mountings; non-functioning parts; or
- wearing or internal deterioration in the ropes.

Where necessary to maintain its condition and prevent deterioration, suitable facilities and arrangements shall be put in place for the cleaning and storage of fall protection equipment (e.g. harnesses shall be hung up rather than stored on the floor).

7. USE OF SAFETY NETS

7.1 Use of Safety Nets as Part of a Safe System of Work

Safety nets can be used as part of a safe system of work to arrest a person's fall. They reduce injury because they absorb a large proportion of any impact energy, which they do by suffering plastic deformation when impacted. They provide a safety system that is collective (i.e. protecting multiple workers at the same time) and passive (i.e., one that requires no input and little co-operation from the workers it is being used to protect).

Safety nets are typically used:

- to minimise injury due to falls from leading edges, through liner panels or through temporarily fixed materials in new-build roofing;
- to guard roof lights and fragile roof materials during cleaning, maintenance and replacing the roof; and

- to minimise injury from falls during roof support erection, e.g. when fitting diagonal bracing.

Nets should never be used where sharp edged objects and objects in excess of 15 kg (i.e. capable of damaging the net and affecting its performance) can fall into them. If such objects are being used then alternative arrangements need to be put in place.

Example of safety nets applied at the “leading edge” on a construction project.

7.2 Selection & Erection of Safety Nets

The selection and erection of safety nets should only be done by trained, qualified and competent personnel.

Safety nets should conform to relevant standards (e.g. *BS EN 1263-1:2002 - Safety nets. Safety requirements, test methods*).BS EN1263-1 specifies two classes (A and B) and two mesh sizes (60mm and 100mm) and although both are suitable for use in roof work, the 100mm mesh net is lighter and will, therefore, have a lower initial sag. All nets must have sacrificial test meshes / cords which are removed every 12 months for testing. At all times there should be written evidence that the net has been tested within the last 12 months. (E.g. a certificate and / or a label from the testing facility).The only time when it is valid for a net not to have a test mesh is during the last year of its life.

Nets should be set up in accordance with the requirements of *BS EN 1263-2:2002Safety nets. Safety requirements for the positioning limits*, and used only in accordance with the manufacturer’s instructions.

Nets should be fitted as close as possible to the underside of the working platform to minimise the distances and consequences of a fall. Adequate clearance must be allowed below the net (including allowing for deformation) for it to function properly and prevent a person from striking the floor or other objects in the case of a fall.

Wherever possible, rig nets to prevent falls of 2 m or less. If they are to be used to arrest falls greater than 2 m, they should have:

- an area greater than 35 m^2;
- a minimum side length (width) greater than 5 m; and
- maximum support spacing of 2.5 m.

Where these criteria cannot be met then a Class B net should be used.

Safety nets can be connected to the structure by tie ropes, attachment devices or specially designed attachment points on the structure. When rigging safety nets it is important to maintain their energy-absorbing characteristics. Too many fixing points and the net will become more rigid and imposes larger loads on the user, the structure and the net itself. Too few fixing points and the net will sag and deflect too much under load. The manufacturer's recommendations and BS EN 1263-1 should be followed on the number and spacing of fixing points. It should also be checked that the supporting structure is capable of resisting the expected anchorage loads.

7.3 Rescue

Rescue plans and associated equipment should be put in place when using safety nets. These should allow for the safe retrieval of a person who has fallen into the net.

7.4 Inspection & Maintenance

Safety nets are manufactured from synthetic materials (normally high tenacity, multifilament polypropylene) which can be damaged by improper use, handling and storage. A number of factors can result in strength loss and embrittlement, including:

- ageing, weathering and UV degradation;
- hot sparks (e.g. from grinding, welding), gases (e.g. from blow lamps), and ashes (e.g. from furnaces);
- weather (e.g. strong winds);
- significant loads or impact;
- accumulation of debris in the net;
- persons jumping or throwing objects into the net.

Safety nets and attachment systems should be properly inspected and maintained by a competent person. This should include inspection of the net system, its supporting framework and anchorages immediately following erection (when a handover certificate should be issued) and at intervals not exceeding seven days thereafter. Records of these inspections should be kept.

