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Project Fall Protection Procedure

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1.0 PURPOSE

The purpose of this procedure is to establish minimum requirements and guidelines to provide maximum prevention/protection against falls from elevation and a minimum standard of training necessary to emphasize personnel understanding and compliance with the program. The procedure is not intended to cover every situation where risk of fall exists. Projects and business entities must develop job specific fall prevention plan for the works undertaken.

2.0 SCOPE

The scope of this procedure applies to all works performed under the National Project Management Organization throughout the Kingdom of Saudi Arabia.

3.0 DEFINITIONS

Definitions	Description
Anchorage	A secure point of attachment for lifelines, lanyards or deceleration device.
Body Harness	A strap which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist chest and shoulders with means for or attaching it on a lanyard, lifeline or deceleration device.
Competent Person	One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them
Equivalent	Means alternative designs, materials or methods that can provide an equal or greater degree of safety.
Guardrail System	Means a barrier erected to prevent employees from falling to a lower level.
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.
Lifeline	A component consisting of a flexible line for connection to an anchorage at both ends to stretch horizontally or at one end to hang vertically, and which serves as means for connecting other components of a personal fall arrest system to anchorage.
Work Area	Means that portion of a walking/working surface where job duties are being performed.
OSHA	Occupational Safety and Health Administration
CFR	Code of Federal Regulations
WMS	Work Method Statements
JHA	Job Hazard Analysis
PPE	Personal Protective Equipment

4.0 REFERENCES

- OSHA 29 CFR 1926 Subpart M-Fall Protection
- OSHA 29 CFR 1926 Subpart R Steel Erection.
- EPM-KSS-PR-000028 Project Floor and Wall Openings Procedure
- EPM-KSS-PR-000003 Project Personal Protective Equipment Procedure.

5.0 RESPONSIBILITIES

Leadership is the single largest factor for success in the establishment of an injury-free workplace. By their actions, leaders cascade, manage, and drive execution, instill operational discipline, and work to ensure that the entire workforce complies with safety and health requirements.

Commitment to working injury-free is required of all Project personnel. The individual actions of leaders and workers provides for safe work execution and compliance with HSSE requirements.

5.1 Project Site Manager

Project Manager's responsibilities include the following:

- Overall responsibility for this procedure and for supporting this process and verifying all Project entities actively participate.
- Providing the personnel, facilities, and other resources necessary to effectively accomplish this procedure.
- Providing leadership regarding HSSE requirements and expectations for Managers, Project Supervisors, Superintendents and other leadership

5.2 Project HSSE Manager

Site HSSE Manager's responsibilities include the following:

- Continuously reviewing and auditing this procedure.
- Confirming that this procedure meets the government requirements and regulations in the location of the Project facility.
- Provides HSSE advice to management, where required, on implementing the requirements of this procedure

5.3 Project Personnel

Project personnel's responsibilities include the following:

- Knowing and understanding the requirements of this Procedure that apply to the work they perform.
- Requesting additional information and further clarification before starting work if personnel receive assignments they do not understand.
- Complying and abiding by this Procedure for any work they perform as defined by the Task Risk Assessment.
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6.0 RISK ASSESSMENT

Before any Project/Work Activity/ commences it is important that Risk Assessments are completed prior to beginning any work.

Risk assessments must be conducted at the Planning Stage:

- Project Risk Assessment.
- Work Method Statements (WMS)
- Job Hazard Analysis (JHA).

It is imperative that prior to beginning of any work activity, a pre-start briefing occurs to discuss the contents of the WMS/JHA which includes mitigations of for other hazards noted by the crew at the jobsite. The

discussion shall also include job steps, expected hazards associated with the activity, and the mitigation and protection methods that shall be implemented to prevent incidents.

The Hierarchy of control shall be used to reduce the likelihood of an incident occurring.

