EXPRO National Manual for Projects Management

Volume 11 ,Chapter 2

Project Roofing Work Procedure

Document No. EPM-KSS-PR-000029 Rev 003

Document Submittal History:

Revision:	Date:	Reason For Issue
000	21/09/2017	For Use
001	03/12/2017	For Use
002	04/12/2018	For Use
003	09/08/2021	For Use

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1.0 PURPOSE

The purpose of this Procedure is to outline the safe requirements that all personnel must abide by when working on roofs. At no time, shall personnel who have to work on a roof be put at risk. Personnel shall have an understanding the contents of this Procedure and use this as a guide to ensure the correct controls for the potential of falls be implemented.

2.0 SCOPE

The scope of this procedure applies to all works performed under all Government Construction Contracts executed throughout the Kingdom of Saudi Arabia.

3.0 DEFINITIONS

Definitions	Description
JHA	Job Hazard Analysis
Inertia Reel	Self-retracting lifelines is a device designed for **fall** prevention. These are designed with a quick activating braking system.
Fall Restraint	Is preventing the worker from accessing the potential hazard
Fall Arrest	Protects the worker who is already in the process of falling by stopping the fall after it has happened
Lanyard	A flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device life line or anchorage. Means a rope, suitable for supporting one person. One end is fastened to a safety belt or harness and the other end is secured to a substantial object or a safety line
Roof Pitch	Is a numerical measure of the steepness of a **roof**
STARRT	Safe Task Analysis and Risk Reduction Talk
SWMS	Safe Work Method Statement
OSHA	Occupational Safety and Health Administration
HSSE	Health, Safety, Security and Environment
JHA	Job Hazard Analysis
SWMS	Safe Work Method Statement
WMS	Work Method Statements
HVAC	Heating Ventilation and Air-Conditioning
LPG	Liquefied Petroleum Gas
PPE	Personal Protective Equipment

4.0 REFERENCES

- OSHA 29CFR 1910 Subpart D Walking-Working Surfaces
- OSHA 29CFR 1910 Subpart I Personal Protective Equipment
- OSHA 29CFR 1926 Subpart E Personal Protective and Life Saving Equipment
- OSHA 29CFR 1926 Subpart G Signs, Signals, and Barricading
- EPM-KSS-PR-000001 Project General Safe Working Requirements Procedure
- EPM-KSS-PR-000004 Project Fire Prevention and Protection Procedure
- EPM-KSS-PR-000005 Project Fall Protection Procedure
- EPM-KSS-PR-000014 Project Emergency Preparedness Procedure
- EPM-KSS-PR-000016 Project Hazardous Work Permit Procedure
- EPM-KSS-PR-000028 Project Floor and Wall Openings Procedure
- EPM-KSS-PR-000030 Project Safety Watches Procedure
- EPM-KSS-PR-000033 Project Scaffold Control Management Procedure

5.0 RESPONSIBILITIES

A commitment to working injury-free is required of Project personnel. The individual actions of leaders and workers will establish the minimum standards to provide for safe work execution and compliance with HSSE (Health, Safety, Security and Environment) requirements.

5.1 Construction Site Manager

The Construction Site Manager is responsible to verify adequate resources, people, equipment, and training are made available to facilitate compliance with the requirements of this Procedure and for verifying that the requirements of this Procedure are effectively implemented.

5.2 Site HSSE Manager

The Site HSSE Manager is responsible for the development, and for the assessment of the Project's compliance requirements.

5.3 Contractor Superintendent

The Contractor Superintendent is responsible for coordinating and monitoring compliance with the requirements of this Procedure. He shall be knowledgeable in the requirements of this Procedure and shall verify that the plans, processes, provisions, instructions, and practices comply with these requirements.

5.4 Contractor Emergency Response Supervisor

The Contractor Emergency Response Supervisor is responsible for:

- Coordinating and monitoring the compliance with the emergency response requirements of this Procedure.
- Verifying that the plans, processes, provisions, instructions, and practices comply with these Emergency Response requirements.
- Providing and participating as applicable in Work at Height rescue response training and exercises.
- Procuring and maintaining supplied Work at Height rescue equipment.

5.5 Contractor General (including Subcontractor)

Subcontractor's responsibilities include:

- Conducting risk assessments to identify and mitigate fall hazards, and develop safe work procedures in conjunction with employees for work at height.
- Eliminating the potential for falls by installing permanent accesses and fall prevention devices, as a priority during construction.
- Exhausting all feasible work-at-grade alternatives before beginning work at height.
- Planning activities to eliminate or reduce the exposure to employees to work at height.
- Ensuring that employees are provided with the necessary equipment to perform their tasks.
- Ensuring applicable employees are trained and competent in the proper use, care, and storage of fall prevention devices.
- Inspecting work-at-height equipment to ensure that it is safe to use.
- Implementing a register and documenting inspection for all fall protection equipment on-site and ensure it is kept up to date on a quarterly basis.
- Ensuring trained and competent personnel are readily available and have the correct self- rescue equipment at the work location.