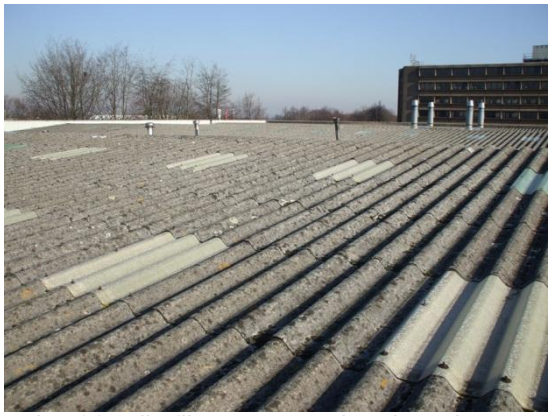
If a net has been used to arrest a fall or has been found to be defective, the area above and below the fall or defect should be cleared of operatives and should not be worked on again until a competent person advises that it is safe to do so.

8. FRAGILE SURFACES

All roofs shall be treated as fragile (a surface which would be liable to fail if any reasonably foreseeable loading were applied to it) until a competent person has confirmed that they are non-fragile. The following roofing material shall always be treated as fragile:

- fibre-cement sheets;

- roof lights;
- liner panels;
- metal corrugated sheets;
- glass; and
- chipboard.



Example of fragile fibre cement sheeting where special precautions would be needed prior to commencing work.

Falls through skylights are a common cause of fatalities during roof work. Temporary or permanent protection should therefore be used where there is a risk of fall.

Warning notices should be set up near fragile surfaces where reasonably practicable.

Wherever possible, (as with all work at height) work shall be planned to avoid the need for people to access fragile surfaces (e.g. by working from above or below the surface on a mobile elevating work platform or other suitable platform). If, however, work needs to be done on or near fragile surfaces, no matter how short the duration, then this should be done after a specific risk assessment. Controls could include combination of crawling boards/roof ladders (appropriately positioned and secured), fall restraint, fall arrest and/or other fall prevention/protection measures such as anchoring safety belts to lifelines.

It is recommended to use crawl ladders along with anchoring safety belt to lifelines while performing work on fragile roofs

Example of crawling boards used together with horizontal lifeline and lanyard.

9. MOBILE ELEVATING WORK PLATFORMS

(e.g. Cherry-pickers, scissor lifts)

This equipment if used correctly by suitably trained personnel is a safe means of accessing difficult to reach equipment and structures. However, if used inappropriately or by unqualified personnel it has been a cause of fatalities. Training on this equipment is an essential requirement, and should include theory and supervised practice. Competent personnel should be issued with a licence to permit them to operate the equipment. It is mandatory for operators and passengers to use suitable secured fall arrest equipment on entering the basket before it is elevated.

The equipment should be maintained according to the supplier's recommendations and be subject to competent independent annual inspections in addition to operator pre-start checks.

Particular attention should be paid to:

- The manufacturer's instructions and the limitations of use;
- Having a suitable level operating surface -work on any incline must be within design specification of the vehicle and there must be a means of preventing runaways;
- Environmental conditions, especially high wind;
- Use of out-riggers (where supplied);
- Hazards from overhead services;
- Having a procedure to lower the basket if the machine fails whilst in the elevated position.

Additional guidance is available in GN 33 on *Ladders and Working Platforms*.

10. WORK OVERHEAD

Where people are working overhead, there is a risk of items falling from the vicinity of the work area. A system should be in place to prevent tools, materials and other objects from falling from height.

Where helmets or bump caps need to be worn, these should be provided with chin straps to retain the helmet on the head.
The area below should be suitably barricaded with prominent warning signs to ensure that personnel below are not placed at risk.

Activities at ground level can also place the personnel working at height at risk. Consider re-routing mobile plant or place substantial barriers if there is a risk of vehicles colliding with temporary access equipment.

11. FURTHER ADVICE

Current relevant EN/ISO and British Standards in relation to working at height are listed below.