- ***Elimination*** (Remove the Hazard)
- ***Substitution/Isolation*** (Replacing material, process or hazard with a lower risk one/ separate people from the hazard (such as through guarding, distance, etc.)
- ***Engineering Controls*** (Redesign or replacement of plant and equipment)
- ***Administration Controls*** (Procedures, training, signage)
- ***PPE*** - ***PERSONAL PROTECTIVE EQUIPMENT***

No work is to commence until the above has been implemented and signed by the relevant Supervisor in charge.

7.0 PROCESS

7.1 General Requirements

- Every effort must be made to minimize the need for work at height.
- Exposures to fall at the workplace shall be monitored at all times, a pre-plan must be prepared and required fall protection systems must be in place prior to assigning the work to employees.
- A form of Risk Assessment/Job Hazard Analysis must be in place whenever workers are assigned in elevated areas.
- Approved full-body safety harnesses (Figure 1) are to be used for employee fall protection where primary fall prevention systems are inadequate and fall exposures exist.
- Personnel traveling or working in elevated areas more than 1.8m above ground level or adjacent surface where a fall exposure exists shall make use of secondary fall protection in securing their safety lanyard (Figure 2) at all times to a structure, lifeline, or approved fall arresting device capable of supporting 2.2 tones.
- All Fall Protection Equipment prior to first use, shall be inspected by a certified rigger and recorded on the site register
- Fall protection devices must be inspected for damage and/or deterioration prior to use. Defective equipment shall be removed from service.
- Fall protection devices subjected to shock loading imposed during fall arresting shall be removed from service and destroyed.
- Fall protection devices and systems shall not be used for any other purpose other than employee safeguarding.
- Maximum use of primary fall-prevention systems such as scaffolds, aerials lifts, personnel hoists, etc. shall be made, these systems shall be equipped with complete working/walking surfaces free of floor openings, with standard guardrail systems in place and a safe means of access.
- In situations where a fall could result in impalement or other similar injury (i.e. working over a hot process, operating equipment), fall protection equipment shall be utilized regardless of the potential falling distance.
- Personnel traveling from one location to another in elevated positions shall utilize auxiliary fall protection equipment, such as static lines, perimeter guards, or other suitable means.
- Access ways, such as ladders, shall be provided for personnel who must perform work in elevated areas.
- Projects/business entities shall ensure that persons who refuse to utilize provided fall protection equipment are not allowed to work and disciplinary action is taken against those who act with negligence.
- Persons shall be provided safe access and egress to all work areas.
- Workers exposed to work at height must be medically fit for the task.

7.2 Fall Protection Systems

To achieve 100%, fall prevention, either primary or secondary fall protection systems will be used. In some instances, a combination of both may be required. When establishing whether to use primary or secondary fall protection systems, use the hierarchy of controls.

7.2.1 Primary Fall Protection System

Primary fall protection systems provide walking and working surfaces in elevated areas which are free from floor openings and are equipped with standard guard rail systems on all open sides and with closure apparatus for ladder openings or other points of access when required.

Use of such protection systems would normally eliminate the risk of falls and, subsequently, eliminate the need for any other type of fall protection methods. These systems include, but are not limited to:

7.2.1.1 Guard Rail Systems

Standard guard rail systems (Figure 3) consist of the following elements:

- A top rail 106 cm ± 8 cm above the walking/working surface.
- A mid-rail 53 cm above said surface (mid-rail must be midway between the handrail and the walking floor).
- A 10-cm tall toe board mounted at the walking/working surface.
- Guardrail system must be capable of supporting 890 N in any direction with minimum deflection.
- Upright support post spacing must not exceed 2.4 m.
- Guardrail systems must be clear of protruding parts and/or sharp edges to protect users from punctures, laceration and cloth tearing.

7.2.1.2 Floor Openings/Hole Covers

Floor opening/hole covers requirements are detailed in EPM-KSS-PR-000028 Project Floor and Wall Openings Procedure.

In summary, floor covers (Figure 4) are used to close openings and holes in floors, platforms and walkways. These covers must be capable of supporting the maximum potential load to which they may be subjected. The cover must completely cover the opening/hole and be secured against accidental displacement. These covers must be marked "FLOOR OPENING – DANGER – DO NOT REMOVE."

