# Standard Operating Procedure For Working at Height

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# Working at Height

## Purpose

The purpose of this procedure is to provide guidelines for working at height activities to protect people from a fall and/or equipment falling from heights.

## Scope

This procedure is applicable to all work performed by BECIS and their EPC/O&M contractors who intend to work at a height of 2 meter or more above ground level.

## Introduction

Risk arises in roof top work activities should be identified on the 3 parameters, people, plant, and procedure. Risk analysis has been done to cover these 3 parameters with all phases of work and requirement of this procedure has been identified for safe execution of height work. This procedure is relevant for construction, operation, and maintenance work at a height of 2 meter or more above ground level (e.g., installation of solar equipment, inspection, repair, maintenance, module cleaning work, etc.). It contains salient points on how to plan and work safely on roof operations such as:

- key considerations in planning roof work.
- fall hazards in various stages of roof work.
- control measures against fall from height.
- administrative controls, and,
- personal protective equipment (PPE).

## Roles and Responsibilities

1. Project/Operations Manager - Managers in all construction and operational areas and BECIS worksites are responsible for ensuring the effective implementation of this procedure at sites. This includes:

    - Providing adequate resources to enable the effective implementation of this procedure to control and manage risks associated with work at height activities.
    - Ensuring all height work activities have been adequately risk assessed and the appropriate controls have been implemented before providing authorisation for the activity to commence.
    - Communicating with Site in-charge to ensure the provision of necessary trainings and implementation of this procedure.
    - Ensuring compliance with this working at height procedure for all employees, contractors, project/operational sites, and facilities under BECIS control.

2. Site in-charge / Site Safety Officer - Site in-charge and/or Site Safety Officer at BECIS worksites are responsible for ensuring that risks associated with height work activities are managed, including:

    - Ensuring compliance with height work requirements for all employees, contractors, project/operational sites, and facilities under their control.
    - Undertaking risk assessments of all height work and implementing adequate control measures to reduce the risk of these activities prior to its approval.

- Providing instruction about risks associated on height work during routine trainings and toolbox talks.
- Must ensure emergency response contact numbers are communicated to workers/working Manpower.
- Must maintain all records, including risk assessments, training registers, checklists, etc.

3. Working Manpower - All working Manpower must ensure that they:

   - Follow the requirements detailed in this SOP and associated documents.
   - Communicate with relevant Site in-charge/Site Safety officer before undertaking any activity and seek approval.
   - Carry emergency contact details when completing any height work activity.
   - Wear, when required, and in the manner instructed, the appropriate PPE supplied.
   - Report any incidents, injuries, unsafe working conditions, near miss cases immediately to their Site in-charge and support in accident investigation process.

4. EPC/O&M Contractors - At all times when performing work on BECIS site or for/on behalf of BECIS, contractors must comply with BECIS's working at height requirements detailed in this and related procedures and must report any unsafe observation to the relevant Project Manager.

5. Visitors – Always when visiting BECIS work area, visitors must be accompanied with BECIS Site In-charge / Site Safety Officer and follow the instructions provided by them

## Identifying fall hazards - work on roof

Roof work consists of construction and installation of lifeline, walkways, guardrails around roof edges, structure and modules installation, inverters and cabling connection, material movement to roof, module cleaning activity, etc. Therefore, it is essential that the hazards associated with the roof work activities are recognised and understood by all the relevant manpower of the EPC and O&M contractors. Site specific risk assessment should be conducted for roof work prior to commencement of the work and based on it, specific Work Instructions (WI) may require to be prepared and followed in addition to this procedure.

The type of fall hazards depends on several factors, such as:

- roof type or profile
- roof slope
- roof height
- duration, frequency, and nature of work.
- staff competency and training

*Industrial building with skylight*

*Metal roof of industrial*

Fall hazards have to be identified during different phases of work, including access to the roof, working on roof, and transfer and placement of work materials to the roof.

## Access to Roof

Safe access to the roof must be carefully planned in order to select the most appropriate method and equipment. Some examples of potential fall hazards could arise from:

- Gaps between scaffold / mobile roof access and roof edge when crossing over to the roof from the scaffold (should not be more than 300 mm).
- Lack of secure handholds when transiting from the ladder onto the roof. This may occur if the ladder does not extend sufficiently from the roof landing (ladder should extend at least 1 m higher).
- Lack of access control to prevent unauthorised access to roof (e.g., permit-to-work [PTW] system).