- BS 8454:2006: Code of practice for the delivery of training and education for work at height and rescue.
- BS EN 358:2000: Personal protective equipment for work positioning and prevention of falls from a height. Belts for work positioning and restraint and work positioning lanyards.
- BS 8437:2005+A1:2012: Code of practice for selection, use and maintenance of personal fall protection systems and equipment for use in the workplace.
- BS EN 12841:2006: Personal fall protection equipment. Rope access systems. Rope adjustment devices.
- BS 8513:2009: Personal fall protection equipment. Twin-legged energy-absorbing lanyards. Specification.
- BS EN 365:2004: Personal protective equipment against falls from a height. General requirements for instructions for use, maintenance, periodic examination, repair, marking and packaging.
- BS EN 795:2012: Personal fall protection equipment. Anchor devices.
- BS EN 341:2011: Personal fall protection equipment. Descender devices for rescue.
- BS EN 354:2010: Personal fall protection equipment. Lanyards.
- BS 8405:2003+A1:2009: Personal protective equipment against falls from a height. Descender devices. Single-hand operated descender devices for self or assisted rescue.
- BS EN 813:2008: Personal fall protection equipment. Sit harnesses.
- BS EN 363:2008: Personal fall protection equipment. Personal fall protection systems.
- BS EN 1497:2007: Personal fall protection equipment. Rescue harnesses.
- BS EN 1498:2006: Personal fall protection equipment. Rescue loops.
- BS EN 1496:2006: Personal fall protection equipment. Rescue lifting devices.
- BS EN 362:2004: Personal protective equipment against falls from a height. Connectors.
- BS EN 353-1:2002: Personal protective equipment against falls from a height. Guided type fall arresters including a rigid anchor line.
- BS EN 1868:1997: Personal protective equipment against falls from a height. List of equivalent terms.
- BS ISO 22846-2:2012: Personal equipment for protection against falls. Rope access systems. Code of practice.
- BS ISO 22846-1:2003: Personal equipment for protection against falls. Rope access systems. Fundamental principles for a system of work.
- BS 7985:2009: Code of practice for the use of rope access methods for industrial purposes.

- BS EN 1263-1:2002 - Safety nets. Safety requirements, test methods.
- BS EN 1263-2:2002 - Safety nets. Safety requirements for the positioning limits.
- BS 8411:2007 -Code of practice for safety nets on construction sites and other works.

Relevant standards from the American National Standards Institute (ANSI):

- A1264.1-2007, Safety Requirements for Workplace Walking/Working Surfaces and Their Access; Workplace Floor, Wall and Roof Openings; Stairs and Guardrail Systems. Sets forth safety requirements for areas where danger exists of persons or objects falling through floor or wall openings, platforms, runways, ramps, and fixed stairs, in normal, temporary, and emergency conditions. This standard applies to industrial and workplace situations and is not intended to apply to construction, residential, or commercial occupancies except where necessary maintenance or work station access may be required.
- ANSI Z359.1-2007, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Component. Establishes requirements for the performance, design, marking, qualification, instruction, training, inspection, use, maintenance, and removal from service of connectors, full body harnesses, lanyards, energy absorbers, anchorage connectors, fall arresters, vertical lifelines, and self-retracting lanyards comprising personal fall arrest systems for users within the capacity range of 130 to 310 pounds (59 to 140 kg).
- ANSI/ASSE Z359.2-2007, Minimum Requirements for a Comprehensive Managed Fall Protection Program.
- ANSl/ASSE Z359.3-2007, Safety Requirements for Positioning and Travel Restraint Systems.
- ANSI/ASSE Z359.4-2007, Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components.
- ANSl/ASSE Z359.6-2009, Specifications and Design Requirements for Active Fall Protection Systems.
- ANSI/ASSE Z359.12-2009, Connecting Components for Personal Fall Arrest System.
- ANSI/ASSE Z359.13-2009, Personal Energy Absorbers and Energy Absorbing Lanyards.
- CSA Z259.14-2007, Fall Restrict Equipment for Wood Pole Climbing.
- ASTM F887-11, Standard Specifications for Personal Climbing Equipment.