7.2.2 Secondary Fall Protection Systems

These systems must be worn and used as a backup to primary fall protection systems or in the absence of primary systems. Secondary fall protection systems shall include, but are not limited to:

- Safety harness/lanyard system.
- Horizontal life lines/running lines
- Vertical life lines/retractable life lines
- Other fall protective devices.

7.2.2.1 Safety Harness/Lanyard System

- Fall protection in the form of safety harnesses and lanyards must be used in situations where it is impracticable to provide primary systems.
- Whenever full body safety harnesses are used they must be secured to an anchorage point (Figure 5), running line or arrester device. Anchorages and anchorage connectors must be independent from all other uses and capable of supporting 2268 kg per employee attached.
- Full safety harnesses with thigh and shoulder straps shall be worn. The lanyard and anchorage point should limit the maximum drop to 1.8 m.

- Shock absorbers must be provided with the harness system in order to reduce the shock loading in the event of a fall.
- The fall protection lanyard shall be attached to the D-ring located in the middle back of the safety harness.
- D-rings located at the waist may only be used for positioning and with rail type ladder climbing devices.
- Work positioning assemblies are to be attached to D-rings at the harness belt location.
- All provided safety harnesses must meet ANSI (**American** National **Standards** Institute) BS (British Standard) or equivalent standards. Refer to EPM-KSS-PR-000003 Project Personal Protective Equipment Procedure.

7.2.2.2 Horizontal Life Lines

- Lifeline systems (Figure 6) are points of attachment for fall protection lanyards and must be capable of supporting at least 2,268 kg. per employee.
- Lifelines may be mounted either vertically or horizontally and are generally intended to provide mobility to personnel working elevated areas.
- As structures are erected, priority shall be given to the consideration of proper lifeline placement
- Horizontal lifelines shall be installed and maintained by a competent person knowledgeable in the rigging practices necessary to safely install and maintain the system. A minimum safety factor of 2 must be maintained at all times.
- Lifelines shall not be used for any purpose other than fall protection.
- Lifelines in use shall be inspected weekly (by the competent person who installed them) evidence records of such inspections must be maintained.
- Running line systems can be used to provide a secure anchorage point for safety harnesses.
- Running lines shall only be installed and maintained by competent persons.
- All horizontal lifelines placed in skeletal steel structures (e.g., pipe racks, etc.) shall be of one-half inch cable as a minimum and shall be secured on each end by at least three cable clamps.
- Softeners shall be placed where lifelines contact sharp edges of beams to prevent damage to lifeline.
- Synthetic rope should not be used in horizontal position if impact loads are possible.
- Synthetic rope can be used for fall restraint only such as at a roof edge where no impact load is possible.
- Intermediate supports shall be adequate to minimize sag and vertical deflection under loading.
- Horizontal lifelines should be positioned so as to provide points of attachment at least waist level or higher for personnel utilizing them.
- Lifelines shall be arranged to provide adequate mobility in all areas of the structure while maintaining 100% fall protection for personnel.
- Personnel installing lifelines shall be protected from falls at all times by use of retractable lanyards or tie off to structural steel, etc.

7.2.2.3 Vertical Life Lines/ Retractable Life Lines

Vertical lifelines are used for personnel fall protection when vertical mobility is required. These lines may be comprised of static lifelines made of synthetic fiber rope or cable equipped with approved rope grabs (Figure 7), or, they may consist of self-retracting reel type (Figure 8) attached directly to a safety harness.

***Static Rope**:*

- Static rope lifelines with rope grabs are required for each person working from sky-climbers and two-point suspension scaffolds. These types of life- lines can also be used to provide fall protection for other operations such as scaffold erection and structural steel erection where tie-off points are limited and vertical mobility is required.
- Static rope lifelines must be anchored independent of other systems at the top and be capable of supporting 2268 kg. Static rope lifelines shall be of synthetic fiber rope approved by a competent person.
- Sliding rope grabs approved for the size rope used are the only method for securing a safety lanyard to a vertical lifeline. Lanyards shall not be attached to lifelines by means of knots or loops.
- Rope grabs shall be positioned on the lifeline at least above the shoulders of the user.