## Working on Roof

Some examples of potential fall hazards when working on roof includes:

- Falling over an unprotected edge on a roof or from part of a roof structure into nonsecure roof openings.
- Falling through an unprotected or fragile skylight or unstable roof surface (e.g., skylights).
- Slipping on wet or smooth roof surface especially on pitched roofs.

## Transfer and Placement of Work Material

Potential hazards include fall of material from heights, injury to manpower involved in the activity. Well-planned material handling and placement have a significant impact on roof work safety as they can:

- Reduce the amount of time spent working on the roof.
- Reduce the amount of travelling around the roof to collect materials.
- Reduce the possibility of work materials falling off the roof and injuring the person below.

When planning to store materials on the roof, the EPC/O&M contractor should check and ensure that the existing roof structure can support the bulk weight of the materials. If lifting operations by crane is required, it should be carried out by competent manpower and using licenced equipment.

All the lifting equipment must be checked for the required load bearing capacity and any physical defects. All the inspection/testing documents of lifting tools and tackles must be verified as per the legal compliance prior to start operations.

## Competency and Training

Roof work is a high-risk activity, and it is essential that the EPC/O&M contractors chosen to carry out the work are competent to do so. For this, all the EPCs and O&M contractors are evaluated on EHS parameters as per **BECIS Contractor HSE Performance Management Procedure** in the bidding stage and will be evaluated later on project completion to understand their EHS performance and need for improvement (if any).

The key aspects EPC/O&M contractor manpower should be able to demonstrate are:

- Sufficient knowledge of the particular type of roof work they are engaged to carry out, including the relevant fall hazards and the associated risks.
- Sufficient knowledge and experience on the latest techniques, standards, and materials to enable them to carry out the work safely.
- Medically fit for work at height and other construction activities.

Implementation of fall control measures relies on the working manpower's competency and discipline, and to ensure that these measures are used consistently and effectively, a trained supervisor should always be at the work site to ensure that the fall control measures are properly set up and are used correctly by the working manpower. BECIS specific training (train the trainer) for work at height activities should be carried out as per the requirements in the training matrix. Training calendar to train the working manpower shall be prepared considering project schedule and completed prior to new workforce commencing any works. Induction training shall be provided to all the working manpower upon their joining the work site. Work specific trainings shall be planned and conducted as per the risks identified in the HIRA and job specific requirements. Training topics shall include, but not limited to:

- Waste management
- Work permit system
- PPE management
- Housekeeping
- Safe material handling
- Safe working on electrical system

## Fall Control Measures

### Hierarchy of Control

The selection of fall control measures should be accomplished by following the Hierarchy of Control. The approach to the control measures should start from the top of the hierarchy. This means that the EPC/O&M contractor should first consider if the key risks involved in roof work can be avoided ("Elimination") before considering "Substitution" methods and so on. PPEs should be the last resort where possible. Depending on the mature of the risk level, a combination of the control measures may need to be applied. Implementation of control measures is illustrated in the following table by taking an example of working near skylight sheets.

| Type of control measures | Examples |
|---|---|
| 1. Elimination<br>Total removal of the hazards | Replacing skylight sheet with existing GI sheet as far as possible. |
| 2. Substitution<br>Replacing the hazard by one that presents a lower risk | Replacing the existing FRP skylight sheet material with polycarbonate material for load bearing at some extend |
| 3. Engineering Control<br>Physical means that limit the hazard. | Skylights to be protected with the safety screen to avoid direct contact with the skylight sheet. |
| 4. Administrative Control<br>Systems of work or work procedures that Help to reduce the exposure of workers to the risks of falling. | Warning signage<br>Toolbox briefing before work.<br>Work at height training |
| 5. Personal Protective Equipment<br>Equipment or devices used by workers as protection against the hazard. | Full body harness with lifelines. |

Considering site specific situations, elimination and substitution may not be possible for height work activities and so BECIS relies on implementation of engineering controls as far as possible. As such, installation of temporary/permanent lifeline, walkways, guardrails, and skylight protection should be as per **BECIS Design for Safety Standards**. No roof work activity should be initiated prior the installation of these safety equipment and **Pre-work roof safety checklist** to be shared to seek an approval on roof activities.