5.6 Contractor Responsible Person (Supervisor)

The Contractor Responsible Person is directly responsible for directing personnel in relation to this Procedure (e.g., trade leading hand). Their responsibilities include:

- Identifying, assessing and controlling the risks to workers from hazards in relation to a fall from one level to another.
- Ensuring persons using fall-arrest systems do not work alone and remain 100% tied off.
- Planning elevated work and verify that required safe access, safe work platforms, and appropriate anchorages are ready for use.
- Ensuring personnel performing work-at-height are competent in the roles for which they are responsible. Persons working at height shall be trained in the proper use, maintenance and inspection of the equipment they will be required to use.
- Monitoring activities in elevated areas and maintain compliance with this plan.

5.7 Contractor Competent Person

The Contractor Competent Person responsibilities include:

- Installing, maintaining, and inspecting the components of fall injury prevention systems at regular intervals, as defined in this procedure and in applicable regulations, codes and standards.
- Tagging and removing from service any fall injury prevention equipment that is defective, worn or damaged.

5.8 Project Personnel

All Project personnel are responsible and accountable for complying with the requirements set forth in this Procedure. In addition, all Project personnel are responsible for the following:

- Actively participating in the risk assessment process and development of Safe Work at Height JHAs, STARRT.
- Using the fall prevention or protection systems provided at all times when working at heights
- Inspecting fall protection equipment prior to use and reporting any defects to Supervisor.
- Storing equipment in a manner that prevents damage.

6.0 RISK ASSESSMENT

A Risk Assessment (SWMS) shall be completed by Responsible Supervisor for any person undertaking work at heights. Responsible Supervisor shall conduct this risk assessment for the assigned scope of work and develop plans and procedures to eliminate and or control fall hazards.

The design and planning considerations include, but are not limited to the following, and should be addressed as applicable in SWMS' and JHAs:

- Installation of guard rails to perimeter structural members prior to erection
- Pre-fabricating modules/structures on the ground, before lifting them into position
- Safety mesh installation (dropped object protection)
- Use of purling trolleys to stack and move roof sheeting across the roof structure during installation
- Installation of appropriate fall protection, restraint or prevention equipment for maintenance on the finished building
- Responsible Persons are to evaluate work for fall exposures; develop JHAs; and pre-plan and install fall prevention systems where practicable.

An integral aspect of the work planning process is the performance of a proper risk assessment. Risk Assessments must be conducted at the Planning Stage to identify the hazard risks and determine control measures.

The Risk Assessments that shall be conducted at the Planning Stage are as follows:

- Project Risk Assessment.
- Work Method Statements (WMS)
- Job Hazard Analysis (JHA).
- Safety Task Analysis and Risk Reduction Talk (STARRT).

The Contractor will conduct a risk assessment for the roof work to be undertaken. The risk assessment will be produced and/or agreed to by the Superintendent. The risk assessment should identify hazards caused by the structural integrity of the roof, such as:

- The capability of the roof to support the intended loads.
- Overhead power lines.
- Fragile material.
- Roof lights made of glass or other translucent material.
- HVAC or exhaust outlets that may emit toxic or noxious gas or smoke.
- Antennas/communications equipment emitting an electromagnetic field, or lasers.

The risk assessment will include the measures to be used to provide fall prevention, fall protection of people and materials, and the protection of workers on lower floor levels and the public. The standards to be met are as follows:

- Low-slope roofs (having a slope less than or equal to 1:3, 1 vertical to 3 horizontal) with unprotected sides and edges 1.83m or more above lower levels will be protected by guardrail systems, safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and personal fall arrest system or warning line system and safety monitoring system. Exception: On low slope roofs 15.2m wide or less, the use of a safety monitoring system alone (i.e., without the warning line system) is permitted.
- A steep roof (having a slope greater than 1:3, 1 vertical to 3 horizontal) with unprotected sides and edges 1.83m or more above lower levels will be protected by guardrail systems with toe boards, safety net systems, or personal fall arrest systems.
- A guardrail system will be installed and maintained at the perimeter of all open sides that present a fall exposure of more than 1.83m.

7.0 PROCESS

7.1 Planning

Primary fall protection systems are those that provide walking and working surfaces in elevated areas which are free from floor openings and are equipped with guard rail systems on all open sides, with self-closing doors/gates for ladder openings or other points of access when required. If people are required to work in areas where there is the risk of falling, Supervisor or Competent Person shall provide a safe method for people to get to and from and move around that work area. This should consider the tools and equipment which people will be required to carry, to, from and around the work area and areas where plant is being used.