General Guidance:

- INDG367 Guidance on Inspecting Fall Arrest Equipment Made from Webbing or Rope, 2002, UK Health & Safety Executive.
- Guidance on inspecting personal fall protection equipment Technical Guidance Note 3: The Work at Height Safety Association, 2006, www.wahsa.org.uk.
- National Code Of Practice For The Prevention Of Falls In General Construction, Australian Safety & Compensation Council 2008.
- Height Safe – Absolutely Essential Health & Safety Information for People Who Work at Height, UK Health & Safety Executive.

- ACR[CP]003:2008 Rev1 - Recommended Practice For Use Of Safety Nets For Roof work, Advisory Committee For Roof Safety.
- ACR[CP]007:2008 Recommended Practice For Use Of Horizontal Safety Lines In Roof work, Advisory Committee For Roof Safety.

- ACR[M]001:2011 Test For Non-Fragility of Profiled Sheeted And Large Element Roofing Assemblies [fourth edition], Advisory Committee For Roof Safety.
- ACR [M] 002:2009 Testing Of Roof Anchors on Roof Systems, Advisory Committee For Roof Safety.
- ACR [CP] 002:2012 Guidance Note For Safe Working On Fragile Roofs Or Roofs With Fragile Elements, Advisory Committee For Roof Safety.
- ACR (CP) 005:2006 Guidance Note For Competence and General Fitness Requirements to Work On Roofs, Advisory Committee For Roof Safety.
- ACR (CP) 006:2009 Practical Methods Of Providing Edge Protection For Working On Roofs.

Organisations:

- Advisory Committee For Roof Safety, www.roofworkadvice.info. (The UK's leading authority on roofwork and roof safety).
- Fall Arrest Safety Equipment Training (FASET), www.faset.org.uk/. (FASET is the trade association and training body for the safety net rigging and fall arrest industry, worldwide).
- Work atHeight Safety Association (WAHSA), www.wahsa.org.uk. WAHSA acts as the UK lead body representing the interests of manufacturers, assemblers, installers, distributors and end users of personal protection equipment used for work at height and rescue.
- Prefabricated Access Suppliers' and Manufacturers' Association (PASMA), www.pasma.co.uk. The UK's lead trade association for the mobile access tower industry.

DEFINITIONS

Definitions of key terms used in this document are shown in the following table.

Term	Definition
Anchorage / anchor point	An anchorage is a secure point of attachment for lifelines, lanyards or deceleration devicesand which is independent of the means of supporting or suspending the employee.
Barricading	A physical barrier that prevents inadvertent access to an area e.g. handrails, access doors and gates or similar installations, temporary or permanent. Barrier tape does not qualify as barricading.
Body belt	Means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.
Body harness	A design of straps which may be secured about the employee in a way which distributes the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.
Connector	A device which is used to couple (connect) parts of the system together. It may be an independent component of the system (such as a carabiner), or an integral component of part of the system (such as a buckle or dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).
Deceleration device	Any mechanism, such as a rope grab, ripstitch lanyard, specially woven lanyard, tearing or deforming lanyard, or automatic self-retracting-lifeline/lanyard, which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on an employee during fall arrest.
Deceleration distance	The additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.
Demarcation	Any method that indicates that an area is used for a specific purpose or that access is restricted. Examples are barrier tape, painted lines on floor surfaces and portable signs denoting drop zones or no access past a specific point.