## Safe Access onto Roof

Safe access to roof requires careful planning, particularly when work is conducted on the roof. Common means of access onto roofs include:

- Fixed permanent access (cage ladders, metal staircase, RCC staircase)
- Mobile permanent access (scaffolds, movable ladders)

## Fixed permanent access (ladders and staircase)

Fixed permanent access includes cage ladders, metal staircase and RCC staircase. Person on ladder should maintain three points of contact at all times, for example, two feet and one hand; or two hands and one foot. Always use a full body harness while ascending/descending through cage ladder. Full body harness should be anchored to the rung of the cage ladder while ascending/descending through it. All the ladders and staircase landing areas should be free from any material storage as it will block egress in case of an emergency. All types of ladder should be checked on quarterly basis as per the ladder inspection checklist. Before every use, a visual check should be carried out for:

- visible defects
- ladder rungs for slip hazards

## Mobile permanent access (scaffold and movable ladder)

All hired and fabricated scaffold and/or movable ladder design should be verified by BECIS. Ensure only BECIS approved equipment is installed and used at site. Secure the scaffold/movable ladder as close as possible to roof edge. The crossover gap maintained between roof and

scaffold/movable ladder should not be more than 300 mm. Wheel lock should be applied at all times except while in motion. No manpower should be on scaffold/movable ladder platform while in motion. Always ensure the platform maximum manpower limit.

### Roof Surfaces with Skylights

Roof with skylights should be identified and the stability and the need for additional protection should be assessed before starting any roof work. EPC/O&M Contractor should:

- Conduct a visual check without stepping on the roof where possible. If access onto roof is inevitable, provisions for temporary fall protection measures including Full body harness with adequate anchorage along access route should be provided.
- Provide warning signage or clear demarcation around the identified skylight roof surfaces.
- Warning signs are displayed at access points to any work area where skylight is present and are fixed securely in a position where they will be clearly visible to persons accessing the working area; and
- Implement a buddy system – if a person is required to work on or from a roof where skylight is present, it is important to ensure that there is another person present at all times when work is being performed on a brittle roof for case of an emergency.

### Working on Roofs with Skylight

All the skylight to be protected with the safety mesh per **BECIS Design for Safety (DFS) Standards** to protect fall of a person/skylight breakage. If possible, arrange the work to avoid working on or passing near skylight. This applies to all operations on the roof, whether construction, maintenance, repair, cleaning, etc. Full body harness to be used all the time when working on roof as appropriate. They also rely on discipline, training, and supervision to make sure that they are used consistently and correctly.

### Measures against Falling off Edge of Roof

When working on roof, it is essential to protect workers from falling from roof edge, falling through skylight and/or any roof opening. All the roof openings to be barricaded to prevent fall of a person/material. “Edge protection” is the term commonly used to describe measures that can be used to prevent workers falling from roof edge. There are a number of popular systems such as:

- Skylight / roof opening protection
- Guardrail
- Lifeline

The most appropriate system depends on roof slope and to be implemented per **BECIS Design for Safety (DFS) Standards**.

## Administrative Controls

Administrative controls are system of work or work procedures that help to reduce the exposure of workers to the risks of falling. However, the effectiveness of such controls depend heavily on the manner of implementation on-site over time. Administrative controls may also be used to support or used in conjunction with other control measures that are put in place. The two key administrative controls include Permit-to-work (PTW) system and Safe operating procedures

(SOP). Specific work instructions (WI) may need to be developed depending on the nature of the project site.

## Travel Restraint System

A travel restraint system is a system that allows a worker to carry out their job but prevents them from reaching any position from which they could fall. A travel restraint system:

- Consists of a Full body harness or belt, attached to one or more lanyards, each of which is attached to a lifeline; and
- Is designed to restrict the travelling range of a person wearing the Full body harness or belt so that the person cannot get into a position where the person could fall off an edge of a surface or through a surface.

Lifeline is used as a travel restraint on GI sheet roof. Travel restraint systems can be used in conjunction with other fall protection methods such as guardrails. Lifeline system prevents a person to go to roof edge unless the use of extended lanyard. Lifeline is also designed to sustain falls. All the time when working on a roof, person should be anchored to the lifeline.

In the initial construction stage, work activities to be carried out only after the installation of lifeline (temporary or permanent) and ensure each manpower is attached to the lifeline by means of Full body harness. All the safety equipment installation should be installed prior to start construction activities on rooftop. Pre-work roof safety checklist to be filled and shared with the EHS Manager for the approval to start construction activities on roof. All the PPEs site manpower is using must be validated by site EHS officer for its effective protection functioning.

## Annexure / Reference Documents:

- Project Safety Plan
- Pre-work roof safety checklist
- BECIS Design for Safety (DFS) Standard
- OH&S Risk Analysis Register
- Standard Operating Procedures (SOP)
- Inspection Checklists