- The Supervisor or Competent Person should provide information and details of the integrity of the roof structure and capability for support and stipulate the maximum weight during work.
- On new builds, the Competent Person should ensure the designer has made provisions in the design for edge protection during roof work. This may be integral to the permanent work for access to conduct future maintenance work by the client. The installation of permanent edge protection should be considered during construction scheduling.
- A supervisor will closely monitor roof access during inclement weather.
- Roof access and work should generally be prohibited at night unless appropriate and adequate illumination is provided and forecast weather conditions are not adverse.

7.2 Access to and Egress from Work Areas

In providing safe access to and egress from and movement around a work area, SWMSs or JHAs should include the following as applicable:

- The installation of fixed work platforms, walkways and stairways.
- The use of temporary work platforms such as Scaffolds, and Crawl boards (however, these are not fall prevention systems and should only be used when alternative methods are not available).
- The frequency and number of people who may need to use the access to or egress from the work area. (Supervision and regular inspection shall also be conducted).
- The safety of work surfaces.

- Exposure of access ways to the weather (e.g., rain can make surfaces slippery and strong winds can cause loss of hand grip).
- The provision of adequate natural or artificial lighting to all access ways.
- The clearance of obstructions so that persons can move easily to and from the workplace.
- Safe access/egress from elevated positions in the event of an emergency or evacuation.
- Consideration is required to access how many entry and exit points are required. A Risk assessment is required to be completed and approved to determine how many.
- For emergency response, a plan is required for the retrieval of personnel from elevated areas.

7.3 Edge Protection Systems

Edge protection shall be provided and kept in place whenever there is a risk that a person could fall from any edge of a scaffold, fixed stair, landing, suspended slab, formwork or false work.

Edge protection shall comply with Reference standards as follows:

- If edge protection is to be used on roofs with pitches exceeding about 1:3 slope from the horizontal, the edge protection should be able to withstand the added impact forces.
- If access points are required for equipment (for example, a hoist), they should be protected adequately with gates, safety chains or any other means to prevent a person falling.
- Where edge protection cannot be provided SWMS and/or JHA shall identify appropriate means to provide protection, such as, construction of scaffolding, use of an elevated work platform, or workbox or similar equipment to access the work area.

Requirements for guardrails include:

The requirements for the guard rail system shall be constructed to withstand a force of:

- 600 N outwards or downwards at any point on the top rail, edge or post
- 350 N per linear meter acting outwards or downwards on the top or intermediate rail
- Where appropriate, wind loading shall be added to the above loadings.
- Top rails shall be between 900 mm and 1,100 mm above the working surface. Nominal clear distance between top and mid rail no greater than 450 mm.
- Mid rails and toe boards shall be provided, unless, wire mesh infill panels incorporating a toe board are used instead of the mid rail.
- When roof slopes are greater than about 1:3 a bottom rail above the toe board and/or infill mesh panels may be required. Both a bottom rail and infill mesh panel will assist in preventing persons and objects from sliding off the roof.

Where guard rail systems are intended to be used in conjunction with steel structures or tilt-up construction, designers and builders should plan for the guard rails and fixings (attachment hardware, plates, contact points, etc. used to secure guard rail) to be attached to the panels prior to the structures being raised from the ground.

7.4 Fall Injury Prevention Systems

Where it is not practicable to provide fall prevention measures, a fall injury prevention system is to be provided for employees exposed to a fall situation. Fall injury prevention systems include:

- Scaffolding
- Fall-arrest systems
- Restraint systems

Where system components require installation, they shall be installed by a competent person trained in the proper installation of the equipment.

8.0 ROOF WORK - IMPLEMENTATION

Roof work is a high-risk activity. Personnel must be fully briefed on all the control measures in place. Ensure STARRT briefing is performed daily and following subsequent changes to the scope of work.

Any Hot Work activities on roofs will require a permit and safety watches required. Refer to EPM-KSS-PR-000004 Project Fire Prevention and Protection Procedure and EPM-KSS-PR-000030 Project Safety Watches Procedure.

8.1 Existing Roofs - Flat Roofs and Roofs up to 10º Pitch (<1:5 slope)

- Scaffold edge protection shall be installed complete with a top guardrail, intermediate guardrail and toe boards.
- The scaffold may be erected from the ground, attached to an existing structure (if structurally sound), or erected at roof level supported counterweights.
- Where work is to be performed is at a distance from the roof edge, then barriers erected around the immediate work area will serve as fall protection.
- All roof lights and other openings must be provided with guardrails or securely covered. Where covers are provided, they shall be clearly marked "'Caution – Fragile Roof Below – Do Not Move" or "Caution – Hole Below – Do Not Move" as appropriate to the hazard. Ensure specific aspects such as these are a focal point in the STARRT briefing.
- Access and work on fragile roofs will be performed from duckboards or other type boards, 430mm wide. In addition, fall arrest equipment must be provided. Inertia reel systems or lifelines may be installed. Employees will be required to wear and attach full body harness and lanyards.
- Where it is not reasonably practicable to install full edge protection, mobile anchor points and inertia reels may be used. Consideration must be given to the load bearing characteristics of the roof and a safe method for installation.