Term	Definition
Employee	An individual who is engaged to work directly for Vedanta on either a part-time or full-time basis and for a fixed period or on a permanent basis and is salaried. By virtue of the individual's contract of employment, the employee is obliged to adhere to Vedanta's terms and conditions of employment (specific to Group or the subsidiary employing the individual), and is protected by national (where it exists) and international laws concerning labour and working conditions.
Fall arrest system	Means the use of multiple, approved safety equipment components such as body harnesses, lanyards, deceleration devices, droplines, horizontal and/or vertical lifelines and anchorages, interconnected and rigged so as to arrest a free fall.
Fall prevention	Means the design and use of a fall prevention system such that no exposure to an elevated fall hazard occurs. This may require more than one fall prevention system or a combination of prevention or protection measures.
Formal Training	Recognised, accepted and prescribed training with a set and replicable structure.
Free fall	The act of falling before the personal fall arrest system begins to apply force to arrest the fall.
Free fall distance	The vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, lifeline and lanyard elongation but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.
Hazard	An object, property or an activity that can cause negativeeffects e.g. a high voltage electricity supply or a toxic chemical may present a hazard, meaning that they present the potential for harm.
Inertia reel	A mechanical device that arrests a fall by locking onto a drop line and at the same time allows freedom of movement.
Lanyard	A lanyard is a flexible line of rope, wire rope, or strap (webbing) which is used to secure the body or belt body harness to a deceleration device, lifeline, or anchorage.
Lifeline	A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.
Operation(s)	A location or activity that is operated by a Vedanta Company and is part of the Vedanta Group. Locations could include mines, refineries, ports or transportation activities, wind farms, oil and gas development sites, offices including corporate head offices, and research and development facilities.
Personal fall arrest system	A system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Term	Definition
Risk	The effect of uncertainty on objectives (as defined by the ISO 31001 Standard). Uncertainties include events (which may or not happen) and uncertainties caused by a lack of information or ambiguity.
Risk assessment	The formal process of identifying, assessing and evaluating the health and environmental risks that may be associated with a hazard.
Rope grab	A deceleration device which travels on a lifeline and automatically frictionally engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/lever locking, or both.
Safety Net	Safety nets are used on construction sites and similar works to arrest a person's fall. They reduce injury because they absorb a large proportion of any impact energy, which they do by suffering plastic deformation when impacted, thus dissipating the energy with minimum rebound.
Scaffold	Any temporarily located, elevated platform used for supporting employees and contractors or material in the course of any and all types of work.
Self-retracting lifeline/lanyard"	Adeceleration device which contains a drum wound line which may be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.
Snap-hook	A connector comprised of a hookshaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snap-hooks are generally one of two types: 1. The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or 2. The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection.
Suspension trauma	Also known as syncope or "orthostatic shock while suspended" - restriction in blood flow caused by the suspended weight of the body in the harness leads to a sudden transient loss of consciousness with spontaneous recovery. This can lead to brain damage due to lack of blood flow (and thus oxygen). If maintained in a vertical position, this can be fatal in as little as 10 minutes. An additional risk is "reflow syndrome", where toxins build up in the pooled blood and on release of the patient from the harness those toxins quickly flow into the body in high concentrations, causing arrest.
Tie-off	The act of an employee, wearing personal fall protection equipment, connecting directly or indirectly to an anchorage. It also means the condition of an employee being connected to an anchorage.
Vedanta Company	A subsidiary of Vedanta Group either fully or majority owned that has its own management structure (e.g. Hindustan Zinc Limited, Vedanta Aluminium Limited, Sterlite Industries Limited, etc.)

RELATED DOCUMENTATION

A summary of the references and supporting documents relevant to this document is provided in the following table.

Doc. Ref.	Document name
POL 06	HSE Policy
TS 06	Supplier and Contractor Management
VED/CORP/SUST/MS 1	Leadership, Responsibilities and Resources
VED/CORP/SUST/MS 3	New Projects, Planning Processes and Site Closure
VED/CORP/SUST/POL 5	Supplier and Contractor Management
VED/CORP/SUST/MS 6	Competency, Training and Awareness
VED/CORP/SUST/MS 9	Documentation and Records Management
VED/CORP/SUST/TS 10	Safety Management
VED/CORP/SUST/MS 11	Incident Reporting and Investigation
VED/CORP/SUST/MS 12	Auditing and Assurance
VED/CORP/SUST/TS 13	Emergency and Crisis Management
VED/CORP/SUST/MS 14	Management Review and Continual Improvement
GN 01	Incident Investigation
GN 07	Risk Assessment
GN 10	PPE
GN 14	Health and Safety Management Systems
GN 19	Permit to Work
GN 33	Ladders and Platforms