Retractable Reel Life Lines/Self Reeling Arrest Devices:

- Retractable lifeline devices shall be secured by means of shackles, karabiners, and wire rope chokers or synthetic slings. Rope (synthetic or natural fiber) shall not be used to secure these devices. These attachment methods must be capable of supporting 2268 kg. impact loading.
- Each retractable lifeline device shall be equipped with a rope tag line for extending the device to elevations below the point of attachment.
- Retractable lifelines may also be used to provide fall protection to structural ironworkers during erection prior to installation of other fall protection systems.

7.2.2.4 Other Fall Protection Devices

There are other fall arrest devices, which are not self- reeling, available for use where anchorage points are limited. Such systems may allow free vertical movement as well as movement around corners and past obstacles without the need to unhook safety harnesses.

Man Lock Girder Grip Devices/Connector Toggles:

These devices are inserted into pre-drilled holes in structural steelwork and are used by steel erectors during the erection of structures.

Devices such as cable arrester and `rail lock' ladder fall arrest systems shall only be installed and maintained by competent persons.

Safety Nets:

- Safety nets (Figure 9) may be used in some situations, as secondary fall protection.
- Only qualified personnel shall install nets in accordance with the net manufacturer's specifications.
- The erection of safety nets must be carefully planned and supervised and only undertaken by properly trained operatives.
- Nets should be fitted as close to the working surface as possible, but in any case must not be lower than 1.83m below the work.
- The initial sag of the net should be 1/4 to 1/5 of the total span of the net, and as the net will be displaced vertically in the event of a fall; there must be a further clearance of a 1.8 m from the lowest point of the net.
- Nets must be inspected after any fall, prior to each use, and at regular intervals (e.g., at least weekly).

NOTE: *Whenever possible, steel erection of structures shall include the provision of permanent staircases.*

Concrete Form Tie-Offs:

These devices attach to patented concrete forms to provide an attachment point for safety lanyards. These devices are to be used when placing concrete forms at elevations 1.8 m or greater where a fall exposure exists.

7.3 Information and Training

Employees required to work at heights shall be trained in fall hazard recognition, and the use of personal fall arrest systems that are applicable.

Employees shall be retrained when the training program has been changed, fall equipment has changed, or the employee exhibits inadequacies in knowledge of fall protection or the employee exhibits inadequacies in equipment use.

The use of pre-task safety analysis is an absolute necessity to its continuing implementation and success. Not every situation in which fall exposures can appear have been addressed here.

Thorough planning, innovative, and total dedication are required to achieve 100 percent fall protection.

7.4 Inspection and Testing of Fall Protection Equipment

- A competent person must inspect personal Fall Protection equipment at least every three months.
- Fall protection equipment must be maintained so that it remains satisfactory for use during the construction period. All defects shall be recorded. Inspections data shall also be recorded.
- A competent person must examine all fall protection equipment that has been deployed in a fall and determine if it will be repaired or destroyed, as necessary (Figure 10).

***NOTE**: The requirement to inspect fall protection equipment that has been deployed in a fall to determine if it will be repaired pertains to inertial reels, karabiners, rope grabs, and other such hardware. Lanyards, and shock absorbing devices deployed in a fall cannot be re-used and should be removed from service and destroyed.*

8.0 ATTACHMENTS

1. Pictorial illustration of key fall-prevention elements.

Attachment 1 - Pictorial illustration of key fall-prevention elements

Figure 1: Full body harness

Figure 2: Standard double lanyard/shock absorber

Figure 3: Standrad guardrail system

Figure 4: Floor cover

Figure 5: Anchorage point

Figure 6: Horizental life-line system

Figure 7: Vertical life-line (Robe grap type)

Figure 8: Vertical Life-line (Inertia reel type)

Figure 9: Safety nets

Figure 10: Visual signs of harness dmage