8.2 Existing Roofs - Over 10º Pitch (>1:5 slope)

- Scaffold edge protection shall be installed complete with a top guardrail, intermediate guardrail and toe boards. An additional intermediate guardrail may be required, or the gap between the top guardrail and the top of the toe board filled in with suitable mesh screen. The scaffold should be erected from the ground, as a work platform will be required for the loading and storage of materials.
- Roof ladders and crawling boards, 430mm wide, must be installed and secured for access over the roof. Lifelines or inertia reels must be installed and full safety harnesses worn by employees.

8.3 New Roof Work

- In the case of a new structure, the risk assessment should be supplementary to the sequencing of work and the ability to tie-in edge protection onto structural steelwork before cladding or block-work.
- Edge protection must also extend gable ends.
- Engineers should consult the Supervisor or Competent Person concerning design of pre-cast and in-situ concrete roof elements and up-stands. Where a permanent guardrail is to be installed, the designed fixing and installation details could accommodate the temporary edge protection for construction.
- Where structural steel roof elements are used, the contractor should consider the attachment of edge protection and scaffold to the roof elements before the elements are lifted into position.
- It is not acceptable for open steelwork to be used as a working platform.
- During the installation of pre-cast concrete roof sections or the installation of sheeting, leading edge protection must be used such as proprietary purlin trolley devices with integral guardrails and toe-boards or inertia reel systems attached to lifelines (or other secure attachments) back from the leading edge.
- Roof openings for services and fragile roof-lights must be securely covered or guardrails installed.

9.0 MATERIAL HANDLING AND STORAGE

- Only sufficient material for a maximum for two days' work should be stored on roofs.
- All material must be secured at the end of every shift. Where necessary, ensure weather forecast is assessed and adequate protective and preventative storage arrangements made.
- Material and tools must not be stacked at roof edges unless there are no other options, in which case secure netting must be installed to cover guardrails.
- Sheets, insulation and cladding must not be used as a working platform on open steelwork.
- Waste and scrap material must be secured and removed at the end of every shift.

- Suitable systems with adequate capacity must be installed for material handling and lifting. Adequate storage space must be planned into the work process.
- Materials may not be stored within 1.83m of the roof edge unless guardrails are erected at the roof edge (netting or batter board/plywood may also be necessary for loose material).

9.1 Work Equipment and Tools

Work equipment includes:

- Hoists
- Tampers – mechanical and hand operated
- Hand tools
- Wheelbarrows
- Cartridge operated fixing tools and ammunition
- Skill saws
- Grinders
- Handheld gas blowtorches
- LPG (Liquefied Petroleum Gas) and oxygen cylinders
- Burning gear
- Blow pipes.

All work equipment driven by gasoline/petrol or diesel must stand on a drip tray. Fuel for re-fueling must be carried and stored in a safety can. Only sufficient fuel for one day's work can be stored on the roof deck.

Tools used at the leading edge of roof work must be attached to a lanyard to prevent tools falling.

9.2 Mechanical Equipment

Mechanical equipment includes all motor or human-propelled wheeled equipment except wheelbarrows and mop carts.

- Mechanical equipment and all materials in storage must be secured to prevent them from sliding off the roof or being blown off by the wind.
- Employees must be protected by safety harnesses or safety net systems when working in any area where mechanical equipment is used or stored within 1.83m of an unprotected roof edge.
- When mechanical equipment is used, or stored in other locations, employees must be protected by warning line systems, safety harnesses, or safety net systems.

10.0 TRAINING

Employees engaged in roofing work will be trained in the safety procedures to be followed to prevent a fall. Training will include, at a minimum, instruction in the following areas:

- The nature of fall hazards in the work area near a roof edge or other roof openings, such as skylights.
- The function, use, and operation of a safety harness or safety net system, warning line system, and safety monitoring systems to be used.
- The correct procedures for erecting, maintaining, and disassembling the systems to be used.
- The limitations on the use of mechanical equipment.
- The correct procedures for the handling and storage of equipment and materials.
- Contingency plan (fire, hydrocarbon release, etc.).
- The correct requirement and standards for the handling and storage of equipment and materials.
- Safe use of LPG.
- Safe use of and handling hot material and application.
- PPE (Personal Protective Equipment) requirement and actions in an emergency.
- Fire prevention.

11.0 ATTACHMENTS

1. Examples of Fall Protection Systems

Attachment 1 - Examples of Fall Protection Systems

Guard Rail

Fall Restraint System

Guard Rail Pitched Roof

Edge Protection on Pitched Roof

Static Line System